

TENDER FOR  
KITCHEN SHELTER  
TERRA NOVA NATIONAL PARK, NL

CECON PROJECT NO. 17401  
PARKS CANADA PCA PROJECT NO. 457

JANUARY 2018

PROVINCE OF NEWFOUNDLAND AND LABRADOR

**PEG**  
Newfoundland  
and Labrador  
PROFESSIONAL ENGINEERS AND GEOSCIENTISTS

**PERMIT HOLDER**  
**This Permit Allows**

**CECON LIMITED**

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To practice Professional Engineering  
in Newfoundland and Labrador.  
Permit No. as issued by PEG D0048  
which is valid for the year 2018.



*Central Engineering Consultants of Newfoundland Limited  
Gander Newfoundland*

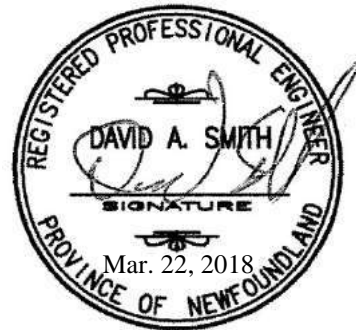
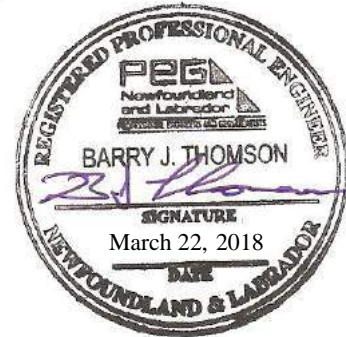
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**Terra Nova National Park  
Kitchen Shelter  
Professional Liability**

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**CECON Ltd.**

- Division 1 - General Requirements
- Division 3 – Concrete
- Division 6 - Wood, Plastics and Composites
- Division 7 - Thermal & Moisture Protection
- Division 8 – Openings
- Division 9 – Finishes
- Division 10 - Specialties
- Division 31 – Earthwork
- Division 32 - Exterior Improvements
- Division 33 – Utilities




**CROSBIE ENGINEERING LTD.**

- Division 22 – Plumbing
- Division 23 - Heating, Ventilation and Air Conditioning (HVAC)
- Division 26 – Electrical




## ELECTRICAL PERMIT

	PROVINCE OF NEWFOUNDLAND
	PERMIT HOLDER Class "A" This Permit Allows <b>CROSBIE ENGINEERING LIMITED</b>
To practice Professional Engineering in Newfoundland and Labrador Permit No. as issued by PEG-NL <u>D0123</u> which is valid for the year <u>2018</u> .	

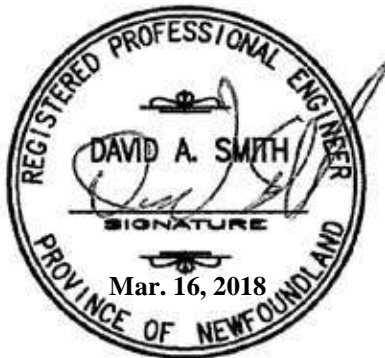
## ELECTRICAL STAMP



## MECHANICAL PERMIT

	PROVINCE OF NEWFOUNDLAND
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To practice Professional Engineering in Newfoundland and Labrador Permit No. as issued by PEG-NL <u>D0123</u> which is valid for the year <u>2018</u> .	

## MECHANICAL STAMP



**DIVISION 1 - GENERAL REQUIREMENTS**

- Section #01 11 00 - Summary of Work
- Section #01 14 00 - Work Restrictions
- Section #01 25 00 - Substitution Procedures
- Section #01 26 00 - Contract Modification Procedures
- Section #01 29 83 - Payment Procedures for Testing Laboratory Services
- Section #01 31 00 - Project Management and Coordination
- Section #01 32 00 - Construction Progress Documentation
- Section #01 33 00 - Submittal Procedures
- Section #01 35 29.06 - Health and Safety Requirements
- Section #01 35 43 - Environmental Procedures
- Section #01 35 99 - Dust Control Procedures
- Section #01 41 00 - Regulatory Requirements
- Section #01 42 00 - References
- Section #01 45 00 - Quality Control
- Section #01 51 00 - Temporary Utilities
- Section #01 52 00 - Construction Facilities
- Section #01 56 00 - Temporary Barriers and Enclosures
- Section #01 61 00 - Common Product Requirements
- Section #01 71 00 - Examination and Preparation
- Section #01 73 00 - Execution
- Section #01 74 11 - Cleaning
- Section #01 74 21 - Construction/Demolition Waste Management and Disposal
- Section #01 77 00 - Closeout Procedures
- Section #01 78 00 - Closeout Submittals

**DIVISION 3 - CONCRETE**

- Section #03 10 00 - Concrete Forming and Accessories
- Section #03 20 00 - Concrete Reinforcing
- Section #03 30 00 - Cast-in-Place Concrete
- Section #03 35 00 - Concrete Finishing

**DIVISION 6 - WOOD, PLASTICS AND COMPOSITES**

- Section #06 10 53 - Miscellaneous Rough Carpentry
- Section #06 17 53 - Shop-Fabricated Wood Trusses
- Section #06 20 00 - Finish Carpentry
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**DIVISION 7 - THERMAL & MOISTURE PROTECTION**

- Section #07 21 13 – Board Insulation
- Section #07 21 16 –Blanket Insulation
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- Section #07 26 00 - Vapour Retarder
- Section #07 27 00.01 - Air Barriers – Descriptive or Proprietary
- Section #07 31 13.13 – Fiberglass-Reinforced Asphalt Shingles
- Section #07 46 23 - Wood Siding – Prefinished
- Section #07 62 00 - Sheet Metal Flashing and Trim
- Section #07 92 00 - Joint Sealants

**DIVISION 8 - OPENINGS**

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Section #08 71 00 - Door Hardware  
Section #08 80 50 - Glazing

**DIVISION 9 - FINISHES**

Section #09 91 13 - Exterior Painting  
Section #09 91 23 - Interior Painting

**DIVISION 10 - SPECIALTIES**

Section #10 20 01 - Cast Iron Wood Stove  
Section #10 44 16.19 - Fire Extinguishers and Safety Blankets

**DIVISION 22 – PLUMBING**

Section #22 05 00 – Common Work Results of Plumbing  
Section #22 11 18.01 - Domestic Water Piping Plastic  
Section #22 13 18 - Drainage Waste and Vent Piping – Plastic  
Section #22 42 01 - Plumbing Specialties and Accessories

**DIVISION 23 - HEATING, VENTILATION AND AIR CONDITIONING (HVAC)**

Section #23 05 05 - Installation of Pipework  
Section #23 08 01 - Performance Verification Mechanical Piping Systems  
Section #23 09 33 - Electric and Electronic Control System for Electric Heating  
Section #23 31 13.01 - Metal Ducts - Low Pressure to 500 Pa  
Section #23 34 24 - Domestic Fans  
Section #23 82 33.02 - Commercial Convectors

**DIVISION 26 - ELECTRICAL**

Section #26 05 00 - Common Work Results – Electrical  
Section #26 05 20 - Wire and Box Connectors (0 - 1000V)  
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**DIVISION 31 - EARTHWORK**

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**DIVISION 32 - EXTERIOR IMPROVEMENTS**

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**DIVISION 33 - UTILITIES**

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Section #33 65 76 - Direct Buried Underground Cable Ducts

**LIST OF DRAWINGS**

SP1 of 1	Kitchen Shelter – Site Plan
F1 of 1	Kitchen Shelter – Foundation Plan
A1 of 2	Kitchen Shelter – Plans and Elevations
A2 of 2	Kitchen Shelter – Building Sections and Roof Plans
M1 of 1	Mechanical Layouts, Schedules and Details
E1 of 2	Legend & Kitchen Site Plan
E2 of 2	Floor Plans – Electrical Layouts, Panel Schedules and Details

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Section 01 11 00 – Summary of Works

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**PART 1**      **GENERAL**

**1.1**            **SECTION INCLUDES**

- .1      Title and description of Work.
- .2      Contractor use of premises.
- .3      Owner occupancy.

**1.2**            **WORK COVERED BY CONTRACT DOCUMENTS**

- .1      Work of this Contract comprises general construction of a new kitchen shelter at the Newman Sound camp grounds. The work includes but is not limited to:
  - .1      Civil, structural construction of the kitchen shelter.
  - .2      Electrical work as detailed.
  - .3      Mechanical work as detailed.
  - .4      Clearing and grubbing of vegetation around the kitchen shelter.
  - .5      Thinning and pruning all remaining trees on the island as per park staff instructions.
  - .6      Supply, place and compact Class A fill around kitchen shelter as detailed.
  - .7      Install two rock sump drainage pits as detailed.

**1.3**            **CONTRACTOR USE OF PREMISES**

- .1      Contractor has unrestricted use of site.
- .2      Coordinate use of premises under direction of Owner's Representative.
- .3      Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4      Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .5      Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Owner's Representative.

**1.4**            **OWNER OCCUPANCY**

- .1      Contractor has exclusive use of site during construction.

**1.5**            **RELATED WORK**

- .1      The following specification sections are referenced to indicate work responsibilities as specified and carried in other versions.



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- .1 Section 21 05 01 – Common Work Results for Mechanical.
- .2 Section 21 05 05 – Common Work Results for Fire Suppression.
- .3 Section 22 05 00 – Common Work Results for Plumbing.
- .4 Section 23 05 00 – Common Work Results for HVAC.
- .5 Section 25 05 01 – EMCS – General Requirements.
- .6 Section 26 05 00 – Common Work Results – Electrical.

**1.6 ON-SITE DOCUMENTS**

- .1 Maintain at job site documents as indicated in Section 01 31 00 – Project Management and Coordination.

**1.7 CONTRACT DOCUMENTS**

- .1 Legends and schedules in the Issued for Tender Drawings take precedence over the Technical Specifications with respect to products and materials identified.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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Section – 01 14 00 Work Restrictions

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**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .1      Connecting to existing services.
- .2      Special scheduling requirements.

**1.2            RELATED SECTIONS**

- .1      Section 01 32 00 – Construct Progress Documentation.
- .2      Section 01 56 00 - Temporary Barriers and Enclosures.

**1.3            EXISTING SERVICES**

- .1      Notify Owner’s Representative and utility companies of intended interruption of services and obtain required permission.
- .2      Where Work involves breaking into or connecting to existing services, give Owner’s Representative a notice of three (3) working days for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3      Provide for pedestrian and vehicular traffic.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED DOCUMENTS**

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

**1.2            SUMMARY**

- .1 Section includes administrative and procedural requirements for substitutions.

**1.3            RELATED SECTIONS**

- .1 Section 01 61 00 – Common Product Requirements.

**1.4            DEFINITIONS**

- .1 Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by General Contractor.
- .2 Substitutions for Cause: Changes proposed by General Contractor that are required due to changed Project conditions, such as unavailability of product, regulatory changes, or unavailability of required warranty terms.
- .3 Substitutions for Convenience: Changes proposed by Contractor or Owner that are not required in order to meet other Project requirements but may offer advantage to General Contractor or Owner. No substitutions for convenience are permitted.

**1.5            ACTION SUBMITTALS**

- .1 Substitution Requests: Submit one (1) copy of each request, in PDF format, for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section Number and Title, and Drawing Numbers and Titles.
  - .1 Substitution Request Form: Use form provided at the end of this section.
  - .2 Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - .1 Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - .2 Coordination information, including a list of changes or revisions needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - .3 Detailed comparison of significant qualities of proposed substitution with those of the Work specified. Include annotated copy of applicable Specification Section. Significant qualities may include attributes such as performance, weight, size, durability, visual effect, sustainable design characteristics, warranties, and specific features and requirements indicated. Indicate deviations, if any, from the Work specified.
    - .4 Product Data, including drawings and descriptions of products and fabrication and installation procedures.

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Section 01 25 00 – Substitution Procedures

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- .5 Samples, where applicable or requested.
  - .6 Certificates and qualification data, where applicable or requested.
  - .7 List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
  - .8 Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - .9 Detailed comparison of General Contractor's construction schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating date of receipt of purchase order, lack of availability, or delays in delivery.
  - .10 Cost information, including a proposal of change, if any, in the Contract Sum.
  - .11 General Contractor's certification that proposed substitution complies with requirements in the Contract Documents except as indicated in substitution request, is compatible with related materials, and is appropriate for applications indicated.
  - .12 General Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of failure of proposed substitution to produce indicated results.
- .3 Owner's Representative Action: If necessary, Owner's Representative will request additional information or documentation for evaluation within five (5) working days of receipt of a request for substitution. Owner's Representative will notify General Contractor of acceptance or rejection of proposed substitution within ten (10) working days of receipt of request, or five (5) working days of receipt of additional information or documentation, whichever is later.
- .1 Forms of Acceptance: Change Order, Construction Change Order, or Owner's Representative Supplemental Instructions for minor changes in the Work.
  - .2 Use product specified if Owner's Representative does not issue a decision on use of a proposed substitution within time allocated.

**1.6 QUALITY ASSURANCE**

- .1 Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

**1.7 PROCEDURES**

- .1 Coordination: Revise or adjust affected work as necessary to integrate work of the approved substitutions.

**PART 2      PRODUCTS**

**2.1            SUBSTITUTIONS**

- .1            Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than fifteen (15) days prior to the time required for preparation and review of related submittals.
  - .1            Conditions: Owner’s representative will consider General Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Owner’s Representative will return requests without action, except to record noncompliance with these requirements:
    - .1            Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - .2            Requested substitution provides sustainable design characteristics that specified product provided.
    - .3            Substitution request is fully documented and properly submitted.
    - .4            Requested substitution will not adversely affect General Contractor's construction schedule.
    - .5            Requested substitution has received necessary approvals of authorities having jurisdiction.
    - .6            Requested substitution is compatible with other portions of the Work.
    - .7            Requested substitution has been coordinated with other portions of the Work.
    - .8            Requested substitution provides specified warranty.
    - .9            If requested substitution involves more than one contractor, requested substitution has been coordinated with other portions of the Work, is uniform and consistent, is compatible with other products, and is acceptable to all contractors involved.
  - .2            Substitutions for Convenience: Not permitted.

**PART 3            PART 3 - EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED DOCUMENTS**

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.
- .2 The General Contractor's attention is specifically directed, but not limited, to the following documents for additional requirements:
  - .1 General Conditions of Stipulated Price Contract.
  - .2 Supplemental General Conditions.

**1.2            SUMMARY**

- .1 Section includes administrative and procedural requirements for handling and processing Contract modifications. Contractor shall develop and implement a system acceptable to Owner's Representative for the preparation, review and processing of Proposed Change Orders, contingency and allowance expenditure authorizations, Change Orders, and requests for information.

**1.3            RELATED SECTIONS:**

- .1 Section 01 25 00 - Substitution Procedures.

**1.4            DEFINITIONS**

- .1 Free Float – the maximum amount of time a scheduled activity can be delayed without delaying the early start date of any succeeding activities or violating a schedule restraint, (or the range an activity can move around without affecting the start of any activity after it.)
- .2 Total Float – the maximum amount of time a scheduled activity can be delayed or extended from its early start date without delaying the project finish date or violating a schedule restraint, (the range an activity can move around without affecting the end date of the project.)

**1.5            MINOR CHANGES IN THE WORK**

- .1 Owner's Representative will issue supplemental instructions authorizing minor changes in the Work, not involving adjustment to the Contract Sum or the Contract Time.

**1.6            OWNER INITIATED PROPOSAL CHANGES**

- .1 Owner's Representative may issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - .1 Work Proposed Change Orders issued by Owner's Representative are not instructions either to stop work in progress or to execute the proposed change.
  - .2 Within time specified in Proposed Change Order or ten (10) working days, when not otherwise specified, after receipt of Proposed Change Order, submit a quotation for cost adjustments to the Contract Sum and the Contract Time necessary to execute the change. Include a list of quantities of products required or

eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

- .1 Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
- .2 Include costs of labor and supervision directly attributable to the change.
- .3 Include an updated Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

## **1.7 GENERAL CONTRACTOR INITIATED PROPOSED CHANGES**

- .1 If latent or changed conditions require modifications to the Contract, the General Contractor may initiate a claim by submitting a request for a change to Owner's Representative.
  - .1 Include a statement outlining reasons for the change and the effect of the change on the Work. Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.
  - .2 Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
  - .3 Indicate applicable delivery charges, equipment rental, and amounts of trade discounts.
  - .4 Include costs of labor and supervision directly attributable to the change.
  - .5 Include an updated General Contractor's construction schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
  - .6 Comply with requirements in Section 01 25 00 - Substitution Procedures if the proposed change requires substitution of one product or system for product or system specified.

## **1.8 CHANGE ORDER PROCEDURES**

- .1 On approval of a Proposed Change Order for the Work, Owner's Representative will issue a Contract Change Order signed by the Owner's Representative and must be signed by the General Contractor and returned to the Owner's Representative.

## **1.9 CONSTRUCTION CHANGE DIRECTIVE**

- .1 Owner's Representative may issue a Construction Change Directive.
  - .2 A Construction Change Directive
    - .1 Instructs Contractor to proceed with a change in the Work, for potential inclusion in a Change Order.
    - .2 Contains a complete description of change in the Work.
    - .3 Designates method to be followed to determine change in the Contract Sum or the Contract Time.
- .3 Documentation:

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- .1 Maintain detailed records on a time and material basis of work required by the Construction Change Directive.
- .2 After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

**1.10 REQUESTS FOR INFORMATION (RFI)**

- .1 In the event that the General Contractor or any Subcontractor involved in the Work, determines that some portion of the drawings, specifications, or other contract documents requires clarification or interpretation by the Owner's Representative, the General Contractor shall submit a Request for Information (RFI) in writing to the Owner's Representative.
- .2 RFI's may only be submitted by the General Contractor and shall only be submitted on the RFI Form as required by the Owner's Representative. Any RFI's submitted, not on the official RFI Form will be returned to the Contractor unreviewed.
- .3 In the RFI, the General Contractor shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed from the Owner's Representative.
- .4 In the RFI, the General Contractor shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.
- .5 The Owner's Representative will review all RFI's to determine whether they are valid RFI's. If it is determined that the document is not a valid RFI, it will be returned to the General Contractor, unreviewed, with an explanation why it was deemed not valid.
- .6 A RFI Response shall be issued within ten (10) working days of receipt of the request from the General Contractor unless the Owner's Representative determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Owner's Representative, the Owner's Representative will, within five (5) working days of receipt of the request, notify the General Contractor of the anticipated response time.
- .7 If the General Contractor submits a RFI on an activity with ten (10) working days or less of float on the current project schedule, the General Contractor shall not be entitled to any time extension due to the time it takes the Owner's Representative to respond to the request provided that the Owner's Representative responds within the ten (10) working days set forth above.
- .8 A RFI Response from Owner's Representative will not change any requirement of the Contract Documents. In the event the General Contractor believes that the RFI Response will cause a change to the requirements of the Contract Documents, the General Contractor shall within five (5) working days give written notice to the Owner's Representative stating that the General Contractor believes the RFI Response will result in a Change Order and the Contractor intends to submit a "Proposed Change Order" request. Failure to give such written notice of five (5) working days shall waive the General Contractor's right to seek additional time or cost under the requirements of the Contract Documents.

**PART 2 - PRODUCTS (NOT USED)**

**PART 3 - EXECUTION (NOT USED)**

**END OF SECTION**



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Section 01 29 83 – Payment Procedures:  
Testing Laboratory Services

Issued 2008/03/18

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**PART 1**      **GENERAL**

**1.1**      **SECTION INCLUDES**

- .1      Inspecting and testing by inspecting firms or testing laboratories designated by Owner's Representative

**1.2**      **RELATED REQUIREMENTS SPECIFIED ELSEWHERE**

- .1      Particular requirements for inspection and testing to be carried out by testing laboratory designated by Owner's Representative are specified under various sections.

**1.3**      **APPOINTMENT AND PAYMENT**

- .1      Owner's Representative will appoint and the contractor will pay for services of testing laboratory.
- .2      Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Owner's Representative to verify acceptability of corrected work.

**1.4**      **CONTRACTOR'S RESPONSIBILITIES**

- .1      Provide 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 Owner's Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3      Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4      Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Owner's Representative.

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Section 01 29 83 – Payment Procedures:  
Testing Laboratory Services

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**PART 2**      **PRODUCTS (NOT APPLICABLE)**

**PART 3**      **EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**Terra Nova  
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**PART 1**      **GENERAL**

**1.1**      **SECTION INCLUDES**

- .1 Coordination work with other contractors and subcontractors under administration of Owner's Representative.
- .2 Scheduled project meetings.

**1.2**      **RELATED SECTIONS**

- .1 Section 01 11 00 - Summary of Work.
- .2 Section 01 91 13 – General Commissioning (Cx) Requirements.

**1.3**      **DESCRIPTION**

- .1 Coordination of progress schedules, submittals, use of site, temporary utilities, construction facilities, and construction Work, with progress of Work of other contractors and subcontractors under instructions of Owner's Representative.

**1.4**      **PROJECT MEETINGS**

- .1 Project meetings to be held at times and locations as determined by Owner's Representative.
- .2 Owner's Representative will arrange project meetings and record and distribute minutes.

**1.5**      **CONSTRUCTION ORGANIZATION AND START-UP**

- .1 Within ten (10) working days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Establish time and location of meetings and notify parties concerned minimum 5 days before meeting.
- .3 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 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 51 00 - Temporary Utilities.
  - .5 Delivery schedule of specified equipment in accordance with Section 01 32 00 - Construction Progress Documentation.
  - .6 Site security in accordance with Section 01 52 00 - Construction Facilities.

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Section 01 31 00 - Project Management and Coordination

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- .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
- .8 Record drawings in accordance with Section 01 78 00 - Closeout Submittals.
- .9 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .10 Take-over procedures, acceptance, and warranties in accordance with Section 01 77 00 - Closeout Procedures and 01 78 00 - Closeout Submittals.
- .11 Monthly progress claims, administrative procedures, photographs, and holdbacks.
- .12 Appointment of inspection and testing agencies or firms in accordance with Section 01 45 00 - Quality Control.
- .13 Insurances and transcript of policies.
- .4 Comply with Owner's Representative's allocation of mobilization areas of site; for field offices and sheds, for access, traffic, and parking facilities.
- .5 During construction coordinate use of site and facilities through Owner's Representative's procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.
- .6 Comply with instructions of Owner's Representative for use of temporary utilities and construction facilities.

**1.6 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 List of outstanding shop drawings.
  - .6 Change orders.
  - .7 Other modifications to Contract.
  - .8 Field test reports.
  - .9 Copy of approved Work schedule.
  - .10 Health and Safety Plan and other Safety related documents.
  - .11 Manufacturers' installation and application instructions.
  - .12 Labour conditions and wage schedules.
  - .13 Other documents as specified.

**1.7 SCHEDULES**

- .1 Submit preliminary construction progress schedule in accordance with Section 01 32 00 - Construction Progress Documents to Owner's Representative coordinated with Owner's Representative's project schedule. Schedule to show anticipated progress stages and final completion of work within time period required by contract documents.

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- .2 After review, revise and resubmit schedule to comply with project schedule requirements.
- .3 During progress of Work revise and resubmit at project progress meetings or as directed by Owner's Representative.

**1.8 SUBMITTALS**

- .1 Make submittal to Owner's Representative 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 Owner's Representative.
- .3 Submit requests for payment for review to Owner's Representative.
- .4 Submit requests for interpretation of Contract Documents, and obtain instructions through Owner's Representative.
- .5 Process change orders through Owner's Representative.
- .6 Deliver closeout submittals for review by Owner's Representative.

**1.9 COORDINATION**

- .1 Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work.
- .2 Coordinate construction operations, included in different Sections that depend on each other for proper installation, connection and operation.
- .3 Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
- .4 Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair of all components, mechanical, electrical, and otherwise,
  - .1 Provide adequate clearances for installation and maintenance of equipment.
  - .2 Install work to permit removal of parts requiring periodic replacement or maintenance.
  - .3 Arrange pipes, ducts, raceways and equipment to permit ready access to valves, cocks, traps, starters, motors, and control components.
  - .4 Doors and access panels shall be kept clear.
  - .5 Utilize space efficiently so that adequate accessibility is retained for future maintenance, repairs, modifications and additions.
  - .6 Check the locations selected for all sprinkler heads and check the Architectural reflected ceiling plans to prevent conflicts between the trades.

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- .7 Contractor is cautioned that, where specific dimensions are not indicated or where Drawings are schematic in nature, as with most Electrical and Mechanical Drawings, Contractor shall have sole responsibility to coordinate the work to meet this requirement.
- .5 Make adequate provisions to accommodate items scheduled for later installation.
- .6 Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work and completion within the specified Contract duration. Such administrative activities include, but are not limited to, the following:
  - .1 Preparation of Contractor's Construction Schedule.
  - .2 Installation and removal of temporary facilities and controls.
  - .3 Delivery and processing of submittals.
  - .4 Progress meetings.
  - .5 Start-up, check-out, and final acceptance of systems.
  - .6 Project closeout activities.
  - .7 Protection of existing and new work.
- .7 Changes required in the Work of the Contract, caused by the Contractor's neglect to coordinate the work with others shall be made at the Contractor's own expense.

**1.10 COORDINATION DRAWINGS**

- .1 Prepare coordination drawings according to requirements in individual Sections, and additionally where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
- .2 Contractor to submit to the Owner's Representative, in AutoCAD format, coordination drawings, drawn accurately to a scale large enough to indicate and resolve conflicts.
- .3 Indicating the functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
- .4 Do not base coordination drawings on standard printed data.
- .5 Indicate space requirements for routine maintenance and for anticipated replacement of components during the life of the installation.
- .6 Show location and size of access doors required for access to concealed dampers, valves, and other controls.
- .7 Indicate required installation sequences.
- .8 Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements.

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- .9 Minor dimension changes and difficult installations will not be considered changes to the Contract.
  
- .10 Owner's Representative will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination. If Owner's Representative determines that coordination drawings are not being prepared in sufficient scope or detail, or are otherwise deficient, Owner's Representative will so inform Contractor, who shall make changes as directed and resubmit.

**1.11 CLOSEOUT PROCEDURES**

- .1 Notify Owner's Representative when Work is considered ready for Substantial Performance.
  
- .2 Accompany Owner's Representative on preliminary inspection to determine items listed for completion or correction.
  
- .3 Comply with Owner's Representative's instructions for correction of items of Work listed in executed certificate of Substantial Performance and for access to Owner-occupied areas.
  
- .4 Notify Owner's Representative of instructions of items of Work determined in Owner's Representative's final inspection.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**PART 1      GENERAL**

**1.1      RELATED SECTIONS**

- .1      Section 01 77 00 - Closeout Procedures.

**1.2      SCHEDULES REQUIRED**

- .1      Submit schedules as follows:
  - .1      Construction Progress Schedule.
  - .2      Submittal Schedule for Shop Drawings and Product Data.
  - .3      Submittal Schedule for Samples.
  - .4      Product Delivery Schedule.
  - .5      Cash Allowance Schedule for purchasing Products.
  - .6      Shutdown or closure activity.

**1.3      FORMAT**

- .1      Prepare schedule in form of a horizontal bar chart.
- .2      Provide a separate bar for each major item of work, trade or operation.
- .3      Split horizontally for projected and actual performance.
- .4      Provide horizontal time scale identifying first work day of each week.
- .5      Format for listings: chronological order of start of each item of work.
- .6      Identification of listings: By Systems description.

**1.4      SUBMISSION**

- .1      Submit initial format of schedules within 15 working days after award of Contract.
- .2      Submit schedules in electronic format, forward on disc as PDF files.
- .3      Submit one opaque reproduction, plus 2 copies to be retained by Owner's Representative.
- .4      Owner's Representative will review schedule and return review copy within ten (10) working days after receipt.
- .5      Resubmit finalized schedule within seven (7) working days after return of review copy.
- .6      Submit revised progress schedule with each application for payment.
- .7      Distribute copies of revised schedule to:
  - .1      Job site office.
  - .2      Subcontractors.



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- .3 Other concerned parties.
- .8 Instruct recipients to report to Contractor within ten (10) working days, any problems anticipated by timetable shown in schedule.

**1.5 CRITICAL PATH SCHEDULING**

- .1 Include complete sequence of construction activities.
- .2 Include dates for commencement and completion of each major element of construction as follows.
  - .1 Site clearing.
  - .2 Site utilities.
  - .3 Foundation Work.
  - .4 Structural framing.
  - .5 Special Subcontractor Work.
  - .6 Equipment Installations.
  - .7 Finishes.
- .3 Show projected percentage of completion of each item as of first day of month.
- .4 Indicate progress of each activity to date of submission schedule.
- .5 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.
- .6 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 prime contractors.

**1.6 SUBMITTALS SCHEDULE**

- .1 Include schedule for submitting shop drawings, product data, and samples.
- .2 Indicate dates for submitting, review time, resubmission time, last date for meeting fabrication schedule.

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**PART 2**      **PRODUCTS (NOT APPLICABLE)**

**PART 3**      **EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**PART 1**      **GENERAL**

**1.1**            **SECTIONS INCLUDE**

- .1      Shop drawings and product data.
- .2      Samples.
- .3      Certificates and transcripts.

**1.2**            **RELATED SECTIONS**

- .1      Section 01 32 00 – Construction Progress Documentation.
- .2      Section 01 45 00 – Quality Control
- .3      Section 01 78 00 – Closeout Submittals

**1.3**            **ADMINISTRATIVE**

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

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- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Owner's Representative review of submission, unless Owner's Representative gives written acceptance of specific deviations.
- .10 Make any changes in submissions which Owner's Representative may require consistent with Contract Documents and resubmit as directed by Owner's Representative. When resubmitting, notify Owner's Representative in writing of revisions other than those requested.
- .11 Notify Owner's Representative, in writing, when resubmitting, of any revisions other than those requested by Owner's Representative.
- .12 Keep one reviewed copy of each submission on site.

**1.4 SUBMITTALS**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Coordinate each submission with requirements of work and Contract Documents. Individual submissions will not be reviewed until all related information is available.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow ten (10) working days for Owner's Representative review of each submission.
- .5 Adjustments made on shop drawings by Owner's Representative are not intended to change contract price. If adjustments affect value of Work, state such in writing to Owner's Representative immediately after receipt of approval of shop drawings. If value of work is to change a change order must be issued prior to proceeding with work.
- .6 Structural Attachments:
  - .1 Make changes in shop drawings as Owner's Representative may require, consistent with Contract Documents. When resubmitting, notify Owner's Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.

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- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.
- .8 Submissions shall include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
- .9 After Owner's Representative review, distribute copies.
- .10 Submit 3 prints plus one electronic copy in PDF format of shop drawings for each requirement requested in specification Sections and as Owner's Representative may reasonably request.
- .11 Submit electronic copy in PDF format of product data sheets or brochures for requirements requested in Specification Sections and as requested by Owner's Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 Cross-reference product data information to applicable portions of Contract Documents.

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- .15 If upon review by Owner's Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of work may proceed.
- .16 Samples: examples of materials, equipment, quality, finishes, workmanship. Label samples with origin and intended use.
- .17 Notify Owner's Representative in writing, at time of submission of deviations in samples from requirements of contract documents.
- .18 Where colour, pattern or texture is criterion, submit full range of samples.
- .19 Adjustments made on samples by Owner's Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Owner's Representative prior to proceeding with Work.
- .20 Make changes in samples, which Owner's Representative may require, consistent with Contract Documents.
- .21 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.
- .22 Submit drawings stamped and signed by Professional Engineer registered or licensed in the Province of Newfoundland and Labrador.

**1.5 MOCK-UPS**

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

**1.6 PROGRESS PHOTOGRAPHS**

- .1 Progress photograph to be electronically formatted and labelled as to location and view.

**1.7 SHOP DRAWINGS REVIEW**

- .1 The review of shop drawings by Owner's Representative is for the sole purpose of ascertaining conformance with the general concept. This review shall not mean that Owner's Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with the Contractor submitting same, and such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of responsibility for meeting all requirements of the construction and contract documents. Without restricting the generality of the foregoing, the Contractor is responsible for dimensions to be confirmed and correlated at the job site, for information that pertains to fabrication processes or to techniques of construction and installation and for co-ordination of the work of all sub-trades.

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**1.8            STRUCTURAL ATTACHMENTS**

- .1            Contractor to engage a third party Professional Structural Engineer, licensed to practice in the Province of Newfoundland and Labrador, for submission of stamped and signed shop drawings indicating acceptable mounting procedures for all equipment which is suspended, mounted or otherwise attached, as per Section 01 91 13 – Commissioning (Cx) Requirements. The Structural Engineer to also verify correct installation of the equipment.

**PART 2            PRODUCTS (NOT APPLICABLE)**

**PART 3            EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1**

**GENERAL**

**1.1**

**REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA-Z259.1 Body Belts and Saddles for Work Positioning and Travel Restraint.
  - .2 CAN/CSA-Z259.10 Full body Harnesses.
  - .3 CAN/CSA-Z259.11 Energy Absorbers and Lanyards.
  - .4 CAN/CSA-Z259.2.1 Fall Arresters, Vertical Lifelines and Rails.
  - .5 FCC No. 301 Standard for Construction Operations.
  - .6 CSA Z275.2 Occupational Safety Code for Diving Operations.
  - .7 CSA Z275.4 Competency Standard for Divers Operations.
  - .8 CSA Z797, Code of Practice for Access Scaffold.
- .2 FCC No. 302 Standard for Welding and Cutting.
- .3 Transportation of Dangerous Goods Act Regulations.
- .4 Newfoundland Occupational Health and Safety Act, Amended
- .5 Consolidated Newfoundland and Regulations 1149 WMIS Regulations Under the Occupational Health and Safety Act
- .6 Consolidated Newfoundland and Regulations Occupational Health and Safety Regulations under the Occupational Health and Safety Act.
- .7 Canada Labour Code, Part 2.
- .8 National Building Code of Canada.
- .9 Department of Transportation and Works Occupational Health and Safety Manual.

**1.2**

**RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 43 - Environmental Procedures.
- .3 Section 01 41 00 - Regulatory Requirements.
- .4 Section 02 82 00.02 – Asbestos Abatement.



**1.3 SUBMITTALS**

- .1 At least 10 (ten) working days prior to commencing any site work: submit to Owner's Representative copies of:
  - .1 A complete Site Specific Health and Safety Plan.
  - .2 If work entails blasting, submit the following:
    - .1 Valid Blaster's Certificate and Certificates of Qualification acceptable to the OHS Regulations 5/12 under section 419 identifying the Level of Qualification for the project requirements (Journey Persons Blaster Certificate will still be accepted). An acceptable letter of extension of blasters certificate from the Industrial Training Division of the Provincial Department of Education is required when certificate expires (5 years max.). Certificate numbers and names are required for all blasters proposed for the project.
    - .2 Temporary Magazine License, when required issued, by Natural Resources Canada.
    - .3 Explosives Vehicle Certificate, when required, issued by Transport Canada for transport of explosives regulated under the Transportation of Dangerous Good Act.
    - .4 Blaster resume which clearly states and demonstrates:
      - .1 Experience in handling, storage and detonation of explosives.
      - .2 Training at a blaster's school which is acceptable to the provincial government.
  - .3 If work entails diving, submit the following:
    - .1 Diver(s) and dive supervisor (s).
      - .1 Copy of valid Diving Certificate and Supervisor Certificate from the Diving Certification Board of Canada (or equivalent) for the required work on the project. (i.e. Restricted SCUBA Diver, Unrestricted SCUBA Diver, SCUBA Supervisor, Restricted Surface-Supplied Diver, Unrestricted Surface-Supplied Diver, etc. (See [www.divercertification.com](http://www.divercertification.com))
      - .2 Resume which clearly demonstrates years of experience for the specific type (SCUBA, Surface Supplied Air, etc.) of diving to be performed at the site and projects completed to achieve minimum number of logged bottom time, hours and
      - .3 First aid and CPT Training Certification.
    - .2 Dive tender(s) resume which clearly states relevant training (including first aid and (CPR) and experience for the specific task (i.e. dive tender log book).
    - .3 Current (less than one year) medical examination certificate (s) from a licensed medical doctor in the Province of Newfoundland and Labrador who is knowledgeable and competent in diving and hyperbaric medicine for all dives.

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- .4 Certificates of Analysis for quality/purity of breathing air to be used by diver(s).
- .5 Documentation showing that diving life support equipment is in good working order and properly maintained.
- .6 Copies of documentation shall be submitted to show:
  - .1 An up-to-date dive site listing of the contact Hyperbaric facility and phone numbers for each location.
  - .2 Written arrangements with standby physician(s) specializing in diving/hyperbaric medicine for contingent emergency response and post dive follow-up for 48 hours after dive is completed.
  - .3 Effective means of communication between the diving supervisor and physician are available.
  - .4 The name, location and telephone number of the hospital and emergency department nearest the dive site.
- .4 If work entails confined space, submit the following:
  - .1 Copies of current confined space entry training certificates acceptable to WHSCC, as well as copies of confined space entry programs, confined space assessment, safe work practices and rescue plans.
  - .2 Acceptance of the Site Specific Health and Safety Plan and other submitted documents by the Owner's Representative shall only be viewed as acknowledgement that the contractor has submitted the required documentation under this specification section.
  - .3 Owner's Representative makes no representation and provides no warranty for the accuracy, completeness and legislative compliance of the Site Specific Health and Safety Plan and other submitted documents by this acceptance.
  - .4 Responsibility for errors and omissions in the Site Specific Health and Safety Plan and other submitted documents is not relieved by acceptance by Owner's Representative.

**1.4 OCCUPATIONAL HEALTH AND SAFETY (SITE SPECIFIC HEALTH AND SAFETY PLANS)**

- .1 Conduct operations in accordance with latest edition of the Newfoundland Occupational Health and Safety (OH&S) Act and Regulations, with specific reference to codes and standards referenced therein, and the Department of Transportation and Works Occupational Health and Safety Manual ([http://www.tw.gov.nl.ca/publications/ohs\\_full.pdf](http://www.tw.gov.nl.ca/publications/ohs_full.pdf)).
- .2 Prepare a detailed Site Specific Health and Safety Plan that shall identify, evaluate and control job specific hazards and the necessary control measures to be implemented for managing hazards.
- .3 Provide a copy of the Site Specific Health and Safety Plan upon request to Occupational Health and Safety Branch, Services NL, Province of Newfoundland and Labrador and the Owner's Representative.

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- .4 The written Site Specific Health and Safety Plan shall incorporate the following:
  - .1 Hazard assessment results.
  - .2 Engineering and administrative demonstrative controls (work-practices and procedures) to be implemented for managing identified and potential hazards, and comply with applicable federal and provincial legislation and more stringent requirements that have been specified in these specifications.
  - .3 An organizational structure which shall establish the specific chain of command and specify the overall responsibilities of contractor's employees at the work site.
  - .4 A comprehensive work plan which shall:
    - .1 define work tasks and objectives of site activities/operations and the logistics and resources required to reach these tasks and objectives.
    - .2 establish personnel requirements for implementing the plan.
  - .5 A personal protected equipment (PPE) Program which shall detail PPE:
    - .1 Selection criteria based on site hazards.
    - .2 Use, maintenance, inspection and storage requirements and procedures.
    - .3 Decontamination and disposal procedures.
    - .4 Inspection procedures prior to, during and after use, and other appropriate medical considerations.
    - .5 Limitations during temperature extremes, heat stress and other appropriate medical consideration.
  - .6 An emergency response procedure, refer to Clause 1.5 Supervision and Emergency Response Procedure of this section for requirements.
  - .7 A hazard communication program for informing workers, visitors and individuals outside of the work area as required. This will include but not be limited to a visitor safety and orientation policy and program that will include education on hazards, required PPE and accompaniment while on site.
  - .8 A hearing conservation program in accordance with the OHS Regulations.
  - .9 A recent (current year) inspection form for all powered mobile equipment that will be used in fulfilling the terms of the contract. The inspection form shall, at a minimum, state that the equipment is in a safe operating condition.
  - .10 A complete listing of employee names, their driver's license classification, expiry date, endorsements and the type of equipment that they are qualified to operate for the complete scope of work for this project. The Driver's License Number should not be provided as this is confidential information. Provision of the License Number may breach *PIPEDA* - the Personal Information Protection and Electronic Documents Act. (Federal Act) or *ATIPPA* - *Access to Information and Protection of Privacy Act* - Part IV. (Provincial Act of Newfoundland and Labrador). This shall also include documentation where required of certification in power line hazards.
  - .11 An acceptable parking policy for all powered mobile equipment to be used on this project. The policy shall, at a minimum, be based on a hazard assessment that considers factors such as equipment type, potential for roll over, load

- capacity of the parking area, pedestrian and vehicular traffic, and potential for equipment tampering, equipment energy, and equipment contact with power lines.
- .12 A diving program which shall contain standard operating procedures to be followed in the diving operation.
  - .13 A health and safety training program which includes a safety training matrix.
  - .14 General safety rules.
- .5 Periodically review and modify as required each component of the Site Specific Health and Safety Plan when a new hazard is identified during completion of work and when an error or omission is identified in any part of the Site Specific Health and Safety Plan.
- .6 Review the completeness of the hazard assessment immediately prior to commencing work, when a new hazard is identified during completion of work and when an error or omission is identified.
- .1 Be solely responsible for investigating, evaluating and managing any report of actual or potential hazards.
  - .2 Clearly define accident incident investigation procedures.
  - .3 Clearly define policy and processes for early and safe return to work.
  - .4 Retain copies of all completed hazard assessments at the project site and make available to the Owner's Representative immediately upon request.
- .7 Implement all requirements of the Site Specific Health and Safety Plan.
- .1 Ensure that every person entering the project site is informed of requirements under the Site Specific Health and Safety Plan.
  - .2 Take all necessary measures to immediately implement any engineering controls, administrative controls, personal protective equipment required or termination of work procedures to ensure compliance with the Site Specific Health and Safety Plan.

## **1.5 SUPERVISION AND EMERGENCY RESCUE PROCEDURE**

- .1 Carry out work under the direct supervision of competent persons responsible for safety by ensuring the work complies with the appropriate section of OH&S Act and Regulations
- .2 Assign a sufficient number of supervisory personnel to the work site.
  - .1 Any person assigned to supervisory duties shall not conduct significant work in relation to the contract that inhibits them from the ability to properly supervise the work site.
- .3 Provide a suitable means of communications and check-in for workers required to work alone.
- .4 Develop an emergency rescue plan for the job site and ensure that supervisors and workers are trained in the emergency rescue plan.

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- .5 The emergency response plan shall address, as a minimum:
  - .1 Pre-emergency planning.
  - .2 Personnel roles, lines of authority and communication.
  - .3 Emergency recognition and prevention.
  - .4 Safe distances and places of refuge.
  - .5 Site security and control
  - .6 Evacuation routes and procedures
  - .7 Decontamination procedures which are not covered by the site specific safety and health plan.
  - .8 Emergency medical treatment and first aid.
  - .9 Emergency alarm, notification and response procedures including procedures for reporting incidents to local, provincial and federal government departments.
  - .10 PPE and emergency equipment.
  - .11 Procedures for handling emergency incidents.
  - .12 Site specific emergency response training requirements and schedules.
  - .13 For diving operation, include procedures for:
    - .1 Managing deteriorating environmental conditions.
    - .2 Managing unexpected weather or sea-state condition.
    - .3 Evacuation of diver(s) under pressures greater than atmospheric pressure.
    - .4 In-water emergency transfers.
    - .5 Managing failing of equipment below the surface that impairs the ability of a diver to complete a dive.
    - .6 Managing failure of any major component of diving plant or equipment.
    - .7 Emergency signalling between divers involved in the diving program and between the diver(s) and the attendants using umbilical, tethers or other suitable methods.
    - .8 Mobilizing stand-by divers.
    - .9 Mobilizing crafts, stand-by boats and any other devices to be used for rescue.
    - .10 Contacting evacuation, rescue, treatment facilities and medical services that will be used in the diving program.
    - .11 Operation of emergency power and lighting facilities.
- .6 The emergency response procedures shall be rehearsed regularly as part of the overall training program.
- .7 Provide adequate first aid facilities for the jobsite and ensure that a minimum number of workers are trained in first aid in accordance with the Occupational Health and Safety First Aid Regulations.

**1.6 CONTRACTORS SAFETY OFFICER**

- .1 The contractor shall employ a Contractor's Safety Officer (CSO) who shall have as a minimum successfully completed the following training, and must have current credentials for those that have expiration dates:
  - .1 Training in hazardous materials management and response/protocols.
  - .2 Training in the use, maintenance of fall protection systems certified by WHSCC at a minimum.
  - .3 Training in the inspection of scaffolding in accordance with CSA Z797.
  - .4 Training in confined space entry protocols, techniques and rescue plans, certified by WHSCC at a minimum.
  - .5 Supervisory training.
  - .6 Training in records and statistics.
  - .7 Training in hazard identification, inspections, analysis and control.
  - .8 Training in WHMIS.
  - .9 Training in health and safety program content.
  - .10 Training in investigations and reporting.
  - .11 Training in occupational health/hygiene.
  - .12 Training in employee training and communication.
  - .13 Training in Emergency Preparedness and First Aid.
  - .14 A working knowledge of, and experience satisfactory to the Department, using the occupational safety and health legislation and regulations specific to Newfoundland and Labrador.
  - .15 Experience, satisfactory to the Department, with the safe work practices required for execution of the work and operation of equipment specific to the project.
  - .16 Experience, satisfactory to the Department, in developing and monitoring site safety and housekeeping policies.
  - .17 Experience, satisfactory to the Department, in developing and monitoring a preventative maintenance and inspection program for Construction Site Equipment.
- .2 The CSO shall:
  - .1 Be responsible for developing, implementing, daily enforcement, monitoring and updating of the Site Specific Health and Safety Plan.
  - .2 Be responsible for the delivery of the site safety orientation and ensure that the personnel who have not been orientated are not permitted to enter the site. This applies to workers, inspectors and visitors.
  - .3 Report directly to and be under direction of the Site Superintendent or Contractor's Project Manager.
  - .4 Prior to mobilization on-site, hold an orientation meeting with the contractors, subcontractors and Owner's Representative to review project occupational health and safety. Include but not limit meeting to a review of:

- .1 Site Specific Health and Safety Plan.
- .2 Construction Safety Measures.
- .3 Supervision and Emergency Rescue Procedures.
- .4 Hazard Assessments
- .5 Maintain a daily log of inspections, meetings, infractions and mitigating measures. Log is to be filed daily and copies to be provided to the Site Superintendent and Owner's Representative.

### **1.7 HEALTH AND SAFETY COMMITTEE**

- .1 Establish an Occupational Health and Safety Committee where ten or more workers are employed on the job site as per the OH&S Act and Regulations. **RESPONSIBILITY**
- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with Site Specific Health and Safety Plan.
- .3 Where safety risks exist, the contractor must stop the work until such time as the risk can be mitigated to a safe level.
- .4 Take appropriate steps to ensure that the hazards are mitigated to a safe level, workers are notified of the hazards and how to protect themselves. As well, workers must be provided with any new safe work practices or information regarding mitigation of the risk.

### **1.9 UNFORSEEN HAZARDS**

- .1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction. Advise Owner's Representative verbally and in writing.

### **1.10 INSTRUCTION AND TRAINING**

- .1 Workers shall not participate in or supervise any activity on the work site until they have been trained to a level required by this job function and responsibility. Training shall as a minimum thoroughly cover the following:
  - .1 Federal and Provincial Health and Safety Legislation requirements including roles and responsibilities of workers and person(s) responsible for implementing, monitoring and enforcing health and safety requirements.
  - .2 Safety and health hazards associated with working on a contaminated site including recognition of symptoms and signs which might indicate over exposure to hazards.

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- .3 Limitations, use, maintenance and disinfection-decontamination of personal protective equipment associated with completing work.
- .4 Limitations, use, maintenance and care of engineering controls and equipment.
- .5 Limitations and use of emergency notifications and response equipment including emergency response protocol.
- .6 Work practices and procedures to minimize the risk of an accident and hazardous occurrence from exposure to a hazard.
- .2 Provide and maintain training of workers, as required, by Federal and Provincial legislation.
- .3 Provide copies of all training certificates to Owner's Representative for review, before a worker is to enter the work site.
- .4 Authorized visitors shall not access the work site until they have been:
  - .1 Notified of the names of persons responsible for implementing, monitoring and enforcing the Site Specific Health and Safety Plan.
  - .2 Briefed on safety and health hazards present on the site.
  - .3 Instructed in the proper use and limitations of personal protective equipment.
  - .4 Briefed as the emergency response protocol including notification and evacuation process.
  - .5 Informed of practices and procedures to minimize risks from hazards and applicable to activities performed by visitors.
  - .6 Accompanied while on site, and provided with the appropriate PPE.
- .5 All workers will be instructed and trained on the hazards associated with work they will perform and how to protect themselves. This will include a review of all safe work practices, the reporting and documentation of hazards, reporting accidents and injuries as well as, formal training in areas of high risk (i.e. fall protection, power line hazards, traffic control persons training).
- .6 The work site shall have the appropriate number of persons trained in emergency and Standard First Aid according to the First Aid Regulations.

**1.11 CONSTRUCTION SAFETY MEASURES**

- .1 Observe construction safety measures of National Building Code, latest edition, Provincial Government, OH&S Act and Regulations, Workplace Health and Safety Compensation Commission and Municipal Authority provided that in any case of conflict or discrepancy more stringent requirements shall apply.
- .2 Administer the project in a manner that will ensure, at all times, full compliance with Federal and Provincial Acts, regulations and applicable safety codes and the Site Specific Health and Safety Plan.



- .3 Provide Owner's Representative with copies of all orders, directions and any other documentation, issued by the Occupational Health and Safety Branch, Services NL, immediately after receipt.

**1.12 POSTING OF DOCUMENTS**

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

**1.13 HEALTH AND SAFETY MONITORING**

- .1 Periodic inspections of the contractor's work may be carried out by the Owner's Representative to maintain compliance with the Health and Safety Program. Inspections will include visual inspections as well as testing and sampling as required.
- .2 The contractor shall be responsible for any and all costs associated with delays as a result of contractor's failure to comply with the requirements outlined in this section.

**1.14 NOTIFICATION**

- .1 For projects exceeding thirty (30) days or more, the contractor shall, prior to the commencement of work, notify in writing the Occupational Health and Safety Branch, Services NL with the following information:
  - .1 Name and location of construction site.
  - .2 Company name and mailing address of contractor doing the work.
  - .3 The number of workers to be employed.
  - .4 A copy of the Site Specific Health and Safety Plan if requested.

**1.15 CORRECTION OF NON-COMPLIANCE**

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Owner's Representative.
- .2 Provide Owner's Representative with written report of action taken to correct non-compliance of health and safety issues identified within ten (10) working days.
- .3 Owner's Representative may stop work if non-compliance of health and safety regulations is not corrected.

**1.16 WHMIS**

- .1 Ensure that all controlled products are in accordance with the Workplace Hazardous Materials Information System (WHMIS) Regulations and Chemical Substances of the OH&S Act and Regulations regarding use, handling, labelling, storage, and disposal of hazardous materials.

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- .2 Deliver copies of relevant Material Safety Data Sheets (MSDS) to job site and the Owner's Representative. The MSDS must be acceptable to Labour Canada and Health and Welfare Canada for all controlled products that will be used in the performance of this work. All MSDS should be located in accessible locations for all workers and visitors throughout the site, bound and organized in binders.
- .3 Train workers required to use or work in close proximity to controlled products as per OH&S Act and Regulations.
- .4 Label controlled products at jobsite as per OH&S and Regulations and WHMIS.
- .5 Provide appropriate emergency facilities as specified in the MSDS where workers might be exposed to contact with chemicals, e.g. eye-wash facilities, emergency shower.
  - .1 Workers to be trained in use of such emergency equipment.
- .6 Contractor shall provide appropriate personal protective equipment as specified in the MSDS where workers are required to use controlled products.
  - .1 Properly fit workers for personal protective equipment
  - .2 Train workers in care, use and maintenance of personal protective equipment.
- .7 No controlled products are to be brought on-site without prior approved MSDS.
- .8 The MSDS are to remain on site at all times.

**1.17 OVERLOADING**

- .1 The Contractor's Full Time CSO and/or Site Superintendent shall ensure no part of work or associated equipment is subjected to loading that will endanger its safety or will cause permanent deformation.

**1.18 FALSEWORK**

- .1 Design and construct falsework in accordance with CSA S269.1.

**1.19 SCAFFOLDING**

- .1 Design, erect, inspect, operate, modify, and dismantle scaffolding in accordance with CSA Z797, the OH&S Act and Regulations, and the scaffold manufacturer's written instructions.
- .2 Provide trained and certified Competent Scaffold Erectors for all scaffold erection, modification and dismantling. Training certification must be valid at time of erection, modification and dismantling of scaffold.
- .3 Conduct and document daily inspections of scaffolding by trained and certified Competent Scaffold Inspectors or Erectors. Training certification must be valid at the time of inspection.

- .4 Provide a scaffold tagging system as described in CSA Z797.
- .5 Ensure that all industry best practices for safe scaffold usage, including fall protection, proper loading, safe access, electrical hazards, exit door management and other concerns are strictly adhered to.

**1.20 WORKING AT HEIGHTS**

- .1 Ensure that fall restraint or fall arrest devices are used by all workers working at elevations greater than 3.05 meters above grade or floor level in accordance with CSA Z259, where alternate fall protection systems are not provided in accordance with Occupational Health and Safety Act and Regulations.
- .2 All workers performing work at height and who will be required to utilize a fall arrest system must be trained in a fall protection program certified by the WHSCC. Training must be current and valid at the time of use.
- .3 Prior to working at height workers shall be instructed in a Contractor Safe Work Practice for working at height and associated Rescue Plan for working at heights, developed specific to the work to be performed, locations and risks.

**1.21 PERSONAL PROTECTIVE EQUIPMENT**

- .1 Ensure workers on the jobsite use personal protective equipment appropriate to the hazards identified in the Site Specific Health and Safety Plan and those workers are trained in the proper care, use, and maintenance of such equipment.
- .2 PPE selections shall be based on an evaluation of the performance characteristics of the PPE relative to the requirements and limitations of the site, task-specific conditions, duration and hazards and potential hazards identified on site. PPE must also be fitted for the worker.
- .3 Provide workers and visitors to the site with proper respiratory protection equipment.
  - .1 No work shall be performed in an area where an airborne contaminant exceeds recommendations of the ACGIH, do not meet the appropriate standards for the specific contaminants or are not in accordance with the OHS regulations..
  - .2 Respiratory protection shall be provided in accordance with the requirements of the Occupational Health and Safety Branch, Services NL and these specifications.
  - .3 Establish, implement and maintain a respirator inspection and maintenance program in accordance with the CSA standard identified in the OHS Regulations.
  - .4 Copies of all respirator owners' maintenance manuals shall be kept at all times at the contractor's site office.
- .4 Provide and maintain a supply of dermal protection equipment to allow visitors and all workers proper dermal protection.

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- .1 Dermal protection shall be sufficient to act as a protective barrier between the skin and an airborne contaminant or hazardous material. Dermal protection shall also be provided for all physical hazards.
- .2 Dermal protection equipment shall not be used after exceeding 75% of the break through time. The break through time shall be based on the contaminant which requires the least amount of time to break through the protective equipment
- .3 Copies of all dermal protection user specifications, owners and maintenance manuals shall be kept at all times at the contractor's site office.
- .4 Establish, implement and maintain air inspection program to ensure proper dermal protection in accordance with CSA, NIOSH, U.S. EPA and manufacturer's requirements.
- .5 Provide all workers and up to five (5) visitors to the site with proper hearing protection. Workers and visitors shall not be exposed to noise levels greater than 85 dB (A) over an eight hour shift without proper hearing protection, in accordance with the Hearing Conservation Program.
- .6 Provide all workers and up to five (5) visitors to the site with CSA approved eye protection sufficient to act as a protective barrier between the eye and airborne contaminants, hazardous materials and physical hazard.
- .7 Provide workers and up to five (5) visitors to the site with CSA approved hard hats meeting the CSA Z94.1.
- .8 Provide high visibility apparel as defined in Occupational Health and Safety Regulations.
- .9 Provide CSA approved safety boots meeting CSA Z195.
- .10 Provide other personal protective equipment, as may be required by the owner, depending on duties being performed.

**1.22 TRAFFIC CONTROL**

- .1 Provide traffic control measures when working on, or adjacent to, roadways in accordance with the "Traffic Control Manual for Roadwork Operations", Department of Transportation and Works.

**1.23 EXCAVATION SAFETY**

- .1 Protect excavations more than 1.25 metres deep against cave-ins or wall collapse by side wall sloping to the appropriate angle of repose, an engineered shoring/sheathing system or an approved trench box.
  - .1 Provide a ladder which can extend from the bottom of the excavation to at least 0.91 metres above the top of the excavation.
- .2 Ensure that all excavations less than 1.25 metres deep are effectively protected when hazardous ground movement may be expected.

- .3 Design trench boxes, certified by a registered Professional Engineer, and fabricated by a reputable manufacturer. Provide the manufacturer's Depth Certificate Statement permanently affixed. Use trench boxes in strict accordance with manufacturer's instructions and depth certification data.
- .4 For excavations deeper than six (6) metres, provide a certificate from a registered Professional Engineer stating that the protection methods proposed have been properly designed in accordance with accepted engineering practice. The engineer's certificate shall verify that the trench boxes, if used, are properly designed and constructed to suit the depth and soil conditions.
- .5 Ensure that the superintendent and every crew chief, foreperson and lead hand engaged in trenching operations or working in trenches have in his/her possession a copy of Occupational Health and Safety Regulations: Part XVII: Construction, Excavation and Demolition and Part XVIII: Excavation, Underground Work and Rock Crushing.

## **1.24**

### **BLASTING OPERATIONS**

- .1 Ensure blasting operations are carried out under the direct visual supervision of a certified Blaster either registered with the Industrial Training Division of the Department of Education or has been issued a certificate from completion of a program approved by Service NL. Ensure that the certificate level is appropriate for the blasting activities which will occur. Comply with the requirements of:
  - .1 Explosives Act.
  - .2 Explosives Regulations.
  - .3 Newfoundland Regulation 5/12, Occupational Health and Safety Regulations.
  - .4 Role of certified blaster set out in section 419 of the Occupational Health and Safety Regulations 5/12.
- .2 Store explosives in accordance with the "Explosives Act (Canada)" and transport, handle and use in the manner prescribed by the manufacturer of the substance and subject to specific regulations. An inventory of explosives shall be kept.
- .3 Ensure that workers required to transport explosives have a valid Transportation of Dangerous Goods Training Certification in accordance with the "Act to Promote Public Safety in the Transportation of Dangerous Goods, and the "Explosives Act (Canada)". Vehicle used to transport explosives on site shall be placarded and explosives shall be transported in containers lined with wood (reference section 428 of the Occupational Health and Safety Regulations 5/12 comply with section 42. Detonators shall not be placed in a magazine or daybox with other types of explosives or in a compartment of a vehicle with another type of explosive.
- .4 Use of explosives on site shall comply with the Occupational Health and Safety Regulations 5/12 General Blasting requirements set out in Part XIX of the Regulations.
- .5 Loaded holes shall be clearly identified with barricades put in place to prevent access to the holes. Drilling shall not be done closer to a loaded bore hole than a distance half the total depth of the hole being drilled and in no case shall drilling be conducted at a

distance closer than 6.0 m from a loaded borehole. Drill cuttings shall not be used as stemming material.

- .6 Advise the public by suitable public notices, advertisements, house to house contacts etc. for blasting operations in close proximity to areas occupied by the public. Advise of the warning device to be sounded and the procedure to be used before detonation of individual blasts. Roads and approaches to the danger area to be guarded or barricaded to prevent anyone from entering. Loaded holes which have not been fired by the end of the day shall not be left unattended.
- .7 Prior to detonation of a blast, give sufficient warning in every direction and ensure that all persons have reached a place of safety before the blast is fired.
- .8 File an Emergency Response Assistance Plan with the Explosives Branch, Natural Resources Canada.
- .9 Blaster shall:
  - .1 Be solely responsible for implementation of the Explosives Management Program.
  - .2 Have a valid blaster's safety certificate from the Department of Education Division of Institutions and Industrial Education, and have a valid temporary Magazine License, when required issued by Natural Resources Canada, for storage and explosives.
  - .3 Possess a thorough working knowledge of the Federal Explosives Act and Provincial Regulations.
  - .4 Possess a specialized training in handling storage and detonation of explosives.
  - .5 Keep a field journal concerning the blast activities.

## **1.25 CONFINED SPACE WORK**

- .1 Comply with the Newfoundland and Labrador Occupational Health and Safety Regulations.
- .2 Ensure a hazard assessment has been conducted related to the confined space and the work to be performed within the space.
- .3 Provide approved air monitoring equipment where workers are working in confined spaces and ensure any test equipment to be used is calibrated, in good working order and used by trained persons.
- .4 Ensure all required PPE is provided to the workers and workers are trained in its use, care and selection.
- .5 Develop a confined space entry (CSE) program specific to the nature of work performed and in accordance with OH&S Act and Regulations and ensure supervisors and workers are trained in the confined space entry program. This shall include training on the CSE permit system, rescue plan, testing, communication equipment and all equipment and safe work procedures conducted in and around the confined space.

- .1 Ensure that personal protective equipment and emergency rescue equipment appropriate to the nature of the work being performed is provided and used.
- .6 Provide and maintain training of workers through a provider certified by the WHSCC.
- .7 Provide Owner’s Representative with a copy of an “Entry Permit” for each entry into the confined space to ensure compliance Provincial Legislation.

**1.26 HAZARDOUS MATERIALS**

- .1 Should material resembling hazardous materials (e.g. asbestos/mould) not previously identified/documentated be encountered during the execution of work, stop work and notify Owner’s Representative. Do not proceed until written instructions have been received from Owner’s Representative.
- .2 Unless otherwise noted the services of a recognized Environmental Consultant to provide all air monitoring and testing services required by regulatory requirements for hazardous materials abatement and repair.

**1.27 HEAVY EQUIPMENT**

- .1 Ensure mobile equipment used on jobsite is of the type specified in OH&S Act and Regulations fitted with a Roll Over Protective (ROP) Structure and Falling Object Protective (FOP) Structure.
- .2 Provide certificate of training in Power Line Hazards for operators of heavy equipment.
- .3 Obtain written clearance from the power utility where equipment is used in close proximity to (within 5.5 metres) overhead or underground power lines.
- .4 Equip cranes with:
  - .1 A mechanism which will effectively prevent the hook assembly from running into the top boom pulley.
  - .2 A legible load chart.
  - .3 A maintenance log book.

**1.28 TREE AND BRUSH CLEARING**

- .1 Ensure workers using chain saws wear the following safety equipment:
  - .1 CSA safety hat.
  - .2 Hearing protection, e.g. ear muffs.
  - .3 CSA approved chain saw pants.
  - .4 CSA approved chain saw boots.
  - .5 CSA approved eye protection.
- .2 Ensure that all workers using brush saws wear the following safety equipment:

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- .1 CSA approved safety hat fitted with face screen or shield or approved safety glasses.
- .2 Hearing protection, e.g. ear muffs.
- .3 CSA approved safety footwear.
- .3 Equip chain saws with a safety chain break.
- .4 A safe work practice (SWP) must be developed, implemented and all workers trained in the SWP prior to undertaking such tasks and utilizing tree and brush clearing equipment.

**1.29 WORK STOPPAGE**

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

**PART 2            PART 2            PRODUCTS (NOT APPLICABLE)**

**PART 3            PART 3            EXECUTION (NOT APPLICABLE)**

**END OF SECTION**



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**PART 1**      **GENERAL**

**1.1**            **FIRES**

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

**1.2**            **DISPOSAL OF WASTES**

- .1      Do not bury rubbish and waste materials on site.
- .2      Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

**1.3**            **DRAINAGE**

- .1      Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2      Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3      Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

**1.4**            **SITE CLEARING AND PLANT PROTECTION**

- .1      Protect trees and plants on site and adjacent properties where indicated.
- .2      Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.
- .3      Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones. Construction traffic will be restricted to established access corridors. Dumping or storage of aggregate or materials in areas to be left undisturbed will not be permitted.
- .4      Minimize stripping of topsoil and vegetation.
- .5      Restrict vegetation removal to areas indicated or designated by Owner's Representative. Prior approval is required from the owners representative before any clearing takes place.
- .6      Removal of vegetation should be minimized during the breeding bird season of May 1<sup>st</sup> to August 15<sup>th</sup>. Ensure all work is in compliance with the Migratory Birds Convention Act.

**1.5**            **WORK ADJACENT TO WATERWAYS**

- .1      Do not operate construction equipment in waterways.

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- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Do not blast under water or within 100 m of indicated spawning beds.

**1.6 POLLUTION CONTROL**

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

**1.7 NOTIFICATION**

- .1 Owner's Representative will notify Contractor in writing of observed non-compliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of environmental protection. Contractor: after receipt of such notice, inform Owner's Representative of proposed corrective action and take such action as approved by Owner's Representative.
- .2 Owner's Representative may issue stop order of work until satisfactory corrective action has been taken.
- .3 No time extensions will be granted or equitable adjustments allowed to Contractor for such suspensions.

**1.8 ENDANGERED SPECIES**

- .1 Terra Nova National Park is home to the Little Brown Myotis and Northern Myotis, which are species of bats classified as endangered under the Species at Risk Act.
- .2 The Contractor is to note that if they encounter bats in or around the Outdoor Theatre during demolition activities, the following is required:
  - .1 Immediately notify the Departmental Representative for directives to be followed.
  - .2 Stop demolition activities and do not disturb the roost.

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- .3 Do not initiate demolition activities until the bat vacates the premises. The expected time frame for a male bat to vacate the premises would be in the order of 1-3 days. In the event a maternity roost is discovered (females with pups), the expected time frame for the bats to vacate the premises would be in the order of 1-3 weeks.
- .4 Departmental Representative will make final decision regarding shut-down times and work return times, as it relates to the discovery of bats in or around the Outdoor Theater.
- .3 Note that there will be no additional cost to Parks Canada for downtime associated with the discovery of endangered bats in or around the Outdoor Theatre and the subsequent no-work periods established by the Departmental Representative.

**1.9 MITIGATIVE MEASURES**

- .1 The contractor shall comply with all mitigative measures, terms and conditions outlined in the attached Basic Impact Analysis (BIA) construction of the Kitchen Shelter Newman Sound Campground – Parks Canada. The BIA is attached as Appendix A of this specification.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SUMMARY**

- .1      Where building related projects involve work that could potentially disturb asbestos or lead based paints, disturbances must be carefully controlled by registered abatement contractors in accordance with the Occupational Health and Safety Regulations (OHS) and other applicable Sections in this Contract. The purpose of this procedure is to ensure that nuisance dust, not containing asbestos or lead, is controlled in an effective manner.
  
- .2      Section includes:
  - .1      Ensuring any maintenance, repair, construction or renovation activity that impacts building materials or creates dust is performed in such a way as to eliminate, minimize, contain and clean up any and all dust generated by the activity. This applies to work preparation, work activities and post-work activities.
  - .2      This applies to, but is not limited to, the following types of dust generating activities:
    - .1      Disturbing gypsum board, plaster or other surfacing materials.
    - .2      Disturbing concrete or wood containing materials.
    - .3      Handling or disturbing fibrous building insulation.
    - .4      Generating welding fumes: in addition to the requirements of this procedure, a hot work permit is also required to be completed by the contractor and submitted to the Owner's Representative for review if hot work is required in an occupied building.

**1.2            RELATED WORK**

- .1      Division 1 – General Requirements.
- .2      Section 02 82 00.02 - Asbestos Abatement.
- .3      Section 06 10 53 – Miscellaneous Rough Carpentry.
- .4      Section 07 26 00 - Vapour Retarder.

**1.3            REFERENCES**

- .1      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-1.205, Sealer for Application to Asbestos-Fibre-Releasing Materials.
- .2      Canadian Standards Association (CSA)
  - .1      CAN/CSA Z317.13-F07, Infection Control During Construction, Renovation and Maintenance of Health Care Facilities.

**PART 2**      **PRODUCTS**

**2.1**            **MATERIALS**

- .1 Polyethylene sheet in accordance with Section 07 26 00 - Vapour Retarders.
- .2 Wood studs for stand-alone barriers in accordance with Section 06 10 53 - Miscellaneous Rough Carpentry.

**PART 3**      **EXECUTION**

**3.1**            **PRE-WORK ACTIVITIES**

- .1 The contractor shall ensure the following prior to commencing work:
  - .1 Specific dust generating activities and associated controls shall be addressed in the Site Specific Health and Safety Plan.
  - .2 Workforce, including sub-contractors, must be made aware of the site dust control requirements.
  - .3 Check the various work zones within the building and adjacent areas to confirm the area are clean.
  - .4 Access to all active work areas shall be restricted to authorized contractors.
  - .5 For occupied buildings, dust generating activities shall be performed after normal hours of operations, unless prior permission is received from the Owner's Representative.

**3.2**            **WORK ACTIVITIES**

- .1 Dust producing projects shall be classified as small scale, medium scale or large scale projects, as detailed in paragraph 3.3.
- .2 For all dust generating activities, Contractor is required to have Site Safety Officer present to ensure dust control procedures are properly followed.
- .3 Any dust related complaints brought to the Contractors attention, must be immediately reported to Owner's Representative, and an incident investigation must be initiated to prevent reoccurrence.
- .4 Where practical, dust generation should be eliminated or minimized through the use of proper engineering controls (i.e. containment at source such as drilling wall surface through a wet sponge, wet suppression, use of HEPA vacuum equipped tools, etc).
- .5 Dust generating power tools shall be equipped with HEPA filtered dust collectors where practical. Power tools capable of generating dust without dust collection shall only be used in conjunction with suitable work area containment and with Owner's Representative approval.

- .6 Walk-off mats shall be employed for medium and large scale dust generating projects at all worker entrances/exits. Purpose of these mats is to trap dust from equipment and shoes of personnel leaving the dust contaminated work zone. Mats shall be vacuumed daily, or more frequently as necessary, using HEPA filtered vacuums. Mats shall be of sufficient size to place both feet on mat at once.

### **3.3 PROJECT CLASSIFICATION**

- .1 Class A - Small Scale Project: (Dust producing activities disturbing less than one (1) linear meter or one (1) square meter of material. These are small scale, short duration jobs generating minimal dust.
  - .1 Some examples include:
    - .1 Installing wires or cables, sanding/repairing small section of wall, cutting out gypsum board to install receptacles.
  - .2 Carry out Work as follows:
    - .1 Remove all furniture, fixtures and belongings from the work area to a minimum of 1.5 m in all directions.
    - .2 Restrict access to immediate work area. Keep all doors closed where practical. Post “Dust Hazard Area – Do Not Enter” signs at all entrances to work area. In common areas use barrier tape to establish the regulated area.
    - .3 Place a drop cloth of polyethylene sheeting immediately underneath the work area extending a minimum of 1.5 m in each direction (unless flooring is easily cleanable).
    - .4 Cover all air return or exhaust vents if within 1.5 m of the work area with polyethylene sheeting and duct tape.
    - .5 Complete the task, minimizing dust production, as prescribed in paragraph 3.2 - Work Activities.
    - .6 When the work is completed, wet-wipe polyethylene sheeting and flooring and if necessary, other areas close by with a damp rag.
    - .7 Visually inspect the area for any remaining dust and wet wipe as necessary.
    - .8 If installed, remove polyethylene sheeting from air return and exhaust vents.
    - .9 Where practical, transport debris after hours using least congested and most direct routes. If any debris is spilled outside the work area, immediately wet-wipe debris.
    - .10 Clean all tools and equipment before removal from the work area.
- .2 Class B - Medium Scale Project (Dust producing activities disturbing greater than one (1) square meter and less than 30 square meters of material) with anticipated moderate dust levels that are typically one shift or more in duration.
  - .1 Examples include:
    - .1 Sanding several sheets of gypsum board.

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- .2 Electrical work above ceiling tiles where general debris is known above the ceiling.
- .3 Removing numerous ceiling tiles in an area.
- .4 New wall construction.
- .2 Carry out the Work as follows:
  - .1 Determine the most effective way of isolating the work area from occupants (i.e. using plastic barriers or by sealing off doors).
  - .2 Complete all items specified under small scale projects.
  - .3 While performing the work, limit the dust generated by removing the materials in sections, lightly misting the material as necessary. Debris shall be bagged immediately for disposal. In addition to wet wiping, HEPA filtered vacuum systems shall be employed where practical to limit airborne dust.
  - .4 When the task is completed, HEPA vacuum and/or wet wipe the polyethylene sheeting.
  - .5 Prior to removing any temporary wall partitions from floor to ceiling or polyethylene barriers, a final inspection shall be performed by the Site Safety Officer or designate to ensure proper clean up has been completed. This inspection shall be documented by the Contractor and made available at the request of the Owner's Representative.
  - .6 Establishment of containment may result in the accumulation of dust within the enclosure. As such, the need for respiratory protection and decontamination would be greater than for small scale projects (i.e. N95 half face respirator with tyvek body covering).
- .3 Class C - Large Scale Projects (Dust Producing Activities disturbing greater than 30 meters of material with anticipated high dust levels and typically involves multiple work shifts.
  - .1 Examples include:
    - .1 Major demolition or construction.
    - .2 Extensive renovations to wall or ceiling surfaces.
    - .3 Generating significant amounts of concrete dust.
  - .2 Carry out the Work as follows:
    - .1 Complete all items as prescribed under the Medium Scale Projects section.
    - .2 If the work produces dust that cannot be limited by removal in sections or misting and the work area configuration allows, use HEPA filtered negative air units with the intake directly across from the dust generating activity. Exhaust the HEPA unit outside the building.
    - .3 If using a disposal cart or container to transport debris within the building, ensure the lid is tightly secured and the wheels are clean prior to exiting the work area.
    - .4 If local source capture is employed (i.e. HEPA filtered power tool) and no significant debris anticipated then treat as a medium scale project.

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- .5 Negative air units shall be left operating at the completion of cleanup, for the duration stipulated in Table 4, CAN/CSA Z317.13-F07.
- .6 Windows, doors, exhaust vents and supply intakes shall be sealed off in dust generating areas. Upper seals must be employed where necessary to prevent the spread of dust into adjacent areas.
- .7 The contractor must be able to show that the work zone is negatively pressurized in relation to adjacent occupied areas.

**END OF SECTION**



**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 02 82 00.02 – Asbestos Abatement

**1.2            REFERENCES AND CODES**

- .1      Perform Work in accordance with National Building Code of Canada (NBC) including all amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2      Meet or exceed requirements of:
  - .1      Contract documents.
  - .2      Specified standards, codes and referenced documents.

**1.3            HAZARDOUS MATERIAL DISCOVERY**

- .1      Asbestos: stop work immediately should materials believed to contain asbestos be encountered in during the execution of the work and notify Owner's Representative. Do not proceed until written instructions have been received from Owner's Representative. Perform asbestos abatement and repair in accordance with Newfoundland and Labrador Asbestos Abatement Regulations, Latest Edition.
- .2      Mould: stop work immediately should material resembling mould be encountered during the execution of work and notify Owner's Representative. Do not proceed until written instructions have been received from Owner's Representative.

**1.4            BUILDING SMOKING ENVIRONMENT**

- .1      Comply with smoking restrictions.

**1.5            RELICS AND ANTIQUITIES**

- .1      Protect relics, antiquities, items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tablets, and similar objects found during course of work.
- .2      Give immediate notice to Owner's Representative and await Owner's Representative's written instructions before proceeding with work in this area.
- .3      Relics, antiquities and items of historical or scientific interest remain Her Majesty's property.

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**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED DOCUMENTS**

- .1      Drawings and general provisions of this contract, including General and Supplementary Conditions and other Division 1 Specification Sections, apply to this section.

**1.2            INDUSTRY STANDARDS**

- .1      Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made part of the Contract Documents by reference.
- .2      All construction industry standards referenced in this specification to meet the edition of the standard referenced by the National Building Code of Canada (NBC). If the construction industry standard is not referenced in the National Building Code of Canada (NBC), the latest edition of the standard shall apply.
- .3      Each entity engaged in construction on this Project must be familiar with construction industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Construction Documents.
  - .1      Where copies of construction industry standards are needed to perform a required construction activity, obtain copies directly from publication source and make them available upon request.

**1.3            ABBREVIATIONS AND ACRONYMS FOR INDUSTRY ORGANIZATIONS**

- .1      Where abbreviations and acronyms are used, they shall mean the recognized name of the entities in the following list. Names are believed to be accurate and up-to-date as of the date of the Contract Documents.
- .2      Industry Organizations:
  - .1      Air Conditioning and Mechanical Contractors Association (AMCA).
  - .2      Air Conditioning and Refrigeration Institute (ARI).
  - .3      Americans with Disability Act (ADA).
  - .4      Air Movement and Control Association (AMCA).
  - .5      The Aluminum Association, Inc. (AA).
  - .6      American Architectural Manufacturers Association (AAMA).
  - .7      American Association of State Highway and Transportation Officials (AASHTO).
  - .8      American Association of Textile Chemists and Colourists (AATCC).
  - .9      American Bearing Manufacturers Association (ABMA).
  - .10     American Boiler Manufacturer's Association (ABMA).

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- .11 American Concrete Institute (ACI).
- .12 American Industrial Hygiene Association (AIHA).
- .13 American Institute of Steel Construction (AISC).
- .14 American Iron & Steel Institute (AISI).
- .15 American National Standards Institute (ANSI).
- .16 American Petroleum Institute (API).
- .17 American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE).
- .18 American Society of Mechanical Engineers (ASME).
- .19 American Society of Sanitary Engineer's (ASSE).
- .20 American Society for Testing and Materials (ASTM).
- .21 American Water Works Association (AWWA).
- .22 American Welding Society (AWS).
- .23 American Wood-Preservers' Association (AWPA).
- .24 Architectural Woodwork Institute (AWI).
- .25 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
- .26 Asphalt Institute (AI).
- .27 Associated Air Balance Council (AABC).
- .28 Association of the Wall and Ceilings Industries International (AWEI).
- .29 Atomic Energy Control Board Regulations.
- .30 Brick Industry Association (BIA).
- .31 Building Industry Consulting Services International (BICSI).
- .32 Canada Green Building Council (CaGCB).
- .33 Canada Labour Code.
- .34 Canadian Council of Ministers of the Environment (CCME).
- .35 Canadian Code for Preferred Packaging.
- .36 Canadian Construction Materials Centre (CCMC).
- .37 Canadian Environmental Protection Act (CEPA).
- .38 Canadian Gas Association (CGA).
- .39 Canadian General Standards Board (CGSB).
- .40 Canadian Institute of Steel Construction (CISC).
- .41 Canadian Nursery Landscape Association (CNLA).
- .42 Canadian Paint Manufacturer's Association (CPMA).
- .43 Canadian Roofing Contractors' Association (CRCA).
- .44 Canadian Sheet Steel Building Institute (CSSBI).
- .45 Canadian Standards Association (CSA).
- .46 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA).
- .47 Canadian Urethane Foam Contractors' Association Inc. (CUFCA).
- .48 Carpet and Rug Institute (CRI).

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- .49 Ceramic Tile Institute (CTI).
- .50 Consumer Electronics Association (CEA).
- .51 Cooling Technology Institute (CTI).
- .52 Department of Justice Canada (Jus).
- .53 Electrical and Electronic Manufacturers' Association of Canada (EEMAC).
- .54 Electronic Industries Alliance (EIA).
- .55 Environment Canada (EC).
- .56 The Environmental Choice Program.
- .57 Environmental Protection Agency (EPA).
- .58 Environmental Protection Services (EPS).
- .59 ETL Listing Laboratories (ETL).
- .60 Factory Mutual (FM).
- .61 Federal Communications Commission (FCC).
- .62 Flat Glass Manufacturers Association (FGMA).
- .63 Green Seal Environmental Standards.
- .64 Health Canada - Workplace Hazardous Materials Information System (WHMIS).
- .65 Hydraulics Institute (HI).
- .66 Hydronic Institute of Boiler and Radiator Manufacturers (IBR).
- .67 Industry Canada - Terminal Attachment Program.
- .68 Institute of Electrical and Electronics Engineers (IEEE).
- .69 Institute for Research in Construction (IRC).
- .70 Insulated Cable Engineers Association (ICEA).
- .71 International ElectroTechnical Commission (IEC).
- .72 International Masonry Industry All-Weather Council (IMIAC).
- .73 International Standards Organization (ISO).
- .74 Laminators Safety Glass Association (LSGA).
- .75 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
- .76 Master Painters Institute (MPI).
- .77 National Energy Code of Canada for Buildings (NECB).
- .78 National Association of Architectural Metal Manufactures (NAAMM).
- .79 National Association of Corrosion Engineers (NACE).
- .80 National Building Code of Canada (NBC).
- .81 National Bureau of Standards/Products Standard (NBS/PS).
- .82 National Electrical Manufacturers Association (NEMA).
- .83 National Environmental Balancing Bureau (NEBB).
- .84 National Fire Code of Canada (NFC).
- .85 National Fire Protection Association (NFPA).
- .86 National Floor Covering Association (NFCA).

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- .87 National Hardwood Lumber Association (NHLA).
- .88 National Lumber Grades Authority (NLGA).
- .89 National Plumbing Code of Canada (NPC).
- .90 National Research Council Canada (NRC).
- .91 National Roofing Contractors Association (NRCA).
- .92 National Sanitation Foundation (NSF).
- .93 Newfoundland Occupational Health and Safety Act.
- .94 Plumbing and Drainage Institute (PDI).
- .95 Province of Newfoundland and Labrador Building Accessibility Regulations.
- .96 Provincial Boiler, Pressure Vessel and Compressed Gas Regulations.
- .97 Scientific Equipment and Furniture Association (SEFA).
- .98 Sealant and Waterproofers' Institute.
- .99 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
- .100 Society of Automotive Engineers (SAE).
- .101 The Society for Protective Coatings (SSPC).
- .102 South Coast Air Quality Management District (SCAQMD).
- .103 Telecommunications Distribution Methods Manual (TDMM).
- .104 Telecommunications Industries Association (TIA).
- .105 Terrazzo Tile and Marble Association of Canada (TTMAC).
- .106 Thermal Insulation Association of Canada (TIAC).
- .107 Transport Canada (TC).
- .108 Transport Canada - Marine Safety (TCMS).
- .109 Treasury Board of Canada (TB).
- .110 Treasury Board Information Technology Standard (TBITS).
- .111 Truss Plate Institute of Canada (TPIC).
- .112 Underwriters' Laboratories Inc. (UL).
- .113 Underwriter's Laboratories of Canada (ULC).
- .114 United States Federal Trade Commission (US Federal Trade Commission).
- .115 U.S. Coast Guard Equipment List (USCG).
- .116 U.S. Department of Transportation (DOT).
- .117 National Fireproofing Contractors Association (NFCA).

**PART 2**      **PRODUCTS (NOT APPLICABLE)**

**PART 3**      **EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SECTIONS INCLUDE**

- .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.

**1.2            RELATED SECTIONS**

- .1      Section 01 21 00 – Allowances.
- .2      Section 01 33 00 – Submittal Procedures
- .3      Section 01 78 00 – Closeout Submittals

**1.3            INSPECTION**

- .1      Allow Owner's Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2      Give 48 hours notice requesting inspection if Work is designated for special tests, inspections or approvals by Owner's Representative instructions.
- .3      If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4      Owner's Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Owner's Representative shall pay cost of examination and replacement.

**1.4            INDEPENDENT INSPECTION AGENCIES**

- .1      Independent Inspection/Testing Agencies will be engaged by Owner's Representative for purpose of inspecting and/or testing portions of Work.
- .2      Allocated costs: to Section 01 21 00 – Allowances and Section 01 29 83 – Payment Procedures: Testing Laboratory Services.

- .3 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Owner's Representative at no cost to Owner's Representative. Pay costs for retesting and reinspection.

**1.5 ACCESS TO WORK**

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

**1.6 PROCEDURES**

- .1 Notify appropriate agency and Owner's Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in 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.

**1.7 REJECTED WORK**

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

**1.8 REPORTS**

- .1 Submit 3 copies of inspection and test reports to Owner's Representative, plus electronic copies in PDF format.



.2 Provide copy to Subcontractor of work being inspected or tested, manufacturer or fabricator of material being inspected or tested.

.3 Include copy of all inspection and test reports in Commissioning Manuals.

### **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 all locations acceptable to Owner's Representative as specified in specific Section.

.3 Prepare mock-ups for Owner's Representative 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 Remove mock-up at conclusion of Work or when acceptable to Owner's Representative

.6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

.7 Reviewed and accepted mock-ups will become standards of workmanship and material against which installed work will be verified.

.8 Mock-ups may remain as part of Work.

### **1.10 EQUIPMENT AND SYSTEMS**

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

.2 Mechanical – coordinate with mechanical division.

.3 Electrical – Coordinate with electrical division.

### **1.11 FIRE SEPARATIONS**

.1 Provide fire separation labelling/stenciling as per Sections 09 91 23 – Interior Painting and 09 91 23.01 – Interior Re-Painting.

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**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 52 00 - Construction Facilities.
- .2      Section 01 56 00 - Temporary Barriers and Enclosures.

**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.

**1.4            WATER SUPPLY**

- .1      Arrange for connection with appropriate utility company and pay all costs for installation, maintenance and removal.

**1.5            TEMPORARY HEATING AND VENTILATION**

- .1      Pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel operation, maintenance and removal of equipment. Use of direct, fired heaters discharging waste products into work areas will not be permitted unless prior approval is given by Owner's Representative.
- .2      Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3      Provide temporary heat and ventilation in enclosed areas as required to:
  - .1      Facilitate progress of Work.
  - .2      Protect Work and products against dampness and cold.
  - .3      Prevent moisture condensation on surfaces.
  - .4      Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
  - .5      Provide adequate ventilation to meet health regulations for safe working environment.
- .4      Maintain temperatures of minimum 10°C and relative humidity less than 60% in areas where construction is in progress.

- .1 Maintain minimum temperature of 10°C or higher where specified as soon as finished work is commenced. Maintain until acceptance of structure by Owner's Representative.
- .2 Maintain ambient temperature and humidity levels as required for comfort of office personnel.
- .5 Ventilating:
  - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
  - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
  - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
  - .4 Ventilate storage spaces containing hazardous or volatile materials.
  - .5 Ventilate temporary sanitary facilities.
  - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 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 Be responsible for damage to Work due to failure in providing adequate heat, humidity and protection during construction.
- .8 Use of new or existing systems for temporary heating, ventilating or air conditioning will not be permitted.

**1.6 TEMPORARY POWER AND LIGHT**

- .1 Provide and pay for temporary power during constructing for temporary lighting, heating, site construction trailers and operating of power tools in accordance with governing regulations and the Canadian Electrical Code, latest edition.
- .2 Arrange for connection with Utility company. Pay all costs for installation, maintenance and removal of cables, distribution and branch panel boards, poles, lighting, heating and general power receptacles as required.
- .3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx. Temporary lighting to consist of wiring, pig tail sockets and 75 watt shatterproof incandescent lamps to provide a minimum light level of 162 lux.
- .5 Electrical power and lighting systems installed under this contract may be used for construction requirements only with prior approval of Owner's Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this contract. Replace lamps which have been used for more than 3 months.
- .6 General contractor responsible for payment of all electrical energy charges associated with temporary power up to date of substantial completion.

**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.

**1.8 SANITARY FACILITIES**

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

**1.9 TEMPORARY COMMUNICATION FACILITIES**

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

**1.10 REMOVAL OF TEMPORARY FACILITIES**

- .1 Remove temporary facilities from site when directed by Owner's Representative.
- .2 When project is closed down at end of construction season keep temporary facilities operational until close down or removal is approved by Owner's Representative.

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**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

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

**1.2            RELATED SECTIONS**

- .1      Section 01 35 29.06 – Health and Safety Requirements
- .2      Section 01 51 00 - Temporary Utilities.
- .3      Section 01 56 00 - Temporary Barriers and Enclosures.

**1.3            INSTALLATION AND REMOVAL**

- .1      Provide construction facilities in order to execute work expeditiously.
- .2      Remove from site all such work after use.

**1.4            SCAFFOLDING**

- .1      Provide and maintain scaffolding in rigid, secure and safe manner.
- .2      Erect scaffolding independent of walls. Remove promptly when no longer required. Refer to Section 01 35 29.06 – Health and Safety Requirements.

**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 cranes shall be operated by certified operator.

**1.6            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.

**1.7 CONSTRUCTION PARKING**

- .1 Parking will be permitted on site provided it does not disrupt performance of work.
- .2 Provide and maintain adequate access to project site.
- .3 Build and maintain temporary roads where indicated or directed by Owner's Representative and provide snow removal during period of Work.
- .4 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.

**1.8 CONTRACTOR'S SITE OFFICES**

- .1 Provide office heated to 22 °C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table, fax machine, telephone, file cabinet and chair. Provide an accessible washroom within the contractor's site office.
- .2 Accessible washroom, meeting space and entrance to contractor's site office to meet the accessibility requirements of the NL Accessibility Act and Regulations, and CSA B651, Accessible Design for the Built Environment.
- .3 Provide a clearly marked and fully stocked first-aid case in a readily available location.
- .4 Subcontractors may provide their own offices as necessary. Direct location of these offices.

**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.

**1.10 SANITARY FACILITIES**

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

**1.11 CLEAN-UP**

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.



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- .3 Store materials resulting from demolition activities that are salvageable.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

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

**1.2            RELATED SECTIONS**

- .1      Section 01 51 00 – Temporary Utilities.
- .2      Section 01 52 00 – Construction Facilities.

**1.3            INSTALLATION AND REMOVAL**

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

**1.4            HOARDING**

- .1      Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres, installed on 89 x 89 mm wood posts at 2400 mm centres or 50 mm dia. steel posts at 2400 mm centres. Posts to be place in post holes filled with concrete to minimum 900 mm depth. Finish temporary site enclosures with 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121 or chain link fence fabric to Section 32 31 13 – Chain Link Fences and Gates.
- .2      Apply plywood panels or chain link fence fabric vertically flush and butt jointed.
- .3      Provide one lockable truck entrance gate and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.
- .4      Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.
- .5      Paint public side of site enclosure in selected colours with one coat primer to CGSB 1.189M and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition.

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- .6 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

**1.5 GUARD RAILS AND BARRICADES**

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

**1.6 WEATHER ENCLOSURES**

- .1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
- .2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
- .3 Erect enclosures to allow access for installation of materials and working inside enclosure.
- .4 Design enclosures to withstand wind pressure and snow loading.

**1.7 DUST TIGHT SCREENS**

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

**1.8 ACCESS TO SITE**

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.
- .2 Build and maintain temporary roads where indicated or directed and provide snow removal during period on work.
- .3 If authorized to use existing roads for access to project site, maintain such roads for duration of Contract and make good damage resulting from Contractor's use of roads.

**1.9 PUBLIC TRAFFIC FLOW**

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

**1.10 FIRE ROUTES**

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

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**1.11 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

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

**1.12 PROTECTION OF BUILDING FINISHES**

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

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .1      Product quality, availability, storage, handling, protection, and transportation.
- .2      Manufacturer's instructions.
- .3      Quality of Work, coordination and fastenings.

**1.2            RELATED SECTIONS**

- .1      Section 01 45 00 – Quality Control.
- .2      Section 01 73 00 – Execution.

**1.3            REFERENCES**

- .1      Within text of each specifications section, reference may be made to reference standards. Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .2      Conform to latest date of issue of referenced standards in effect on date of submission of Tenders, except where specific date or issue is specifically noted.

**1.4            QUALITY**

- .1      Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2      Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3      Should any dispute arise as to quality or fitness of products, decision rests strictly with Owner's Representative based upon requirements of Contract Documents.
- .4      Within seven (7) working days of written request by Owner's Representative, submit following information for material and equipment proposed for supply:
  - .1      Name and address of manufacturer.
  - .2      trade name, model and catalogue number,
  - .3      performance, descriptive and test data,
  - .4      manufacturer's installation or application instructions,

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- .5 evidence of arrangements to procure.
- .5 Use products of one manufacturer for material and equipment of same type or classification unless otherwise specified.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

**1.5 AVAILABILITY**

- .1 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 Owner's Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of work.
- .2 In event of failure to notify Owner's Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Owner's Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

**1.6 STORAGE, HANDLING AND PROTECTION**

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

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**1.7           TRANSPORTATION**

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

**1.8           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 Owner's Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Owner's Representative may establish course of action.
- .3     Improper installation or erection of products, due to failure in complying with these requirements, authorizes Owner's Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

**1.9           QUALITY OF WORK**

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

**1.10          CO-ORDINATION**

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

**1.11          CONCEALMENT**

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

**1.12            REMEDIAL WORK**

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

**1.13            LOCATION OF FIXTURES**

- .1    Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2    Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3    Inform Owner's Representative of conflicting installation. Install as directed.
- .4    Submit field drawings to indicate relative position of various services and equipment when required by Owner's Representative.

**1.14            FASTENINGS GENERAL**

- .1    Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work, unless stainless steel or other material is specifically requested in affected specification section.
- .2    Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood plugs are not acceptable.
- .3    Conceal fasteners where indicated. Space evenly and lay out neatly.
- .4    Fastenings which cause Spalding or cracking are not acceptable.
- .5    Obtain Owner's Representative's approval before using explosive actuated fastening devices. If approval is obtained comply with CSA Z166.

**1.15            FASTENINGS - EQUIPMENT**

- .1    Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2    Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3    Bolts may not project more than one diameter beyond nuts.



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- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

**1.16 PROTECTION OF WORK IN PROGRESS**

- .1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Owner's Representative.

**1.17 EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute work at times directed by local governing authorities, with minimum of disturbance to work.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.
- .3 Submit schedule to and obtain approval from Owner's Representative for any shut-down or closure of active services or facility. Adhere to approved schedule and provide notice to affected parties.
- .4 Where unknown services are encountered, immediately advise Owner's Representative and confirm findings in writing.
- .5 Remove abandoned services lines within 2m of structures. Cap or otherwise seal lines at cut-off points as directed by Owner's Representative.

**1.18 SELECTION OF MATERIAL AND EQUIPMENT**

- .1 Material and equipment will be specified in the tender documents, and selected by Contractor, by one or more of the following methods:
  - .1 Specification by reference to a relevant Standard, such as CSA, ASTM, ULC, etc., select any material or equipment that meets or exceeds the specified.
  - .2 Specification by reference to an accepted product evaluation publication, such as the CGSB "Qualified Products List", or CCMC Registry of Product Evaluations", - select any manufacturer's product so listed.
  - .3 Specification by Prescriptive or Performance specification – select any material or equipment meeting or exceeding specification.
  - .4 Specification by identification of one or more Manufacturer's specific product(s) as an "Acceptable Product", along with a listing of other manufacturers who may offer equivalent products – select any product so named, or select from equivalent product(s) of other listed manufacturers.
- .2 "Acceptable Product" is deemed to be a complete and working commodity as described by a manufacturer's name, catalogue number, trade name, or any combination thereof, and will constitute the minimum standard of acceptance.

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- .3 Owner's Representative will determine acceptability of Contractor's selection of material and equipment at time of Shop Drawing review.
- .4 When material or equipment is specified by a Standard, Prescriptive or Performance specification, upon request of the Owner's Representative, obtain from manufacturer an independent laboratory reporting, showing that material or equipment meets or exceeds the specified requirements.

**1.19 SUBSTITUTION OF MATERIAL AND EQUIPMENT**

- .1 Substitution prior to Tender closing will be considered by Owner's Representative only if the conditions of Section 01 25 00 – Substitution Procedures are met..
- .2 **After Contract award** substitutions of material or equipment, other than as selected by Contractor from those specified, will be considered by Owner's Representative only if the conditions of Section 01 25 00 – Substitution Procedures are met.
- .3 Requests for substitutions after Contract award must be accompanied by sufficient information in the form of shop drawings, manufacturer's literature, samples or other data to permit proper investigation of the substitutes used. Requests must also include statements of respective costs of material or equipment originally specified and the proposed substitution.
- .4 Should a proposed substitution be accepted after Contract award either in part or in whole, assume full responsibility and costs when substitution affects other work on Project. Contractor to pay for design or drawing changes required as a result of the substitution.
- .5 Amounts of all credits arising from approval of substitutions after Contract award will be determined by Owner's Representative and the Contract amount will be reduced accordingly.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .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.

**1.2            QUALIFICATIONS OF SURVEYOR**

- .1      Qualified registered land surveyor, licensed to practise in the Province of Newfoundland and Labrador.

**1.3            SURVEY REFERENCE POINTS**

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

**1.4            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 for grading, fill placement .
- .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.

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**1.5 EXISTING SERVICES**

- .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by authorities having jurisdiction, with minimum of disturbance to pedestrian and vehicular traffic.
- .2 Before commencing work, establish location and extent of service lines in area of Work and notify Owner's Representative of findings.
- .3 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Owner's Representative.

**1.6 LOCATION OF EQUIPMENT AND FIXTURES**

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Owner's Representative of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Owner's Representative.

**1.7 RECORDS**

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

**1.8 SUBMITTALS**

- .1 Submit name and address of Surveyor to Owner's Representative.
- .2 On request of Owner's Representative, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

**1.9 SUBSURFACE CONDITIONS**

- .1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.

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- .2 After prompt investigation, should Owner's Representative determine that conditions do differ materially, instructions will be issued for changes in Work.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .1      Requirements and limitations for cutting and patching the Work.

**1.2            RELATED SECTIONS**

- .1      Section 01 11 00 - Summary of Work.
- .2      Section 01 33 00 - Submittal Procedures.

**1.3            SUBMITTALS**

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

**1.4            PREPARATION**

- .1      Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2      After uncovering, inspect conditions affecting performance of Work.
- .3      Beginning of cutting or patching means acceptance of existing conditions.
- .4      Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

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- .5 Provide protection from elements for areas which may be exposed by uncovering work; maintain excavations free of water.
- .6 Obtain Owner's Representative's approval before cutting, boring or sleeving load-bearing members.

**1.5 EXECUTION**

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

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**1.6 WASTE MANAGEMENT AND DISPOSAL**

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

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**



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**PART 1**      **GENERAL**

**1.1**            **GENERAL**

- .1      Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
- .2      Store volatile waste in covered metal containers and remove from premises at end of each working day.
- .3      Provide adequate ventilation during use of volatile or noxious substances. Use for building ventilation systems is not permitted for this purpose.

**1.2**            **RELATED SECTION**

- .1      Section 01 77 00 - Closeout Procedures.

**1.3**            **PROJECT CLEANLINESS**

- .1      Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Owner or other Contractors.
- .2      Remove waste materials and debris from site at the end of each working day. Do not burn waste materials on site.
- .3      Clear snow and ice from access to building.
- .4      Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5      Provide on-site containers for collection of waste materials and debris.
- .6      Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.
- .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, and as recommended by cleaning material manufacturer.
- .10     Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

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**1.4 FINAL CLEANING**

- .1 Refer to General Conditions.
- .2 When Work is Substantially Performed, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4 When the Work is Totally Performed, remove surplus products, tools, construction machinery and equipment. Remove waste products and debris other than that caused by the Owner or other Contractors.
- .5 Remove waste materials from the site at regularly scheduled times or dispose of as directed by the Owner's Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Leave the work broom clean before the inspection process commences.
- .8 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors and ceilings.
- .10 Clean lighting reflectors, lenses, and other lighting surfaces.
- .11 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .12 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .13 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .14 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .15 Remove dirt and other disfiguration from exterior surfaces.
- .16 Clean roofs, gutters, downspouts and drainage systems. Clean areaways and sunken wells.
- .17 Sweep and wash clean paved areas.
- .18 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.
- .19 Remove snow and ice from access to building.

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- .20 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

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

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .1      Text, schedules and procedures for systematic Waste Management Program for construction, deconstruction, demolition, and renovation projects, including:
  - .1      Diversion of Materials.
  - .2      Waste Audit (WA) - Schedule A.
  - .3      Waste Reduction Workplan (WRW) - Schedule B.
  - .4      Demolition Waste Audit (DWA) - Schedule C.
  - .5      Cost/Revenue Analysis Workplan (CRAW) - Schedule D.
  - .6      Materials Source Separation Program (MSSP).
  - .7      Canadian Governmental Responsibility for the Environment Resources - Schedule E.

**1.2            DEFINITIONS**

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

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- .9 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.

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

- .1 Prepare MSSP and have ready for use prior to project start-up.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by authorities having jurisdiction.
- .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide containers to deposit reusable and recyclable materials.
- .5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .6 Locate separated materials in areas which minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
  - .1 Transport to recycling facility.

**1.4 STORAGE, HANDLING AND PROTECTION**

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

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**1.5 DISPOSAL OF WASTES**

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

**1.6 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Provide security measures approved by Owner's Representative.

**1.7 SCHEDULING**

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

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION**

**3.1 APPLICATION**

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

**3.2 CLEANING**

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

**3.3 DIVERSION OF MATERIALS**

- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Owner's Representative and consistent with applicable fire regulations.
  - .1 Mark containers or stockpile areas.
  - .2 Provide instruction on disposal practices.

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.2 On-site sale or distribution of salvaged materials to third parties is not permitted.

**END OF SECTION**

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**PART 1      GENERAL**

**1.1      RELATED SECTIONS**

- .1      Section 01 74 11 - Cleaning.
- .2      Section 01 78 00 - Closeout Submittals.
- .3      Section 01 91 13 – General Commissioning (Cx) Requirements.

**1.2      FINAL INSPECTION AND DECLARATION PROCEDURES**

- .1      Contractor's Inspection: The Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects; repair as required. Notify the Owner's Representative in writing of satisfactory completion of the Contractor's Inspection and that corrections have been made. Request an Owner's Representative's Consultant's Inspection.
- .2      Owner's Representative's Inspection: Owner's Representative and the Contractor will perform an inspection of the Work to identify obvious defects or deficiencies. The contractor shall correct Work accordingly.
- .3      Completion: submit written certificate that the following have been performed:
  - .1      Work has been completed and inspected for compliance with Contract Documents.
  - .2      Defects have been corrected and deficiencies have been completed.
  - .3      Equipment and systems have been tested, adjusted and balanced and are fully operational.
  - .4      Certificates required by Fire Commissioner, Utility companies have been submitted.
  - .5      Operation of systems have been demonstrated to Owner's personnel.
  - .6      Commissioning of building systems: completed in accordance with section 01 91 13 – Commissioning (Cx) Requirements and copies of final Commissioning Report submitted to Owner's Representative.
  - .7      Work is complete and ready for Final Inspection.
- .4      Final Inspection: When items noted above are completed, request final inspection of Work by the Owner's Representative, representative of DTW and the Contractor. If Work is deemed incomplete by the Owner's Representative, complete outstanding items and request a reinspection.
- .5      Declaration of Substantial Performance: When the Owner's Representative considers deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Certificate of Substantial Performance. Refer to General Conditions for specifics to application.



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- .6 Commencement of Lien and Warranty Periods: The date of DTW acceptance of the submitted declaration of Substantial Performance shall be the date for commencement for the warranty period and commencement of the lien period.
  
- .7 Declaration of Total Performance: When the Owner's Representative considers final deficiencies and defects have been corrected and it appears requirements of the Contract have been totally performed, make application for certificate of Total Performance. Refer to General Conditions for specifics to application. If Work is deemed incomplete by the Consultant, complete the outstanding items and request a reinspection.

**1.3 REINSPECTION**

- .1 Should status of work require reinspection by Owner's Representative due to failure of work to comply with Contractor's claims for inspection, Owner will deduct amount of compensation for reinspection services from payment to Contractor.

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .1      As-built, samples, and specifications.
- .2      Equipment and systems.
- .3      Product data, materials and finishes, and related information.
- .4      Operation and maintenance data.
- .5      Spare parts, special tools and maintenance materials.
- .6      Warranties and bonds.
- .7      Final site survey.

**1.2            RELATED SECTIONS**

- .1      Section 01 33 00 – Submittal Procedures.
- .2      Section 01 45 00- Quality Control.
- .3      Section 01 71 00 – Examination and Preparation.
- .4      Section 01 77 00 - Closeout Procedures.
- .5      Section 01 91 13 – General Commissioning (Cx) Requirements.

**1.3            SUBMISSION**

- .1      Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2      Submit one copy of completed volumes in final form 15 days prior to final inspection.
- .3      Copy will be returned after final inspection, with Owner's Representative's comments.
- .4      Revise content of documents as required prior to final submittal.
- .5      Two weeks prior to Substantial Performance of the Work, submit to the Owner's Representative, two final copies of operating and maintenance manuals.
- .6      Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.
- .7      If requested, furnish evidence as to type, source and quality of products provided.

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- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9 Pay costs of transportation.

**1.4           FORMAT**

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

**1.5           CONTENTS - EACH VOLUME**

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

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- .6 Training: Refer to Section 01 91 13 – General Commissioning (Cx) Requirements.

**1.6 AS-BUILTS AND SAMPLES**

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

**1.7 RECORDING ACTUAL SITE CONDITIONS**

- .1 Record information on set of blue line opaque drawings, provided by Owner's Representative.
- .2 Provide felt tip marking pens, maintaining red color pens for recording information.
- .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:
- .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Changes made by change orders.

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- .6 Details not on original Contract Drawings.
- .7 References to related shop drawings and modifications.
- .5 Specifications: legibly mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: submit manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 At completion of project, provide all recorded information on print drawings. Transfer recorded information to AutoCAD files in DWG format. Submit DWG files, also with electronic files in PDF format as part of the Closeout Submittals.

**1.8 FINAL SURVEY**

- .1 Submit final site survey certificate certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

**1.9 EQUIPMENT AND SYSTEMS**

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

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- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports
- .15 Additional requirements: As specified in individual specification sections.

**1.10 MATERIALS AND FINISHES**

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

**1.11 SPARE PARTS**

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

**1.12 MAINTENANCE MATERIALS**

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site location as directed; place and store.

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- .4 Receive and catalogue all items. Submit inventory listing to Owner's Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

**1.13 SPECIAL TOOLS**

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and equipment.
- .3 Deliver to project site place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Owner's Representative. Include approved listings in Maintenance Manual.

**1.14 STORAGE, HANDLING AND PROTECTION**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Owner's Representative.

**1.15 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan to Owner's Representative's approval.
- .3 Warranty management plan to include required actions and documents to assure that Owner receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

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- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of the applicable item of work.
- .4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.
- .5 Verify that documents are in proper form, contain full information, and are notarized.
- .6 Co-execute submittals when required.
- .7 Retain warranties and bonds until time specified for submittal.
- .6 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems, lightning protection systems.
  - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
    - .1 Name of item.
    - .2 Model and serial numbers.
    - .3 Location where installed.
    - .4 Name and phone numbers of manufacturers or suppliers.
    - .5 Names, addresses and telephone numbers of sources of spare parts.
    - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
    - .7 Cross-reference to warranty certificates as applicable.
    - .8 Starting point and duration of warranty period.
    - .9 Summary of maintenance procedures required to continue warranty in force.
    - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
    - .11 Organization, names and phone numbers of persons to call for warranty service.
    - .12 Typical response time and repair time expected for various warranted equipment.
  - .4 Procedure and status of tagging of equipment covered by extended warranties.
  - .5 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .7 Respond in a timely manner to oral or written notification of required construction warranty repair work.



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- .8 Written verification will follow oral instructions. Failure to respond will be cause for the Owner's Representative to proceed with action against Contractor.

**1.16 PRE-WARRANTY CONFERENCE**

- .1 Meet with Owner's Representative to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Owner's Representative.
- .2 Owner's Representative will establish communication procedures for:
- .1 Notification of construction warranty defects.
  - .2 Determine priorities for type of defect.
  - .3 Determine reasonable time for response.

**1.17 WARRANTY TAGS**

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

**PART 2      PRODUCTS (NOT APPLICABLE)**

**PART 3      EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**PART 1      GENERAL**

**1.1      RELATED SECTIONS**

- .1      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2      Section 03 20 00 - Concrete Reinforcing.
- .3      Section 03 30 00 - Cast-in-place Concrete.

**1.2      REFERENCES**

- .1      Canadian Standards Association (CSA)
  - .1      CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2      CSA-O86S1, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .3      CSA O121, Douglas Fir Plywood.
  - .4      CSA O151, Canadian Softwood Plywood.
  - .5      CAN/CSA-S269.3, Concrete Formwork.

**1.3      SUBMITTALS**

- .1      Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. 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.
- .3      Indicate sequence of erection and removal of formwork/falsework as directed by Owner's Representative.
- .4      Each shop drawing submission shall bear stamp and signature of qualified professional engineer licensed in Province of Newfoundland and Labrador, Canada.

**PART 2      PRODUCTS**

**2.1      MATERIALS**

- .1      Formwork materials:
  - .1      For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121.

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- .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
- .2 Tubular column forms: round, spirally wound laminated fiber forms, internally treated with release material. Spiral pattern to show in hardened concrete.
- .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 dia. in concrete surface.
  - .2 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .4 Form liner:
  - .1 Plywood: medium density overlay Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151, T and G thickness as indicated.
- .5 Form release agent: chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps, non-toxic, biodegradable.
- .6 Falsework materials: to CSA-S269.1.
- .7 Sealant: to Section 07 92 10 - Joint Sealing.

**PART 3      EXECUTION**

**3.1      FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Fabricate and erect falsework in accordance with CSA S269.1.
- .3 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- .4 Do not place shores and mud sills on frozen ground.
- .5 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .6 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.
- .7 Align form joints and make watertight. Keep form joints to minimum.

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- .8 Locate horizontal form joints for exposed columns 2400 mm above finished floor elevation.
- .9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners , joints, unless specified otherwise.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Construct forms for architectural concrete, and place ties as indicated and/or as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.
- .12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Ensure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

**3.2 REMOVAL AND RESHORING**

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
  - .1 3 days for walls and sides of beams.
  - .2 5 days for columns.
  - .3 1 day for footings and abutments.
- .2 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.
- .3 Space reshoring in each principal direction at not more than 3000 mm apart.
- .4 Re-use formwork and falsework subject to requirements of CSA-A23.1A23.2.

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2      Section 03 10 00 – Concrete Forming and Accessories.
- .3      Section 03 30 00 - Cast-in-Place Concrete.

**1.2            REFERENCES**

- .1      American Concrete Institute (ACI)
  - .1          SP-66, ACI Detailing Manual, 2004.
- .2      American Society for Testing and Materials International (ASTM)
  - .1          ASTM A185/A185M, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - .2          ASTM A497/A497M, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
  - .3          ASTM A1022/A1022M, Standard Specification for Deformed and Plain Stainless Steel Wire and Welded Wire for Concrete Reinforcement.
- .3      Canadian Standards Association (CSA)
  - .1          CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of test 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-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel /Structural Quality Steel.
  - .5          CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .6          CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4      Reinforcing Steel Institute of Canada (RSIC)
  - .1          RSIC, Reinforcing Steel Manual of Standard Practice.

**1.3            SUBMITTALS**

- .1      Indicate on shop drawings, bar bending details, lists, quantities of reinforcement, sizes, spacings, locations of reinforcement and mechanical splices if approved by Owner's Representative, with identifying code marks to permit correct placement without reference to structural drawings. Indicate sizes, spacings and locations of chairs, spacers and hangers. Prepare reinforcement drawings in accordance with Reinforcing Steel Manual of

Standard Practice - by Reinforcing Steel Institute of Canada . SP-66, ACI Detailing Manual, 2004, American Concrete Institute.

- .2 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
- .3 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador.

## **PART 2      PRODUCTS**

### **2.1      MATERIALS**

- .1 Substitute different size bars only if permitted in writing by Owner's Representative.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: to ASTM A497/A497M.
- .4 Welded steel wire fabric: to ASTM A185/A185M. Provide in flat sheets only.
- .5 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .6 Mechanical splices: subject to approval of Owner's Representative.
- .7 Plain round bars: to CSA-G40.20/G40.21.

### **2.2      FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1A23.2, SP-66, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Owner's Representative's approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Owner's Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

### **2.3      SOURCE QUALITY CONTROL**

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

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- .2 Upon request inform Owner's Representative of proposed source of material to be supplied.

**PART 3      EXECUTION**

**3.1            FIELD BENDING**

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

**3.2            PLACING REINFORCEMENT**

- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete. Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint. When paint is dry, apply a thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Owner's Representative approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

**END OF SECTION**

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2      Section 03 10 00 - Concrete Forming and Accessories.
- .3      Section 03 20 00 - Concrete Reinforcing.
- .4      Section 03 35 00 - Concrete Finishing.
- .5      Section 03 35 05 - Concrete Floor Hardening.

**1.2            MEASUREMENT PROCEDURES**

- .1      Cast-in-place concrete will not be measured but will be paid for as a fixed price item.

**1.3            REFERENCES**

- .1      American Society for Testing and Materials (ASTM)
  - .1      ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.
  - .2      ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .3      ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
  - .4      ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
  - .5      ASTM D624, Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
  - .6      ASTM D1751, Standard Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
- .2      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3      Canadian Standards Association (CSA)
  - .1      CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2      CAN3-A266.4, Guidelines for the Use of Admixtures in concrete.



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

.4 CSA-A3001, Cementitious Materials for Use in Concrete.

#### **1.4 ACRONYMS AND TYPES**

.1 Cement: hydraulic cement or blended hydraulic cement (XXb - where b denotes blended).

.1 Type GU or GUb - General use cement.

#### **1.5 SUBMITTALS**

.1 At least 4 weeks prior to commencing work, inform Owner's Representative of proposed source of aggregates and provide access for sampling.

.2 Submit testing results and reports for review by Owner's Representative and do not proceed without written approval when deviations from mix design or parameters are found.

.3 Certificates:

.1 Minimum 4 weeks prior to starting concrete work submit to Owner's Representative manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:

.1 Portland cement.

.2 Blended hydraulic cement.

.3 Supplementary cementing materials.

.4 Grout.

.5 Admixtures.

.6 Aggregates.

.7 Water.

.8 Waterstops.

.9 Waterstop joints.

.10 Joint filler.

.2 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1/A23.2.

.3 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1/A23.2.

#### **1.6 SOURCE QUALITY CONTROL**

.1 Have all concrete produced and delivered by a ready-mix plant that is a member of the Atlantic Provinces Ready Mixed Concrete Association (APRMCA) and holds a current "Certificate of Ready Mixed Concrete Production Facilities" issued by the

Association. Submit a copy of this certificate to the Owner's Representative for approval.

### **1.7 QUALITY ASSURANCE**

- .1 Minimum 4 weeks prior to starting concrete work, submit proposed quality control procedures in accordance with Section 01 45 00 - Quality Control for Owner's Representative approval for following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.

### **1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
  - .1 Modifications to maximum time limit must be agreed to Owner's Representative and concrete producer as described in CSA A23.1/A23.2.
  - .2 Deviations to be submitted for review by Owner's Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .3 Waste Management and Disposal:
  - .1 Divert unused concrete materials from landfill to local facility approved by Owner's Representative.
  - .2 Provide an appropriate area on the job site where concrete trucks can be safely washed.
  - .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the Owner's Representative.
  - .4 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
  - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial and National regulations.

**PART 2      PRODUCTS**

**2.1          MATERIALS**

- .1      Portland cement: to CAN/CSA-A3001, Type GU.
- .2      Water: to CAN/CSA-A23.1.
- .3      Aggregates: to CSA-A23.1.
- .4      Coarse aggregates to be normal density to CSA-A23.1/A23.2.
- .5      Admixtures:
  - .1      Air entraining admixture: to ASTM C260.
  - .2      Chemical admixtures: to ASTM C494, Owner's Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .6      Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days.
- .7      Ribbed waterstops: extruded PVC of sizes indicated shop welded corner and intersecting pieces.
  - .1      Tensile strength: to ASTM D412, method A, Die "C".
  - .2      Elongation: to ASTM D412, method A, Die "C", minimum 275%.
  - .3      Tear resistance: to ASTM D624, method A, Die "B".
- .8      Premoulded joint fillers:
  - .1      Bituminous impregnated fiber board: to ASTM D1751.
- .9      Polyethylene film: minimum 0.25 mm thickness to ASTM C171.
- .10     Bonding adhesive: as approved by Owner's Representative.

**2.2          MIXES**

- .1      Proportion normal density concrete in accordance with CSA-A23.1/A23.2, Alternative 1 to give following quality and yield for all concrete.
  - .1      Cement:
    - .1      Type GU Portland cement.
  - .2      Minimum compressive strength at 28 days: 32 MPa.
  - .3      Minimum cement content: 300 kg/m<sup>3</sup> of concrete.
  - .4      Class of exposure: F2.
  - .5      Nominal size of coarse aggregate: 20 mm.
  - .6      Slump at time and point of discharge: 75 to 100 mm.

- .7 Air content: 5 to 8 %.
- .8 Chemical admixtures: admixtures in accordance with ASTM C494.

**PART 3      EXECUTION**

**3.1          PREPARATION**

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

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- .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.
- .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 manufacturers'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 Owner's Representative or those noted in CSA-A23.1/A23.2, to remove excess bleed water. Ensure surface is not damaged.
  - .3 Wet cure using polyethylene sheets placed over sufficiently hardened concrete to prevent damage. Overlap adjacent edges 150 mm and tightly seal with sand on wood planks. Weigh sheets down to maintain close contact with concrete during the entire curing period.
  - .4 Where burlap is used for moist curing, place two prewetted layers on concrete surface and keep continuously wet during curing period.
  - .5 Finish concrete floor to meet requirements of CSA-A23.1/A23.2.
  - .6 Concrete floor to have finish hardness equal or greater than Mohs hardness in accordance with CSA-A23.1/A23.2.
  - .7 Provide swirl-trowelled finish for exterior walks, ramps, pads.
  - .8 Provide float finish for interior floor slabs.
  - .9 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.

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- .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,  $F_F = 25$ ,  $F_L = 20$ .
- .2 Finish all interior exposed concrete slabs to a tight consistent steel trowel appearance without burnishing the surface.

### **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 For compressive strength testing of concrete a minimum of four (4) cylinders and three (3) field cured cylinders are required for:
  - .1 Each day's pour.
  - .2 Each type of grade of concrete.
  - .3 Each change of supplier.
  - .4 Each 50 cubic meters or fraction thereof for footings and foundation walls, requirements of CAN/CSA A 23.1.

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- .5 Conduct at least one (1) slump and one (1) air entrainment test with each compressive strength test.
- .3 Pay for costs of tests as specified from Cash Allowance. Costs of retesting due to deficient work will be paid for by contractor, by credit change order.
- .4 Take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.1/A23.2.
- .6 Provide Certificate of Field Quality Inspection and Testing to Owner's Representative for inclusion in Commissioning Manual.
- .7 Inspection or testing by Owner's Representative will not augment or replace Contractor quality control nor relieve the Contractor of his contractual responsibility.

**3.5 DEFECTIVE WORK**

- .1 Repairs and classification of unacceptable concrete to be in accordance with CAN/CSA-A23.1.
- .2 Remove defective concrete and embedded debris and repair as directed by Owner's Representative.
- .3 Remove to bare concrete curing compounds detrimental to application of specified finishes.
- .4 Concrete to be supplied at the minimum strength requirement at 28 days. Tests indicating strengths lower than specified will necessitate further testing as required by the Owner's Representative. Cost for such testing to be at the Contractor's expense. Should further tests confirm low values, the Owner's Representative has the right to require strengthening of the affected area or removal and replacing of the weak concrete all to the Contractor's expense.
- .5 Repair all shrinkage cracks in the completed slab-on-grade to remain exposed employing a suitable epoxy injection technique acceptable to Owner's Representative to completely seal all such cracks, all to the Contractor's expense.
- .6

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2      Section 03 30 00 - Cast-in-Place Concrete .

**1.2            REFERENCES**

- .1      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-25.20, Surface Sealer for Floors.
- .2      Canadian Standards Association (CSA)
  - .1      CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

**1.3            PERFORMANCE REQUIREMENTS**

- .1      Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.
- .2      Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

**1.4            PRODUCT DATA**

- .1      Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content.
- .2      Include application instructions for concrete floor treatment.

**1.5            ENVIRONMENTAL REQUIREMENTS**

- .1      Temporary lighting:
  - .1      Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2      Electrical power:
  - .1      Provide sufficient electrical power to operate equipment normally used during construction.
- .3      Work area:
  - .1      Make the work area water tight protected against rain and detrimental weather conditions.



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- .4 Temperature:
  - .1 Maintain ambient temperature of not less than 10°C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture:
  - .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.
- .6 Safety:
  - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
  - .1 Ventilate area of work as directed by Owner's Representative by use of approved portable supply and exhaust fans.
  - .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
  - .3 Provide continuous ventilation during and after coating application.

**PART 2      PRODUCTS**

**2.1            CHEMICAL HARDENERS**

- .1 Type 1- Sodium silicate.
- .2 Water: potable.

**2.2            SEALING COMPOUNDS**

- .1 Surface sealer: to CAN/CGSB-25.20, Type 2 - water based.
- .2 Surface sealers may not be manufactured or formulated with aromatic solvents formaldehyde halogenated solvents mercury lead cadmium hexavelant chromium and their compounds.

**2.3            WET CURE**

- .1 Clear polyethylene film to ASTM C171, minimum thickness 0.15 mm.

**2.4            MIXES**

- .1 Mixing, ratios and application in accordance with manufacturer's instructions.

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**2.5 JOINT SEALANT**

- .1 Joint sealants to Section 07 92 00 – Joint Sealants.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verify that slab surfaces are ready to receive work and elevations are as indicated on drawings by manufacturer.

**3.2 CONCRETE FINISH**

- .1 The concrete floor surface shall be finished to a smooth compacted surface with a steel trowel finishing tool.

**3.3 PREPARATION OF EXISTING SLAB**

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.
- .2 Saw cut control joints to CSA-A23.1/A23.2, 24 hours maximum after placing of concrete.
- .3 Use mechanical stripping to remove chlorinated rubber or existing surface coatings.
- .4 Use protective clothing, eye protection, respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

**3.4 APPLICATION**

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

**3.5 PROTECTION**

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

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2      Section 06 05 73 - Wood Treatment.
- .3      Section 06 17 53 - Shop-Fabricated Wood Trusses.
- .4      Section 07 52 00 - Modified Bituminous Membrane Roofing
- .5      Section 07 91 00 - Joint Sealants.
- .6      Section 09 21 16 - Gypsum Board Assemblies.

**1.2            REFERENCES**

- .1      American Society for Testing and Materials (ASTM)
  - .1      ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2      ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .3      ASTM C578, Specification for Rigid, Cellular Polystyrene Thermal Insulation.
  - .4      ASTM C1396/C1396M, Standard Specification for Gypsum Board.
  - .5      ASTM D5055, Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
  - .6      ASTM F1667, Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .2      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-71.26, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
- .3      Canadian Wood Council
  - .1      Wood Design Manual.
  - .2      Engineering Guide for Wood Frame Construction.
- .4      Canadian Standards Association (CSA)
  - .1      CSA A123.2, Asphalt Coated Roofing Sheets.
  - .2      CSA B111, Wire Nails, Spikes and Staples.
  - .3      CSA 0112.9, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).

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- .4 CSA O121, Douglas Fir Plywood.
- .5 CSA-O141, Softwood Lumber.
- .6 CSA O151, Canadian Softwood Plywood.
- .7 CSA-O325.0, Construction Sheathing.
- .5 National Lumber Grades Authority (NLGA)
  - .1 Standard Grading Rules for Canadian Lumber.
- .6 National Research Council Canada (NRC)
  - .1 National Building Code of Canada (NBC).

**1.3 QUALITY ASSURANCE**

- .1 Lumber identification: 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 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2      PRODUCTS**

**2.1            STRUCTURAL FRAMING**

- .1      Lumber: unless specified otherwise, softwood, No. 1 or No. 2 grade, 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      Wood I-joists in accordance with Prefabricated Wood I-Joists ASTM D5055.
- .3      Framing and board lumber: in accordance with NBC.
- .4      Furring, blocking, nailing strips, grounds, rough bucks, 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.
- .5      Pressure treated material to be Alkaline Copper Quaternary (ACQ).
- .6      Where indicated, provide pressure treated materials for furring, blocking, nailing strips, grounds, rough bucks, cants , curbs, fascia backing and sleepers in accordance with Section 06 05 73.

**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      Insulating fiberboard sheathing: CAN/CSA-A247.
- .5      Expanded polystyrene sheathing: to Section 07 21 13 – Board Insulation.

**2.3            ACCESSORIES**

- .1      Exterior wall sheathing paper: to CAN/CGSB-51.32 single ply, spunbonded olefin type coated impregnated as indicated.
- .2      Polyethylene film: to Section 07 26 00 – Vapour Retarders.
- .3      Sill Gasket Air seal: closed cell polyurethane or polyethylene.
- .4      Sealants: Section 07 91 00 – Joint Sealants.

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- .5 General purpose adhesive: to CSA O112.9.
- .6 Nails, spikes and staples: to CSA B111.
- .7 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .8 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.
- .9 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation.
- .10 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, type approved by Owner's Representative.

**2.4 FASTENER FINISHES**

- .1 Galvanizing: to ASTM A123/A123M, ASTM A653, use galvanized fasteners for exterior work, interior highly humid areas and fire-retardant treated lumber.

**2.5 WOOD PRESERVATIVE**

- .1 Surface-applied wood preservative: clear or copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

**PART 3 EXECUTION**

**3.1 PREPARATION**

- .1 Treat surfaces of material with wood preservative, before installation.
- .2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and one minute soak on plywood.
- .3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.
- .4 Treat all material as indicated as follows:
  - .1 Wood fascia, backing, curbs, nailers.
  - .2 Wood furring for sheeting/siding on outside surface of exterior masonry concrete walls.
  - .3 Wood sleepers supporting wood subflooring over concrete slabs in contact with ground or fill.

**3.2 SYSTEMS INTEGRATION**

- .1 Install air barrier and vapour retarder sheeting around framing members to ensure continuity of protection and to lap and seal to main sheets.
- .2 Install insulation in exterior wall framing cavities that will not be accessible after completion of framing.
- .3 Install sill plate gasket in continuous lengths between concrete surfaces and wood framing.

**3.3 INSTALLATION**

- .1 Comply with requirements of NBC latest edition, 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 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .7 Countersink bolts where necessary to provide clearance for other work.
- .8 Install specified panel product for each application.
- .9 Install wall sheathing in accordance with manufacturer's printed instructions.
- .10 Install roof sheathing in accordance with requirements of NBC.
- .11 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.
- .12 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .13 Install sleepers as indicated.
- .14 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

**3.4 SCHEDULES**

- .1 Roof sheathing:
  - .1 Plywood, DFP or CSP sheathing grade (SHG) T&G edge, 16 mm thick, unless otherwise indicated.
- .2 Exterior wall sheathing:
  - .1 Plywood, DFP or CSP sheathing grade or (SHG) grade, T&G edge, 16 mm thick, unless otherwise indicated.
  - .2 Expanded polystyrene sheathing, Type 1, RSI indicated, shiplapped edges, thickness as indicated.
- .3 Electrical equipment mounting boards:
  - .1 Plywood, DFP or CSP grade, (G1S) select square edge 16 mm thick, unless otherwise indicated.

**3.5 PROTECTION**

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

**END OF SECTION**



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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 – Submittal Procedures.
- .2      Section 01 61 00 – Common Product Requirements.
- .3      Section 05 12 23 – Structural Steel for Buildings.
- .4      Section 06 10 53 – Miscellaneous Rough Carpentry.

**1.2            REFERENCES**

- .1      Canadian Standards Association (CSA)
  - .1      CAN/CSA-O80 Series, Wood Preservation.
  - .2      CAN/CSA-O86.1, Engineering Design in Wood.
  - .3      CAN/CSA-O141, Softwood Lumber.
  - .4      CSA S307-, Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.
  - .5      CSA S347, Method of Test for Evaluation of Truss Plates Used in Lumber Joints.
  - .6      CSA W47.1, Certification of Companies for Fusion Welding of Steel.
- .2      National Lumber Grades Authority (NLGA)
  - .1      NLGA, Standard Grading Rules for Canadian Lumber.
- .3      Truss Plate Institute of Canada (TPIC)
  - .1      TPIC, Truss Design Procedures and Specifications for Light Metal Plate Connected Trusses (Limit States Design)

**1.3            DESIGN REQUIREMENTS**

- .1      Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for wood truss chords and webs in accordance with engineering properties in CSA O86.
- .2      Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for truss joint designs to test engineering properties in accordance with CSA S347 and listed in CCMC Registry of Product Evaluations.
- .3      Design trusses, bracing and bridging in accordance with CAN/CSA-O86.1 for loads indicated and minimum uniform and minimum concentrated loadings stipulated in NBC commentary.

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- .4 Limit live load deflection to 1/360th of span where plaster gypsum board ceilings are hung directly from trusses.
- .5 Limit live load deflections to 1/240th of span unless otherwise specified or indicated.
- .6 Provide camber for trusses as indicated.

**1.4 SOURCE QUALITY CONTROL**

- .1 Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board.
- .2 Certify preservative and fire retardant treated wood in accordance with CAN/CSA-O80 Series.

**1.5 QUALIFICATION OF MANUFACTURERS**

- .1 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.

**1.6 QUALITY ASSURANCE**

- .1 Provide Certificate of Quality Compliance from truss manufacturer upon completion of fabrication.
- .2 Provide Certificate of Quality Compliance upon satisfactory completion of installation.

**1.7 SUBMITTALS**

- .1 Each shop drawing submission shall bear signature and stamp of professional Engineer registered or licensed in Province of Newfoundland and Labrador, Canada.
- .2 Indicate TPIC Truss Design Procedure and CSA O86 Engineering Design in Wood and specific CCMC Product Registry number of the truss plates.
- .3 Indicate species, sizes, and stress grades of lumber used as truss members. Show pitch, span, camber, configuration and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details. Indicate design load for members.
- .4 Submit stress diagram or print-out of computer design indicating design load for truss members. Indicate allowable load and stress increase.
- .5 Indicate arrangement of webs or other members to accommodate ducts and other specialties.
- .6 Show lifting points for storage, handling and erection.
- .7 Show location of lateral bracing for compression members.

**1.8 DELIVERY AND STORAGE**

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Store trusses on job site in accordance with manufacturer's instructions. Provide bearing supports and bracings. Prevent bending, warping and overturning of trusses.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Lumber: Spruce (S-P-F) species, No. 1 grade, softwood, S4S, with maximum moisture content of 19% at time of fabrication and to following standards:
  - .1 CAN/CSA-O141.
  - .2 NLGA (National Lumber Grading Association), Standard Grading Rules for Canadian Lumber.
- .2 Fastenings: to CAN/CSA-O86.1.

**2.2 FABRICATION**

- .1 Fabricate wood trusses in accordance with reviewed shop drawings.
- .2 Provide for design camber and roof slopes when positioning truss members.
- .3 Connect members using metal connector plates.

**PART 3 EXECUTION**

**3.1 ERECTION**

- .1 Erect wood trusses in accordance with reviewed erection drawings.
- .2 Indicated lifting points to be used to hoist trusses into position.
- .3 Make adequate provisions for handling and erection stresses.
- .4 Exercise care to prevent out-of-plane bending of trusses.
- .5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.
- .6 Install permanent bracing in accordance with reviewed shop drawings, prior to application of loads to trusses.
- .7 Do not cut or remove any truss material without approval of Owner's Representative.

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- .8 Remove chemical and other surface deposits on treated wood, in preparation for applied finishes.

**3.2 CLEANING**

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

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 61 00 - Common Product Requirements.
- .3      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .4      Section 06 40 00 - Architectural Woodwork.
- .5      Section 09 91 23 - Interior Painting.

**1.2            REFERENCES**

- .1      American National Standards Institute (ANSI)
  - .1      ANSI A208.1, Particleboard.
  - .2      ANSI A208.2, Medium Density Fibreboard (MDF).
  - .3      ANSI/HPVA HP-1, American National Standard for Hardwood and Decorative Plywood.
- .2      Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
  - .1      Architectural Woodwork Quality Standards, 1st edition.
- .3      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-11.3, Hardboard.
- .4      Canadian Standards Association (CSA)
  - .1      CSA B111, Wire Nails, Spikes and Staples.
  - .2      CSA O121, Douglas Fir Plywood.
  - .3      CAN/CSA O141, Softwood Lumber.
  - .4      CSA O151, Canadian Softwood Plywood.
  - .5      CSA O153, Poplar Plywood.
- .5      National Lumber Grades Authority (NLGA)
  - .1      Standard Grading Rules for Canadian Lumber.

**1.3            QUALITY ASSURANCE**

- .1      Lumber by grade stamp of agency certified by Canadian Lumber Standards Accreditation Board (CLSAB).

- .2 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI standards.
- .3 Wood fire rated frames and panels: listed and labelled by an organization accredited by Standards Council of Canada to CAN4-S104 and CAN/ULC-S105.

#### **1.4 SUBMITTALS**

- .1 Indicate details of construction, profiles, jointing, fastening and other related details.
- .2 Indicate materials, thicknesses, finishes and hardware.

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

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Protect materials against dampness during and after delivery.
- .3 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.

### **PART 2 PRODUCTS**

#### **2.1 LUMBER MATERIAL**

- .1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:
  - .1 CAN/CSA-O141.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
  - .3 AWMAC custom premium grade, moisture content as specified.
- .2 Machine stress-rated lumber is acceptable.
- .3 Hardwood lumber: moisture content 10 % or less in accordance with following standards:
  - .1 National Hardwood Lumber Association (NHLA).
  - .2 AWMAC custom grade, moisture content as specified.

#### **2.2 PANEL MATERIAL**

- .1 Panel materials to be urea-formaldehyde free.
- .2 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .3 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .4 Hardwood plywood: to ANSI/HPVA HP-1.

- .5 Poplar plywood (PP): to CSA O153, standard construction.
- .6 Hardboard: to CAN/CGSB-11.3.
- .7 Medium density fibreboard (MDF): to ANSI A208.2, density 640-800 kg/m<sup>3</sup>.

### **2.3 ACCESSORIES**

- .1 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.
- .2 Wood screws: plain, type and size to suit application.
- .3 Splines: wood
- .4 Adhesive: recommended by manufacturer.
- .5 Use least toxic sealants, adhesives, sealers, and finishes necessary to comply with requirements of this section.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Do finish carpentry to 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.

### **3.2 CONSTRUCTION**

- .1 Fastening.
  - .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
  - .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
  - .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round 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.
- .2 Standing and running trim.

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- .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° scarf type joint.
- .4 Install door and window trim in single lengths without splicing.
- .3 Shelving.
  - .1 Install shelving on shelf brackets, where indicated.
- .4 Hardware.
  - .1 Miscellaneous hardware as indicated.
- .5 Panelling:
  - .1 Secure panelling and perimeter trim using adhesive recommended for purpose by manufacturer. Fill nail holes caused by temporary fixing with filler matching wood in colour.
  - .2 Secure panelling and perimeter trim using concealed fasteners.
  - .3 Secure panelling and perimeter trim using counter sunk screws plugged with matching wood plugs.

**END OF SECTION**



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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 45 00 - Quality Control.
- .3      Section 01 61 00 - Common Product Requirements.
- .4      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .5      Section 06 20 00 – Finish Carpentry.
- .6      Section 07 92 00 – Joint Sealants.
- .7      Section 08 70 05 – Cabinet and Miscellaneous Hardware.

**1.2            REFERENCES**

- .1      American National Standards Institute (ANSI)
  - .1      ANSI/NPA A208.1, Particle board.
  - .2      ANSI A208.2, Medium Density Fiberboard (MDF) for Interior Applications.
  - .3      ANSI/HPVA HP-1, Standard for Hardwood and Decorative Plywood.
- .2      Architectural Woodwork Manufacturers Association of Canada (AWMAC)
  - .1      Architectural Woodwork Standards (AWS).
    - .1      AWS Manual.
- .3      American Society for Testing and Materials (ASTM)
  - .1      ASTM D5116, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
  - .2      ASTM D2832, Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
  - .3      ASTM E1333, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
  - .4
- .4      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-71.20, Adhesive, Contact, Brushable.
- .5      Canadian Standards Association (CSA)
  - .1      CSA B111, Wire Nails, Spikes and Staples.

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- .2 CSA O112.10, Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure).
- .3 CSA O121, Douglas Fir Plywood.
- .4 CSA O141, Softwood Lumber.
- .5 CSA O151, Canadian Softwood Plywood.
- .6 CSA O153, Poplar Plywood.
- .6 National Electrical Manufacturers Association (NEMA)
  - .1 ANSI/NEMA LD-3, High-Pressure Decorative Laminates (HPDL).

**1.3 QUALITY ASSURANCE**

- .1 Provide Certificate of Quality Compliance upon completion of Fabrication, in accordance with Architectural Woodwork Manufacturer's Association of Canada (AWMAC) quality standards.
- .2 Provide Certificate of Quality Compliance upon satisfactory completion of installation.
- .3 Work in accordance with Grade or Grades specified of the AWS.

**1.4 SUBMITTALS**

- .1 Indicate details of construction, profiles, jointing, fastening and other related details.  
Scales:
  - .1 profiles full size, details 1/2 full size.
- .2 Indicate all materials, thicknesses, finishes and hardware.
- .3 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.
- .4 Submit duplicate colour samples of laminated plastic for colour selection.
- .5 Submit duplicate samples of laminated plastic joints, edging, cutouts, and postformed profiles.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, handle, store and protect materials of this section in accordance with Section 01 61 00 – Common Product Requirements.
- .2 Protect millwork against dampness and damage during and after delivery.
- .3 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.
- .4 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

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- .5 Store and protect architectural woodwork from nicks, scratches, and blemishes.
- .6 Replace defective or damaged materials with new.

**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 premium grade, moisture content as specified.
- .2 Machine stress-rated lumber is acceptable for all purposes.
- .3 Hardwood lumber: moisture content 10% or less in accordance with following standards:
  - .1 National Hardwood Lumber Association (NHLA).
  - .2 AWMAC premium grade, moisture content as specified.
- .4 Douglas fir plywood (DFP): to CSA O121, standard construction.
  - .1 Urea-formaldehyde free.
- .5 Canadian softwood plywood (CSP): to CSA O151, standard construction.
  - .1 Urea-formaldehyde free.
- .6 Hardwood plywood: to ANSI/HPVA HP-1.
  - .1 Urea-formaldehyde free.
- .7 Poplar plywood (PP): to CSA O153, standard construction.
  - .1 Urea-formaldehyde free.
- .8 Birch plywood: to AWMAC Natural.
  - .1 Urea-formaldehyde free.
- .9 Hardboard: to CAN/CGSB – 11.3.
  - .1 Urea-formaldehyde free.
- .10 Medium density fibreboard (MDF): to ANSI A208.2, density 769 kg/m<sup>3</sup>
  - .1 Urea-formaldehyde free.
  - .2 Must meet the performance requirements of ANSI A208.2
- .11 Laminated plastic: Section 06 40 23.13 - Plastic Laminate for Interior Architectural Woodwork.
- .12 Thermofused Melamine: to NEMA LD3 Grade VGL.

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- .1 High wear resistant thermofused melamine: equal or exceed 400 cycles (Minimum standard for HPL abrasion test).
- .13 Nails and staples: to CSA B111.
- .14 Wood screws: steel plain, type and size to suit application.
- .15 Splines: wood.
- .16 Sealant: Section 07 92 00 – Joint Sealants.
- .17 Glazing: provide glazing to the requirements of Section 08 80 50 – Glazing.

## **2.2 FABRICATION**

- .1 Set nails and countersink screws apply stained wood filler to indentations, sand smooth and leave ready to receive finish.
- .2 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.
- .3 Shelving to cabinetwork to be adjustable unless otherwise noted.
- .4 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.
- .5 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
- .6 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.
- .7 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .8 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 3000 mm. Keep joints 600 mm from sink cutouts.
- .9 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.
- .10 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.

## **2.3 FINISHING**

- .1 Section 09 91 23 – Interior Painting

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**PART 3      EXECUTION**

**3.1            INSTALLATION**

- .1      Do architectural woodwork to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
- .2      Install prefinished millwork at locations shown on drawings. Position accurately, level, plumb straight.
- .3      Fasten and anchor millwork securely. Provide heavy duty fixture attachments for wall mounted cabinets.
- .4      Use draw bolts in countertop joints.
- .5      Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .6      At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant in accordance with section 07 92 00 – Joint Sealants.
- .7      Apply bituminous coating over wood framing members in contact with masonry or cementitious construction.
- .8      Fit hardware accurately and securely in accordance with manufacturer's written instructions.

**3.2            CLEANING**

- .1      Clean millwork and cabinet work inside cupboards and drawers and outside surfaces.
- .2      Remove excess glue from surfaces.

**3.3            PROTECTION**

- .1      Protect millwork and cabinet work from damage until final inspection.
- .2      Protect installed products and components from damage during construction.
- .3      Repair damage to adjacent materials caused by architectural woodwork installation.

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 03 30 00 – Cast in Place Concrete.
- .4      Section 06 10 53 – Miscellaneous Rough Carpentry.
- .5      Section 07 26 00 - Vapour Retarders.

**1.2            REFERENCES**

- .1      American Society for Testing and Materials International, (ASTM).
  - .1      ASTM C1289, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
- .2      Canadian Standards Association (CSA)
  - .1      CSA B149 PACKAGE, Consists of B149.1 Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.
- .3      Canadian General Standards Board (CGSB).
  - .1      CGSB 71-GP-24M, Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .4      Underwriters Laboratories of Canada (ULC).
  - .1      CAN/ULC-S701, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
  - .2      CAN/ULC-S702, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
  - .3      CAN/ULC-S704, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.

**1.3            SUBMITTALS**

- .1      Product Data:
  - .1      Submit manufacturer's printed product literature, specifications and data.
  - .2      Submit two copies of WHMIS MSDS - Material Safety Data Sheets. Indicate VOC's insulation products and adhesives.
- .2      Manufacturer's Instructions:
  - .1      Submit manufacturer's installation instructions.

**1.4 QUALITY ASSURANCE**

- .1 Provide certificate of quality compliance from insulation manufacturer.

**PART 2 PRODUCTS**

**2.1 INSULATION**

- .1 Extruded polystyrene (XPS): for use below grade and exterior walls: to CAN/ULC-S701 Type 2, RSI 0.70 per 25 mm, total thickness as indicated on drawings.
- .2 Urethane (Isocyanurate): Faced, to CAN/ULC-S704 foil facing, RSI 1.05 per 25 mm, total thickness as indicated on drawings.
- .3 Mineral fibre board: to CAN/ULC-S702, Type 2, semi-rigid, density 17.6 kg/m<sup>2</sup>, flexible spinbonded olefin facing, RSI 0.70 per 25 mm, total thickness as indicated on drawings may be used as outboard insulation on walls.
- .4 Extruded polystyrene (XPS): to CAN/ULC S701 Type 3, RSI 0.88 per 25 mm, total thickness as indicated on drawings.
- .5 Insulation types not indicated on drawings to be expanded polystyrene (EPS), Type 2 as a default, as per article 2.1.1.

**2.2 ADHESIVE**

- .1 Adhesive suitable for bonding polystyrene and mineral fibre insulation to substrates as indicated.

**2.3 ACCESSORIES**

- .1 Insulation clips: impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.
- .2 Joint sealing tape: air resistant pressure sensitive adhesive tape as recommended by insulation manufacturer.

**PART 3 EXECUTION**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 WORKMANSHIP**

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

**3.3 EXAMINATION**

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

**3.4 RIGID INSULATION INSTALLATION**

- .1 Apply adhesive to insulation board in accordance with manufacturer's recommendations.
- .2 Imbed insulation boards into vapour barrier type adhesive, applied as specified, prior to skinning of adhesive.
- .3 In addition to adhesive install mineral fibre insulation boards with insulation clips and disk, 2 per 600 x 1200 mm board minimum, fit boards tight, cut off fastener spindle 3 mm beyond disk.
- .4 Leave insulation board joints unbonded over line of expansion and control joints. Bond a continuous 150 mm wide 0.15 mm modified bituminous membrane over expansion and control joints using compatible adhesive and primer before application of insulation.
- .5 Carefully inspect for continuity of air barrier prior to placement of insulation.



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**3.5 PERIMETER FOUNDATION INSULATION**

- .1 Exterior application: extend boards vertically below bottom of finish floor slab to depth as indicated on drawings. Install on exterior face of perimeter foundation wall with adhesive.

**3.6 CLEANING**

- .1 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 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 06 10 53 – Miscellaneous Rough Carpentry.
- .4      Section 07 26 00 - Vapour Retarders.

**1.2            REFERENCES**

- .1      American Society for Testing and Materials, (ASTM).
  - .1      ASTM C553, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
  - .2      ASTM C665, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  - .3      ASTM C1320, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
  - .4      ASTM E84, Test Method for Surface Burning Characteristics of Building Materials.
- .2      Canadian Standards Association (CSA International).
  - .1      CSA B111, Wire Nails, Spikes and Staples.
  - .2      CSA B149 PACKAGE, Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.
- .3      Underwriters Laboratories of Canada (ULC).
  - .1      CAN/ULC-S702, Standard for Mineral Fibre Insulation.

**1.3            SUBMITTALS**

- .1      Product Data:
  - .1      Submit manufacturer's printed product literature, specifications and data sheet.
- .2      Manufacturer's Instructions:
  - .1      Submit manufacturer's installation instructions.

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**PART 2      PRODUCTS**

**2.1            INSULATION**

- .1      Thermal batt and blanket mineral fibre:
  - .1      Unfaced glass fiber thermal insulation to ASTM C665 Type:I, thickness and RSI value as indicated on drawings.

**PART 3      EXECUTION**

**3.1            MANUFACTURER’S INSTRUCTIONS**

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

**3.2            INSULATION INSTALLATION**

- .1      Install insulation to maintain continuity of thermal protection to building elements and spaces and for sound attenuation as noted on drawings.
- .2      Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .3      Do not compress insulation to fit into spaces.
- .4      Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls and CSA B149.1 and CSA B149.2 Type B and L vents.
- .5      Do not enclose insulation until it has been inspected and approved by Owner’s Representative.

**3.3            CLEANING**

- .1      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 74 21 - Construction/Demolition Waste Management and Disposal.
- .3      Section 01 45 00 - Quality Control.
- .4      Section 01 51 00 - Temporary Utilities.
- .5      Section 07 26 00 – Vapour Retarders
- .6      Section 07 27 00.01 – Air Barriers - Descriptive or Proprietary.

**1.2            REFERENCES**

- .1      Canadian Urethane Foam Contractors' Association Inc. (CUFCA)
- .2      Underwriters' Laboratories of Canada (ULC)
  - .1      CAN/ULC-S101, Fire Endurance Tests of Building Construction and Materials.
  - .2      CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
  - .3      CAN/ULC-S705.1, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Material Specification.
  - .4      CAN/ULC-S705.2, Standard for Thermal Insulation Spray Applied Rigid Foam, Medium Density, Installer's Responsibilities-Specification.

**1.3            TEST REPORTS**

- .1      Submit test reports, verifying qualities of foam sealant meet or exceed requirements of this specification.
- .2      Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.

**1.4            QUALITY ASSURANCE**

- .1      Applicators to conform to CUFCA Quality Assurance Program.

**1.5            SAFETY REQUIREMENTS**

- .1      Protect workers as recommended by CAN/ULC-S705.2 and manufacturer's recommendations:

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- .1 Workers must wear gloves, respirators, dust masks, eye protection, protective clothing when applying foam sealant.
- .2 Workers must not eat, drink or smoke while applying foam sealant.

**1.6 PROTECTION**

- .1 Ventilate area in accordance with Section 01 51 00 - Temporary Utilities.
- .2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hours after application to maintain non-toxic, unpolluted, safe working conditions.
- .3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .5 Dispose of waste foam sealant daily in location designated by Owner's Representative and decontaminate empty drums in accordance with foam sealant manufacturer's instructions.

**1.7 ENVIRONMENTAL REQUIREMENTS**

- .1 Apply foam sealant only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Low expanding, one-component, polyurethane foam sealant, curing to a semi-rigid, closed cell urethane foam providing a RSI of 0.9 per 25.4 mm. To meet the following physical properties:
  - .1 Density: 25.7 kg/m<sup>3</sup>
  - .2 Compressive Strength Parallel @ 10%: 69-96 psi
  - .3 Tensile Strength: 103 psi
  - .4 Water Vapour Transmission: 5.97 perms
  - .5 Flame Spread: 20
  - .6 Smoke Development: 70

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**PART 3**

**EXECUTION**

**3.1**

**APPLICATION**

- .1 Apply foam sealant to clean surfaces in accordance manufacturer's printed instructions. Surfaces to be free of dust, dirt, oil and other foreign materials.
- .2 Cover surfaces not intended to be foamed.
- .3 Apply foam sealant to perimeter of openings indicated and to thickness as recommended by manufacturer. Trim excess cured foam from finished area.
- .4 Cover exposed urethane foam sealants to protect from adverse affects from ultraviolet light (sunlight).

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 – Submittal Procedures.
- .2      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 03 30 00 - Cast-in-Place Concrete.
- .4      Section 06 10 53 – Miscellaneous Rough Carpentry.

**1.2            REFERENCES**

- .1      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.
- .2      Underwriters Laboratories Canada (ULC)
  - .1      CAN/ULC S102, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

**1.3            SUBMITTALS**

- .1      Submit manufacturer's printed product literature, specifications and datasheet and include:
  - .1      Product characteristics.
  - .2      Performance criteria.
  - .3      Limitations.
- .2      Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).
- .3      Quality assurance submittals:
  - .1      Certificates: submit certificates certifying that materials comply with specified performance characteristics and physical properties.
  - .2      Instructions: submit manufacturer's installation instructions and comply with written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.

**1.4            MOCK-UPS**

- .1      Construct mock-up of sheet vapour barrier installation including one lap joint, one inside corner and at one electrical box. Mock-up may be part of finished work.

- .2 Mock-up will be used to judge workmanship, substrate preparation, and material application.
- .3 Allow two (2) working days for inspection of mock-up by Owner's Representative before proceeding with vapour barrier work.
- .4 When accepted, mock-up will demonstrate minimum standard of quality required for this work.

## **PART 2      PRODUCTS**

### **2.1      SHEET VAPOUR RETARDER**

- .1 Polyethylene film: to CAN/CGSB-51.34, 0.15mm thick with a water vapour permeance of not greater than  $45 \text{ ng}/(\text{P}\cdot\text{s}\cdot\text{m}^2)$ , flame spread rating of less than 150 to CAN/ULC S102.

### **2.2      ACCESSORIES**

- .1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
- .2 Sealant: compatible with vapour retarder, recommended by vapour retarder manufacturer, to Section 07 92 00 - Joint Sealants.
- .3 Staples: minimum 6 mm leg.
- .4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

## **PART 3      EXECUTION**

### **3.1      INSTALLATION**

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



**3.2 EXTERIOR SURFACE OPENINGS**

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

**3.3 PERIMETER SEALS**

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

**3.4 LAP JOINT SEALS**

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

**3.5 ELECTRICAL BOXES**

- .1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
  - .1 Install moulded box vapour barrier or wrap boxes with film sheet providing minimum 300 mm perimeter lap flange.
  - .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

**3.6 CLEANING**

- .1 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            SECTION INCLUDES**

- .1      Materials and installation methods providing primary air/vapour barrier materials and assemblies.
- .2      Air/vapour barrier materials to provide continuous seal between components of building envelope and building penetrations.

**1.2            RELATED SECTIONS**

- .1      Section 01 45 00 - Quality Control.
- .2      Section 01 51 00 - Temporary Utilities.
- .3      Section 01 61 00 - Common Product Requirements.
- .4      Section 07 92 00 - Joint Sealants.

**1.3            REFERENCES**

- .1      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-19.13M, Sealing Compound, One Component, Elastomeric Chemical Curing.
  - .2      CAN/CGSB-19.18M, Sealing Compound, One Component, Silicone Base Solvent Curing.
  - .3      CAN/CGSB-19.24M, Multi-Component, Chemical Curing Sealing Compound.
  - .4      CGSB 19-GP-14M, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
- .2      National Building Code of Canada (NBCC)
  - .1      NBCC, Part 5 - Environmental Separation
- .3      Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification.

**1.4            SUBMITTALS**

- .1      Submit manufacturer's product data sheets.
- .2      Submit manufacturer's installation instructions.

**1.5            QUALITY ASSURANCE**

- .1      Perform Work in accordance with Sealant and Waterproofer's Institute - Sealant and Caulking Guide Specification requirements for materials and installation.

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- .2 Perform Work in accordance with National Air Barrier Association - Professional Contractor Quality Assurance Program and requirements for materials and installation.
- .3 Manufacturer's Representative:
  - .1 Inspect substrate prior to commencement of work, twice during application of membrane and at commissioning to ascertain that air/vapour barrier system is installed according to membrane manufacturer's most current published specifications and details.
  - .2 Provide technical assistance to applicator and assist where required in correct installation of membrane.
  - .3 Provide certificate of quality compliance upon satisfactory completion of installation.
- .4 Maintain one copy of documents on site.

**1.6 QUALIFICATIONS**

- .1 Applicator: Company specializing in performing work of this section with experience with installation of air/vapour barrier systems. Complete installation must be approved by the material manufacturer.
- .2 Applicator: Company who is currently licensed by certifying organization must maintain their license throughout the duration of the project.

**1.7 MOCK-UP**

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct typical panel, 10 m<sup>2</sup> minimum, incorporating wall openings, insulation, building corner condition, illustrating materials interface and seals.
- .3 Locate where directed.
- .4 Mock-up may remain as part of the Work.
- .5 Allow two (2) working days for inspection of mock-up by Owner's Representative before proceeding with air/vapour barrier Work.

**1.8 PRE- INSTALLATION MEETINGS**

- .1 Convene one week prior to commencing work of this section.

**1.9 DELIVERY, STORAGE AND HANDLING**

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

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- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions. Deliver membrane materials in factory wrapped packaging indicating name of manufacturer and product.
- .3 Avoid spillage. Immediately notify Owner's Representative if spillage occurs and start clean up procedures.
- .4 Clean spills and leave area as it was prior to spill.
- .5 Store roll materials on end in original packaging.
- .6 Store primers at temperatures of 5 °C and above to facilitate handling. Keep solvent away from open flame and excessive heat.

**1.10 PROJECT ENVIRONMENTAL REQUIREMENTS**

- .1 Do not install solvent curing sealants or vapour release adhesive materials in enclosed spaces without ventilation.
- .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
- .3 Maintain temperature and humidity recommended by materials manufactures before, during and after installation.

**1.11 WARRANTY**

- .1 Provide a written warranty for work of this section from Manufacturer for failure due to defective materials and from contractor for failure due to defective installation workmanship for ten (10) years respectively from the date of Substantial Completion.
- .2 Include coverage of installed sealant and sheet materials which fail to achieve air tight and watertight seal, exhibit loss of adhesion or cohesion or do not cure.

**PART 2 PRODUCTS**

**2.1 EXTERIOR WALL SHEATHING PAPER**

- .1 spunbonded olefin type coated impregnated sheathing paper to CAN/CGSB-51.32 single ply, as indicated.

**2.2 TAPE**

- .1 Manufacturer approved joint sealing tape.

**PART 3      EXECUTION**

**3.1            EXAMINATION**

- .1      Verify that surfaces and conditions are ready to accept the Work of this section.
- .2      Ensure all surfaces are clean, dry, sound, smooth, continuous and comply with air barrier manufacturer's requirements.
- .3      Report any unsatisfactory conditions to the Owner's Representative in writing.
- .4      Do not start work until deficiencies have been corrected.

**3.2            PREPARATION**

- .1      Remove loose or foreign matter which might impair adhesion of materials.
- .2      Ensure all substrates are clean of oil or excess dust; all masonry joints struck flush, and open joints filled; and all concrete surfaces free of large voids, spalled areas or sharp protrusions.
- .3      Ensure all substrates are free of surface moisture prior to application of membrane and primer.
- .4      Ensure metal closures are free of sharp edges and burrs.
- .5      Prime substrate surfaces to receive adhesive and sealants in accordance with manufacturer's instructions.

**3.3            INSTALLATION OF WALL SHEATHING PAPER**

- .1      Spread sheathing paper over entire surface. Secure in place with staples.
- .2      Lap seams 150mm and tape all seams and along edges with approved seam tape.

**3.4            PROTECTION OF WORK**

- .1      Protect finished Work in accordance with Section 01 61 00 - Common Product Requirements.
- .2      Do not permit adjacent work to damage work of this section.
- .3      Ensure finished Work is protected from climatic conditions.

**3.5            INSPECTION**

- .1      Carefully inspect for continuity of air barrier prior to placement of insulation.
- .2      Repair all deficient membrane areas.

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- .3 Misaligned or inadequately lapped seams, punctures or other damage must be repaired with a patch of air barrier membrane extending 50mm in all directions from edge of damaged areas.
- .4 Cover membrane immediately after Owner's Representative's inspection to protect from damage by other trades.

**3.6 TESTING**

- .1 Air leakage testing as directed by Owner's Representative and paid for by contractor will be performed by professional testing agency for the locations selected at random for penetrations, laps, corners, etc.
- .2 Testing will be witnessed by Owner's Representative and test reports will be signed by tester, site representative and contractor.
- .3 Inform Owner's Representative two (2) working days prior to required testing.

**END OF SECTION**

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**PART 1**      **GENERAL**

**1.1**      **SECTION INCLUDES**

- .1      Materials, removal and installation of fiberglass-reinforced asphalt shingles and roll roofing.

**1.2**      **RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 45 00 - Quality Control.
- .3      Section 01 61 00 - Common Product Requirements.
- .4      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .5      Section 01 78 00 - Closeout Submittals.
- .6      Section 07 62 00 – Sheet Metal Flashing and Trim.

**1.3**      **REFERENCES**

- .1      Canadian General Standards Board (CGSB).
  - .1      CAN/CGSB-37.4, Fibrated, Cutback Asphalt, Lap Cement for Asphalt Roofing.
  - .2      CAN/CGSB-37.5, Cutback Asphalt Plastic Cement.
  - .3      CAN/CGSB-51.32, Sheathing, Membrane, Breather Type.
  - .4      CAN/CGSB-51.34, Vapour Barrier Polyethylene Sheet, for Use in Building Construction.
- .2      Canadian Roofing Contractors' Association (CRCA).
  - .1      CRCA Roofing Specification Manual.
- .3      Canadian Standards Association (CSA).
  - .1      CAN/CSA-A123.1/A123.5, Asphalt Shingles Made From Organic Felt and Surfaced With Mineral Granules/Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules.
  - .2      CSA A123.2, Asphalt-Coated Roofing Sheets.
  - .3      CAN/CSA-A123.3, Asphalt Saturated Organic Roofing Felt.
  - .4      CAN3-A123.51, Asphalt Shingle Application on Roof Slopes 1:3 and Steeper.
  - .5      CAN3-A123.52, Asphalt Shingle Application on Roof Slopes 1:6 to Less Than 1:3.
  - .6      CSA B111, Wire Nails, Spikes and Staples.

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.4 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC).

.1 CCMC, Registry of Product Evaluations.

**1.4 EXTRA MATERIALS**

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

.2 All unused shingles remain property of owner.

**1.5 SUBMITTALS**

.1 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence, cleaning procedures.

.2 Submit product data sheets for asphalt shingles. Include:

.1 Product characteristics.

.2 Performance criteria.

.3 Installation instructions.

.4 Limitations.

.5 Colour and finish.

.3 Submit duplicate samples of full size specified shingles.

**1.6 DELIVERY, STORAGE AND HANDLING**

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

.2 Provide and maintain dry, off-ground weatherproof storage.

.3 Remove only in quantities required for same day use.

**1.7 WASTE MANAGEMENT AND DISPOSAL**

.1 Place materials defined as hazardous or toxic in designated containers.

.2 Ensure emptied containers are sealed and stored safely for disposal away from children.

.3 Use the least toxic sealants, and adhesives necessary to comply with requirements of this section.

.4 Close and seal tightly. Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.5 Place used hazardous sealant tubes and adhesive containers in areas designated for hazardous materials.



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**1.8            WARRANTY**

- .1      Provide a written guarantee, signed and issued in the name of the owner, stating the fiberglass-reinforced asphalt shingles shall remain free from defects in materials and workmanship for a period of twenty five (25) years from the date of Substantial Completion.

**PART 2            PRODUCTS**

**2.1            MATERIALS**

- .1      Fiberglass-reinforced asphalt shingles: to CSA A123.1/A123.5.
  - .1      Type: self-seal, standard, pattern rectangular
  - .2      Mass: minimum 33 kg/3m<sup>2</sup>
  - .3      Colours: as selected by Owner's Representative
- .2      Roofing underlayment: self-adhesive, non-woven glass fibre matt coated with SBS modified bitumen, minimum thickness 1.8 mm, bottom surface release film, top surface sanded.
- .3      Continuous Ridge Vent: minimum 285 mm wide durable, copolymer plastic ridge vent, providing minimum 357 cm<sup>2</sup>/m net free vent area, capable of accepting fiberglass-reinforced asphalt shingle cap over for shingle finish.
- .4      Cement: Plastic cement: to CAN/CGSB-37.5.
- .5      Nails: to CSA B111, of galvanized steel, sufficient length to penetrate 19 mm into deck.

**PART 3            EXECUTION**

**3.1            REMOVAL OF EXISTING ROOFING**

- .1      Remove existing roofing, flashings and underlay, and expose sheathing or shingle lath of roof.
- .2      Withdraw existing shingle and flashing nails, set those which break off. Leave surfaces free from dirt and loose material.
- .3      Owner's Representative to inspect roof sheathing. Take up, cut out, portion of sheathing boards affected by fungal or insect attack as directed on site by Owner's Representative.
- .4      Replace cut out portions of sheathing or lath with sheathing of equal sectional dimensions, and specified grade. Seat each end of board on rafter/truss, with 25mm bearing, and secure to rafter/truss.

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**3.2 APPLICATION**

- .1 Do fiberglass-reinforced asphalt shingle work in accordance with CAN3-A123.51/CAN3-A123.52, NBC/CRCA Specification, except where specified otherwise.
- .2 Install layer of self-adhesive roof underlayment over the entire roof area.
- .3 Install drip edge along eaves, overhanging 12 mm, with minimum 50 mm flange extending onto roof decking. Nail to deck at 400 mm oc.
- .4 Install bottom step flashing (soaker base flashing) interleaved between shingles at vertical junctions.
- .5 Install fiberglass-reinforced asphalt shingles on roof slopes 1:3 and steeper in accordance with CAN3-A123.51 supplemented as follows:
- .6 Install fiberglass-reinforced asphalt shingles on roof slopes 1:6 to less than 1:3 in accordance with CAN3-A123.52 supplemented as follows.

**3.3 PROTECTION**

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

**END OF SECTION**

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1        Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2        Section 06 10 53 – Miscellaneous Rough Carpentry.
- .3        Section 07 62 00 – Sheet Metal Flashing and Trim.
- .4        Section 07 92 00 - Joint Sealants.

**1.2            REFERENCES**

- .1        American National Standards Institute (ANSI)
  - .1        ANSI A135.6, Hardboard Siding Standard.
- .2        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-11.3, Hardboard.
  - .2        CAN/CGSB-11.5, Hardboard, Precoated, Factory Finished, for Exterior Cladding.
  - .3        CAN/CGSB-11.6, Installation of Exterior Hardboard Cladding.
  - .4        CAN/CGSB-51.32, Sheathing, Membrane, Breather Type.
- .3        Canadian Standards Association (CSA)
  - .1        CSA B111, Wire Nails, Spikes and Staples.
  - .2        CSA O121, Douglas Fir Plywood.
  - .3        CSA O151, Canadian Softwood Plywood.
- .4        National Lumber Grading Authority (NLGA)
  - .1        NLGA Standard Grading Rules for Canadian Lumber.

**1.3            SUBMITTALS**

- .1        Product Data:
  - .1        Submit manufacturer's printed product literature, specifications and data sheet.
  - .2        Submit copies of WHMIS MSDS - Material Safety Data Sheets. Indicate VOC's for caulking materials during application and curing.
- .2        Submit duplicate 300 x 300 mm size profile specified.
- .3        Submit manufacturer's installation instructions.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 – Common Product Requirements.
- .2 Deliver siding suitable packaged to avoid damage to finished surface.
- .3 Store in an unheated structure or under cover until application. Siding may be temporarily stored outside if at least 4 inches off the ground and on a flat, well drained surface protected from moisture with a shed pack or waterproof cover.

**1.5 QUALITY ASSURANCE**

- .1 Provide Certificate of Quality Compliance from siding manufacturer upon completion of fabrication.
- .2 Provide Certificate of Quality Compliance upon satisfactory completion of installation.

**1.6 WARRANTY**

- .1 Warranty Period: 15 years against cracking, peeling, blistering, chalking, loss of coating adhesion, yellowing with age, and no damage caused by rinse cleaning surface dirt. Warranty to commence at date of Substantial Completion.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Clapboard Siding: Western Lodgepole Pine or Eastern Spruce, NO. 1 select or better grade, factory finished, saw texture, bevel profile, cove or V-joint pattern, free of large knots, knot holes, or loose knots: maximum moisture content of 12 percent. Size: 16 mm thickness, 150 mm width, 114 mm actual coverage.
- .2 Moldings and trim: Western Lodgepole Pine or Eastern Spruce, No. 1 select or better grade, factory finished same as siding.
- .3 Strapping: Softwood Lumber, kiln dried treated with brush applied wood preservative.
- .4 Nails: Mechanically galvanized, to securely and rigidly retain the work permanently in position, pre-finished baked on coating to match siding finish. Nails 64 mm long for siding and 83 mm for trims.

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- .5 Exterior Sheathing Membrane: CAN/CGSB 51.32M, Spun bonded olefin sheeting, conforming to ASTM D3575, single ply laminated and coated.
- .6 Sealant: Thermoplastic type, color to exactly match siding.
- .7 Concealed Flashings: 0.4 mm thick galvanized steel.

**2.2 FINISH**

- .1 Pre-finish color: 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.
  - .1 Standard color or custom color from manufacturers range of colors.
  - .2 Touch-Up Paint: Thermoplastic acrylic latex emulsion, same type and color as siding.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

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

**3.2 PREPARATION**

- .1 Install metal flashing continuous over window and other openings. Secure in position tight to wall sheathing.
- .2 Install one layer of sheathing membrane horizontally on sheathed walls, weather lap edges and ends minimum 150 mm. Stagger vertical laps. Tape all edges.
- .3 Install strapping at 460 mm o.c.
- .4 Install siding kitchen starter strips, behind first row of siding.
- .5 Apply sealant around window, door and other opening frames.

**3.3 INSTALLATION**

- .1 Install siding and accessories to manufacturer's instructions.
- .2 Install screen at bottom of base trim.
- .3 Install siding for natural watershed.
- .4 Install siding in straight aligned lengths, set level with plumb ends and corners.
- .5 Install hardboard to CGSB11-GP-6M and manufacturers' instructions.

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- .6 Achieve siding joints no less than 800 mm apart in adjoining boards and distribute evenly over wall surface.
- .7 Miter external and internal corners: Install corner strips, closures, frieze boards skirt boards and trim.
- .8 Fasten siding securely to wood batten substrate.
- .9 Face nail 25 mm from bottom of siding board directly into wood strapping, drive nail head just flush with siding surface; do not indent or penetrate painted coating.

**3.4 INCIDENTAL SITE FINISHING**

- .1 Carefully set exposed nails flush with siding coating.
- .2 Touch-up blemished siding materials to match siding color.

**3.5 CLEANING**

- .1 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 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 06 10 53 – Miscellaneous Rough Carpentry.
- .4      Section 07 52 00 – Modified Bituminous Membrane Roofing.
- .5      Section 07 61 00 – Sheet Metal Roofing.
- .6      Section 07 92 00 – Joint Sealants.

**1.2      REFERENCES**

- .1      The Aluminum Association Inc. (AA)
  - .1      AA Aluminum Design Manual, Part VIII Guidelines for Aluminum Sheet Metal Work in Building Construction.
  - .2      AA DAF45, Designation System for Aluminum Finishes.
- .2      American Society for Testing and Materials (ASTM International)
  - .1      ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2      ASTM A792/A792M, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
  - .3      ASTM D523, Standard Test Method for Specular Gloss.
- .3      Canadian Roofing Contractors Association (CRCA)
  - .1      Roofing Specifications Manual.
- .4      Canadian Standards Association (CSA International)
  - .1      CSA A123.3, Asphalt Saturated Organic Roofing Felt.
  - .2      CSA B111, Wire Nails, Spikes and Staples.
- .5      Canadian Sheet Steel Building Institute (CSSBI)
  - .1      CSSBI S8, Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.
  - .2      CSSBI B17, Barrier Series Prefinished Steel Sheet: Product Performance & Applications.
  - .3      CSSBI Sheet Steel Facts #12, Fastener Guide for Sheet Steel Building Products.

**1.3 ACTION AND INFORMATION SUBMITTALS**

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

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Handle and store flashing materials to prevent creasing, buckling, scratching, or other damage.

**PART 2      PRODUCTS**

**2.1 SHEET METAL MATERIALS**

- .1 Provide sheet metal in base metal thickness specified. Where no thickness specified, provide base sheet metal in thickness recommended in SMACNA Architectural Sheet Metal Manual for type of item being fabricated, but not less than the thickness required by the authority having jurisdiction.
- .2 Aluminum-zinc alloy coated steel sheet: to ASTM A792/A792M, commercial quality, grade 33 with AZ150 coating, regular spangle surface, 0.60 mm base metal thickness. Pre-painted to CGSB –GP-71.

**2.2 PREFINISHED STEEL SHEET**

- .1 Prefinished sheet with factory applied polyvinylidene fluoride.
  - .1 Class F1S



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- .2 Colour as selected by Owner's Representative from manufacturer's standard range.
- .3 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.
- .4 Coating thickness: not less than 22 micrometres.
- .5 Resistance to accelerated weathering for caulk rating of 8, colour fade 5 units or less and erosion rate less than 20 % to ASTM D822 as follows:
  - .1 Outdoor exposure period 2500 hours.
  - .2 Humidity resistance exposure period 5000 hours.

**2.3 ACCESSORIES**

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.
- .3 Sealants: Section 07 92 00 – Joint Sealants.
- .4 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.
- .5 Fasteners: of same material as sheet metal, to CSA B111, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .6 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .7 Touch-up paint: as recommended by prefinished material manufacturer.

**2.4 FABRICATION**

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details as indicated.
- .2 Fabricate aluminum flashings and other sheet aluminum work in accordance with Aluminum Association Aluminum Sheet Metal Work in Building Construction.
- .3 Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.
- .4 Hem exposed edges on underside 12 mm. Mitre and seal corners with sealant.
- .5 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .6 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

**2.5 METAL FLASHINGS**

- .1 Form flashings, copings and fascias to profiles indicated of 0.60 mm thick prefinished steel.

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**PART 3      EXECUTION**

**3.1            INSTALLATION**

- .1      Install sheet metal work in accordance with CRCA FL series details and 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.
- .4      Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips, as detailed.
- .5      Lock end joints and caulk with sealant.

**END OF SECTION**

**PART 1      GENERAL**

**1.1      SECTION INCLUDES**

- .1      Materials, preparation and application for caulking and sealants.
- .2      Text to complete other various Sections containing sealant or caulking specifications, including Section 07 52 00 - Modified Bituminous Membrane Roofing.

**1.2      RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 45 00 - Quality Control.
- .3      Section 01 61 00 - Common Product Requirements.
- .4      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**1.3      REFERENCES**

- .1      American Society for Testing and Materials International, (ASTM)
  - .1      ASTM C321, Standard Test Method for Bond Strength of Chemical-Resistant Mortars.
  - .2      ASTM C834, Standard Specification for Latex Sealants.
  - .3      ASTM C882, Standard Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete by Slant Shear.
  - .4      ASTM C919, Standard Practice for Use of Sealants in Acoustical Applications.
  - .5      ASTM C920, Standard Specification for Elastomeric Joint Sealants.
  - .6      ASTM C1330, Standard Specification for Cylindrical Sealant Backing for use with Cold Liquid Applied Sealants.
- .2      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-19.21, Sealing and Bedding Compound Acoustical.
- .3      Department of Justice Canada (Jus)
  - .1      Canadian Environmental Protection Act (CEPA).
- .4      Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1      Material Safety Data Sheets (MSDS).
- .5      Transport Canada (TC)
  - .1      Transportation of Dangerous Goods Act (TDGA).

**1.4 SUBMITTALS**

- .1 Manufacturer's product to describe.
  - .1 Caulking compound.
  - .2 Primers.
  - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
  - .4 Installation instructions, surface preparation and product limitations.
- .2 Submit duplicate samples of each type of material and colour.
- .3 Cured samples of exposed sealants for each color where required to match adjacent material.
- .4 Manufacturers' instructions to include installation instructions for each product used.

**1.5 QUALITY ASSURANCE**

- .1 Manufacturer Qualifications: company engaged in the manufacturing of products specified in this section with documented experience.
- .2 Applicator Qualifications: Experienced installer equipped and trained for application of joint sealant required for this project with record of successful completion of projects of similar scope.
  - .1 Applicator to be approved by sealant manufacturer.
  - .2 Applicator to submit documentation of successfully completed projects of similar size, scope and complexity.

**1.6 MOCK-UP**

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct mock-up to show location, size, shape and depth of joints complete with back-up material, primer, caulking and sealant. Mock-up may be part of finished work.
- .3 Allow two (2) working days for inspection of mock-up by Owner's Representative before proceeding with sealant work.
- .4 Mock-up will be used:
  - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
- .5 When accepted, mock-up will demonstrate minimum standard of quality required for this Work.

**1.7 FIELD ADHESION/COHESION TESTS**

- .1 Test Frequency:

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- .1 Perform a field test each type of sealant and substrate combination, for all interior and exterior sealants associated with the building envelope.
- .2 Perform three (3) additional tests for each failed test.
- .2 Locate test joints as directed by Owner's Representative. Tests to be performed in the presence of the Owner's Representative and/or manufacturer's representative.
- .3 Notify Owner's Representative seven (7) days prior to dates tests are to be performed.
- .4 Test joint sealants by hand-pull methods #1 and # 2. Record test results in Field Adhesion/Cohesion Test Form.
  - .1 Test Method #1:
    - .1 Make a knife cut horizontally from one side of the joint to the other.
    - .2 Make two (2) vertical cuts (from the horizontal cut) approximately 75 mm long on each side of the joint.
    - .3 Pry out flap created from cuts.
    - .4 Firmly grasp flap and slowly pull at 90° from sealant plane.
    - .5 Pull flap until adhesive or cohesive failure occurs.
      - .1 Adhesive failure will be evidenced by the sealant pulling off clean from the substrate.
      - .2 Cohesion failure will be evidenced by the sealant ripping or failing within itself, leaving well-adhered sealant to the substrate.

**(Cohesive failure is considered a positive result).**
  - .2 Test Method # 2:
    - .1 Follow steps one (1) through four (4) of Test Method # 1.
    - .2 Mark a benchmark on the sealant 25 mm (1") from the plane of the installed sealant.
    - .3 Firmly grasp the flap and pull slowly, while holding a ruler parallel to the sealant flap. Note the position of the benchmark on the ruler.
    - .4 Refer to manufacturer's printed literature for each sealant tested for the required extension factor pass criteria; (i.e.: if the 25 mm (1") benchmark on the sealant can be pulled to 100 mm (4") and held with no failure of sealant, 400% elongation is achieved.)
    - .5 **If no failure occurs prior to the manufacturer's stated extension factor, the test is successful.** Extension factor should be three (3) times the movement capability of the sealant.
- .5 Inspect joints for:
  - .1 Complete fill,
  - .2 Absence of voids,
  - .3 Primer,
  - .4 Proper width/depth ratio, and

- .5 Back up material.
- .6 Repair sealants pulled in test area by applying new sealants following same procedures used to original seal joints.
- .7 Contractor shall repair test areas at no additional cost to the Owner.

**1.8 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 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.
- .3 Condition products to approximately 16 to 20 degrees C for use in accordance with manufacturer's recommendations.
- .4 Handle all products with appropriate precautions and care as stated on the Material Safety Data Sheet.

**1.9 PROJECT CONDITIONS**

- .1 Environmental Limitations:
  - .1 Do not proceed with installation of joint sealants under following conditions:
    - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4°C.
    - .2 When joint substrates are wet.
- .2 Joint-Width Conditions:
  - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
  - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

**PART 2 PRODUCTS**

**2.1 SEALANT MATERIALS**

- .1 Sealants and Caulking compounds must:
  - .1 Meet or exceed all applicable governmental and industrial safety and performance standards; and
  - .2 Be manufactured and transported in such a manner that all steps fo the process, including the disposal of waste products arising therefrom, will meet the

requirements of all applicable governmental acts, by laws and regulations including, for facilities located in Canada, the Fisheries Act and the Canadian Environmental Protection Act (CEPA).

- .2 Sealant and caulking compounds must not be formulated or manufactured with: aromatic solvents, fibrous talc or asbestos, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium, barium or their compounds, except barium sulphate.
- .3 Sealant and caulking compounds must not contain a total of volatile organic compound (VOC's) in excess of 100 grams per litre as calculated from records of the amounts of constituents used to make the product.
- .4 Sealant and caulking compounds must be accompanied by detailed instructions for proper application so as to minimize health concerns and maximize performance, and information describing proper disposal methods.
- .5 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .6 When low toxicity caulks are not possible, confine usage to areas which off-gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off-gas time.
- .7 Where sealants are qualified with primers use only these primers.
- .8 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Board for Joint Sealants. Where sealants are qualified with primers use only these primers.

## 2.2

### SEALANT MATERIAL DESIGNATIONS

- .1 Single component, low odor, moisture cure, medium modulus, low VOC sealant for use in sealing air/vapour barrier penetrations, to ASTM C920, Type S, Grade NS, Class 35.
  - .1 ASTM C719:  $\pm 35\%$ .
  - .2 Ultimate Elongation: 450 - 550%.
  - .3 Modulus, 100%: 275 - 345 kPa.
  - .4 Shore A Hardness:  $25 \pm 5$ .
  - .5 Tensile Strength: 1034 – 1378 kPa.
  - .6 Maximum VOC: 5 g/L.
- .2 Single component, medium modulus, high-performance, neutral-cure silicone sealant for general purpose exterior use, to ASTM C920, Type S, Grade NS, Class 35, Use NT, M, A and O.
  - .1 ASTM C719:  $\pm 25\%$ .
  - .2 Ultimate Elongation: 550%.

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- .3 Modulus, 50% extension: 380 kPa.
- .4 Shore A Hardness: 25 ± 5.
- .5 Tensile Strength: 1240 kPa.
- .6 Maximum VOC: 35 g/L.
- .7 Colour to be selected from manufacturer's standard range.
- .3 Single component, low modulus, neutral-cure silicone sealant for general purpose masonry use, to ASTM C920, Type S, Grade NS, Class 50, Use T, NT, M, G, A and O.
  - .1 ASTM C719: ± 50%.
  - .2 Ultimate Elongation: 1600%.
  - .3 Modulus, 50% extension: 193 kPa.
  - .4 Shore A Hardness: 15.
  - .5 Tensile Strength: 690 kPa.
  - .6 Maximum VOC: 22 g/L.
  - .7 Colour to be selected from manufacturer's standard range.
- .4 Two-component, high modulus, neutral-cure flexible silicone rubber sealant for use with aluminum window and curtain wall fabrication, assembly and glazing installation, to ASTM C1184 and ASTM C920, Type M, Grade NS, Class 12 ½, Use NT.
  - .1 ASTM C719: ± 25%.
  - .2 Ultimate Elongation: 120%.
  - .3 Shore A Hardness: 30 - 40.
  - .4 Tensile Strength: 2000 kPa.
  - .5 Maximum VOC: < 18 g/L.
- .5 Single component, medium modulus, neutral-cure silicone sealant for general roofing applications, to ASTM C920, Type S, Grade NS, Class 50, Use NT, G, A and O.
  - .1 ASTM C719: ± 50%.
  - .2 Shore A Hardness: 35.
  - .3 Tensile Strength: 415 kPa.
  - .4 Maximum VOC: 28 g/L.
  - .5 Colour to be selected from manufacturer's standard range.
- .6 Single component, chemical cure, silicone rubber sealant, for use with plumbing fixtures, showers, sinks, tubs, and junction of counter tops and adjacent wall finishes, to ASTM C920, Type S, Grade NS, Class 25, Use NT.
  - .1 Shore A Hardness: 25.
  - .2 Tensile Strength: 2100 kPa.
  - .3 Maximum VOC: 36 g/L.
  - .4 Colour to be selected from manufacturer's standard range.



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- .7 Single component, high-performance, elastomeric polyurethane sealant, paintable, for general purpose interior use, to ASTM C920, Type S, Grade NS, Class 35, Use NT, M, A, T, O and I.
  - .1 ASTM C719: 35%.
  - .2 Ultimate Elongation: 800%.
  - .3 Shore A Hardness: 25 - 30.
  - .4 Tensile Strength: 2400 kPa.
  - .5 Maximum VOC: 35 g/L.
  - .6 Colour to be selected from manufacturer's standard range.
- .8 Single component, non-skinning, non-hardening, synthetic rubber sealant for use in acoustical applications, to CAN/CGSB 19.21.
  - .1 Shrinkage: maximum 20%.
  - .2 Maximum VOC: 53 g/L.
  - .3 Sag: Maximum 4.0 mm.
- .9 Two-component, non-sag, tamper resistant, elastomeric polyurethane sealant, for use in interior joints, penetrations, doors, windows, perimeters of fixtures, where a flexible security sealant is required due to idle tampering or vandalism, to ASTM C920, type M, Grade NS, Class 12.5, Use T<sub>1</sub>, M and O.
  - .1 Ultimate Elongation: 175 - 200%.
  - .2 Shore A Hardness: 40 - 45.
  - .3 Tensile Strength: 2000 to 2400 kPa.
  - .4 Maximum VOC: Activator - < 25 g/L, Base - < 100 g/L.
  - .5 Colour to be selected from manufacturer's standard range.

## **2.3**

### **ACCESSORIES**

- .1 Primer: Type as recommended by sealant manufacturer. Primer to be compatible with joint forming materials.
- .2 Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer and compatible with joint forming materials.
- .3 Preformed Compressible and Non-Compressible back-up materials.
  - .1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
    - .1 Extruded closed cell foam backer rod.
    - .2 Size: oversize 30 to 50 %.
  - .2 Neoprene or Butyl Rubber.
    - .1 Round solid rod, Shore A hardness 70.
  - .3 High Density Foam.
    - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa,

extruded polyolefin foam, 32 kg/m<sup>3</sup> density, or neoprene foam backer,  
size as recommended by manufacturer.

- .4 Bond Breaker Tape.
  - .1 Polyethylene bond breaker tape which will not bond to sealant.

**PART 3      EXECUTION**

**3.1            PROTECTION**

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

**3.2            SURFACE PREPARATION**

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

**3.3            PRIMING**

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

**3.4            BACKUP MATERIAL**

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

**3.5            MIXING**

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

**3.6 APPLICATION**

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

**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            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 06 20 00 - Finish Carpentry.
- .4      Section 08 71 00 - Door Hardware.
- .5      Section 08 80 50 - Glazing.

**1.2            REFERENCES**

- .1      Architectural Woodwork Manufacturers Association of Canada (AWMAC).
  - .1      Quality Standards for Architectural Woodwork.
- .2      Canadian General Standards Board (CGSB).
  - .1      CAN/CGSB-71.19, Adhesive, Contact, Sprayable.
  - .2      CAN/CGSB-71.20, Adhesive, Contact, Brushable.
- .3      Canadian Standards Association (CSA).
  - .1      CSA O115, Hardwood and Decorative Plywood.
  - .2      CAN/CSA O132.2 Series, Wood Flush Doors.
  - .3      CAN/CSA-O132.5, Stile and Rail Wood Doors.
- .4      National Fire Protection Association (NFPA).
  - .1      NFPA 80, Standard for Fire Doors and Fire Windows.
  - .2      NFPA 252, Standard Method of Fire Tests of Door Assemblies.
- .5      Underwriters' Laboratories of Canada (ULC).
  - .1      CAN-4S104M, Fire Tests of Door Assemblies.
  - .2      CAN4-S105M, Fire Door Frames Meeting the Performance Required by CAN4-S104.

**1.3            SUBMITTALS**

- .1      Product Data:
  - .1      Submit manufacturer's printed product literature, specifications and data sheet
- .2      Shop Drawings:

- .1 Indicate door types and cutouts for lights and louvres, sizes, core construction, transom panel construction and cutouts.
- .3 Show door construction, core, glazing detail and faces.
- .4 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions.

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

- .1 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
- .2 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.
- .3 Protect doors from scratches, handling marks and other damage.
- .4 Store doors away from direct sunlight.

#### **1.5 WARRANTY**

- .1 Provide a written guarantee, signed and issued in the name of the owner, covering the wood doors for both material and workmanship for a period of 2 (two) years from the date of Substantial Completion.
- .2 Areas which prove to be defective in any way shall be repaired or replaced and any damage to other work as a result of such defects shall be repaired at no cost to the Owner.

### **PART 2 PRODUCTS**

#### **2.1 WOOD FLUSH DOORS**

- .1 Solid core: to CAN/CSA-O132.2.1.
  - .1 Construction:
    - .1 Pre hung solid wood stile and rail frame poplar, with interchangeable single pane tempered glass and black aluminium screen panels.
    - .1 Standard of acceptance: Vintage doors by Yester Year.

#### **2.2 GLAZING**

- .1 Glass: to Section 08 80 50 – Glazing.

#### **2.3 WINDOWS**

- .1 Supply and install solid vinyl operable window in each door.

**2.4 FABRICATION**

- .1 Vertical edge strips to match face veneer.
- .2 Prepare doors for louvres and glazing. Provide hardwood species to match face veneer glazing stops with mitred corners.
- .3 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.
- .4 Radius vertical edges of double acting doors to 60 mm radius.
- .5 Provide waterproof non-staining membrane at cutouts on exterior doors to exclude moisture from core.

**2.5 WOOD FRAME**

- .1 Pre-assembled wood frame complete with weather stripping and aluminum threshold.

**PART 3 EXECUTION**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 INSTALLATION**

- .1 Unwrap and protect doors in accordance with CAN/CSA-O132.2 Series, Appendix A.
- .2 Install labelled fire rated doors to NFPA- 80.
- .3 Install doors and hardware in accordance with manufacturer's printed instructions and CAN/CSA-O132.2 Series, Appendix A.
- .4 Adjust hardware for correct function.
- .5 Install glazing in accordance with Section 08 80 50 - Glazing.
- .6 Install louvres and stops.
- .7 Secure transom and side panels by means of concealed fasteners or countersunk screws concealed by means of wood plugs matching panel in grain and colour.

**3.3 ADJUSTMENT**

- .1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

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**3.4 CLEANING**

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Remove traces of primer, caulking; clean doors and frames.
- .3 Clean glass and glazing materials with approved non-abrasive cleaner.
- .4 On completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**3.5 COMMISSIONING**

- .1 Contractor to instruct maintenance personnel in operation and maintenance of doors and hardware.
- .2 Confirm operation and function for all doors and hardware.
- .3 Commissioning will be witnessed by Owner's Representative and certificate will be signed by Contractor and Owner's Representative.

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 01 78 00 - Closeout Submittals.
- .4      Section 07 21 20 – Low Expanding Foam Sealant.
- .5      Section 07 26 00 –Vapour Retarders.
- .6      Section 07 92 00 - Joint Sealants.
- .7      Section 08 80 50 - Glazing

**1.2            REFERENCES**

- .1      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-79.1, Insect Screens.
- .2      Canadian Standards Association (CSA)
  - .1      CSA-A440-00/A440.1, A440, Windows / Special Publication A440.1, User Selection Guide to CSA Standard A440, Windows.
  - .2      CAN/CSA-Z91, Health and Safety Code for Suspended Equipment Operations.

**1.3            SUBMITTALS**

- .1      Indicate materials and details in scale full size for head, jamb and sill, profiles of components, interior and exterior trim. Junction between combination units, elevations of unit, anchorage details, location of isolation coating, description of related components and exposed finishes fasteners, and caulking. Indicate location of manufacturer's nameplates.
- .2      Shop drawings to include continuation of air barrier and vapour barrier between wall assembly and vinyl window.
- .3      Submit one complete full size window sample of each type window.
- .4      Include frame, sash, sill, glazing and weatherproofing method, insect screens, surface finish and hardware. Show location of manufacturer's nameplates.
- .5      Include 150 mm long samples of head, jamb, sill, meeting rail, mullions to indicate profile.



**1.4 TEST REPORTS**

- .1 Submit test reports from approved independent testing laboratories, certifying compliance with specifications, for:
  - .1 Windows classifications
  - .2 Air tightness
  - .3 Water tightness
  - .4 Wind load resistance
  - .5 Condensation resistance
  - .6 Forced entry resistance
  - .7 Insect screens
  - .8 Glazing
  - .9 Safety drop - vertical sliding windows only
  - .10 Ease of operation - windows with operable lights
  - .11 Sash pull-off - vinyl windows

**1.5 WARRANTY**

- .1 Provide a written warranty for work under this Section from Manufacturer for failure due to defective materials and from Contractor for failure due to defective installation, workmanship for ten (10) years respectively from the date of Substantial Completion.

**1.6 CLOSEOUT SUBMITTALS**

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

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Materials: to CSA-A440/A440.1 supplemented as follows:
  - .2 All vinyl windows by same manufacturer.
  - .3 Sash: vinyl.
  - .4 Main frame: vinyl, thermally broken.
  - .5 Glass: in accordance with Section 08 80 50 - Glazing.
  - .6 Screens: to CAN/CGSB-79.1.
    - .1 Insect screening mesh: count 18 x 14
    - .2 Fasteners: tamper proof

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- .3 Screen frames: aluminum, colour to match window frames
- .4 Mount screen frames for exterior replacement.
- .5 Provide full insect screens to cover entire window

**2.2 WINDOW TYPE AND CLASSIFICATION**

- .1 Types:
  - .1 Single hung, bottom vented, top position fixed, insulating glass.
  - .2 Fixed: with insulating glass.
  - .3 Screens: screens as indicated.
- .2 Classification rating: to CSA-A440/A440.1 for various regions of Newfoundland and Labrador as follows:
  - .1 Gander                                      A3, B4, C3, I40, F1, S1
- .3 Energy ratings: windows to be Energy Star certified to Natural Resources Canada Climate Zones for various regions of Newfoundland and Labrador as follows:
  - .1 Island Region (Except northern part Northern Peninsula)
    - .1 Zone 2 ( $\geq 3500$  to  $<6000$  HDDs)

**2.3 FABRICATION**

- .1 Fabricate in accordance with CSA-A440/A440.1 supplemented as follows:
- .2 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less and plus or minus 3.0 mm for units with a diagonal measurement over 1800 mm.
- .3 Face dimensions detailed are maximum permissible sizes.
- .4 Brace frames to maintain squareness and rigidity during shipment and installation.

**2.4 VINYL FINISHES**

- .1 Vinyl finishes: in accordance with CSA-A440/A440.1, including appendices.

**2.5 GLAZING**

- .1 Glaze windows in accordance with CSA-A440/A440.1 and Section 08 80 50 - Glazing.

**2.6 HARDWARE**

- .1 Hardware:
  - .1 stainless steel or white bronze trimline camlocks to provide security and permit easy operation of units.
  - .2 Counter balance: stainless steel coil balance hardware.

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- .2 Vertical slider windows are not required to have inward tilt action. All vertical slider windows provided for this project are to have the inward tilt action mechanism disabled prior to delivery to the project site.

**2.7 AIR BARRIER AND VAPOUR RETARDER**

- .1 Provide low expanding, single component polyurethane foam sealant installed at head, jamb and sill perimeter of window for sealing to building air barrier, vapour retarder and window frame. Foam sealant width to be adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder foam interior. Refer to Section 07 21 20 – Low Expanding Foam Sealant.

**PART 3 EXECUTION**

**3.1 WINDOW INSTALLATION**

- .1 Install in accordance with CSA-A440.
- .2 Arrange components to prevent abrupt variation in colour.
- .3 Install shims between windows and building frame at each installation screw location. Shim and fasten windows in accordance with manufacturer's recommendations and CAN/CSA A440.4.

**3.2 CAULKING**

- .1 Seal joints between windows and window sills with sealant. Caulk between sill upstand and window-frame. Caulk butt joints in continuous sills.
- .2 Apply sealant in accordance with Section 07 92 00 - Joint Sealants. Conceal sealant within window units except where exposed use is permitted by Owner's Representative.

**END OF SECTION**

**PART 1      GENERAL**

**1.1      RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 61 00 - Common Product Requirements.
- .3      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .4      Section 01 78 00 - Closeout Submittals.
- .5      Section 08 11 00- Metal Doors & Frames.
- .6      Section 08 11 16 – Aluminum Doors and Frames.
- .7      Section 08 14 16 – Flush Wood Doors.
- .8      Division 26 - Electrical wiring for magnetic strikes, electric releases, electric locks.

**1.2      REFERENCES**

- .1      American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
  - .1      ANSI/BHMA A156.1, American National Standard for Butts and Hinges.
  - .2      ANSI/BHMA A156.2, Bored and Preassembled Locks and Latches.
  - .3      ANSI/BHMA A156.3, Exit Devices.
  - .4      ANSI/BHMA A156.4, Door Controls - Closers.
  - .5      ANSI/BHMA A156.5, Cylinders and Input Devices for Locks.
  - .6      ANSI/BHMA A156.6, Architectural Door Trim.
  - .7      ANSI/BHMA A156.8, Door Controls - Overhead Stops and Holders.
  - .8      ANSI/BHMA A156.12, Interconnected Locks and Latches.
  - .9      ANSI/BHMA A156.13, Mortise Locks and Latches Series 1000.
  - .10     ANSI/BHMA A156.14, Sliding and Folding Door Hardware.
  - .11     ANSI/BHMA A156.15, Release Devices - Closer Holder, Electromagnetic and Electromechanical.
  - .12     ANSI/BHMA A156.16, Auxiliary Hardware.
  - .13     ANSI/BHMA A156.17, Self-closing Hinges and Pivots.
  - .14     ANSI/BHMA A156.18, Materials and Finishes.
  - .15     ANSI/BHMA A156.19, Power Assist and Low Energy Power - Operated Doors.
  - .16     ANSI/BHMA A156.21, Thresholds.
  - .17     ANSI/BHMA A156.22, Door Gasketing and Edge Seal Systems.

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- .18 ANSI/BHMA A156.26, Continuous Hinges.
- .19 ANSI/BHMA A156.28, Keying Systems.
- .20 ANSI/BHMA A156.31, Electronic Strikes.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA)
  - .1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
  - .2 CSDFMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.

**1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet.
- .2 Samples:
  - .1 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
  - .2 After approval samples will be returned for incorporation in the Work.
- .3 Hardware List:
  - .1 Submit contract hardware list.
  - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .4 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions.
- .5 Closeout Submittals
  - .1 Provide operation and maintenance data for door closers, locksets, door holders electrified hardware and fire exit hardware for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**1.4 MAINTENANCE MATERIALS**

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

**1.5 WARRANTY**

- .1 Provide a written manufacturer's warranty for work of this Section for failure due to defective materials for ten (10) years, dated from substantial completion certificate.

- .2 Provide a written Contractor's warranty for work of this Section for failure due to defective installation workmanship for one (1) year, dated from submittal completion certificate.

## **1.6 QUALITY ASSURANCE**

- .1 Regulatory Requirements:
  - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
  - .2 Only products certified in accordance with ANSI/BHMA standards are acceptable. Items that are equal in design, function and quality will be accepted upon approval of the Owner's Representative.
  - .3 Only recognized contract hardware distributors will be considered for the work of this section. The distributor shall have on staff a qualified Architectural Hardware Consultant recognized by the Door and Hardware Institute or a person with equivalent qualifications to assist installers and direct detailing, processing and delivery of material, and certify installation acceptance.
  - .4 Upon completion of finish hardware installation, hardware supplier shall inspect work and shall certify in writing that all items and their installation are in accordance with requirements of Contract Documents and are functioning properly.

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

- .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Store finishing hardware in locked, clean and dry area.
- .3 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

## **1.8 MAINTENANCE SERVICE**

- .1 Provide maintenance service for one year during warranty period to maintain all barrier free entrance automatic operators as follows:
  - .1 Qualified service personal approved by manufacturer of operators.
  - .2 Site inspection every three months will all necessary adjustment made during this visit. Separate warranty service calls, if required, will only qualify as an inspection if time of call is close to the three month intervals.
  - .3 Make detailed reports of each visit and copy to Owner and Engineer.
  - .4 Cost of this service will be included as part of this Section and is not covered by any allowance amount.

**PART 2      PRODUCTS**

**2.1            HARDWARE ITEMS**

- .1      Only door locksets and latches listed on ANSI/BHMA Standards list are acceptable for use on this project.
- .2      Use one manufacturer's products only for similar items.

**2.2            DOOR HARDWARE**

- .1      Locks and latches:
  - .1      Bored and preassembled locks and latches: to ANSI/BHMA A156.2, 4000 bored lock, grade 1, designed for function and keyed as stated in Hardware Schedule.
  - .2      Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, designed for function and keyed as stated in Hardware Schedule.
  - .3      Lever handles : design as indicated in hardware groups.
  - .4      Roses: round.
  - .5      Normal strikes: box type, lip projection not beyond jamb.
  - .6      Cylinders: key into keying system as directed.
  - .7      All corresponding cylinders to be removable.
  - .8      Finished as indicated in Hardware Groups.
- .2      Butts and hinges:
  - .1      Butts and hinges: to ANSI/BHMA A156.1, designated by letter A and numeral identifiers, followed by size and finish, listed in Hardware Schedule.
  - .2      Interior hinges of steel, unless otherwise indicated.
  - .3      Continuous hinges shall be heavy duty as indicated, full height, complete with installation aids and fasteners to suit door and frame conditions. Hinge to have access to electrical items without removing hinge.
  - .4      Quantity, size and width of hinges in accordance with manufacturer's recommendations and ANSI/BHMA 156.1.
- .3      Exit devices:
  - .1      To ANSI/BHMA A156.3, function, grade and finish as per schedule. Rim type with push pad design.
- .4      Door Closers and Accessories:
  - .1      Door controls (closers): to ANSI/BHMA A156.4, designated by letter C and numeral identifiers listed in Hardware Schedule, size in accordance with ANSI/BHMA A156.4. Table A1.
  - .2      Closers of narrow, slim line design complete with backcheck, rack and pinion hydraulic action.

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- .3 Closers equipped with full cover, as noted in Hardware Groups, complete with secure and concealed mounting screws
- .4 Adapter plates for added reinforcing shall be added to any opening if required to suit field conditions or door design.
- .5 Closers shall include all necessary arm brackets, cushion arm supports and blade stop spacers to suit door swing, frame reveals or stop conditions.
- .6 Closers capable of field adjustments of at least fifteen (15) percent.
- .7 Finish as indicated in Hardware Groups.
- .5 Door Operators:
  - .1 Power-operated pedestrian doors: to ANSI/BHMA A156.10.
  - .2 Complete with all components including operator housing, power operator, electronic control, soft start, switching networks, and all connecting hardware.
  - .3 Design intent and function of opening as indicated in Hardware Groups. Supplier to include additional components and power supplies required to properly operate all hardware devices, door control devices, remote control devices, complete with any special cables or wirings to connect all parts.
  - .4 Operator housing shall be complete with finished end caps prepared for mounting to door frame.
  - .5 Operator housing shall be factory assembled with all necessary components for proper operation and switching. Relays, wiring harness and other components shall be plug-in type.
  - .6 Operator controls shall include adjustable time delay, safe-swing circuit as well as provision for accessories as detailed in Hardware Groups.
  - .7 Complete unit shall be mounted with provisions for easy servicing or replacement without removing the door or frame.
  - .8 All wiring shall be of shielded type with proper number and gauge of conductor wires to install all components as specified.
  - .9 Installation of operators shall be carried out by manufacturer's certified and authorized personnel.
- .6 Power Supplies:
  - .1 To ANSI/BHMA 156.19, designated by numerical identifiers listed in Hardware Groups.
  - .2 Shall be concealed in ceiling space of suitable adjacent area.
  - .3 Shall interface with all electrical security components and supplied with all relays and devices to operate as per Hardware Groups.
  - .4 When key switch is used, it will operate as per hardware notes and reset the power supply.
- .7 Auxiliary locks and associated products: to ANSI/BHMA A156.5, designated by letter E and numeral identifiers listed in Hardware Schedule.
  - .1 Key into keying system as noted.



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- .8 Architectural door trim: to ANSI/BHMA A156.6, designated by letter J and numeral identifiers listed in Hardware Schedule.
  - .1 Door protection plates: 1.27 mm thick stainless steel, finished to BMHA 630.
  - .2 Push plates: 1.27 mm thick stainless steel finished to BMHA 630.
  - .3 Push/Pull units: type stainless steel finished to BMHA 630.
  - .4 Fastened with through bolts or concealed bolts depending on application.
  - .5 Where pull has back plate, fasteners will be countersunk and bevelled with no sharp edges.
  - .6 Where bolts cannot be concealed under the push plate they shall have a grommet washer finished to match other hardware.
- .9 Auxiliary hardware: to ANSI/BHMA A156.16, designated by letter L and numeral identifiers listed in Hardware Schedule.
  - .1 Combination stop and holder, floor mounted: finished to BMHA 626.
  - .2 Surface bolt lever extension flush bolt: finish to BMHA 626.
- .10 Door bottom seal: heavy duty, door seal of extruded aluminum frame and hollow closed cell neoprene weather seal, surface mounted with drip cap closed ends, clear anodized finish.
- .11 Thresholds:
  - .1 To ANSI/BHMA A156.21 extruded aluminum mill finish, serrated surface, with lip and vinyl door seal insert, thermally broken.
  - .2 Thresholds of aluminum material. Provide 50 mm longer than opening to allow fitting on site.
  - .3 When mullion is used, increase length of threshold to fit around mullion.
  - .4 Fasteners of countersink type suitable to properly install to floor/sill conditions. Supply complete with screw anchors.
- .12 Weatherstripping:
  - .1 Head and jamb seal:
    - .1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.
- .13 Astragal: overlapping, extruded aluminum frame with vinyl insert, finished to match doors.

### **2.3 FASTENINGS**

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.

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- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

**2.4 KEYING**

- .1 Doors, padlocks and cabinet locks to be master keyed as directed. Prepare detailed keying schedule in conjunction with Owner's Representative and owner.
- .2 Provide keys in triplicate for every lock in this Contract.
- .3 Provide six master keys for each MK or GMK group. Allow for six (6) levels of sub master keying.
- .4 Stamp keying code numbers on keys and cylinders.
- .5 Provide all permanent cores and keys to Owner's Representative.
- .6 Supply ten (10) blanks for each sub master group used.

**2.5 FINISHES**

- .1 Following finishes are indicated in hardware groups.

BHMA	CAN MATERIAL	FINISH
626	C26D Brass/Bronze	Satin Chrome
628	C28 Aluminum	Satin Alum, Anodized
630	C32D Stainless Steel	Satin Stainless Steel
652	C26D Steel	Plated Satin Chrome
689	Al All	Painted Aluminum
	Alum Aluminum	Mill Finish
	TMDFP (to match door and frame finish).	

**2.6 ABBREVIATIONS**

ALD	Aluminum Door and Frame
ATMS STMS	Arm/strike To Template with Machine Screws
ASB	Arm Complete with Sex Bolts
BC	Back Check
C to C, C/L	Centerline to Centerline
Cyl	Cylinder (of a lock)
CMK	Construction Master Key
Deg.	Degree (of opening)
DEL	Delayed Action
FBB or BB	Ball bearing hinge

**PART 3**      **EXECUTION**

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

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

**3.2**            **INSTALLATION**

- .1      Install door hardware in accordance with manufacturer's instructions, using special tools and jigs. Fit accurately and apply securely. Ensure that hardware is installed correctly.
- .2      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.
- .3      No operating hardware shall be installed at a height of more than 1200 above the finished floor (NBC 3.4.6.16).
- .4      Installation to be done by a qualified tradesman. Technical assistance provide by door hardware supplier where required.
- .5      Closers shall be installed according to manufacturer's templates and installation instructions. Unless required otherwise, installation shall be on pull side of door. Outswing doors shall be on push side using top jamb or parallel arm installation.
- .6      Where closer or arm is installed on door, sex bolts will be used, finished to match other hardware.
- .7      Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners. Plates drilled to accept through bolts will not be acceptable.
- .8      Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .9      Install key control cabinet.
- .10     Use only manufacturer's supplied fasteners. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .11     Remove construction cores and locks when directed by Owner's Representative; install permanent cores and check operation of locks.

- .12 Installation of all Automatic Operator items to be performed by AAADM certified and manufacturer authorized personnel, including connections to hardware products installed by others.
- .13 Installation of Access Control items to be performed by manufacturer certified authorized personnel, including connections to hardware products installed by others.
- .14 Wiring Diagrams:
  - .1 Provide any special information, voltage requirements and wiring diagrams to other trades requiring such information.

### **3.3 EXAMINATION**

- .1 Visit site prior to start of installation of hardware.
- .2 Visit will include examination of openings, site conditions and materials for conditions that prevent proper application of finish hardware.
- .3 Report to General Contractor, in writing, defects of work prepared by other trades and other unsatisfactory site conditions. Commencement of installation will imply acceptance of prepared work by others.

### **3.4 FIELD QUALITY CONTROL**

- .1 Hardware contractor to have a qualified AHC representative from the manufacturer/supplier on site at Substantial Completion Inspection and at commissioning of the finished hardware. Cost of the visits to be included in contract.
- .2 Provide an inspection report 6 (six) months after Substantial Completion, completed by a qualified Architectural Hardware Consultant, to note any deficiencies. The inspection should include checking each lock against the key schedule to make sure the correct locks and cylinders are on the proper doors.
- .3 Fire Rated Door Assemblies On-Site Inspection:
  - .1 Upon completion of the installation, inspect each fire rated door assembly to confirm proper operation of its closing device, confirming it meets the criteria of NFPA 80.
  - .2 Provide a written report to the Owner's Representative listing each fire rated door assembly for the project including:
    - .1 Each door number,
    - .2 An itemized list of hardware set components for each door opening, and
    - .3 Each door location in the facility.

### **3.5 ADJUSTING**

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.

- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to provide tight fit at contact points with frames.
- .4 Where hardware is found defective, repair or replace or correct as desired by inspection reports.

**3.6 CLEANING**

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

**3.7 PROTECTION**

- .1 All hardware shall be protected against damage from paint, plaster or other defacing materials. Whenever possible manufacturers protective covering when applied, shall not be removed until final project cleaning takes place. Material not protected by manufacture shall be covered or removed from door during painting or any other adjustments that can cause damage to hardware.

**3.8 HARDWARE GROUPS**

- .1 Provide hardware as specified in the previous articles in sets according to the following groups:

HG1

2	Single doors	914 x 2134	
2	Locksets	10U15xLJ	C26D
2	Deadbolts	486	C26D
2	Closures	1460 WT Hold Open 3049	689
6	Hinges	BB991 NRP 4.5 x 4	C26D

**3.9 DEMONSTRATION**

- .1 Keying System Setup and Cabinet:
  - .1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.
  - .2 Place file keys and duplicate keys in key cabinet on their respective hooks.

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- .3 Lock key cabinet and turn over key to Owner's Representative.
- .2 Designated Staff Briefing:
  - .1 Brief designated staff regarding:
    - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
    - .2 Description, use, handling, and storage of keys.
    - .3 Use, application and storage of wrenches for door closers, locksets, and fire exit hardware.
  - .3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

**3.10 COMMISSIONING**

- .1 Site inspection or visit at Substantial Completion and training follow up and inspection at commissioning as directed by Owner's Representative.
- .2 Provide 10 month warranty service.

**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 21 – Construction/Demolition Waste Management and Disposal.
- .4      Section 01 78 00 - Closeout Submittals.
- .5      Section 07 82 00 – Joint Sealants.
- .6      Section 08 14 16 – Flush Wood Doors.
- .7      Section 08 53 13 – Vinyl Windows.

**1.2      REFERENCES**

- .1      American National Standards Institute (ANSI).
  - .1      ANSI/ASTM E330, Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .2      American Society for Testing and Materials (ASTM)
  - .1      ASTM C542, Specification for Lock-Strip Gaskets.
  - .2      ASTM D2240, Test Method for Rubber Property – Durometer Hardness.
- .3      Canadian General Standards Board (CGSB).
  - .1      CAN/CGSB-12.1, Tempered or Laminated Safety Glass.
  - .2      CAN/CGSB-12.3, Clear Float Glass
  - .3      CAN/CGSB-12.5, Mirrors, Silvered.
  - .4      CAN/CGSB-12.8, Insulating Glass Units.
  - .5      CAN/CGSB-12.11, Wired Safety Glass.
- .4      Canadian Standards Association (CSA).
  - .1      CSA A440.2, Energy Performance Evaluation of Windows and Sliding Glass Doors.
  - .2      CSA Certification Program for Windows and Doors.
- .5      Glass Association of North American (GANA)
  - .1      GANA Glazing Manual.
  - .2      GANA Laminated Glazing Reference Manual.

**1.3 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
    - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
  - .2 Size glass to withstand wind loads, dead loads and positive and negative live loads as measured in accordance with ANSI/ASTM E330 and NBC latest edition.
  - .3 Limit glass deflection to 1/200 with full recovery of glazing materials.

**1.4 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and data sheet.
- .2 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions.
- .3 Closeout Submittals:
  - .1 Provide maintenance data including cleaning instructions for incorporation into manual specified in Section 01 78 00 - Closeout Submittals

**1.5 QUALITY ASSURANCE**

- .1 Perform work in accordance with GANA Glazing Manual and Laminated Glazing Reference Manual for glazing installation methods. Provide shop inspection and testing for glass.
- .3 Provide certificate of quality compliance from manufacturer.

**1.6 MOCK-UPS**

- .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
- .2 Construct mock-up to including glass glazing, and perimeter air barrier and vapour retarder seal.
- .3 Mock-up will be used to judge workmanship, substrate preparation, operation of equipment and material application.
- .4 Construct mock-up where directed.
- .5 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.



- .6 Allow two (2) working days for inspection of mock-up by Owner's Representative before proceeding with work.

## **1.7 WARRANTY**

- .1 Provide ten (10) year warranty for glazing units from the date of Substantial Completion.

## **1.8 ENVIRONMENTAL REQUIREMENTS**

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

## **PART 2 PRODUCTS**

### **2.1 MATERIALS: FLAT GLASS**

- .1 Float glass: to CAN/CGSB-12.3, Glazing quality, 5 mm minimum thickness.
- .2 Safety glass: to CAN/CGSB-12.5, transparent, 6 mm thick.
  - .1 Type 1, Laminated, Type 2 - tempered
  - .2 Class B - float
  - .3 Category 11

### **2.2 MATERIALS: SEALED INSULATING GLASS**

- .1 Insulating glass units: to CAN/CGSB-12.8, double unit, minimum 25 mm overall thickness (as per NBCC for window area and climatic conditions.)
  - .1 Glass: to CAN/CGSB-12.3
  - .2 Glass thickness: As per NBCC calculations for window area and climatic conditions.
  - .3 Inter-cavity space thickness: 13 mm.
  - .4 Provide Low-E coating.

### **2.3 MATERIALS**

- .1 Sealant: 07 92 00 – Joint Sealants.

### **2.4 ACCESSORIES**

- .1 Setting blocks: Neoprene, 80-90 Shore A durometer hardness to ASTM D2240, minimum 100 mm x width of glazing rabbet space minus 1.5 mm x height.

- .2 Spacer shims: Neoprene, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.
- .3 Glazing tape:
  - .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; black colour.
- .4 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot, colour as selected.
- .5 Glazing clips: manufacturer's standard type.
- .6 Lock-strip gaskets: to ASTM C542.

**PART 3      EXECUTION**

**3.1      MANUFACTURER'S INSTRUCTIONS**

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

**3.2      EXAMINATION**

- .1 Verify that openings for glazing are correctly sized and within tolerance.
- .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

**3.3      PREPARATION**

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

**3.4      INSTALLATION: EXTERIOR – WET/DRY METHOD (PREFORMED TAPE AND SEALANT)**

- .1 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.
- .2 Cut glazing tape to length and set against permanent stops, 6 mm below sight line. Seal corners by butting tape and dabbing with sealant.

- .3 Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.
- .4 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.
- .5 Rest glazing on setting blocks and push against tape and heel of sealant with sufficient pressure to attain full contact at perimeter of light or glass unit.
- .6 Install removable stops with spacer strips inserted between glazing and applied stops 6 mm below sight line.
- .7 Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, maximum 9 mm below sight line.
- .8 Apply cap head of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

**3.5 INSTALLATION: INTERIOR DRY METHOD (TAPE AND TAPE)**

- .1 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.
- .2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.
- .3 Place setting blocks at 1/4 with edge block maximum 150 mm from corners.
- .4 Rest glazing on setting blocks and push against tape with sufficient pressure to attain full contact at perimeter of light or glass unit.
- .5 Place glazing tape on free perimeter of glazing in same manner described in 3.4.3. Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.
- .6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- .7 Knife trim protruding tape.

**3.6 CLEANING**

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Remove traces of primer, caulking.
- .3 Remove glazing materials from finish surfaces.
- .4 Remove labels after work is complete.

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- .5 Clean glass and mirrors using approved non-abrasive cleaner in accordance with manufacture's instructions.
- .6 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**3.7 PROTECTION OF FINISHED WORK**

- .1 After installation, mark light with an "X" by using removable plastic tape or paste. Do not mark heat absorbing or reflective glass units.
- .2 Repair damage to adjacent materials caused by glazing installation.

**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 61 00 - Common Product Requirements.
- .4      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .5      Section 01 78 00 – Closeout Submittals.
- .6      Section 32 17 23 - Pavement Marking.

**1.2**            **REFERENCES**

- .1      Environmental Protection Agency (EPA)
  - .1      EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings).
- .2      Master Painters Institute (MPI)
  - .1      MPI Architectural Painting Specifications Manual
- .3      Society for Protective Coatings (SSPC).
  - .1      SSPC Painting Manual, Systems and Specifications Manual.
- .4      National Research Council (NRC).
  - .1      National Fire Code of Canada

**1.3**            **QUALITY ASSURANCE**

- .1      Contractor shall have proven satisfactory experience. When requested, provide a list of comparable jobs including, job name and location, specifying authority, and project manager.
- .2      Qualified journeyperson shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyperson in accordance with trade regulations.
- .3      Conform to latest MPI requirements for exterior painting work including preparation and priming.
- .4      Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Products" listing and shall be from a single manufacturer for each system used.

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- .5 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.
- .6 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Owner's Representative.
- .7 Standard of Acceptance:
  - .1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.
  - .2 Ceilings: No defects visible from floor at 45° to surface when viewed using final lighting source.
  - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.
- .8 Mock-Ups:
  - .1 When requested by Owner's Representative or Paint Inspection Agency, prepare and paint designated surface, area, room or item to requirements specified herein, with specified paint or coating showing selected colours, number of coats, gloss/sheen, textures and quality of work to MPI Painting Specification Manual standards for review and approval.
  - .2 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
  - .3 Mock-up will be used to judge quality of work, substrate preparation, operation of equipment and material application and skill to MPI Architectural Painting Specification Manual standards.
  - .4 Locate as directed by Owner's Representative.
  - .5 Allow two (2) working days for inspection of mock-up before proceeding with Work.
  - .6 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

**1.4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS**

- .1 Provide paint products meeting MPI "Environmentally Friendly" E2 or E3 ratings based on VOC (EPA Method 24) content levels.

**1.5 SCHEDULING OF WORK**

- .1 Submit work schedule for various stages of painting to Owner's Representative for approval. Submit schedule minimum of two (2) working days in advance of proposed operations.
- .2 Obtain written authorization from Owner's Representative for changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants in and about the building.

**1.6 SUBMITTALS**

- .1 Submit product data and manufacturer's installation/application instructions for paints and coating products to be used.
- .2 Submit WHMIS - MSDS - Material Safety Data Sheets.
- .3 Upon completion, submit records of products used, records to be included in Operation and Maintenance Manuals. List products in relation to finish system and include the following:
  - .1 Product name, type and use.
  - .2 Manufacturer's product number.
  - .3 Colour numbers.
  - .4 Manufacturer's Material Safety Data Sheets (MSDS).
  - .5 MPI Environmentally Friendly classification system rating.
- .4 Submit manufacturer's application instructions for each product specified.
- .5 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:
  - .1 3 mm plate steel for finishes over metal surfaces.
  - .2 13 mm birch plywood for finishes over wood surfaces.
  - .3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
  - .4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
- .6 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.
- .7 Submit full range of available colours where colour availability is restricted.

**1.7 EXTRA MATERIALS**

- .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit 1 - 4 litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish formula.
- .3 Deliver to Owner's Representative and store where directed.

**1.8 DELIVERY, HANDLING AND STORAGE**

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

- .3 Labels shall clearly indicate:
  - .1 Manufacturer's name and address.
  - .2 Type of paint or coating.
  - .3 Compliance with applicable standard.
  - .4 Colour number in accordance with established colour schedule.
- .4 Remove damaged, opened and rejected materials from site.
- .5 Provide and maintain dry, temperature controlled, secure storage.
- .6 Observe manufacturer's recommendations for storage and handling.
- .7 Store materials and supplies away from heat generating devices.
- .8 Store materials and equipment in a well ventilated area with temperature range 7°C to 30°C.
- .9 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .10 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Consultant. After completion of operations, return areas to clean condition to approval of Consultant.
- .11 Remove paint materials from storage only in quantities required for same day use.
- .12 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .13 Fire Safety Requirements:
  - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
  - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
  - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.
- .14 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

## **1.9 SITE REQUIREMENTS**

- .1 Heating, Ventilation and Lighting:
  - .1 Ventilate enclosed spaces.
  - .2 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate



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- temperatures above 10°C for 24 hours before, during and after paint application until paint has cured sufficiently.
- .3 Where required, provide continuous ventilation for seven days after completion of application of paint.
- .4 Provide temporary ventilating and heating equipment where permanent facilities are not available.
- .5 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
  - .1 Unless specifically pre-approved by Owner's Representative and, applied product manufacturer, perform no painting work when:
    - .1 ambient air and substrate temperatures are below 10°C.
    - .2 substrate temperature is over 32°C unless paint is specifically formulated for application at high temperatures.
    - .3 substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
    - .4 the relative humidity is above 85% or when dew point is less than 3°C variance between air/surface temperature.
    - .5 rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
  - .2 Perform no painting work when maximum moisture content of substrate exceeds:
    - .1 12% for concrete and masonry (clay and concrete brick/block).
    - .2 15% for wood.
    - .3 12% for plaster and gypsum board.
  - .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
  - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
  - .1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
  - .2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.
  - .3 Apply paint only when previous coat of paint is dry or adequately cured.
  - .4 Apply paint finishes only when conditions forecast for entire period of application fall within manufacturer's recommendations.
  - .5 Do not apply paint when:
    - .1 Temperature is expected to drop below 10°C before paint has thoroughly cured.

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- .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
- .3 Surface to be painted is wet, damp or frosted.
- .6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
- .7 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
- .8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.
- .9 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of the Owner's Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

**1.10 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Ensure emptied containers are sealed and stored safely.
- .5 Unused paint, coating materials must be disposed of at official hazardous material collections site as approved by Owner's Representative.
- .6 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal.
- .7 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .8 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .9 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
  - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
  - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
  - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.

- .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
- .10 Empty paint cans are to be dry prior to disposal or recycling (where available).

**PART 2      PRODUCTS**

**2.1          MATERIALS**

- .1 Paint materials listed in the latest edition of the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Paint materials for each coating formula to be products of a single manufacturer.
- .3 Low odour products: whenever possible, select products exhibiting low odour characteristics. If two products are otherwise equivalent, select the product with the lowest odour. Only qualified products with E2 or E3 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 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 be manufactured without compounds which contribute to smog in the lower atmosphere.
  - .5 do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
- .5 Water-borne surface coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).
- .6 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .7 Water-borne surface coatings must have a flash point of 61.0°C or greater.
- .8 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
  - .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

- .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
- .9 Water-borne paints and stains, and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

## **2.2 COLOURS**

- .1 Owner's Representative will provide Colour Schedule after Contract award.
- .2 Selection of colours will be from manufacturer's full range of colours.
- .3 Where specific products are available in a restricted range of colours, selection will be based on the limited range.
- .4 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.
- .5 For deep and ultra-deep colours 4 coats may be required.

## **2.3 MIXING AND TINTING**

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Owner's Representative written permission.
- .2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
- .3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.
- .4 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 Owner's Representative.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

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**2.4 GLOSS/SHEEN RATINGS**

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

<b>Gloss Level /Category</b>	<b>Units @ 60°/</b>	<b>Units @ 85°</b>
G1 - matte 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 Gloss level ratings of painted surfaces shall be as specified herein.

**2.5 EXTERIOR PAINTING SYSTEMS**

- .1 The following paint formulas requires a three coat finish as indicated in the MPI Architectural Painting Specifications Manual.
- .2 Dimension Lumber: columns, beams, exposed joists, underside of decking, siding, fencing, etc.
- .1 EXT 6.2M - Latex G5 finish (over latex primer) premium grade.
- .3 Dressed Lumber: doors, door and window frames, casings, battens, smooth facias, etc.
- .1 EXT 6.3L - Latex G5 finish (over latex primer) premium grade.

**PART 3 EXECUTION**

**3.1 GENERAL**

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

**3.2 EXISTING CONDITIONS**

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

- .3 Maximum moisture content as follows:
  - .1 Concrete: 12%.
  - .2 Clay and Concrete Block/Brick: 12%.
  - .3 Wood: 15%.

### **3.3 PROTECTION**

- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Owner's Representative.
- .2 Cover or mask windows and other ornamental hardware adjacent to areas being painted to prevent damage and to protect from paint drops and splatters. Use non-staining coverings.
- .3 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .4 Protect factory finished products and equipment.
- .5 Protect passing pedestrians, building occupants and general public in and about the building.
- .6 Remove electrical cover plates, light fixtures, surface hardware on doors, and all other surface mounted fittings, equipment and fastenings prior to undertaking any painting operations. Store for re-installation after painting is completed.
- .7 Cover or move exterior furniture and portable equipment around building as necessary to carry out painting operations. Replace as painting operations progress.
- .8 As painting operations progress, place "WET PAINT" signs in areas of work to approval of Owner's Representative.

### **3.4 CLEANING AND PREPARATION**

- .1 Clean and prepare exterior surfaces in accordance with MPI Painting Specification Manual requirements. Refer to the MPI Manual in regard to specific requirements and as follows:
  - .1 Remove dust, dirt, and other surface debris by wiping with dry, clean cloths or compressed air.
  - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
  - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
  - .4 Allow surfaces to drain completely and allow to dry thoroughly.
  - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.

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- .6 Use trigger operated spray nozzles for water hoses.
- .7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.
- .2 Prevent contamination of cleaned surfaces 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 Where possible, prime surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
  - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
  - .2 Apply wood filler to nail holes and cracks.
  - .3 Tint filler to match stains for stained woodwork.
- .4 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.
- .5 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 blowing with clean dry compressed air.
- .6 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.
- .7 Do not apply paint until prepared surfaces have been accepted by Owner's Representative.

**3.5 APPLICATION**

- .1 Method of application to be as approved by Owner's Representative. Apply paint by brush roller, air sprayer, airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
  - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
  - .2 Work paint into cracks, crevices and corners.
  - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
  - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple.
  - .5 Remove runs, sags and brush marks from finished work and repaint.

- .3 Spray Application:
  - .1 Provide and maintain equipment that is suitable for intended purpose, capable of 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 runs and sags.
  - .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.
  - .6 Wood, stucco, concrete, cement masonry units CMU's and brick; if sprayed, must be back rolled.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Owner's Representative.
- .5 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.
- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.
- .9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

**3.6 MECHANICAL/ELECTRICAL EQUIPMENT**

- .1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.
- .2 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .3 Paint fire protection piping red.
- .4 Do not paint over nameplates.
- .5 Paint steel electrical light standards. Do not paint outdoor transformers and substation equipment.



**3.7 FIELD QUALITY CONTROL**

- .1 Field inspection of exterior painting operations to be carried out by Owner's Representative.
- .2 Advise Owner's Representative when each applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .3 Co-operate with Owner's Representative and provide access to areas of work.
- .4 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer to provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost.

**3.8 RESTORATION**

- .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 surfaces from paint droppings and dust to approval of Owner's Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Owner's Representative.

**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 61 00 - Common Product Requirements.
- .4      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .5      Section 01 78 00 - Closeout Submittals.
- .6      Section 06 20 00 – Finish Carpentry.
- .7      Section 06 40 00 - Architectural Woodwork.

**1.2            REFERENCES**

- .1      Environmental Protection Agency (EPA)
  - .1      EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings).
  - .2      SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.
- .2      Master Painters Institute (MPI)
  - .1      MPI Architectural Painting Specifications Manual.
- .3      Society for Protective Coatings (SSPC)
  - .1      SSPC Painting Manual, Volume Two, Systems and Specifications Manual.
- .4      National Fire Code of Canada.

**1.3            QUALITY ASSURANCE**

- .1      Contractor shall have proven satisfactory experience. When requested, provide a list of comparable jobs including, job name and location, specifying authority, and project manager.
- .2      Qualified journeymen 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.

- .3 Conform to latest MPI requirements for interior painting work including preparation and priming.

#### **1.4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS**

- .1 Provide paint products meeting MPI "Environmentally Friendly" E2 or E3 ratings based on VOC (EPA Method 24) content levels.
- .2 Where indoor air quality (odour) is a problem, use only MPI listed materials having a minimum E2 or E3 rating.

#### **1.5 SCHEDULING**

- .1 Submit work schedule for various stages of painting to Owner's Representative for approval. Submit schedule minimum of two (2) working days in advance of proposed operations.
- .2 Obtain written authorization from Owner's Representative for any changes in work schedule.
- .3 Schedule painting operations to prevent disruption of occupants in and about the building.

#### **1.6 SUBMITTALS**

- .1 Submit product data and manufacturer's installation/application instructions for each paint and coating product to be
- .2 Submit product data for the use and application of paint thinner.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets. Indicate VOCs during application and curing.
- .4 Upon completion, submit records of products used, records to be included in Operating and Maintenance Manuals. List products in relation to finish system and include the following:
  - .1 Product name, type and use
  - .2 Manufacturer's product number
  - .3 Colour numbers
  - .4 MPI Environmentally Friendly Classification System Rating
  - .5 Manufacturer's Material Safety Data Sheets (MSDS)
- .5 Submit full range colour sample chips to indicate where colour availability is restricted.
- .6 Submit duplicate 200 x 300 mm sample panels of each paint with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:

- .1 3 mm steel plate for finishes over metal surfaces.
- .2 13 mm birch plywood for finishes over wood surfaces.
- .3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
- .4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
- .7 When approved, sample panels shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

**1.7 QUALITY CONTROL**

- .1 Provide mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 When requested by Owner's Representative, prepare and paint designated surface, area, room or item (in each colour scheme) to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

**1.8 EXTRA MATERIALS**

- .1 Submit maintenance materials from same product run as products installed in accordance with Section 01 78 00 - Closeout Submittals. Package products with protective covering and identify with descriptive labels.
- .2 Submit one - four litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish formula.
- .3 Deliver to Owner's Representative and store where directed.
- .4 Provide certificate signed by staff that extra materials have been received in order.

**1.9 DELIVERY, HANDLING AND STORAGE**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver and store materials in original containers, sealed, with labels intact.
- .3 Labels shall clearly indicate:
  - .1 Manufacturer's name and address.
  - .2 Type of paint or coating.
  - .3 Compliance with applicable standard.
  - .4 Colour number in accordance with established colour schedule.
- .4 Remove damaged, opened and rejected materials from site.
- .5 Provide and maintain dry, temperature controlled, secure storage.

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- .6 Observe manufacturer's recommendations for storage and handling.
- .7 Store materials and supplies away from heat generating devices.
- .8 Store materials and equipment in a well ventilated area with temperature range 7° C to 30° C.
- .9 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .10 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Owner's Representative. After completion of operations, return areas to clean condition to approval of Consultant.
- .11 Remove paint materials from storage only in quantities required for same day use.
- .12 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .13 Fire Safety Requirements:
  - .1 Provide minimum one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
  - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
  - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

**1.10 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Ensure emptied containers are sealed and stored safely.
- .5 Unused paint, coating materials must be disposed of at official hazardous material collections site as approved by Owner's Representative.
- .6 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal.
- .7 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

- .8 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .9 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
  - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
  - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
  - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
  - .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
  - .5 Empty paint cans are to be dry prior to disposal or recycling (where available).

## **1.11 SITE CONDITIONS**

- .1 Heating, Ventilation and Lighting:
  - .1 Ventilate enclosed spaces.
  - .2 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 24 hours before, during and after paint application until paint has cured sufficiently.
  - .3 Where required, provide continuous ventilation for seven days after completion of application of paint.
  - .4 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by General Contractor.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
  - .1 Unless specifically pre-approved by the specifying body, Paint Inspection Agency and the applied product manufacturer, perform no painting work when:
    - .1 Ambient air and substrate temperatures are below 10°C.
    - .2 Substrate temperature is over 32°C unless paint is specifically formulated for application at high temperatures.
    - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
    - .4 The relative humidity is above 60% or when the dew point is less than 3°C variance between the air/surface temperature.
  - .2 Perform no painting work when the maximum moisture content of the substrate exceeds:
    - .1 12% for concrete and masonry (clay and concrete brick/block).
    - .2 15% for wood.
    - .3 12% for plaster and gypsum board.

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- .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
- .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
  - .1 Apply paint finish only in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
  - .2 Apply paint only to adequately prepared surfaces and to surfaces within moisture limits noted herein.
  - .3 Apply paint only when previous coat of paint is dry or adequately cured.
- .4 Additional Interior Application Requirements:
  - .1 Apply paint finishes only when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.
  - .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Owner's Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

**PART 2      PRODUCTS**

**2.1          MATERIALS**

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Paint materials for paint systems shall be products of a single manufacturer.
- .3 Low odor products. Whenever possible, select products exhibiting low odor characteristics. If two products are otherwise equivalent, select the product with the lowest odor. Only qualified products with E2 or E3 "Environmentally Friendly" rating are acceptable for use on this project.
- .4 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 be manufactured without compounds which contribute to smog in the lower atmosphere.
  - .5 do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
- .5 Water-borne surface coatings must be manufactured and transported in a manner that steps of process, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for

facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).

- .6 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .7 Water-borne surface coatings must have a flash point of 61.0°C or greater.
- .8 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
  - .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
  - .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
- .9 Water-borne paints and stains, and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

## **2.2 COLOURS**

- .1 Owner's Representative will provide Colour Schedule after contract award.
- .2 Selection of colours will be from manufacturers full range of colours.
- .3 Where specific products are available in a restricted range of colours, selection will be based on the limited range.
- .4 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.
- .5 For deep and ultra-deep colours; 4 coats may be required.

## **2.3 MIXING AND TINTING**

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Owner's Representative written permission.
- .2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.
- .3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.
- .4 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 Owner's Representative.



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

**2.4 GLOSS/SHEEN RATINGS**

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

<b>Gloss Level Category</b>	<b>Units @ 60°</b>	<b>Units @ 85°</b>
G1 - matte finish	max. 5	max. 10
G2 - velvet finish	max. 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 Gloss level ratings of painted surfaces shall be as specified herein.

**2.5 INTERIOR PAINTING SYSTEMS**

- .1 The following paint formulas requires a three coat finish as indicated in the MPI Architectural Painting Specifications Manual.
- .2 Galvanized Metal: doors, frames, railings, misc. steel, pipes, overhead decking, ducts, etc.
  - .1 INT 5.3A Latex G5 finish.
- .3 Dimension Lumber: columns, beams, exposed joists, underside of decking, etc.
  - .1 INT 6.2D Latex G5 finish (over latex primer).
- .4 Dressed Lumber: including doors, door and window frames casings, mouldings, etc.
  - .1 INT 6.3T Latex G5 finish (over latex primer).
- .5 Wood Paneling and Casework: partitions, panels, shelving, millwork, etc.
  - .1 INT 6.4B Alkyd G5 over alkyd sealer.

**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 data sheet.

**3.2 GENERAL**

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

**3.3 PROTECTION**

- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage. If damaged, clean and restore such surfaces as directed by Owner's Representative.
- .2 Cover or mask floors, windows and other ornamental hardware adjacent to areas being painted to prevent damage and to protect from paint drops and splatters. Use non-staining coverings.
- .3 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .4 Protect factory finished products and equipment.
- .5 Protect passing pedestrians, building occupants and general public in and about the building.
- .6 Remove electrical cover plates, light fixtures, surface hardware on doors, door stops, bath accessories and other surface mounted fittings and fastenings prior to undertaking any painting operations. Store for re-installation after painting is completed.
- .7 As painting operations progress place "WET PAINT" signs in occupied areas to approval of Owner's Representative.

**3.4 EXAMINATION**

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Owner's Representative all damage, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Owner's Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .3 Maximum moisture content as follows:
  - .1 Plaster and wallboard: 12%
  - .2 Masonry/Concrete: 12%
  - .3 Concrete Block/Brick: 12%
  - .4 Wood: 15%

### **3.5 CLEANING AND PREPARATION**

- .1 Clean and prepare surfaces in accordance with MPI Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
  - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
  - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
  - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
  - .4 Allow surfaces to drain completely and allow to dry thoroughly.
  - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
  - .6 Use trigger operated spray nozzles for water hoses.
  - .7 Many water-based paints cannot be removed with water once dried. However, minimize the use of kerosene or any such 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 existing surfaces with intact, smooth, high gloss coatings to provide adequate adhesion for new finishes.
- .4 Where possible, prime surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
  - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
  - .2 Apply wood filler to nail holes and cracks.
  - .3 Tint filler to match stains for stained woodwork.
- .5 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.
- .6 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 blowing with clean dry compressed air, or vacuum cleaning.
- .7 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.

- .8 Do not apply paint until prepared surfaces have been accepted by Owner's Representative.

### **3.6 APPLICATION**

- .1 Method of application to be as approved by Owner's Representative. Apply paint by brush, roller, air sprayer, airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
  - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
  - .2 Work paint into cracks, crevices and corners.
  - .3 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple.
  - .4 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
  - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray application:
  - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
  - .2 Keep paint ingredients properly mixed in containers during paint application 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 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Owner's Representative.
- .5 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.
- .8 Finish tops of cupboards, cabinets and projecting ledges, both above and below sight lines as specified for surrounding surfaces.

- .9 Finish closets and alcoves as specified for adjoining rooms.
- .10 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.
- .11 Wood, drywall, plaster, stucco, concrete, concrete masonry units and brick; if sprayed, must be back rolled.

### **3.7 MECHANICAL/ELECTRICAL EQUIPMENT**

- .1 In finished areas: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.
- .2 In boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
- .3 In other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .5 Do not paint over nameplates.
- .6 Keep sprinkler heads free of paint.
- .7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .8 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .9 Paint all fire protection piping red.
- .10 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.
- .11 Do not paint interior transformers and substation equipment.

### **3.8 FIRE SEPARATIONS**

- .1 Contractor to stencil on both sides of fire rated partitions the fire rating for that assembly (i.e.: **1 HR FIRE SEPARATION**).
- .2 Stenciled fire ratings to be minimum 100 mm high **RED** letters, minimum 150 mm above finished ceilings, and minimum 2400 mm o.c. along partition.

**3.9 FIELD QUALITY CONTROL**

- .1 Field inspection of interior painting operations to be carried out by Owner's Representative.
- .2 Advise Owner's Representative when each applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .3 Co-operate with Owner's Representative and provide access to all areas of the work.
- .4 Standard of Acceptance:
  - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
  - .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
  - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

**3.10 RESTORATION**

- .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 Owner's Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Owner's Representative.

**END OF SECTION**

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Section 10 20 01 – Cast Iron Wood Stove

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**PART 1      GENERAL**

**1.1      REQUIREMENTS**

- .1      This section specifies the requirement for the cast iron wood stove, chimney and associated equipment.

**PART 2      PRODUCTS**

**2.1      WOOD STOVE**

- .1      The wood stove shall be cast iron front loading, top vented, four legs measuring approximately 470mm x 838mm x 617mm high with a 650mm deep fire box and 150mm chimney vent.
- .2      Standard of Acceptance: United States Stove Company Model 1269E.

**2.2      CHIMNEY**

- .1      Insulated 150mm chimney suitable for wood burning. Chimney to extend from underside of ceiling to 800mm above the roof peak.
- .2      Provide all necessary top cap, roof attachments, ceiling attachments and associated fittings as recommended by the manufacturer.
- .3      Standard of Acceptance: Selkirk.
- .4      Connection between chimney and stove to be 150mm stove pipe.

**END OF SECTION**

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 01 78 00 - Closeout Submittals.

**1.2            REFERENCES**

- .1      American National Standards Institute (ANSI)
  - .1      ANSI/NFPA 10, Portable Fire Extinguishers.
- .2      Underwriters' Laboratories of Canada (ULC)
  - .1      CAN/ULC-S508, Rating and Fire Testing of Fire Extinguishers and Class "D" Extinguishing Media.

**1.3            SUBMITTALS**

- .1      Submit manufacturer's technical data for each type of fire extinguisher and safety blanket.

**1.4            CLOSEOUT SUBMITTALS**

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

**1.5            WASTE MANAGEMENT AND DISPOSAL**

- .1      Separate and recycle waste materials in accordance with municipal regulations.

**PART 2      PRODUCTS**

**2.1            MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS**

- .1      Stored pressure rechargeable type with hose and shut-off nozzle, ULC labelled for A, B and C class protection. Sizes 9 and 14 kg or as indicated on drawings.

**2.2            CABINETS**

- .1      Surface type as indicated, constructed of 1.6 mm thick steel, 180° opening door of 2.5 mm thick steel with latching device.
- .2      Cabinet to maintain fire resistive rating of construction in which they occur.



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- .3 Cabinet door: with 5.0 mm thick full clear safety glass panel.
- .4 Finish:
  - .1 Tub: prime coated with finish painted with a hand-baked matte black enamel.
  - .2 Door and frame: No.4 satin finish 304 stainless steel.

**2.3 IDENTIFICATION**

- .1 Identify extinguishers in accordance with recommendations of ANSI/NFPA 10 and CAN/ULC-S508.
- .2 Attach bilingual tag or label to extinguishers, indicating month and year of installation. Provide space for service dates.

**PART 3      EXECUTION**

**3.1            INSTALLATION**

- .1 Install or mount extinguishers in cabinets as indicated.

**END OF SECTION**

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**PART 1        GENERAL**

**1.1            SUBMITTALS**

- .1        Submittals: in accordance with Division 01.
- .2        Shop drawings; submit drawings stamped and signed for approval by Departmental Representative.
- .3        Shop drawings to show:
  - .1        Mounting arrangements.
  - .2        Operating and maintenance clearances.
- .4        Shop drawings and product data accompanied by:
  - .1        Detailed drawings of bases, supports, and anchor bolts.
  - .2        Acoustical sound power data, where applicable.
  - .3        Points of operation on performance curves.
  - .4        Manufacturer to certify current model production.
  - .5        Certification of compliance to applicable codes.
- .5        In addition to transmittal letter referred to in Division 01: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
- .6        Closeout Submittals:
  - .1        Provide operation and maintenance data for incorporation into manual specified in Division 01.
  - .2        Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .3        Operation data to include:
    - .1        Control schematics for systems including environmental controls.
    - .2        Description of systems and their controls.
    - .3        Description of operation of systems at various loads together with reset schedules and seasonal variances.
    - .4        Operation instruction for systems and component.
    - .5        Description of actions to be taken in event of equipment failure.
    - .6        Valves schedule and flow diagram.
    - .7        Colour coding chart.
  - .4        Maintenance data to include:
    - .1        Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2        Data to include schedules of tasks, frequency, tools required and task time.
  - .5        Performance data to include:
    - .1        Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

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- .2 Equipment performance verification test results.
- .3 Special performance data as specified.
- .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
- .6 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
  - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .7 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
  - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings or AutoCAD files. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
  - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour for each service.
  - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

**1.2 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Division 01.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Division 01.

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**1.3 MAINTENANCE**

- .1 Furnish spare parts in accordance with Division 01 as follows:
  - .1 One set of packing for each pump.
  - .2 One casing joint gasket for each size pump.
  - .3 One glass for each gauge glass.
- .2 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Division 01.
- .3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

**1.4 DELIVERY, STORAGE, AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Division 01.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 All materials used on this project shall be new and CSA approved unless noted otherwise.

**PART 3 EXECUTION**

**3.1 PAINTING, REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23 - Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

**3.2 CLEANING**

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

**3.3 FIELD QUALITY CONTROL**

- .1 Site Tests: conduct following tests in accordance with Division 01 and submit report as described in PART 1 - SUBMITTALS.
  - .1 Perform tests as specified in other sections of this specification.
- .2 Manufacturer's Field Services:

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- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

**3.4 DEMONSTRATION**

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Contractor to supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .4 Instruction duration time requirements as specified in appropriate sections.
- .5 Departmental Representative may record these demonstrations on video tape for future reference.

**3.5 PROTECTION**

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

**END OF SECTION 22 05 00**

**Part 1            GENERAL**

**1.1                RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 35 28 - Health and Safety Requirements.
- .3      Section 01 78 00 - Closeout Submittals.
- .4      Section 21 05 01 - Common Work Results - Mechanical.
- .5      Section 22 05 00 – Common Work Results for Plumbing.
- .6      Section 23 05 05 - Installation of Pipework.
- .7      Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

**1.2                REFERENCES**

- .1      Canadian Standard Association (CSA)
  - .1      CSA B137.5, Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.
- .2      National Sanitation Foundation (NSF)
  - .1      NSF61 Potable Water Listing.
- .3      Underwriters Listing of Canada (ULC)
  - .1      ASTM D1784 Standard Specification for Rigid Poly (Vinyl Chloride) PVC Compounds and Chlorinated Poly (Vinyl Chloride) CPVC compounds.
  - .2      ASTM D2467, Standard Specification for Poly (Vinyl Chloride) PVC Plastic Pipe Fittings, Schedule 80.
  - .3      ASTM F437 Standard Specification for Threaded Chlorinated Poly (Vinyl Chloride) CPVC Plastic Pipe Fittings Schedule 80.
  - .4      ASTM F439 Standard Specification for Chlorinated Poly (Vinyl Chloride) CPVC Plastic Pipe Fittings Schedule 80.
  - .5      ASTM F441/441M Standard Specification for Chlorinated Poly (Vinyl Chloride) CPVC Plastic Pipe Schedules 40 and 80.
  - .6      ASTM F876 Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
  - .7      ASTM F877 Standard Specification for Crosslinked Polyethylene (PEX) Hot and Cold Water Distribution System.
- .4      Department of Justice Canada (Jus).
  - .1      Canadian Environmental Protection Act (CEPA).
- .5      Health Canada/Workplace Hazardous Materials Information System (WHMIS).

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- .1 Material Safety Data Sheets (MSDS).
- .6 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
  - .1 MSS-SP-67, Butterfly Valves.
  - .2 MSS-SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.
  - .3 MSS-SP-71, Cast Iron Swing Check Valves, Flanged and Threaded Ends.
  - .4 MSS-SP-80, Bronze Gate, Globe, Angle and Check Valves.
  - .5 MSS-SP-110 Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends
- .7 National Research Council (NRC)/Institute for Research in Construction.
  - .1 NRCC, National Plumbing Code of Canada (NPC).
- .8 Transport Canada (TC).
  - .1 Transportation of Dangerous Goods Act (TDGA).

**1.3 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data for following: valves.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets.
- .4 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

**1.4 HEALTH AND SAFETY**

- .1 Do construction occupational health and safety in accordance with Section 01 35 28 - Health and Safety Requirements.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for reuse and recycling in accordance with Division 01.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.
- .4 Place materials defined as hazardous or toxic in designated containers.
- .5 Handle and dispose of hazardous materials in accordance with CEPA , TDGA , Regional and Municipal regulations.
- .6 Fold up metal banding, flatten and place in designated area for recycling.

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**PART 2      PRODUCTS**

**2.1            PIPING**

- .1 Domestic hot, cold and recirculation systems, within building.
  - .1 Above ground: NPS ½ to 3 PEX to SDR9: CSA B137.5, ASTM F876 and ASTM F877.

**2.2            FITTINGS**

- .1 PEX fittings certified to CSA B137.5, ASTM F876 and ASTM F877, and certified to be used with PEX tubing.

**2.3            JOINTS**

- .1 Rubber gaskets, elastomeric, full face, hardness of 50 to 70 durometer.
- .2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.
- .3 Solder: 95/5 tin copper alloy lead free for copper pipe.
- .4 Teflon tape: for threaded joints.
- .5 Solvent weld with primer to ASTM F493.
  - .1 Pressure rating 690 kPa at 82<sup>0</sup>C, 2760 kPa at 23<sup>0</sup>C

**2.4            BALL VALVES**

- .1 NPS2 and under:
  - .1 CPVC to ASTM D 1784 Cell Class of 23447 and NSF 61.
    - .1 Rating 1599 kPa at 23° C and 717 kPa at 60° C
    - .2 O-rings: EPDM
    - .3 ENDS: socket, flanged, threaded
    - .4 Seats: Teflon PTFE
    - .5 Seals: EPDM
    - .6 Full port, downstream union nut for full blocking
    - .7 Ball: CPVC

**PART 3      EXECUTION**

**3.1            INSTALLATION**

- .1 Install in accordance with Canadian Plumbing Code and local authority having jurisdiction.



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- .2 Install pipe work in accordance with Section 23 05 05 – Installation of Pipework and manufacturers’ recommendations by certified journey person supplemented as specified herein.
- .3 Assemble piping using fittings manufactured to ANSI standards.
- .4 Install CWS piping below and away from HWS and HWR and other hot piping so as to maintain temperature of cold water as low as possible.
- .5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .6 Buried Tubing
  - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
  - .2 Bend tubing without crimping or constriction. Minimize use of fittings.

**3.2 VALVES**

- .1 Isolate equipment, fixtures and branches with ball valves.

**3.3 PRESSURE TESTS**

- .1 Conform to requirements of Mechanical Division.
- .2 Test pressure: greater of 1 ½ times maximum system operating pressure or 860 kPa.

**3.4 FLUSHING AND CLEANING**

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

**3.5 PRE-START-UP INSPECTIONS**

- .1 Systems to be complete, prior to flushing, testing and start-up.
- .2 Verify that system can be completely drained.
- .3 Ensure that pressure booster systems are operating properly.
- .4 Ensure that air chambers, expansion compensators are installed properly.

**3.6 DISINFECTION**

- .1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction and approval of Owner’s Representative.

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- .2 Coordinate with Division 33.
- .3 Upon completion, provide laboratory test reports on water quality to Owner's Representative.

**3.7 START-UP**

- .1 Timing: Start up after:
  - .1 Pressure tests have been completed.
  - .2 Disinfection procedures have been completed.
- .2 Provide continuous supervision during start-up.
- .3 Start-up procedures:
  - .1 Establish circulation and ensure that air is eliminated.
  - .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
  - .3 Bring HWS storage tank up to design temperature slowly.
  - .4 Monitor HWS and HWR piping systems for freedom of movement, pipe expansion as designed.
  - .5 Check control, limit, safety devices for normal and safe operation.
- .4 Rectify start-up deficiencies.

**3.8 PERFORMANCE VERIFICATION**

- .1 Timing:
  - .1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.
- .2 Procedures:
  - .1 Verify that flow rate and pressure meet Design Criteria.
  - .2 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
  - .3 Sterilize HWS and HWR systems for Legionella control.
  - .4 Verify performance of temperature controls.
  - .5 Verify compliance with safety and health requirements.
  - .6 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut off water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
  - .7 Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.

**END OF SECTION**

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**PART 1      GENERAL**

**1.1      SUMMARY**

- .1 Section includes:
  - .1 The installation of drainage waste and vent piping – plastic.

**1.2      RELATED SECTIONS**

- .1 Section 01 35 28 - Health and Safety Requirements.
- .2 Section 23 05 05 - Installation of Pipework.

**1.3      REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM D2235, Specification for Solvent Cement for Acrylonitrille-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
  - .2 ASTM D2564, Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 Canadian Standards Association (CSA)
  - .1 CSA-B1800 Series, ABS Drain, Waste and Vent Pipe and Pipe Fittings.
  - .2 CSA-B181.2, PVC Drain, Waste and Vent Pipe and Pipe Fittings.
  - .3 CSA-B182.1, Plastic Drain and Sewer Pipe and Pipe Fittings.
- .3 Underwriters Laboratory of Canada (ULC)
  - .1 CAN/ULC-S102.2 Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.

**1.4      DELIVERY STORAGE AND DISPOSAL**

- .1 Waste Management and Disposal:
  - .1 Separate and recycle waste materials in accordance with Division 01.
  - .2 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

**1.5      SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data for following: valves.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets.

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- .4 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
- .5 Submit all unique fire stop listing diagrams.

**PART 2      PRODUCTS**

**2.1      PIPING AND FITTINGS**

- .1 For buried DWV piping to:
  - .1      CSA-B181.2.
  - .2      CSA-B182.1.
- .2 For aboveground DWV piping for non-combustible construction, except vertical services shafts and downstream of kitchen equipment:
  - .1      Flame spread rating less than 25 and smoke developed classification less than 50.
  - .2      CSA B181.2
  - .3      Third party certified to CAN/VLC S102.2

**2.2      JOINTS**

- .1 Solvent weld for PVC: to ASTM D2564.
  - .1      NPS 1 ½ to 6: one step or two step cement

**PART 3      EXECUTION**

**3.1      INSTALLATION**

- .1 In accordance with Section 23 05 05 - Installation of Pipework and certified journeyperson.
- .2 Install in accordance with National Plumbing Code and local authority having jurisdiction.

**3.2      TESTING**

- .1 Pressure test buried systems before backfilling in accordance with National Plumbing Code.
- .2 Hydraulically test to verify grades and freedom from obstructions.

**3.3      PERFORMANCE VERIFICATION**

- .1 Cleanouts:
  - .1      Ensure accessible and that access doors are correctly located.

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- .2      Open, cover with linseed oil and re-seal.
- .3      Verify cleanout rods can probe as far as the next cleanout, at least.
- .2      Test to ensure traps are fully and permanently primed.
- .3      Ensure fixtures are properly anchored, connected to system and effectively vented.
- .4      Affix applicable label (sanitary, vent, pump discharge etc.) c/w directional arrows.
- .5      Provide copies of test reports for Commissioning Manuals.

**END OF SECTION**

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**PART 1      GENERAL**

**1.1            SUMMARY**

- .1      Section Includes:
  - .1      Materials and installation for plumbing specialties and accessories.

**1.2            RELATED SECTIONS**

- .1      Section 01 33 00 – Submittal Procedures.
- .2      Section 01 35 28 – Health and Safety Requirements.
- .3      Section 01 45 00 – Quality Control.
- .4      Section 01 78 00 – Closeout Submittals.

**1.3            REFERENCES**

- .1      American Society for Testing and Materials International (ASTM)
  - .1      ASTM A126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
  - .2      ASTM B62, Specification for Composition Bronze or Ounce Metal Castings.
- .2      American Water Works Association (AWWA)
  - .1      AWWA C700, Cold Water Meters-Displacement Type, Bronze Main Case.
  - .2      AWWA C701, Cold Water Meters-Turbine Type for Customer Service.
  - .3      AWWA C702, Cold Water Meters-Compound Type.
- .3      American National Standards Institute (ANSI)
  - .1      ANSI Z358.1 Emergency eyewash and shower equipment.
- .4      Canadian Standards Association (CSA)
  - .1      CSA-B64 Series, Backflow Preventers and Vacuum Breakers.
  - .2      CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .5      Health Canada/Workplace Hazardous Materials Information Systems (WHMIS).
  - .1      Material Safety Data Sheets (MSDS).
- .6      Plumbing and Drainage Institute (PDI)
  - .1      PDI-G101, Testing and Rating Procedure for Grease Interceptors with Appendix of Sizing and Installation Data.
  - .2      PDI-WH201, Water Hammer Arresters Standard.

**1.4 SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
  - .2 Indicate dimensions, construction details and materials for specified items.
  - .3 Submit WHMIS MSDS in accordance with Section 02 62 00.01 – Hazardous Materials. Indicate VOC's for adhesive and solvents during application and curing.
- .3 Shop Drawings:
  - .1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Instructions: submit manufacturer's installation instructions.
- .6 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 – Closeout Submittals. Include:
  - .1 Description of plumbing specialties and accessories, giving manufacturer's name, type, model, year and capacity.
  - .2 Details of operation, servicing and maintenance.
  - .3 Recommended spare parts list.

**1.5 QUALITY ASSURANCE**

- .1 Pre-Installation Meetings:
  - .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations.
    - .1 Verify project requirements.
    - .2 Review installation and substrate conditions.
    - .3 Co-ordination with other building subtrades.
    - .4 Review manufacturer's installation instructions and warranty requirements.
  - .2 Health and Safety:
    - .1 Do construction occupational health and safety in accordance with Section 01 35 28 – Health and Safety Requirements.

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and recycling in accordance with Division 01.
  - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
  - .3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard packaging materials in appropriate on-site bins for recycling in accordance with Waste Management Plan.
  - .4 Divert unused metal materials from landfill to metal recycling facility as approved by Owner's Representative.
  - .5 Fold up metal and plastic banding flatten and place in designated area for recycling.

**PART 2 PRODUCTS**

**2.1 FLOOR DRAINS**

- .1 Floor drains and trench drains.
  - .1 Provide floor drains in accordance with "floor drain schedule" shown on drawings.

**2.2 CLEANOUTS**

- .1 Cleanout plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
  - .1 Acceptable Product: Zurn, Jay R. Smith, MIFAB.
- .2 Access covers:
  - .1 Wall access: face or wall type, or stainless steel square cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
  - .2 Floor access: round cast iron body and frame with adjustable secured nickel bronze top.
    - .1 Plugs: bronze with neoprene gasket.
    - .2 Cover for unfinished concrete floors: cast iron round, gasket, vandal-proof screws.
    - .3 Cover for tile and linoleum floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.
    - .4 Cover for carpeted floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.



**2.3 VACUUM BREAKERS**

- .1 To CSA-B64 Series.
- .2 Atmospheric vacuum breaker (inlet to domestic hot water tanks):
  - .1 Plain brass body with silicone disc.
  - .2 Suitable for temperatures up to 82°C.
  - .3 Maximum operating pressure: 860 kPa.
  - .4 Size: NPS ¾.
  - .5 Acceptable Product: Watts Series 288a, Wilkins, Jay R. Smith, MIFAB.
- .3 Hose connection vacuum breaker:
  - .1 NPS ¾ female hose thread inlet, NPS ¾ male hose thread outlet, brass finish.

**2.4 HOSE BIBBS AND SEDIMENT FAUCETS**

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

**2.5 TRAP SEAL PRIMERS**

- .1 Pressure drop actuated:
  - .1 Brass body construction with inlet opening of ½ male NPT and outlet opening of female ½ NPT.
  - .2 Provide complete with four-hole view built-in air gap to prevent any backflow from trap being fed into the water supply.
  - .3 Provide removable inlet filter screen.
  - .4 Capacity to serve up to four (4) floor drains.
  - .5 Provide complete with trap seal primer distribution unit as follows:
    - .1 Brass body construction.
    - .2 ½ NPT inlet connection.
    - .3 Four (4) 3/8 FPT brass nipple outlet connections.
    - .4 Four (4) 6 mm diameter vent holes in lid to provide air gap and backflow protection.
  - .6 Acceptable Product: MIFAB MR-500 trap seal primer complete with MIFAB MI-DU series distribution unit, Precision Plumbing Products, Zurn.

**2.6 STRAINERS**

- .1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.
- .2 NPS2 and under, bronze body, screwed ends, with brass cap, tapped blowoff and plug.
- .3 NPS2½ and over, cast iron body, flanged ends, with bolted cap, tapped blow off connection with bronze ball valve.

**2.7 PIPE WALL AND FLOOR PENETRATION SEAL**

- .1 Application:
  - .1 Pipes penetrating exterior concrete walls below grade and concrete floors on grade.
- .2 Seal material to be EPDM.
- .3 Pressure plates to be glass-reinforced plastic.
- .4 Bolts and nuts to be stainless steel 18-8.
- .5 Suitable temperature range to be -40°C to 121°C.
- .6 Wall sleeves to be Schedule 40 black iron pipe. Sleeves in exterior walls to be galvanized.
- .7 Acceptable Product: Metraseal MS Series, Link Seal.

**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 data sheet.

**3.2 INSTALLATION**

- .1 Install in accordance with Canadian Plumbing Code, and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

**3.3 CLEANOUTS**

- .1 In addition to those required by code, and as indicated, install at base of soil and waste stacks, and rainwater leaders.
- .2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
- .3 Building drain cleanout and stack base cleanouts: line size to maximum NPS4.

**3.4 HOSE BIBBS AND SEDIMENT FAUCETS**

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

**3.5 TRAP SEAL PRIMERS**

- .1 Install for floor drains and elsewhere, as indicated.
- .2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Owner's Representative.
- .3 Install Type K soft copper tubing to floor drain.

**3.6 STRAINERS**

- .1 Install with sufficient room to remove basket.

**3.7 START-UP AND COMMISSIONING**

- .1 General:
  - .1 In accordance with Division 01.
- .2 Timing: Start-up only after:
  - .1 Pressure tests have been completed.
  - .2 Disinfection procedures have been completed.
  - .3 Water treatment systems operational.
- .3 Provide continuous supervision during start-up.

**3.8 TESTING AND ADJUSTING**

- .1 General:
  - .1 In accordance with Division 01.
- .2 Timing:
  - .1 After start-up deficiencies rectified.
  - .2 After certificate of completion has been issued by authority having jurisdiction.
- .3 Application tolerances:
  - .1 Pressure at fixtures: +/- 70 kPa.
  - .2 Flow rate at fixtures: +/- 20%.
- .4 Adjustments:
  - .1 Verify that flow rate and pressure meet design criteria.
  - .2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.
- .5 Floor drains:
  - .1 Verify operation of trap seal primer.

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- .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
- .3 Check operations of flushing features.
- .4 Check security, accessibility, removeability of strainer.
- .5 Clean out baskets.
- .6 Access doors:
  - .1 Verify size and location relative to items to be accessed.
- .7 Cleanouts:
  - .1 Verify covers are gas-tight, secure, yet readily removable.
- .8 Wall, Ground hydrants:
  - .1 Verify complete drainage, freeze protection.
  - .2 Verify operation of vacuum breakers.
- .9 Strainers:
  - .1 Clean out repeatedly until clear.
  - .2 Verify accessibility of cleanout plug and basket.
  - .3 Verify that cleanout plug does not leak.
- .10 Hose bibbs, sediment faucets:
  - .1 Verify operation and at all low points.
- .11 Commissioning Reports:
  - .1 In accordance with Division 01.
- .12 Training:
  - .1 In accordance with Division 01.
  - .2 Demonstrate full compliance with Design Criteria.

**PART 1 GENERAL**

**1.1 RELATED SECTIONS**

- .1 Division 01.

**1.2 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.181, Ready-Mixed Organic Zinc-Rich Coating.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Division 01.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility approved by Engineer.

**1.4 QUALITY ASSURANCE**

- .1 Installers to be certified to journeyperson.

**PART 2 PRODUCTS (NOT USED)**

**PART 3 EXECUTION**

**3.1 CONNECTIONS TO EQUIPMENT**

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

**3.2 CLEARANCES**

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

### **3.3 DRAINS**

- .1 Install piping with grade in direction of flow except as indicated.
- .2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.
- .3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.
- .4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

### **3.4 DIELECTRIC COUPLINGS**

- .1 General: Compatible with system, to suit pressure rating of system.
- .2 Locations: Where dissimilar metals are joined.
- .3 NPS 2 and under: Isolating unions or bronze valves.
- .4 Over NPS 2: Isolating flanges.

### **3.5 PIPEWORK INSTALLATION**

- .1 Installation by certified journey person.
- .2 Screwed fittings jointed with Teflon tape or pipe dope as recommended by manufacturer.
- .3 Protect openings against entry of foreign material.
- .4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.
- .5 Assemble piping using fittings manufactured to ANSI standards.
- .6 Saddle type branch fittings may be used on mains if branch line is no larger than half the size of main.
  - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
- .7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

- .9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .10 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .11 Group piping wherever possible and as indicated.
- .12 Ream pipes, remove scale and other foreign material before assembly.
- .13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .14 Provide for thermal expansion as indicated.
- .15 Valves:
  - .1 Install in accessible locations.
  - .2 Remove interior parts before soldering.
  - .3 Install with stems above horizontal position unless otherwise indicated.
  - .4 Valves accessible for maintenance without removing adjacent piping.
  - .5 Install globe valves in bypass around control valves.
  - .6 Use ball or butterfly valves at branch take-offs for isolating purposes except where otherwise specified.
  - .7 Install butterfly valves on chilled water and related condenser water systems only.
  - .8 Install butterfly valves between weld neck flanges to ensure full compression of liner.
  - .9 Install ball valves for glycol service.
  - .10 Use chain operators on valves NPS 2-1/2 and larger where installed more than 2400 mm above floor in Mechanical Rooms.
- .16 Check Valves:
  - .1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and elsewhere as indicated.
  - .2 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.

### **3.6 SLEEVES**

- .1 General: Install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.
- .2 Material: Schedule 40 black steel pipe.
- .3 Construction: Foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.
- .4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

- .5 Installation:
  - .1 Concrete, masonry walls, concrete floors on grade: Terminate flush with finished surface.
  - .2 Other floors: Terminate 25 mm above finished floor.
  - .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- .6 Sealing:
  - .1 Foundation walls and below grade floors: Fire retardant, waterproof non-hardening mastic.
  - .2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.
  - .3 Sleeves installed for future use: Fill with lime plaster or other easily removable filler.
  - .4 Ensure no contact between copper pipe or tube and sleeve.

### **3.7 ESCUTCHEONS**

- .1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- .2 Construction: One piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.
- .3 Sizes: Outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

### **3.8 FLUSHING OUT OF PIPING SYSTEMS**

- .1 Before start-up, clean interior of piping systems in accordance with requirements of Division 01 supplemented as specified in relevant sections of other Divisions.
- .2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

### **3.9 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK**

- .1 Advise Owner's Representative, 48 hours minimum prior to performance of pressure tests.
- .2 Pipework: Test as specified in relevant sections of other sections or Divisions.
- .3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant sections of other Divisions.
- .4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
- .5 Conduct tests in presence of Departmental's Representative. Work to be carried out in off hours after 5 p.m., weekends or holidays.



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Section 23 05 05 – Installation of Pipework

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- .6 Pay costs for repairs or replacement, retesting, and making good. Departmental's Representative to determine whether repair or replacement is appropriate.
- .7 Insulate or conceal work only after approval and certification of tests by Departmental's Representative.

**3.10 EXISTING SYSTEMS**

- .1 Connect into existing piping systems at times approved by Departmental's Representative. Work to be carried out off hours after 5 p.m., weekends or holidays.
- .2 Request written approval 10 days minimum, prior to commencement of work.
- .3 Be responsible for damage to existing plant by this work.
- .4 Ensure daily clean-up of existing areas.

END OF SECTION

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 22 42 01 – Plumbing Specialities and Accessories.
- .2      Section 23 05 93 – Testing, Adjusting and Balancing for HVAC.
- .3      Section 23 08 02 – Cleaning and Start-up of Mechanical Piping Systems.
- .4      Section 23 11 13 – Facility Fuel-Oil Piping.
- .5      Section 22 11 18 – Domestic Water Piping Copper.
- .6      Section 23 21 13.02 – Hydronic Systems: Steel.
- .7      Section 23 23 00 – Copper Tubing and Fittings Refrigerant.

**1.2            REFERENCES**

- .1      ASTM E202, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.

**1.3            CLEANING AND START-UP OF MECHANICAL PIPING SYSTEMS**

- .1      In accordance with Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems.

**1.4            POTABLE WATER SYSTEMS**

- .1      When cleaning is completed and system filled:
  - .1      Verify performance of equipment and systems as specified elsewhere in mechanical Division.
  - .2      Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor. Repeat for each outlet and flush valve.
  - .3      Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.

**1.5            SANITARY AND STORM DRAINAGE SYSTEMS**

- .1      Buried systems: Perform tests prior to back-filling. Perform hydraulic tests to verify grades and freedom from obstructions.
- .2      Ensure that traps are fully and permanently primed.
- .3      Ensure that fixtures are properly anchored, connected to system.

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- .4 Operate flush valves, tank and operate each fixture to verify drainage and no leakage.
- .5 Cleanouts: Refer to Section 22 42 01 - Plumbing Specialities and Accessories.
- .6 Roof drains:
  - .1 Refer to Section 22 42 01 - Plumbing Specialities and Accessories.
  - .2 Remove caps as required.

**1.6            REPORTS**

- .1 In accordance with Division 01: supplemented as specified herein.

**1.7            TRAINING**

- .1 In accordance with Division 01: supplemented as specified in relevant specification sections

**PART 2            PRODUCTS (NOT APPLICABLE)**

**PART 3            EXECUTION (NOT APPLICABLE)**

**END OF SECTION**

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**PART 1      GENERAL**

**1.1            SUMMARY**

- .1      Section Includes:
  - .1          Materials and installation procedures for electric heating.

**1.2            RELATED SECTIONS:**

- .1      Section 01 33 00 – Submittal Procedures.
- .2      Section 01 35 29.06 – Health and Safety Requirements.
- .3      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**1.3            REFERENCES**

- .1      Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1          Material Safety Data Sheets (MSDS).

**1.4            SUBMITTALS**

- .1      Product Data:
  - .1          Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 – Submittal Procedures. Include product characteristics, performance criteria, and limitations.
  - .1          Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 – Submittal Procedures.
- .2      Quality assurance submittals: submit following in accordance with Section 01 33 00 – Submittal Procedures.
  - .1          Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2          Instructions: submit manufacturer's installation instructions.

**1.5            QUALITY ASSURANCE**

- .1      Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.

**1.6            DELIVERY, STORAGE, AND HANDLING**

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

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- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Construction/Demolition Waste Management and Disposal.

**PART 2      PRODUCTS**

**2.1      THERMOSTAT (LOW VOLTAGE)**

- .1 Low voltage electronic wall thermostat:
  - .1 For use on 24 V circuit at 1.5 A capacity.
  - .2 With heat anticipator adjustable 0.1 to 1.2 A.
  - .3 Temperature setting range: 5° C to 30° C.
  - .4 White in color.
  - .5 Temperature setting recorded permanently.
  - .6 Digital display of ambient temperature.
  - .7 Backlit.

**2.2      THERMOSTAT GUARDS**

- .1 Thermostat guards: lockable, clear opaque plastic cast metal. Slots for air circulation to thermostat.

**2.3      ELECTRIC HEATING RELAYS**

- .1 Low voltage solid state electric heating relays installed in heater by heater manufacturer. Complete assembly to be CSA approved.

**PART 3      EXECUTION**

**3.1      MANUFACTURER'S INSTRUCTIONS**

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

**3.2      INSTALLATION**

- .1 Install control devices.
- .2 On outside wall, mount thermostats on bracket or insulated pad 25 mm from exterior wall.

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Section 23 09 33 – Electric and Electronic Control System for Electric Heating Page 3 of 3

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**3.3**

**CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

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Section 23 31 13.01 – Metal Ducts – Low Pressure to 500 Pa

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**PART 1**

**GENERAL**

1.1 SUMMARY

.1 Section includes:

- .1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 35 28 – Health and Safety Requirements
- .3 Section 07 84 00 – Firestopping
- .4 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

1.3 REFERENCES

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
- .2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A 480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
- .2 ASTM A 635/A635M, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
- .3 ASTM A 653/A653M, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Department of Justice Canada (Jus).
- .1 Canadian Environmental Protection Act (CEPA).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).
- .5 National Fire Protection Association (NFPA).
- .1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
- .2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .3 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).

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- .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- .2 SMACNA HVAC Air Duct Leakage Test Manual.
- .3 IAQ Guideline for Occupied Buildings Under Construction, 1st Edition.
- .7 Transport Canada (TC).
  - .1 Transportation of Dangerous Goods Act (TDGA).
- 1.4 SUBMITTALS
  - .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Product Data: submit WHMIS MSDS - Material Safety Data Sheets for the following:
    - .1 Sealants.
    - .2 Tape.
    - .3 Proprietary Joints.
- 1.5 QUALITY ASSURANCE
  - .1 Certification of Ratings:
    - .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
  - .2 Health and Safety:
    - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
    - .2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings under Construction.
- 1.6 DELIVERY, STORAGE AND HANDLING
  - .1 Protect on site stored or installed absorptive material from moisture damage.
  - .2 Waste Management and Disposal:
    - .1 Separate waste materials for reuse and recycling in accordance with Division 01.
    - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
    - .3 Collect and separate for disposal, paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
    - .4 Separate for reuse and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management Plan.
    - .5 Place materials defined as hazardous or toxic in designated containers.
    - .6 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.



- .7 Fold up metal and plastic banding, flatten and place in designated area for recycling.

**PART 2      PRODUCTS**

**2.1      SEALANT**

- .1 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30°C to plus 93°C.
- .2 Maximum VOC Limit – 30.

**2.2      TAPE**

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

**2.3      DUCT LEAKAGE**

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

**2.4      FITTINGS**

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
  - .1 Rectangular: Centreline radius: 1.5 times width of duct.
  - .2 Round: smooth radius or five piece. Centreline radius: 1.5 times diameter.
- .3 Transitions:
  - .1 Diverging: 20<sup>0</sup> maximum included angle.
  - .2 Converging: 30<sup>0</sup> maximum included angle.
- .4 Offsets:
  - .1 Full short radiused elbows as indicated.

**2.5      GALVANIZED STEEL**

- .1 Lock forming quality: to ASTM A653, G90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA.
- .3 Joints: to SMACNA or proprietary manufactured duct joint. Proprietary manufactured flanged duct joint to be considered to be a class A seal.

**2.6      HANGERS AND SUPPORTS**

- .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct. Maximum size duct supported by strap hanger: 500 mm.

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- .2 Hanger configuration: to SMACNA.
- .3 Hangers: galvanized steel angle with black steel rods to ASHRAE or SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25x25x3	6
751 to 1050	40x40x3	6
1051 to 1500	40x40x3	10
1501 to 2100	50x50x3	10
2101 to 2400	50x50x5	10
2401 and over	50 x 50 x 6	10

**PART 3**      **EXECUTION**

**3.1**            **GENERAL**

- .1 Do work in accordance with NFPA 90A, NFPA 90B, and SMACNA.
- .2 Support risers in accordance with SMACNA.

**3.2**            **SEALING AND TAPING**

- .1 Apply sealant to outside of joint to manufacturer's recommendations.
- .2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations. Sealant and tape to be applied to full perimeter of duct.

**3.3**            **LEAKAGE TESTS/COMMISSIONING**

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

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SUMMARY**

- .1      Section Includes:
  - .1          Fans, window ventilators, exterior, wall and ceiling mounted discharge fans for domestic use.

**1.2            RELATED SECTIONS**

- .1      Section 01 33 00 – Submittal Procedures
- .2      Section 01 35 28 – Health and Safety Requirements.
- .3      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .4      Section 01 78 00 – Closeout Submittals

**1.3            REFERENCES**

- .1      Codes and standards referenced in this section refer to the latest edition thereof.
- .2      Air Conditioning and Mechanical Contractors Association (AMCA)
  - .1          AMCA 201, Fans and Systems.
  - .2          AMCA 300, Reverberant Room Method for Sound Testing of Fans.
  - .3          AMCA 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
  - .4          AMCA 302, Application of Sone Ratings for Non-Ducted Air Moving Devices.
  - .5          AMCA 303, Application of Sound Power Level Ratings for Fans.
- .3      American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
  - .1          ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .4      Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1          Material Safety Data Sheets (MSDS).

**1.4            SYSTEM DESCRIPTION**

- .1      Performance Requirements:
  - .1          Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.

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**1.5 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
  - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures
  - .2 Indicate following: dimensions, performance, sound rating, and installation procedure.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
- .4 Closeout Submittals
  - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals

**1.6 QUALITY ASSURANCE**

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 28 - Health and Safety Requirements.

**1.7 MAINTENANCE**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
    - .1 Bearings and seals.
    - .2 Belts
    - .3 Addresses of suppliers.
    - .4 List of specialized tools necessary for adjusting, repairing or replacing.

**1.8 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:

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- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Division 01.

**PART 2      PRODUCTS**

**2.1          FANS GENERAL**

- .1 Standard of rating:
  - .1 AMCA 201 for fan application.
  - .2 AMCA 302 for application of some loudness ratings for non-ducted air moving devices.
  - .3 AMCA 303 for application of sound power ratings for ducted air moving devices.
  - .4 Performance: to ANSI/AMCA 210 and ANSI/ASHRAE 51.
- .2 Pwl sound ratings to comply with AMCA 301, tested to AMCA 300
- .3 Maximum loudness: 5 sones.

**2.2          WALL AND CEILING DISCHARGE FANS**

- .1 Centrifugal direct drive, with plug-in type electric motor suitable for ceiling or wall installation, zinc coated rectangular metal housing.
- .2 Sizes and capacity: see schedule.
- .3 Toggle switch or timer operated complete with integral electrical outlet box with plug-in type receptacle.
- .4 Top or side 80 mm x 250 mm rectangular duct outlet with integral backdraft damper.
- .5 Roof jack or wall cap complete with spring loaded backdraft damper with neoprene gasket.
- .6 White polymeric or silver anodized aluminum grille.

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**PART 3      EXECUTION**

**3.1            MANUFACTURER'S INSTRUCTIONS**

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

**3.2            INSTALLATION**

- .1      Install in accordance with manufacturer's recommendations.

**3.3            ANCHOR BOLTS AND TEMPLATES**

- .1      Supply for installation by other divisions.

**3.4            CLEANING**

- .1      Proceed in accordance with Section 01 74 11 - Cleaning.
- .2      Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**3.5            COMMISSIONING**

- .1      Commission in accordance with Division 01.

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3      Section 01 78 00 - Closeout Submittals.
- .4      Section 23 09 33 – Electric and Electronic Control System for Electric Heating.
- .5      Section 26 05 00 – Common Work Results - Electrical

**1.2            REFERENCES**

- .1      Canadian Standards Association (CSA International)
  - .1      CSA C22.2 No.46, Electric Air-Heaters.
- .2      Underwriters' Laboratories (UL) Inc.
  - .1      UL 1042, Electric Baseboard Heating Equipment.

**1.3            PRODUCT DATA**

- .1      Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2      Submit product data sheets for baseboard convectors, include:
  - .1      Product characteristics.
  - .2      Performance criteria.
  - .3      Mounting methods.
  - .4      Physical size.
  - .5      kW rating, voltage, phase.
  - .6      Cabinet material thicknesses.
  - .7      Limitations.
  - .8      Colour and finish.
- .3      Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence and cleaning procedures.

**1.4            CLOSEOUT SUBMITTALS**

- .1      Submit operation and maintenance data for baseboard convectors in accordance with Section 01 78 00 - Closeout Submittals.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Construction/Demolition Waste Management And Disposal, and with Waste Reduction Workplan.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Owner’s Representative.
- .5 Collect, package and store existing convector units for either reuse or recycling and return to recycler in accordance with Waste Management Plan.

**PART 2 PRODUCTS**

**2.1 COMMERCIAL CONVECTORS**

- .1 Heaters: to CSA C22.2 No.46 standard wattage density as indicated with connection box both ends.
- .2 White in color. Epoxy/polyester powder paint.
- .3 Rated 208 Volts.
- .4 20 gauge steel cabinet.
- .5 16 gauge steel front cover.
- .6 Extruded aluminum bar grilles.
- .7 Front fresh air inlet, top warm air outlet.
- .8 Linear high-limit temperature control with automatic reset.
- .9 Two stainless steel tubular heating elements with aluminum fins.
- .10 Floating elements on high temperature nylon bushings.
- .11 Heater complete with low voltage relay and transformer kit.

**2.2 CONTROLS**

- .1 Wall mounted thermostats: low voltage Energy Star certified, to Section 23 09 33 - Electric and Electronic Control System for Electric Heating.



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Section 23 82 33.02 – Commercial Convectors

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- .2 Electrical Division to supply and install all low voltage wiring and conduit as required.

**PART 3      EXECUTION**

**3.1            INSTALLATION**

- .1 Install baseboard convector heaters, blank sections and controls.
- .2 When wireway is used, remove knock-outs and insert insulating bushing between units.
- .3 Install grounding wire to maintain ground integrity between heating, blank, and auxiliary sections.
- .4 Install thermostats in locations indicated.
- .5 Make power and control connections.

**3.2            COMMISSIONING**

- .1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical.
- .2 Ensure that heaters and thermostatic controls operate correctly.

**END OF SECTION**

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**PART 1**

**General**

**1.1 GENERAL**

- .1 This Section covers items common to Sections of Division 26. This section supplements requirements of Division 1 and Division 33.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CSA C22.1, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
  - .2 CAN/CSA-22.3 No. 1, Overhead Systems.
  - .3 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

**1.3 CARE, OPERATION AND START-UP**

- .1 Instruct Owner's 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.

**1.4 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. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

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1.5 SUBMITTALS

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Newfoundland and Labrador, Canada where required.
- .2 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .3 Quality Control: in accordance with Section 01 45 00 - Quality Control.
  - .1 Provide CSA certified equipment and material. Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for approval before delivery to site.
  - .2 Submit test results of installed electrical systems and instrumentation.
  - .3 Submit, upon completion of Work, load balance report as described in sentence 3.4.6.
  - .4 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Owner's Representative.
- .4 Manufacturer's Field Reports: submit to Owner's Representative within seven (7) working days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in paragraph 3.6- FIELD QUALITY CONTROL.

1.6 PERMITS, FEES AND INSPECTION

- .1 Submit to Electrical Inspection Division and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Owner's Representative will provide drawings and specifications required by Electrical Inspection Division and Supply Authority at no cost.
- .4 Notify Owner's Representative of changes required by Electrical Inspection Division prior to making changes.
- .5 Furnish Certificates of Acceptance from Electrical Inspection Division or authorities having jurisdiction on completion of work to Owner's Representative.

1.7 CO-ORDINATION

- .1 Co-ordinate 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.

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- .4 Where interference occurs, Owner's 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 Owner's Representative shall decide the extent of relocation required.
- 1.8 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. Obtain written approval of Structural engineer before drilling any beams or floors.
- 1.9 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.
- 1.10 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.
- 1.11 INSPECTION OF WORK
- .1 The Owner 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.

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1.12            **SCHEDULING OF WORK**

- .1            Work shall be scheduled in phases as per other divisions of the architectural specifications.
- .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.

1.13            **FIRE RATING OF PENETRATIONS**

- .1            Maintain fire ratings around conduits passing through floors, ceilings and fire rated walls.
- .2            Use 3M brand or equal fire barrier products at each penetration.
- .3            Acceptable products for fire barrier products shall be 3M #CP25 fire barrier caulk, #303 putty, #FS 195 wrap and #CS195 sheet.
- .4            Acceptable manufacturers: Nelson, Fire Stop Systems, 3M or approved equal. Material of same manufacturer to be used throughout project.

**PART 2**            **PRODUCTS**

2.1            **ELECTRIC MOTORS, EQUIPMENT AND CONTROLS**

- .1            Supplier and installer responsibility is indicated on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings, where applicable.
- .2            Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Mechanical Division and shown on mechanical drawings. Mechanical Contractor is responsible for all conduit, wiring and connections below 50V which are related to control systems in Mechanical Division and shall comply with the requirements of Division 26 for standard of quality.
- .3            Control wiring relating to heating system to be supplied and installed by electrical division,

2.2            **MATERIALS AND EQUIPMENT**

- .1            Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.

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- .2 Equipment and material to be CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Division.
- .3 Factory assemble control panels and component assemblies.

2.3 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.

2.4 WARNING SIGNS

- .1 As specified and to meet requirements of Electrical Inspection Department and Owner's Representative.
- .2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be 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, black white face, black white 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:
  - .1 Embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Owner's Representative prior to manufacture.
- .4 Allow for average of twenty-five (25) letters per nameplate and label.

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- .5 Identification to be English (and French where applicable).
- .6 Nameplates for terminal cabinets and junction boxes to indicate system name and voltage characteristics.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system name and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages and transformer number.

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, Canadian Electrical Code.
- .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.

<u>Conduit System</u>	<u>Prime Color</u>	<u>Auxiliary Color</u>
up to 250 V	Yellow	
up to 600 V	Yellow	Green

**PART 3**      **EXECUTION**

3.1 **NAMEPLATES AND LABELS**

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

3.2 **LOCATION OF OUTLETS**

- .1 Locate outlets in accordance with Section 26 27 26 – Wiring Devices.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

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- .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. Locate disconnect devices in mechanical and elevator machine rooms on latch side of door.

3.3 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete. 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.

3.4 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 at following heights unless indicated otherwise.
  - .1 Local switches: 1200 mm.
  - .2 Wall receptacles:
    - .1 General: 300 mm.
    - .2 Above top of continuous baseboard heater: 200mm.
    - .3 Above top of counters or counter splash backs: 175 mm.
    - .4 In mechanical rooms: 1400 mm.
  - .3 Panelboards: as required by Code or as indicated.
  - .4 Exit lights: 2400 mm.
  - .5 Emergency lighting heads: 2400 mm.

3.5 CO-ORDINATION OF PROTECTIVE DEVICES

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

3.6 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



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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 and Section 01 91 13 – Commissioning (Cx) Requirements.
- .4 Load Balance:
  - .1 Measure phase current to panelboard with normal loads (lighting) operating at time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
  - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
  - .3 Submit, at completion of work, report listing phase and neutral currents on panelboards and dry-core transformers, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.
- .5 Conduct and pay for following tests:
  - .1 Power distribution system including phasing, voltage, grounding and load balancing.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and its control.
  - .4 Motors, heaters and associated control equipment including sequenced operations of systems where applicable.
- .6 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .7 Insulation resistance testing.
  - .1 Megger and record circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - .2 Megger and record 350 – 600 V circuits, feeders and equipment with a 1000 V instrument.
  - .3 Check resistance to ground before energizing and record value.
- .8 Carry out tests in presence of Owner's Representative.
- .9 Provide instruments, meters, equipment and personnel required to conduct tests during and conclusion of project.
- .10 Submit test results for Owner's Representative's review and include in Operation and Maintenance Manuals

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3.7 CLEANING

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

**END OF SECTION**

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Section 26 05 20 - Wire and Box Connectors 0-1000 V

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**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .1            Materials and installation for wire and box connectors.

**1.2            RELATED SECTIONS**

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

**1.3            REFERENCES**

- .1            Canadian Standards Association (CSA)
  - .1            CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
  - .2            CAN/CSA-C22.2 No.65, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2            Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1            EEMAC 1Y-2, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3            National Electrical Manufacturers Association (NEMA)

**PART 2      PRODUCTS**

**2.1            MATERIALS**

- .1            Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2            Fixture type splicing connectors to: 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 to consist of:
  - .1            Connector body and stud clamp for stranded copper conductors.
  - .2            Clamp for copper bar.
  - .3            Stud clamp bolts.
  - .4            Bolts for copper bar.
  - .5            Sized for conductors and bars as indicated.
- .4            Clamps or connectors for armoured cable, aluminum sheathed cable and flexible conduit, as required to: CAN/CSA-C22.2 No.18.

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Section 26 05 20 - Wire and Box Connectors 0-1000 V

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**PART 3      EXECUTION**

**3.1            INSTALLATION**

- .1      Remove insulation carefully from ends of conductors and:
  - .1      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.
  - .2      Install fixture type connectors and tighten. Replace insulating cap.
  - .3      Install bushing stud connectors in accordance with EEMAC 1Y-2.

**END OF SECTION**

**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            REFERENCES**

- .1      Canadian Standards Association (CSA)
  - .1      CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.
  - .2      CAN/CSA-C22.2 No. 131, Type TECK 90 Cable.

**PART 2      PRODUCTS**

**2.1            BUILDING WIRES**

- .1      Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2      Copper alloy conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE as indicated.
- .3      Copper conductors: size as indicated, with thermoplastic insulation type TWH rated at 600 V, typically used for insulated ground wires.

**2.2            TECK CABLE**

- .1      Cable: to CAN/CSA-C22.2 No. 131.
- .2      Conductors:
  - .1      Grounding conductor: copper.
  - .2      Circuit conductors: copper and ACM alloy, size as indicated.
- .3      Insulation:
  - .1      Cross-linked polyethylene XLPE, rating – 600 V.
- .4      Inner jacket: polyvinyl chloride material.
- .5      Armour: interlocking aluminum, compliant to applicable Building Code classification for this project.
- .6      Overall covering: thermoplastic polyvinyl chloride material.
- .7      Fastenings:

- .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- .2 Channel type supports for two or more cables at 1500 mm centers.
- .3 Threaded rods: 6 mm dia. to support suspended channels.
- .8 Connectors:
  - .1 Watertight and/or type approved for TECK cable, as indicated.

### **2.3 ARMOURED CABLES**

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

### **2.4 CONTROL CABLES**

- .1 Type LVT: 2 soft annealed copper conductors, sized as indicated, with thermoplastic insulation, outer covering of thermoplastic jacket. Low energy 300 V control cable: stranded annealed copper conductors sized as indicated, with PVC insulation type TW - 40° C polyethylene insulation with shielding of tape coated with paramagnetic material wire braid over each conductor and overall covering of PVC jacket.

## **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 Owner's Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 No splices permitted in panel board feeders in new construction. Splices in re-work or renovation projects only with pre-approval by Owner's Representative.

### **3.2 GENERAL CABLE INSTALLATION**

- .1 Install cable in trenches in accordance with Section 33 71 73.02 - Underground Electrical Service.
- .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 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.
- .6 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

### **3.3 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34- Conduits, Fastenings and Fittings.
  - .2 In underground ducts in accordance with Section 26 05 43.01- Installation of Cables in Ducts.
  - .3 In trenches in accordance with Section 26 05 43.01- Installation of Cables in Trenches.

### **3.4 INSTALLATION OF TECK CABLE 0 -1000 V**

- .1 Install cables.
  - .1 Group cables wherever possible on channels.
- .2 Install cable concealed, securely supported by straps and hangers.

### **3.5 INSTALLATION OF ARMOURED CABLES (AC-90)**

- .1 Group cables wherever possible.
- .2 Use permitted only for work in movable partitions and vertical power supply drops to lighting fixtures.
- .3 Ensure all cables are terminated and made safe prior to ceiling grid being installed. All lighting drops to be terminated safely, with approved connectors, within an approved box, complete with cover.

### **3.6 INSTALLATION OF CONTROL CABLES**

- .1 Install all control cables in conduit. Size as per Canadian Electrical Code.
- .2 Ground control cable shield.

**END OF SECTION**

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**PART 1**      **GENERAL (NOT APPLICABLE)**

**PART 2**      **PRODUCTS**

**2.1**            **SUPPORT CHANNELS**

- .1            U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings as required.

**PART 3**      **EXECUTION**

**3.1**            **INSTALLATION**

- .1            Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2            Secure equipment to poured concrete with expandable inserts.
- .3            Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4            Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5            Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6            Fasten exposed conduit or cables to building construction or support system using straps.
  - .1            One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
  - .2            Two-hole steel straps for conduits and cables larger than 50 mm.
  - .3            Beam clamps to secure conduit to exposed steel work.
  - .4            Strap AC-90 cable at box location plus every 900 mm.
- .7            Suspended support systems.
  - .1            Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
  - .2            Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .8            For surface mounting of two or more conduits use channels at 1.5 m on centre 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.



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- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing, wood blocking, plastic strap 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 Owner's Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

**END OF SECTION**

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**PART 1      GENERAL**

**1.1            REALTED SECTIONS**

- .1      Section 01 33 00 – Submittal Procedures.
- .2      Section 26 05 00 – Common Work Results – Electrical.

**1.2            SUBMITTALS**

- .1      Submit shop drawings and product data for cabinets.
- .2      Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3      Provide drawings stamped and signed by professional engineer registered or licensed in the Province of Newfoundland and Labrador, Canada where required.

**PART 2      PRODUCTS**

**2.1            SPLITTERS**

- .1      Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2      Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3      At least three spare terminals on each set of lugs in splitters less than 400 A.

**2.2            JUNCTION AND PULL BOXES**

- .1      Welded steel construction with screw-on flat covers for surface mounting.
- .2      Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

**2.3            CABINETS**

- .1      Type E: sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.
- .2      Type T: sheet steel cabinet, with hinged door, latch, lock, 2 keys, containing 19 mm fir plywood backboard for surface flush mounting.

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Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets

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**PART 3      EXECUTION**

**3.1            SPLITTER INSTALLATION**

- .1      Install splitters and mount plumb, true and square to the building lines.
- .2      Extend splitters full length of equipment arrangement except where indicated otherwise.

**3.2            JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1      Install pull boxes in inconspicuous but accessible locations.
- .2      Mount cabinets with top not higher than 2 m above finished floor.
- .3      Install terminal block as indicated in Type T cabinets.
- .4      Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.
- .5      Ensure all electrical boxes above drywall ceilings are accessible via a properly sized access door installed directly below the box in drywall ceilings. Temporary removal of electrical light fixtures are not considered safe access to above ceiling electrical boxes and shall not be permitted.

**3.3            IDENTIFICATION**

- .1      Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.
- .2      Install size 2 identification labels indicating system name voltage and phase.

**END OF SECTION**

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 26 05 00 – Common Work Results – Electrical.
- .2      Section 26 05 29 – Hangers and Supports for Electrical Systems.
- .3      Section 26 05 34 – Conduits, Conduit Fastenings and Fittings.

**1.2            REFERENCES**

- .1      Canadian Standards Association (CSA)
  - .1      CSA C22.1, Canadian Electrical Code, Part 1.

**PART 2      PRODUCTS**

**2.1            OUTLET AND CONDUIT BOXES GENERAL**

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

**2.2            GALVANIZED STEEL OUTLET BOXES**

- .1      Electro-galvanized steel 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.
- .2      Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .3      102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .4      102 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished plaster walls.

**2.3            CONDUIT BOXES**

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

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**2.4            FITTINGS - GENERAL**

- .1        Bushing and connectors with nylon insulated throats.
- .2        Knock-out fillers to prevent entry of debris.
- .3        Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4        Double locknuts and insulated bushings on sheet metal boxes.
- .5        Double split rings for AC-90 terminations.

**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, and armoured cable connections. Reducing washers are not allowed.
- .5        Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6        Identify systems for outlet boxes as required.

**END OF SECTION**

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**PART 1**      **GENERAL**

**1.1**            **REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware, a National Standard of Canada.
  - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
  - .5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.

**1.2**            **SUBMITTALS**

- .1 Product data: submit manufacturer's printed product literature, specifications and datasheets.
  - .1 Submit cable manufacturing data.
- .2 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.

**PART 2**      **PRODUCTS**

**2.1**            **CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .3 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .4 Flexible metal conduit: to CSA C22.2 No. 56, aluminum liquid-tight flexible metal.

**2.2**            **CONDUIT FASTENINGS**

- .1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.5 m oc.

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- .4 Threaded rods, 6 mm dia., to support suspended channels.

**2.3 CONDUIT FITTINGS**

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90°, 45 ° or 22.5 ° 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 Connectors and couplings for EMT. Steel set-screw type, size as required.

**2.4 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

**2.5 FISH CORD**

- .1 Polypropylene.

**PART 3 EXECUTION**

**3.1 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 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.
- .2 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .3 Conceal all conduits except in mechanical and electrical service rooms and in unfinished areas.

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- .4 Use rigid hot dipped galvanized steel threaded conduit for exposed work below 2.4 m above finished floor.
- .5 Use electrical metallic tubing (EMT) except in cast concrete and above 2.4 m not subject to mechanical injury, as well as concealed work in masonry construction.
- .6 Use rigid PVC conduit underground and buried in or under concrete slab on grade.
- .7 Use flexible metal conduit for connection to motors in dry areas, connection to recessed light fixtures without a prewired outlet box, connection to surface or recessed light fixtures and work in movable metal partitions.
- .8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .9 Use AC-90 for vertical power supply drops to light fixtures.
- .10 Minimum conduit size for lighting and power circuits: 21 mm. 12 mm conduit is acceptable for switch leg drops only where one two-wire circuit and ground is required.
- .11 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .12 Mechanically bend steel conduit over 21 mm dia.
- .13 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .14 Install fish cord in empty conduits.
- .15 Run 2 - 27 mm spare conduits up to ceiling space and 2 - 27 mm spare conduits down to ceiling space from each flush panel. 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 flush concrete type box.
- .16 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .17 Dry conduits out before installing wire.

**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 suspended channels.
- .5 Do not pass conduits through structural members except as indicated.



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- .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 SLABS ON GRADE**

- .1 Run conduits 25 mm and larger below slab and encased in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.

**3.6 CONDUITS UNDERGROUND**

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

**3.7 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 On Completion and verification of performance of installation, remove surplus materials, excess materials rubbish, tools and equipment.

**END OF SECTION**

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1            Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .2            Section 26 05 00 - Common Work Results - Electrical.

**1.2            REFERENCES**

- .1            Canadian Standards Association, (CSA)
- .2            Insulated Cable Engineers Association, Inc. (ICEA)

**PART 2      PRODUCTS**

**2.1            CABLE PROTECTION**

- .1            38 x 140 mm planks pressure treated with copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

**2.2            MARKERS**

- .1            150 mm wide, 4 mil, polyethylene marker tape.

**PART 3      EXECUTION**

**3.1            CABLE INSTALLATION IN DUCTS**

- .1            Install cables as indicated in ducts.
  - .1            Do not pull spliced cables inside ducts.
- .2            Install multiple cables in duct simultaneously.
- .3            Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .4            To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .5            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.
- .6            After installation of cables, seal duct ends with duct sealing compound.

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**3.2            MARKERS**

- .1        Install warning tape entire length of trench 200 mm below surface.

**3.3            FIELD QUALITY CONTROL**

- .1        Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2        Perform tests using qualified personnel. Provide 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. 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.
- .7        Provide Owner's Representative with list of test results showing location at which each test was made, circuit tested and result of each test. Include results in Commissioning Manual.
- .8        Remove and replace entire length of cable if cable fails to meet any of test criteria.

**END OF SECTION**

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Section 26 24 16.01 – Panelboards - Breaker Type

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**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .1            Materials and installation for standard and custom breaker type panelboards.

**1.2            RELATED SECTIONS**

- .1            Section 01 33 00 - Submittal Procedures.
- .2            Section 06 10 53 – Miscellaneous Rough Carpentry.
- .3            Section 26 05 00 – Common Work Results - Electrical.
- .4            Section 26 28 16.02 - Moulded Case Circuit Breakers.

**1.3            REFERENCES**

- .1            Canadian Standards Association (CSA)
  - .1            CSA C22.2 No.29, Panelboards and enclosed Panelboards.

**1.4            SUBMITTALS**

- .1            Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

**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            250 V panelboards: bus and breakers rated for 18,000 A (symmetrical) minimum interrupting capacity or as indicated on electrical drawings.
- .3            Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4            Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5            Two keys for each panelboard and key panelboards alike.
- .6            Tin plated aluminum bus with neutral of same ampere rating as mains.

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- .7 Mains: suitable for bolt-on breakers.
- .8 Trim with concealed front bolts and hinges.
- .9 Trim and door finish: baked grey enamel.

**2.2 BREAKERS**

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .3 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Owner Representative.
- .4 Lock-on devices for receptacles, emergency, stairway, exit and night light circuits as indicated.

**2.3 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00 – Common Work Results - Electrical or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .1            Switches, receptacles, wiring devices, cover plates and their installation.

**1.2            RELATED SECTIONS**

- .1            Section 01 33 00 - Submittal Procedures.
- .2            Section 26 05 00 – Common Work Results - Electrical.

**1.3            REFERENCES**

- .1            Canadian Standards Association (CSA)
  - .1            CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.
  - .2            CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
  - .3            CSA-C22.2 No.55, Special Use Switches.
  - .4            CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

**PART 2      PRODUCTS**

**2.1            SWITCHES**

- .1            15 A, 120 V, single pole, double pole, three-way, four-way switches as indicated to: CSA-C22.2 No.55 and 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.
  - .6            Specification grade.
- .3            Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4            Switches of one manufacturer throughout project.

**2.2 RECEPTACLES**

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:
  - .1 White thermoplastic 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.
  - .6 Specification grade.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
  - .1 White thermoplastic moulded housing.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Four back wired entrances, 2 side wiring screws.
- .3 Other receptacles with ampacity and voltage as indicated.
- .4 Receptacles of one manufacturer throughout project.

**2.3 COVER PLATES**

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .4 Stainless steel cover plates as indicated, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.
- .5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .7 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.
- .8 All wiring device cover plates to be labeled using clear adhesive strips with black type identifying panel and circuit number for each device.

**PART 3**      **EXECUTION**

**3.1**            **INSTALLATION**

- .1      Switches:
  - .1      Install single throw switches with handle in "UP" position when switch closed.
  - .2      Install switches in gang type outlet box when more than one switch is required in one location.
  - .3      Mount toggle switches at height in accordance with Section 26 05 00 – Common Work Results - Electrical.
  
- .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 - Electrical.
  - .3      Where split receptacle has one portion switched, mount vertically and switch upper portion.
  
- .3      Cover plates:
  - .1      Protect cover plate finish with paper or plastic film until painting and other work is finished.
  - .2      Install suitable common cover plates where wiring devices are grouped.
  - .3      Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

**END OF SECTION**



**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 26 05 00 - Common Work Results – Electrical.

**1.2            SUBMITTALS**

- .1      Include time-current characteristic curves for breakers with ampacity of 600 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

**PART 2      PRODUCTS**

**2.1            BREAKERS GENERAL**

- .1      Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .2      Common-trip breakers: with single handle for multi-pole applications.
- .3      Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .4      Circuit breakers with interchangeable trips as indicated.
- .5      Circuit breakers to have minimum of 18,000 A symmetrical rms interrupting capacity rating.

**2.2            THERMAL MAGNETIC BREAKERS DESIGN A**

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

**PART 3      EXECUTION**

**3.1            INSTALLATION**

- .1      Install circuit breakers as indicated.

**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .1            Equipment and installation for ground fault circuit interrupters (GFCI).

**1.2            RELATED SECTIONS**

- .1            Section 01 33 00 - Submittal Procedures.
- .2            Section 01 45 00 - Quality Control.
- .3            Section 26 05 00 – Common Work Results - Electrical.

**1.3            REFERENCES**

- .1            Canadian Standards Association (CSA)
  - .1            CAN/CSA-C22.2 No.144, Ground Fault Circuit Interrupters.
- .2            National Electrical Manufacturers Association (NEMA)
  - .1            NEMA PG 2.2, Application Guide for Ground Fault Protection Devices for Equipment.

**1.4            SUBMITTALS**

- .1            Submit product data and shop drawings.
- .2            Submit test report for field testing of ground fault equipment to Owner’s Representative and a certificate that system as installed meets criteria specified herein.

**PART 2      PRODUCTS**

**2.1            MATERIALS**

- .1            Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA-C22.2 No.144.
- .2            Components comprising ground fault protective system to be of same manufacturer.

**2.2            BREAKER TYPE GROUND FAULT INTERRUPTER**

- .1            Single or two pole ground fault circuit interrupter for 15-20 A, 120 V, 1 phase circuit c/w test and reset facilities.

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Section 26 28 20 – Ground Fault Circuit Interrupters – Class “A”

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**PART 3**      **EXECUTION**

**3.1**            **INSTALLATION**

- .1      Do not ground neutral on load side of ground fault relay.
- .2      Pass phase conductors including neutral through zero sequence transformers.
- .3      Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

**3.2**            **FIELD QUALITY CONTROL**

- .1      Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2      Demonstrate simulated ground fault tests.

**END OF SECTION**

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**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 26 05 00 – Common Work Results - Electrical.

**PART 2      PRODUCTS**

**2.1            DISCONNECT SWITCHES**

- .1      Fusible and non-fusible, disconnect switch in CSA Enclosure type 1, size as indicated.
- .2      Provision for padlocking in on-off switch position by three locks.
- .3      Mechanically interlocked door to prevent opening when handle in ON position.
- .4      Fuses: size as indicated, to Section 26 28 13.01 - Fuses - Low Voltage.
- .5      Fuseholders: suitable without adaptors, for type and size of fuse indicated.
- .6      Quick-make, quick-break action.
- .7      ON-OFF switch position indication on switch enclosure cover.
- .8      All disconnects to be heavy duty rated.
- .9      EEMAC 2 (sprinkler proof) for interior and EEMAC 4X for exterior use.

**2.2            EQUIPMENT IDENTIFICATION**

- .1      Provide equipment identification in accordance with Section 26 05 00 – Common Work Results - Electrical.
- .2      Indicate name of load controlled on size 4 nameplate.

**PART 3      EXECUTION**

**3.1            INSTALLATION**

- .1      Install disconnect switches complete with fuses as indicated.

**PART 1      GENERAL**

**1.1            REFERENCES**

- .1      American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1          ANSI/IEEE C62.41, Surge Voltages in Low-Voltage AC Power Circuits.
- .2      American Society for Testing and Materials (ASTM)
  - .1          ASTM F1137, Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .3      United States of America, Federal Communications Commission (FCC)
  - .1          FCC (CFR47) EM and RF Interference Suppression.

**1.2            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 01 45 00 - Quality Control.

**1.3            SUBMITTALS**

- .1      Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Owner's Representative.
- .2      Photometric data to include: VCP Table and spacing criterion and luminaire coefficient of utilization (CU) tables.
- .3      Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .4      Quality assurance submittals: provide the following in accordance with Section 01 45 00 - Quality Control.
  - .1          Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures and relamping schedule.

**1.4            DELIVERY, STORAGE AND HANDLING**

- .1      Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2      Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3      Divert unused metal materials from landfill to metal recycling facility.

**1.5 ACCEPTABLE PRODUCTS**

- .1 Luminaires described in the Lighting Fixture Schedule identify quality, performance criteria and other parameters, as indicated for this project. Named fixtures are acceptable with modifications and accessories, as indicated.
- .2 Fixtures from other manufacturers may be acceptable provided:
  - .1 Appearance and lighting performance are similar.
  - .2 Quality is equal or better.
  - .3 Fixture criteria remain the same.
  - .4 The fixture is provided with modifications and accessories to provide a complete product in keeping with the intent of the project.
  - .5 Approval in writing is obtained from the Owner's Representative to the supplier/manufacturer 5 days prior to tender closing date.

**PART 2 PRODUCTS**

**2.1 FIXTURES**

- .1 Provide LED fixtures as per electrical drawings.

**2.2 FINISHES**

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

**2.3 OPTICAL CONTROL DEVICES**

- .1 As indicated in luminaire schedule on drawings.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

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

**3.2 WIRING**

- .1 Connect luminaires to lighting circuits.
  - .1 Install flexible conduit for vertical power supply drop to luminaires as indicated. Horizontal wiring using flexible conduit is not permitted.

**3.3 LUMINAIRE SUPPORTS**

- .1 For suspended ceiling installations support luminaires from ceiling grid in accordance with local inspection requirements.

**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 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical.

**END OF SECTION**

**PART 1      GENERAL**

**1.1            SECTION INCLUDES**

- .1      Materials and installation for emergency lighting systems.

**1.2            RELATED SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 26 05 00 - Common Work Results – Electrical.
- .3      Section 26 05 21 - Wires and Cables (0-1000 V).
- .4      Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

**1.3            REFERENCES**

- .1      Canadian Standards Association (CSA)
  - .1      CSA C22.2 No.141, Unit Equipment for Emergency Lighting.

**1.4            SUBMITTALS**

- .1      Data to indicate system components, mounting method, source of power and special attachments.

**1.5            WARRANTY**

- .1      For batteries, the ten years warranty period is extended to 120 months, with no-charge replacement during the first 5 years and pro-rate charge on the second 5 years from the date of Substantial Completion.

**PART 2      PRODUCTS**

**2.1            EQUIPMENT**

- .1      Emergency lighting equipment: to CSA C22.2 No.141.
- .2      Supply voltage: 120 V, ac.
- .3      Output voltage: 12 V dc.
- .4      Operating time: 90 minutes.
- .5      Battery: sealed, maintenance free.



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- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V 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 Signal lights: solid state, for 'AC Power ON'.
- .10 Lamp heads: integral on unit and remote, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: LED as indicated.
- .11 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.
- .12 Finish: standard.
- .13 Auxiliary equipment:
  - .1 Test switch.
  - .2 Time delay relay.
  - .3 Battery disconnect device.
  - .4 AC input and DC output terminal blocks inside cabinet.
  - .5 Shelf.
  - .6 Cord and single twist-lock plug connection for AC.
  - .7 RFI suppressors.

**2.2 WIRING OF REMOTE HEADS**

- .1 Conduit: type EMT, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Conductors: RW90 type in accordance with Section 26 05 21 - Wires and Cables (0-1000 V) sized as indicated in accordance with manufacturer's recommendations.

**PART 3      EXECUTION**

**3.1          INSTALLATION**

- .1 Install unit equipment and remote mounted fixtures.
- .2 Direct heads.
- .3 Connect exit lights to unit equipment.
- .4 Perform tests in accordance with Section 26 05 00 – Common Work Results - Electrical.

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**PART 1      GENERAL**

**1.1            SCOPE OF WORK**

- .1      Testing and commissioning are called for throughout the individual specifications. This does not relieve this trade from providing all testing and commissioning necessary to ensure that systems and equipment operate as required and that they interface with other systems and equipment as required.

**1.2            SECTION INCLUDES**

- .1      Commissioning of all building electrical systems and component including:
  - .1      Testing and adjustment.
  - .2      Demonstrations and Training.
  - .3      Instructions of all procedures for Owner's personnel.
  - .4      Updating as-built data.
  - .5      Co-ordination of Operation and Maintenance material.

**1.3            RELATED SECTION**

- .1      Section 01 77 00 – Closeout Procedures.
- .2      Section 26 05 00 – Common Work Results - Electrical.

**1.4            REFERENCES**

- .1      CSA (Canadian Standards Association).
- .2      Underwriters Laboratories of Canada.

**1.5            QUALITY ASSURANCE**

- .1      Provide qualified trades persons, certified testing agencies, factory trained and approved by the Commissioning Team Leader.
- .2      Submit the names of all personnel to be used during the Commissioning activities for Owner Approval.

**1.6            COMMISSIONING**

- .1      The purpose of the commissioning process is to fully test all building systems including architectural, mechanical and electrical components and operating procedures by challenging these systems to realistic operation conditions.
- .2      The Commissioning activities shall be co-ordinated by the General Contractor.
- .3      Commissioning activities for the electrical systems must have available up to date as-built drawing information and accurate Operations and Maintenance Manuals. These documents shall be a major part of this activity.

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- .4 Contractor shall be responsible to update all documentation with information and any changes duly noted during the Commissioning exercise.
- .5 Contractor shall arrange for all outside suppliers, equipment manufacturers, test agencies and others as identified in the commissioning sections of this specification. The cost associated with this requirement shall be included as part of the tender price.

1.7 SUBMITTALS

- .1 The electrical sub-contractor shall be responsible for ensuring all activities are properly documented in this manual and co-ordinated through the General Contractor.
- .2 As-built drawings and data books must be available two weeks prior to commissioning for review and use by the consultant and Commissioning Team prior to the start of the commissioning activities.

1.8 PREPARATION

- .1 Provide test instruments required for all activities as defined in the manufacturer's installation documents.
- .2 Verify all systems are in compliance with the requirements of the manufacturer's installation documents prior to the precommissioning check out operation.
- .3 Confirm all scheduled activities have identified personnel available.
- .4 Where systems or equipment do not operate as required, make the necessary corrections or modifications, re-test and re-commission.

1.9 SYSTEM DESCRIPTION

- .1 Perform all start up operations, control adjustment, trouble shooting, servicing and maintenance of each item of equipment as defined in the manufacturer's installation documentation.
- .2 Owner will provide list of personnel to receive instructions and will co-ordinate their attendance at agreed upon times.
- .3 Prepare and insert additional data in the operations and maintenance manuals and update as-built drawings when need for additional data becomes apparent during the commissioning exercise.
- .4 Where instruction is specified in the manufacturer's installation documents, instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .5 Conduct presentation on Owner's premises. Owner will provide space.

1.10 FINAL REPORT

- .1 This trade shall assemble all testing data and commissioning reports and submit them to the Owner.

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- .2 Each form shall bear signature of recorder, and that of supervisor of reporting organizer.

1.11 SCHEDULE OF ACTIVITIES

- .1 Commissioning activities shall be conducted based on pre-established schedule with all members of the commissioning team.
- .2 Adhering to the established schedule is very important as the co-ordination and scheduling of the participants will be difficult to alter once this is established. Close co-ordination of this schedule is important.
- .3 In the event project cannot be commissioned in the allotted time slot, the contractor shall pay for all costs associated with assembling the Commissioning Team at a later date. If the contractor has not performed his duties to reach commissioning stage as outlined earlier, he will incur all expenses of other trades and the Commissioning Team due to his non-compliance.

END OF SECTION

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**PART 1**      **GENERAL**

1.1            **GENERAL**

- .1            This section describes the extent of services to be provided for wiring of equipment supplied by others.
- .2            Within the context of this section, Others means:
  - .1            Other divisions of this specification.
  - .2            The Owner, as defined in the Contract.
  - .3            Other contractors supplying and installing equipment to the contract.

1.2            **EXTENT OF SERVICES PROVIDED**

- .1            The work of this contract is to include all power and control wiring of equipment which is provided by Division 26.
- .2            All power and control wiring above 50 V for equipment supplied by Mechanical Division will be the responsibility of this contractor. Coordinate with Mechanical contractor for exact requirements.
- .3            All control wiring 50 V and less for equipment supplied by Mechanical Division will be the responsibility of Mechanical Contractor. Conduit and wire associated with this is the responsibility of Mechanical Division.
- .4            All power and control wiring associated with equipment supplied by Division 01 will be the responsibility of this contractor. Coordinate with general contractor for exact requirements.
- .5            Final connection of all wiring to equipment provided by others (except control wiring below 50 V associated with Mechanical Division equipment) will be by Division 26. Coordinate with the provider for connection instructions.

1.3            **RESPONSIBILITY OF DIVISION 26**

- .1            It is the responsibility of the Division 26 subcontractor to verify final requirements for wiring of all equipment noted. Verification of wiring requirements to include:
  - .1            Confirmation of electrical characteristics.
  - .2            Location of connection point.
  - .3            Method of connection (i.e. direct or plug-in etc.)
- .2            Obtain and become familiar with shop drawings for all relevant equipment.
- .3            No claim for extra will be entertained for wiring equipment which has been indicated, or changes to installed wiring where installation proceeded prior to verification of electrical requirements.

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PART 2      PRODUCTS (NOT APPLICABLE)

PART 3      EXECUTION (NOT APPLICABLE)

**END OF SECTION**

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**PART 1      GENERAL**

**1.1            REFERENCES**

- .1      American Society for Testing and Materials International (ASTM)
  - .1      ASTM D 698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft<sup>3</sup>) (600kN-m/m<sup>3</sup>).
  - .2      Canadian Standards Association (CSA International)
    - .1      CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
    - .2      CSA A3000, Cementitious Materials Compendium.

**1.2            QUALITY ASSURANCE/REGULATORY REQUIREMENTS**

- .1      Shore and brace excavations, protect slopes and banks and perform all work in accordance with Provincial and Municipal regulations whichever is more stringent.
- .2      Comply with Explosives Act of Canada.
- .3      Perform blasting in accordance with Provincial and Municipal regulations. Repair damage to approval of Owner's Representative.
- .4      No blasting will be permitted within 3 m of any building and where damage would result.

**1.3            TESTS AND INSPECTIONS**

- .1      Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Owner's Representative.
- .2      Not later than one week before backfilling or filling, provide to designated testing agency, 23 kg sample of backfill for fill material proposed for use.
- .3      Do not begin backfilling or filling operations until material has been approved for use by Owner's Representative.
- .4      Not later than 48 hours before backfilling or filling with approved material, notify Owner's Representative so that compaction tests can be carried out by designated testing agency.
- .5      Before commencing work, conduct, with Owner's Representative, condition survey of existing structures, trees and other plants, lawns, fencing, service poles, wires, rail tracks and paving, survey bench marks and monuments which may be affected by work.

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**1.4            EXISTING CONDITIONS**

- .1      Examine soil report available from Owner's Representative.
- .2      Before commencing work verify the location of all buried services on and adjacent to the site.
- .3      Arrange with appropriate authority for relocation of buried services that interfere with execution of work. Pay costs of relocating services.
- .4      Remove obsolete buried services within 2 m of foundations. Cap cut-offs.

**PART 2            PRODUCTS**

**2.1            MATERIALS**

- .1      Granular B-Type I, B-Type II, Select Subgrade to OPSS1010. Sand to OPSS1004.
- .2      Crushed Granular to CCDG14.02.
- .3      Unshrinkable fill: proportioned and mixed to provide:
  - .1      Maximum compressive strength of 0.4 MPa at 28 days.
  - .2      Maximum Portland cement content of 25 kg/m<sup>3</sup>.
  - .3      Minimum strength of 0.07 MPa at 24 h.
  - .4      Concrete aggregates: to CSA-A23.1/A23.2,
  - .5      Cement: to CSA A3000, Type GU.
  - .6      Slump: 160 to 200 mm.

**PART 3            EXECUTION**

**3.1            PROTECTION/PROTECTION**

- .1      Protect excavations from freezing.
- .2      Keep excavations clean, free of standing water, and loose soil.
- .3      Where soil is subject to significant volume change due to change in moisture content, cover and protect to Owner's Representative's Consultants approval.
- .4      Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5      Protect buried services that are required to remain undisturbed.



**3.2 CLEARING AND GRUBBING**

- .1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
- .2 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.
- .3 Dispose of cleared and grubbed material off site daily to disposal areas acceptable to authority having jurisdiction.

**3.3 EXCAVATION**

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial regulations.
- .2 Perform blasting in accordance with Provincial regulations: repair damage as directed by Owner's Representative.
- .3 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
  - .1 Stockpile topsoil on site for later use.
- .4 Excavate as required to carry out work, in all materials met.
  - .1 Do not disturb soil or rock below bearing surfaces.
  - .2 Notify Owner's Representative when excavations are complete.
  - .3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work. Excavation taken below depths shown without Owner's Representative written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
- .5 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.
  - .1 Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
- .6 Excavate for slabs and paving to subgrade levels.
  - .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

**3.4 BACKFILLING**

- .1 Inspection: do not commence backfilling until fill material and spaces to be filled have been inspected and approved by Owner's Representative.

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- .2 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .3 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .4 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same compaction as specified for fill.
  - .1 Fill excavated areas with selected subgrade material or gravel and sand compacted as specified for fill.
- .5 Placing:
  - .1 Place backfill, fill and basecourse material in 150 mm lifts. Add water as required to achieve specified density.
- .6 Compaction: compact each layer of material to following densities for material to ASTM D698,
  - .1 To underside of basecourses: 95%.
  - .2 Basecourses: 100%.
  - .3 Elsewhere: 90%.
- .7 In trenches:
  - .1 Up to 300 mm above pipe or conduit: sand placed by hand.
  - .2 Over 300 mm above pipe or conduit: native material approved by Owner's Representative.
- .8 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.
- .9 Blown rock material, not capable of fine grading, is not acceptable, imported material must be placed on this type of material.
- .10 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.
- .11 Underground tanks: use sand to bottom of granular basecourses or to bottom of topsoil, as applicable.

**3.5**

**GRADING**

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by the Owner's Representative.
  - .1 Grade to be gradual between finished spot elevations shown on drawings.

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**3.6 SHORTAGE AND SURPLUS**

- .1 Supply all necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.
- .2 Dispose of surplus material off site.

**3.7 CLEANING**

- .1 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 SECTIONS**

- .1      Section 01 33 00 - Submittal Procedures.
- .2      Section 03 30 00 – Cast-in-Place Concrete.
- .3      Section 31 23 33.01 – Excavating, Trenching and Backfilling.
- .4      Section 32 11 16.01 – Granular Sub Base.
- .5      Section 32 11 23 – Aggregate Base Courses.

**1.2      REFERENCES**

- .1      American Society for Testing and Materials (ASTM International).
  - .1      ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.

**1.3      SOURCE QUALITY CONTROL**

- .1      Source of materials to be incorporated into work or stockpiles requires approval.
- .2      Inform Owner's Representative of proposed source of aggregates and provide access for sampling at least 4 weeks prior to commencing production.
- .3      If, in opinion of Owner's Representative, materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate an alternative source or demonstrate that material from source in question can be processed to meet specified requirements.
- .4      Should a change of material source be proposed, advise Owner's Representative 4 weeks in advance of proposed change to allow sampling and testing.
- .5      Acceptance of material at source does not preclude future rejection if it is subsequently found to lack uniformity, or if its field performance is found to be satisfactory.

**1.4      SAMPLES**

- .1      Aggregate will be subject to continual sampling by Owner's Representative during production.
- .2      Provide Owner's Representative with access to source and processed material for sampling and testing.

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- .3 Bear the cost of sampling and testing of aggregates which fail to meet specified requirements.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended.
- .2 Flat and elongated particles of coarse aggregate: to ASTM D4791.
  - .1 Greatest dimension to exceed five times least dimension.
- .3 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
  - .1 Natural sand.
  - .2 Manufactured sand.
  - .3 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
- .4 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
  - .1 Crushed rock or slag.
  - .2 Gravel and crushed gravel composed of naturally formed particles of stone.

**PART 3 EXECUTION**

**3.1 TOPSOIL STRIPPING**

- .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
- .2 Commence topsoil stripping of areas as indicated after area has been cleared and removed from site.
- .3 Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.
- .4 Stockpile in locations as directed by Owner's Representative. Stockpile height not to exceed 2.0 m.

**3.2 DEVELOPMENT OF AGGREGATE SOURCE**

- .1 Contractor to produce aggregates off site.

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- .2 Contractor to develop aggregate source to prevent contamination of aggregates stockpiled.

**3.3 PROCESSING**

- .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
- .2 Blend aggregates, if required, to obtain gradation requirements, percentage of crushed particles, or particle shapes, as specified. Use methods and equipment approved by Owner's Representative.
- .3 Wash aggregates, if required to meet specifications. Use only equipment approved by Engineer /Architect.
- .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate.

**3.4 HANDLING**

- .1 Handle and transport aggregates to avoid segregation, contamination and degradation.

**3.5 STOCKPILING**

- .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Owner's Representative. Do not stockpile on completed pavement surfaces.
- .2 Stockpile aggregates in sufficient quantities to meet Project schedules.
- .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
- .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into work.
- .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Owner's Representative within two (2) working days of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
  - .1 Max 1.0 m for coarse aggregate and base course materials.
  - .2 Max 2.0 m for fine aggregate and sub-base materials.
  - .3 Max 1.5 m for other materials.
- .8 Complete each layer over entire stockpile area before beginning next layer.

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- .9 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .10 Do not cone piles or spill material over edges of piles.
- .11 Do not use conveying stackers.
- .12 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

**3.6 CLEANING**

- .1 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .2 Leave any unused aggregates in neat compact stockpiles as directed by Owner's Representative.

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**            **RELATED SECTIONS**

- .1      Section 01 35 43 - Environmental Procedures.
- .2      Section 31 23 16.26 - Rock Removal.
- .3      Section 31 23 33.01 - Excavation, Trenching and Backfilling.

**1.2**            **DEFINITIONS**

- .1      Clearing consists of cutting off trees and brush vegetative growth to not more than a specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2      Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3      Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.
- .4      Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of all fallen timber and surface debris.
- .5      Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than a specified depth below existing ground surface.

**1.3**            **QUALITY ASSURANCE**

- .1      Safety Requirements: worker protection.
  - .1      Workers must wear gloves, dust masks, eye protection, protective clothing, when applying herbicide materials.
  - .2      Workers must wear gloves, dust masks, safety boots, protective clothing, eye protection, safety vests when clearing and grubbing.
  - .3      Workers must not eat, drink or smoke while applying herbicide material.
  - .4      Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.



**1.4 STORAGE AND PROTECTION**

- .1 Prevent damage to fencing, trees, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, root systems of trees which are to remain.
- .2 Repair any damaged items to approval of Owner's Representative. Replace any trees designated to remain, if damaged, as directed by Owner's Representative.

**1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.
- .2 Trim limbs and tops, and saw into saleable lengths. Stockpile adjacent to site.

**PART 2 PRODUCTS (NOT APPLICABLE)**

**PART 3 EXECUTION**

**3.1 PREPARATION**

- .1 Inspect site and verify with Owner's Representative, items designated to remain.
- .2 Locate and protect utility lines. Preserve in operating condition active utilities traversing site:
  - .1 Notify Owner's Representative immediately of damage to or when unknown existing utility lines are encountered.
  - .2 When utility lines which are to be removed are encountered within area of operations, notify Owner's Representative in ample time to minimize interruption of service.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 Keep roads and walks free of dirt and debris.

**3.2 CLEARING**

- .1 Clearing includes felling, trimming and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags brush and rubbish occurring within cleared areas.
- .2 Clear as directed by Owner's Representative, by cutting at a height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

- .3 Cut off branches and cut down trees overhanging area cleared as directed by Owner's Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Owner's Representative.

**3.3 CLOSE CUT CLEARING**

- .1 Close cut clearing to ground level.
- .2 Cut off branches down trees overhanging area cleared as directed by Owner's Representative.
- .3 Cut off unsound branches on trees designated to remain as directed by Owner's Representative.

**3.4 ISOLATED TREES**

- .1 Cut off isolated trees as directed by Owner's Representative at height of not more than 300mm above ground surface.
- .2 Grub out isolated tree stumps.
- .3 Prune individual trees as indicated.
- .4 Trim trees designated to be left standing within cleared areas of dead branches 4.0 cm or more in diameter; and trim branches to heights as indicated.
- .5 Cut limbs and branches to be trimmed close to bole of tree or main branches.

**3.5 UNDERBRUSH CLEARING**

- .1 Clear underbrush from areas as indicated at ground level.

**3.6 GRUBBING**

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots and designated stumps from indicated grubbing area.
- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m<sup>3</sup>.
- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

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**3.7 REMOVAL AND DISPOSAL**

- .1 Remove cleared and grubbed materials off site.
- .2 Cut timber greater than 125 mm diameter to 3000mm lengths and stockpile as indicated. Unless otherwise notified, stockpiled timber becomes property of the Owner.
- .3 Dispose of cleared and grubbed materials off site.
- .4 Remove diseased trees identified by Owner's Representative and dispose of this material to approval of Owner's Representative.

**3.8 FINISHED SURFACE**

- .1 Leave ground surface in condition suitable for immediate grading operations stripping of topsoil to approval of Owner's Representative.

**3.9 CLEANING**

- .1 On 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 SECTIONS**

- .1      Section 31 11 00 - Clearing and Grubbing.
- .2      Section 31 23 16.26 - Rock Removal.
- .3      Section 31 23 33.01 - Excavation, Trenching and Backfilling.

**1.2            REFERENCES**

- .1      American Society for Testing and Materials (ASTM)
  - .1      ASTM D698, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600kN-m/m<sup>3</sup>),

**1.3            EXISTING CONDITIONS**

- .1      Examine subsurface investigation report which is available for inspection from Owner's Representative.
- .2      Known underground and surface utility lines and buried objects are as indicated on site plan.
- .3      Refer to dewatering in Section 31 23 33.01 - Excavating Trenching and Backfilling.

**1.4            PROTECTION**

- .1      Protect and/or transplant existing fencing trees, landscaping, natural features, bench marks, buildings, pavement, surface or underground utility lines which are to remain as directed by Owner's Representative. If damaged, restore to original or better condition unless directed otherwise.
- .2      Maintain access roads to prevent accumulation of construction related debris on roads.

**PART 2      PRODUCTS**

**2.1            MATERIALS**

- .1      Fill material: Type 3 in accordance with of Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2      Excavated or graded material existing on site may be suitable to use as fill for grading work if approved by Owner's Representative.

**PART 3**      **EXECUTION**

**3.1**            **STRIPPING OF TOPSOIL**

- .1      Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Owner's Representative.
- .2      Commence topsoil stripping of areas as indicated after area has been cleared of brush, weeds and grasses and removed from site.
- .3      Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.
- .4      Stockpile in locations as directed by Owner's Representative. Stockpile height not to exceed 2 m.
- .5      Dispose of unused topsoil as directed by Owner's Representative.

**3.2**            **GRADING**

- .1      Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2      Rough grade to following depths below finish grades:
  - .1      250mm for concrete slabs and walks precast paving units.
- .3      Slope rough grade away from building 1:50 minimum.
- .4      Grade ditches to depth as indicated.
- .5      Prior to placing fill over existing ground, scarify surface to depth of 150 mm. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .6      Compact filled and disturbed areas to corrected maximum dry density to ASTM D698, as follows:
  - .1      85% under landscaped areas.
  - .2      95% under paved and walk areas.
- .7      Do not disturb soil within branch spread of trees or shrubs to remain.

**3.3**            **TESTING**

- .1      Inspection and testing of soil compaction will be carried out by testing laboratory designated by Owner's Representative. Refer to Sections 01 29 83 - Payment Procedures for Testing Laboratory Services and 01 45 00 – Quality Control.
- .2      Submit testing procedure, frequency of tests, to Owner's Representative for approval.

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**3.4 SURPLUS MATERIAL**

- .1 Remove surplus material and material unsuitable for fill, grading or landscaping as directed by Owner's Representative.

**END OF SECTION**

**PART 1**      **GENERAL**

**1.1**      **RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures.
- .2 Section 01 35 43 - Environmental Procedures.
- .3 Section 01 56 00 - Temporary Barriers and Enclosures.
- .4 Section 31 05 16 – Aggregate Materials.
- .5 Section 31 22 13 – Rough Grading.
- .6 Section 33 11 16 - Site Water Utility Distribution Piping.

**1.2**      **REFERENCES**

- .1 American Society for Testing and Materials (ASTM).
  - .1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
  - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.
  - .4 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .5 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB).
  - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
  - .2 CA/CGSB-8.2, Sieves, Testing, Woven Wire, Metric
- .3 Canadian Standards Association (CSA)
  - .1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
    - .1 CSA-A3001, Cementitious Materials for Use in Concrete.
  - .2 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/ Methods of Test and Standard Practices for Concrete.

**1.3 DEFINITIONS**

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
  - .1 Rock excavation: excavation of material from solid masses of igneous, sedimentary or metamorphic rock which, prior to its removal, was integral with its parent mass, and boulders or rock fragments having individual volume in excess of 1 m<sup>3</sup>. Frozen material not classified as rock.
  - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in work.
- .3 Topsoil: material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
- .4 Waste material: excavated material unsuitable for use in work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded, and required for construction of fill areas or for other portions of work.
- .6 Unsuitable materials:
  - .1 Weak and compressible materials under excavated areas.
  - .2 Frost susceptible materials under excavated areas.
  - .3 Frost susceptible materials:
    - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM D422 and ASTM C136: Sieve sizes to CAN/CGSB-8.1.

<u>Sieve Designation</u>	<u>%Passing</u>
2.00 mm	100
0.10 mm	45-100
0.02 mm	10-80
<u>0.005 mm</u>	<u>0-45</u>
    - .2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

**1.4 SUBMITTALS**

- .1 Inform Owner’s Representative at least 4 weeks prior to commencing work, of proposed source of fill materials and provide access for sampling.
- .2 Submit 70 kg samples of type of fill specified including representative samples of excavated material.
- .3 Ship samples as directed by Owner’s Representative in tightly closed containers to prevent contamination.



**1.5 QUALITY ASSURANCE**

- .1 Submit design and supporting data at least 2 weeks prior to commencing work.
- .2 Design and supporting data submitted to bear stamp and signature of qualified professional engineer registered or licensed in the province of Newfoundland and Labrador.
- .3 Keep design and supporting data on site.
- .4 Engage services of qualified professional engineer who is registered or licensed in Province of Newfoundland and Labrador to design and inspect cofferdams, shoring, bracing and underpinning required for work.
- .5 Do not use soil material until written report of soil test results are reviewed and approved by Owner's Representative.

**1.6 EXISTING CONDITIONS**

- .1 Buried services:
  - .1 Before commencing work verify location of buried services on and adjacent to site.
  - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
  - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
  - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
  - .5 Prior to commencing excavation work, notify applicable Owner or authorities having jurisdiction, establish location and state of use of buried utilities and structures. Owners or authorities having jurisdiction to clearly mark such locations to prevent disturbance during work.
  - .6 Confirm locations of buried utilities by careful test excavations.
  - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered as indicated.
  - .8 Where utility lines or structures exist in area of excavation, obtain direction of Owner's Representative before removing or re-routing.
  - .9 Record location of maintained, re-routed and abandoned underground lines.
  - .10 Confirm locations of recent excavations adjacent to area of excavation.
- .2 Existing buildings and surface features:
  - .1 Conduct, with Owner's Representative condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by work.
  - .2 Protect existing buildings and surface features from damage while work is in progress. In event of damage, immediately make repair to approval of Owner's Representative.
  - .3 Where required for excavation, cut roots or branches as approved by Owner's Representative.

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**PART 2      PRODUCTS**

**2.1      MATERIALS**

- .1      .1      Backfill Type 1 and Type 2 fill: properties to Section 31 05 16 - Aggregate Materials and the following requirements:
  - .1      Crushed, pit run or screened stone, gravel or sand.
  - .2      Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB-8.1.

Sieve Designation	%Passing	
	<u>Type1</u>	<u>Type2</u>
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-
9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
<u>0.075 mm</u>	<u>3-8</u>	<u>0-10</u>

- .2      Type 3 fill: selected material from excavation or other sources, approved by Owner's Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.

**PART 3      EXECUTION**

**3.1      SITE PREPARATION**

- .1      Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.

**3.2      PREPARATION/PROTECTION**

- .1      Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2      Keep excavations clean, free of standing water, and loose soil.
- .3      Where soil is subject to significant volume change due to change in moisture content, cover and protect to Owner's Representative's approval.
- .4      Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage. Protect buried services that are required to remain undisturbed.

**3.3 STRIPPING OF TOPSOIL**

- .1 Commence topsoil stripping of areas as indicated by Owner's Representative after area has been cleared of brush, weeds and grasses and removed from site.
- .2 Strip topsoil to depths as indicated by Owner's Representative. Do not mix topsoil with subsoil.
- .3 Stockpile in locations as directed by Owner's Representative. Stockpile height not to exceed 2 m.
- .4 Dispose of unused topsoil as directed by Owner's Representative.

**3.4 STOCKPILING**

- .1 Stockpile fill materials in areas designated by Owner's Representative. Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.

**3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING**

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 30 - Health and Safety Requirements and Occupational Health and Safety Act for the Province of Newfoundland and Labrador.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of water course.
- .3 Construct temporary works to depths, heights and locations as indicated or approved by Owner's Representative.
- .4 During backfill operation:
  - .1 Unless otherwise as indicated or as directed by Owner's Representative remove sheeting and shoring from excavations.
  - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
  - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at an elevation at least 500 mm above toe of sheeting.
- .5 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .6 Upon completion of substructure construction:
  - .1 Remove cofferdams, shoring and bracing.
  - .2 Remove excess materials from site and restore water courses as indicated and as directed by Owner's Representative.

**3.6 DEWATERING AND HEAVE PREVENTION**

- .1 Keep excavations free of water while work is in progress.

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- .2 Submit for Owner's Representative's review details of proposed dewatering or heave prevention methods, such as dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur. Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or any portion of work completed or under construction.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, water courses or drainage areas.

**3.7 EXCAVATION**

- .1 Excavate to lines, grades, elevations and dimensions as indicated by Owner's Representative.
- .2 Remove concrete, masonry, paving, walks, demolished foundations and rubble and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Site Demolition.
- .3 Excavation must not interfere with bearing capacity of adjacent foundations.
- .4 Do not disturb soil within branch spread of trees or shrubs that are to remain. If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .5 For trench excavation, unless otherwise authorized by Owner's Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .6 Keep excavated and stockpiled materials a safe distance away from edge of trench as directed by Owner's Representative.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Notify Owner's Representative when bottom of excavation is reached.
- .12 Obtain Owner's Representative approval of completed excavation.

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- .13 Remove unsuitable material from trench bottom to extent and depth as directed by Owner's Representative.
- .14 Correct unauthorized over-excavation as follows:
  - .1 Fill under bearing surfaces and footings with concrete specified for footings.
  - .2 Fill under other areas with Type 2 fill compacted to not less than 95% of corrected maximum dry density.
- .15 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil. Clean out rock seams and fill with concrete mortar or grout to approval of Owner's Representative.

### **3.8           FILL TYPES AND COMPACTION**

- .1 Use fill of types as indicated or specified below. Compaction densities are percentages of maximum densities obtained from ASTM D698 corrected maximum dry density.
  - .1 Exterior side of perimeter walls: use Type 3 fill to subgrade level. Compact to 95%.
  - .2 Within building area: use Type 2 to underside of base course for floor slabs. Compact to 98%.
  - .3 Under concrete slabs: provide 150 mm compacted thickness base course of Type 1 fill to underside of slab. Compact base course to 100%.
  - .4 Retaining walls: use Type 2 fill to subgrade level on high side for minimum 500 mm from wall and compact to 95%. For remaining portion, use Type 3 fill compacted to 95%.
  - .5 To correct over excavation in trenches: use Type 2 fill to underside of sand bedding compacted to 95%.

### **3.9           BEDDING AND SURROUND OF UNDERGROUND SERVICES**

- .1 Place and compact granular material for bedding and surround of underground services as indicated.
- .2 Place bedding and surround material in unfrozen condition.

### **3.10          BACKFILLING**

- .1 Vibratory compaction equipment: approved by Owner's Representative.
- .2 Do not proceed with backfilling operations until Owner's Representative has inspected and approved installations.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.

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- .5 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfill around installations.
  - .1 Place bedding and surround material as specified elsewhere.
  - .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
  - .3 Place layers simultaneously on both sides of installed work to equalize loading. Difference not to exceed 600 mm.
  - .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures.
    - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure, and approval obtained from Owner's Representative, or
    - .2 If approved by Owner's Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Owner's Representative.

**3.11 RESTORATION**

- .1 Upon completion of work, remove waste materials and debris, trim slopes, and correct defects as directed by Owner's Representative.
- .2 Replace topsoil as indicated by Owner's Representative.
- .3 Reinstate lawns to elevation which existed before excavation.
- .4 Reinstate pavement and sidewalks distributed by excavation to thickness, structure, and elevation which existed before excavation.
- .5 Clean and reinstate areas affected by work as directed by Owner's Representative.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 h.

**END OF SECTION**

**PART 1      GENERAL**

**1.1            RELATED SECTIONS**

- .1      Section 31 05 16 - Aggregate Materials.
- .2      Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .3      Section 32 11 23 - Aggregate Base Courses.

**1.2            REFERENCES**

- .1      American Society for Testing and Materials (ASTM).
  - .1      ASTM C117, Standard Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2      ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
  - .3      ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup>) (600 kN-m/m<sup>3</sup>).
  - .4      ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .5      ASTM D4318, Standard Test Methods for Liquid Unit, Plastic Unit and Plasticity Index of Soils.
- .2      Canadian General Standards Board (CGSB).
  - .1      CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch series.
  - .2      CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.

**PART 2      PRODUCTS**

**2.1            MATERIALS**

- .1      Granular sub-base material to Section 31 05 16 - Aggregate Materials and following requirements:
  - .1      Crushed pit run or screened stone, gravel or sand.
  - .2      Granulations to be within limits specified when tested to ASTM C136 and ASTM C117 - sieve sizes to CAN/CGSB-8.1.

.1      Granulation to:	
<u>Sieve Designation</u>	<u>% Passing (Base Type 2)</u>
100 mm	-
75 mm	-
50 mm	75-100
38.1 mm	-
25 mm	-

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19 mm	-
15.9 mm	45-80
12.5 mm	-
9.5 mm	-
4.75 mm	25-55
2.00 mm	-
1.20 mm	12-35
0.425 mm	-
0.180 mm	-
0.075 mm	3-6

- .3 Other properties as follows:
  - .1 Liquid limit: to ASTM D4318, maximum 25
  - .2 Plasticity index: to ASTM D4318, maximum 6

**PART 3      EXECUTION**

**3.1            PLACING**

- .1 Place granular sub-base after subgrade is inspected and approved by Owner's Representative.
- .2 Construct granular sub-base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .6 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Owner's Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
- .7 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .8 Remove and replace portion of layer in which material has become segregated during spreading.

**3.2            COMPACTION**

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Compact to density of not less than 98% corrected maximum dry density ASTM D698.
- .3 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.



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- .4 Apply water as necessary during compaction to obtain specified density.
- .5 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Owner's Representative.
- .6 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

**3.3 SITE TOLERANCES**

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

**3.4 PROTECTION**

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Owner's Representative.

**END OF SECTION**

**PART 1      GENERAL**

**1.1      RELATED SECTIONS**

- .1      Section 31 05 16 - Aggregate Materials.
- .2      Section 32 11 16.01 - Granular Sub Base.

**1.2      REFERENCES**

- .1      American Society for Testing and Materials (ASTM).
  - .1      ASTM C117, Standard Test Method for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
  - .2      ASTM C136, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
  - .3      ASTM D136, Standard Test Method for Sieve Analysis of Fine and Course Aggregated.
  - .4      ASTM D698, Stand Test Methods for Laboratory Compaction Characteristics of Soil Using standard Effort (12,400 ft-lbf/ft<sup>3</sup>)(600 N m/m<sup>3</sup>).
  - .5      ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup>) (2,700 kN-m/m<sup>3</sup>).
  - .6      ASTTM D 1883, Standard Test Method of CBR (California Bearing Ratio) of Laboratory Compacted Soil.
  - .7      ASTM D4318, Standard Test Methods for Liquid Unit, Plastic Unit and Plasticity Index of Soils.
- .2      Canadian General Standards Board (CGSB)
  - .1      CAN/CGSB-8.1, Sieves, Testing, Woven-Wire, Inch Series.
  - .2      CAN/CGSB-8.2-, Sieves, Testing, Woven Wire, Metric.

**1.3      DELIVERY, STORAGE, AND HANDLING**

- .1      Deliver and stockpile aggregates in accordance with Section 31 05 16 – Aggregate Materials. Stockpile minimum 50% of total aggregate required prior to commencing operation.
- .2      Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

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**PART 2      PRODUCTS**

**2.1      MATERIALS**

.1      Granular base: material to Section 31 05 16- Aggregate Materials and the following requirements:

- .1      Crushed stone or gravel.
- .2      Granulations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CAN/CGSB - 8.1.

.1      Granulation to:

Sieve Designation	% Passing (Base Type 1)
200 mm	-
75 mm	-
50 mm	-
38.1 mm	-
25 mm	-
19 mm	100
15.9 mm	-
12.5 mm	-
9.5 mm	55-80
4.75 mm	35-60
2.00 mm	-
1.20 mm	17-35
0.425 mm	-
0.180 mm	-
0.075 mm	3-6

- .3      .Liquid limit: to ASTM D4318, maximum 25
- .4      Plasticity index: to ASTM D4318 maximum 6
- .5      Los Angeles degranulation: to ASTM C131. Maximum % loss by weight 45.
- .6      Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least 1 (one) freshly fractured face. Materials to be divided into ranges using methods of ASTM C136.

<u>Passing</u>	<u>Retained on</u>
50 mm	to 25 mm
25 mm	to 19 mm
19 mm	to 4.75 mm

- .7      Soaked CBR to ASTMD1833, min 100 when compacted to 100% of ASTM D1557.

**PART 3      EXECUTION**

**3.1      SEQUENCE OF OPERATION**

.1      Place granular base after granular sub base surface is inspected and approved by Owner's Representative.

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- .1 Construct granular base to depth and grade in areas indicated.
  - .2 Ensure no frozen material is placed.
  - .3 Place material only on clean unfrozen surface, free from snow and ice.
  - .4 Place material using methods which do not lead to segregation or degradation of aggregate.
  - .5 Place material to full width in uniform layers not exceeding 150 mm compacted thickness. Owner's Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
  - .6 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
  - .7 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .2 Compaction Equipment
- .1 Compaction equipment to be capable of obtaining required material densities.
- .3 Compacting
- .1 Compact to density not less than 100% corrected maximum dry density ASTM D698
  - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
  - .3 Apply water as necessary during compacting to obtain specified density.
  - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Owner's Representative.
  - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

**3.2 SITE TOLERANCES**

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

**3.3 PROTECTION**

- .1 Maintain finished base in condition conforming to this section until succeeding material is applied or until acceptance by Owner's Representative.

**END OF SECTION**

## **8GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Materials and installation for water mains, hydrants, valves, valve boxes, and valve chambers, including service connections.

### **1.2 RELATED SECTIONS**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 78 00 - Closeout Submittals.
- .3 Section 03 20 00 – Concrete Reinforcing.
- .4 Section 03 30 00 – Cast-in-Place Concrete.
- .5 Section 31 23 33.01 – Excavating, Trenching and Backfilling.

### **1.3 REFERENCES**

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
  - .1 ANSI/AWWA B301, Liquid Chlorine.
  - .2 ANSI/AWWA C104/A21.4, Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
  - .3 ANSI/AWWA C110/A21.10, Ductile-Iron and Gray Iron Fittings, 3 inch through 48 inch (75 mm through 1200 mm), for Water.
  - .4 ANSI/AWWA C111/A21.11, Rubber-Gasket Joints for Ductile-Iron and Gray Iron Pressure Pipe and Fittings.
  - .5 ANSI/AWWA C151/A21.51, Ductile-Iron Pipe, Centrifugally Cast, for Water.
  - .6 ANSI/AWWA C153/A21.53, Ductile-Iron Compact Fittings for Water Service.
  - .7 ANSI/AWWA C500, Metal-Seated Gate Valves for Water Supply Service (Includes Addendum C500a-95).
  - .8 ANSI/AWWA C600, Installation of Ductile-Iron Water Mains, and Their Appurtenances.
  - .9 ANSI/AWWA C651, Disinfecting Water Mains.
- .2 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
  - .2 ASTM C117, Standard Test Method for Material Finer Than 75 [MU] m (No. 200) Sieve in Mineral Aggregates by Washing.

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- .3 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM C478M, Standard Specification for Precast Reinforced Concrete Manhole Sections, Metric.
- .5 ASTM D698, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft (600 kN-m/m<sup>3</sup>)).
- .3 American Water Works Association (AWWA)/Manual of Practice
  - .1 AWWA M17, Installation, Field Testing, and Maintenance of Fire Hydrants.
- .4 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
- .5 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-A257 Series, Standards for Concrete Pipe.
  - .2 CSA A3000, Cementitious Materials Compendium
  - .3 CSA B137 Series, Thermoplastic Pressure Piping Compendium
  - .4 CAN/CSA-G30.18, Billet Steel Bars for Concrete Reinforcement.
  - .5 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

**1.4 SUBMITTALS**

- .1 Submit complete shop drawings and construction schedule for water mains 600 mm diameter and larger. Include method for installation of water main.
- .2 Inform Owner's Representative of proposed source of bedding materials and provide access for sampling at least 4 weeks prior to commencing work.
- .3 Submit manufacturer's test data and certification that pipe materials meet requirements of this section at least 4 weeks prior to beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.
- .4 Pipe certification to be on pipe.

**1.5 CLOSEOUT SUBMITTALS**

- .1 Provide record drawings, including directions for operating valves, list of equipment required to operate valves, details of pipe material, location of air and vacuum release valves, hydrant details, maintenance and operating instructions.
  - .1 Include top of pipe, horizontal location of fittings and type, valves, valve boxes, valve chambers and hydrants.

**1.6 DELIVERY, STORAGE AND HANDLING**

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

**1.7 SCHEDULING OF WORK**

- .1 Schedule Work to minimize interruptions to existing services.
- .2 Submit schedule of expected interruptions to Owner's Representative for approval and adhere to interruption schedule as approved by Owner's Representative.
- .3 Notify Owner's Representative, building occupants, superintendent minimum of two (2) working days in advance of interruption in service.
- .4 Notify fire department of any planned or accidental interruption of water supply to hydrants.
- .5 Advise local police department of anticipated interference with movement of traffic.
- .6 Provide "Out of Service" sign on hydrant not in use.

**PART 2**

**PRODUCTS**

**2.1 PIPE, JOINTS AND FITTINGS**

Crossed Linked Polyethylene Pipe:

To conform to AWWA C904, ASTM F876, F877, F2023, NSF 14 & 61, and CSA B137.5. Pipe to have CTS outer diameter, with operating pressure of 160psi at 23°C / 73.4°F, 100 psi at 82°C / 180°F, and 80 psi at 93°C / 200° F. Pipe to be marked with manufacturing date, and footage every five feet.

**2.2 VALVES AND VALVE BOXES**

- .1 Gate valves: to AWWA C500, Latest Edition, standard iron body, bronze mounted double disc valves with non-rising stems. Suitable for 1 Pa with mechanical joints.
- .2 Valves to open counter clockwise and to be supplied with a square-sided operating nut, 51 mm to the side unless otherwise specified.
- .3 Cast iron valve boxes: bituminous coated screw type adjustable over minimum of 450 mm complete with valve operating extension rod, 30 mm minimum diameter, 25 x 25 mm cross section, of such length that when set on valve operating nut, top of rod will not be more than 150 mm below cover. Top of box to be marked "WATER".

**2.3 PIPE BEDDING AND SURROUND MATERIAL**

- .1 Granular material to: Section 31 05 16 - Aggregate Materials and following requirements:
  - .1 Crushed or screened stone, gravel or sand.
  - .2 Gradations to be within limits specified when tested to ASTM C136, and ASTM C117, Sieve sizes to CAN/CGSB-8.1,
  - .3 Table:

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Sieve Designation	% Passing	
	Stone/Gravel	Gravel/Sand
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	100	-
19 mm	-	-
12.5 mm	65-90	100
9.5 mm	-	-
4.75 mm	35-55	80-100
2.00 mm	-	50- 90
0.425 mm	10-25	10- 50
0.180 mm	-	-
0.075 mm	0- 8	0- 10

- .2 Concrete mixes and materials required for bedding cradles, encasement, supports, thrust blocks: to Section 03 30 00 - Cast-in-Place Concrete. Minimum 28 day strength 25 Mpa.

**2.4 BACKFILL MATERIAL**

- .1 Type 3, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

**2.5 PIPE DISINFECTION**

- .1 Liquid chlorine to ANSI/AWWA B301, to disinfect water mains.
- .2 Undertake disinfection of water mains in accordance with ANSI/AWWA C651,

**2.6 TOOLS AND EQUIPMENT**

- .1 Provide Owner’s Representative with following tools:
  - .1 One tee-handle operating keys for valves.

**PART 3 EXECUTION**

**3.1 PREPARATION**

- .1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation. Carefully inspect materials for defects to approval of Owner’s Representative. Remove defective materials from site as directed by Owner’s Representative.



**3.2 TRENCHING**

- .1 Do trenching work in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling.
- .2 Trench depth to provide cover over pipe of not less than 3.05 m from finished grade or as indicated.
- .3 Trench alignment and depth require Owner's Representative approval prior to placing bedding material and pipe.

**3.3 GRANULAR BEDDING**

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to depth of 150 mm below bottom of pipe.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to at least 95% of corrected maximum density to ASTM D698.
- .6 Fill authorized or unauthorized excavation below design elevation of bottom of specified bedding in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling with (*compacted bedding material, compacted Type 3, fill lean mix concrete*).

**3.4 PIPE INSTALLATION**

- .1 Terminate building water service 1.5 m inside building wall opposite point of connection to main. Install flange adapter and or coupling necessary for connection to building plumbing. If plumbing is already installed, make connection; otherwise cap or seal end of pipe and place temporary marker to locate pipe end.
- .2 Lay pipes to manufacturer's standard instructions and specifications. Do not use blocks except as permitted in 3.3.2.
- .3 Join pipes in accordance with manufacturer's recommendations.
- .4 Handle pipe by methods recommended by pipe manufacturer. Do not use chains or cables passed through pipe bore so that weight of pipe bears on pipe ends.
- .5 Lay pipes on prepared bed, true to line and grade. Ensure barrel of each pipe is in contact with shaped bed throughout its full length. Take up and replace defective pipe. Correct pipe which is not in true alignment or grade or pipe which shows differential settlement after installation greater than 10 mm in 3 m.
- .6 Do not exceed permissible deflection at joints as recommended by pipe manufacturer.

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- .7 Keep jointing materials and installed pipe free of dirt and water and other foreign materials. Whenever work is stopped, install a removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .8 Position and join pipes with equipment and methods approved by Owner's Representative.
- .9 Cut pipes in approved manner as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .10 Align pipes before jointing.
- .11 Install gaskets to manufacturer's recommendations. Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
- .12 Avoid displacing gasket or contaminating with dirt or other foreign material. Gaskets so disturbed or contaminated shall be removed, cleaned, lubricated and replaced before jointing is attempted again.
- .13 Complete each joint before laying next length of pipe.
- .14 Minimize deflection after joint has been made.
- .15 Apply sufficient pressure in making joints to ensure that joint is completed to manufacturer's recommendations.
- .16 Ensure completed joints are restrained by compacting bedding material alongside and over installed pipes or as otherwise approved by Owner's Representative.
- .17 When stoppage of work occurs, block pipes in an approved manner to prevent creep during down time.
- .18 Do not lay pipe on frozen bedding.
- .19 Do hydrostatic and leakage test and have results approved by Owner's Representative before surrounding and covering joints and fittings with granular material.
- .20 Backfill remainder of trench.

### **3.5**

#### **VALVE INSTALLATION**

- .1 Install valves to manufacturer's recommendations at locations as indicated.
- .2 Support valves located in valve boxes or valve chambers by means of concrete blocks, located between valve and solid ground. Valves not to be supported by pipe.

**3.6 THRUST BLOCKS AND RESTRAINED JOINTS**

- .1 Do concrete work in accordance with Section 03 30 00 - Cast-in-Place Concrete.
- .2 Place concrete thrust blocks between valves, tees, plugs, caps, bends, changes in pipe diameter, reducers, hydrants and fittings and undisturbed ground as indicated or as directed by Owner's Representative.
- .3 Keep joints and couplings free of concrete.
- .4 Do not backfill over concrete within 24 hours after placing.
- .5 For restrained joints: only use restrained joints approved by Owner's Representative.

**3.7 HYDROSTATIC AND LEAKAGE TESTING**

- .1 Do tests in accordance with ANSI/AWWA C600.
- .2 Provide labour, equipment and materials required to perform hydrostatic and leakage tests hereinafter described.
- .3 Notify Owner's Representative at least two (2) working days in advance of proposed tests. Perform tests in presence of Owner's Representative.
- .4 Where section of system is provided with concrete thrust blocks, conduct tests at least 5 days after placing concrete or 2 days if high early strength concrete is used.
- .5 Test pipeline in sections not exceeding 365 m in length, unless otherwise authorized by Owner's Representative.
- .6 Upon completion of pipe laying and after Owner's Representative has inspected work in place, surround and cover pipes between joints with approved granular material placed to dimensions indicated.
- .7 Leave valves, joints and fittings exposed.
- .8 When testing is done during freezing weather, protect hydrants, valves, joints and fittings from freezing.
- .9 Strut and brace caps, bends, tees, and valves, to prevent movement when test pressure is applied.
- .10 Open valves.
- .11 Expel air from main by slowly filling main with potable water. Install corporation stops at high points in main where no air-vacuum release valves are installed. Remove stops after satisfactory completion of test and seal holes with plugs.
- .12 Thoroughly examine exposed parts and correct for leakage as necessary.

- .13 Apply hydrostatic test pressure of 1000 kPa based on elevation of lowest point in main and corrected to elevation of test gauge, for period of 1 hour.
- .14 Examine exposed pipe, joints, fittings and appurtenances while system is under pressure.
- .15 Remove joints, fittings and appurtenances found defective and replace with new sound material and make watertight.
- .16 Repeat hydrostatic test until defects have been corrected.
- .17 Define leakage as amount of water supplied from water storage tank in order to maintain test pressure for 2 h.
- .18 Do not exceed allowable leakage of 0.03 L/mm diameter per 300 m of pipe, including lateral connections, per hour.
- .19 Locate and repair defects if leakage is greater than amount specified.
- .20 Repeat test until leakage is within specified allowance for full length of watermain.
- .21 Co-ordinate test procedure with Owner's Representative and provide certification of test acceptance.

### **3.8**

#### **PIPE SURROUND**

- .1 Upon completion of pipe laying and after Owner's Representative has inspected work in place, surround and cover pipes as indicated.
- .2 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated. Do not dump material within 1.00 m of pipe.
- .3 Place layers uniformly and simultaneously on each side of pipe.
- .4 Do not place material in frozen condition.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 95% maximum density to ASTM D698.
- .6 Compact each layer from mid height of pipe to underside of backfill to at least 90 % of corrected maximum density to ASTM D698.

### **3.9**

#### **BACKFILL**

- .1 Place backfill material, above pipe surround, in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .2 Do not place backfill in frozen condition.

- .3 Under footings, parking area and walks, compact backfill to at least 95% maximum density to ASTM D698.

### **3.10 FLUSHING AND DISINFECTING**

- .1 Flushing and disinfecting operations shall be carried out by specialist contractor and witnessed by Owner's Representative. Notify Owner's Representative at least 4 days in advance of proposed date when disinfecting operations will commence.
- .2 Flush water mains through available outlets with a sufficient flow of potable water to produce velocity of 1.5 m/s, within pipe for minimum 10 minutes, or until foreign materials have been removed and flushed and water is clear.
- .3 Flushing flows as follows: 38 L/s minimum.
- .4 Provide connections and pumps for flushing as required.
- .5 Open and close valves, hydrants and service connections to ensure thorough flushing.
- .6 When flushing has been completed to satisfaction of Owner's Representative introduce a strong solution of chlorine as approved by Owner's Representative into watermain and ensure that it is distributed throughout entire system.
- .7 Disinfect water mains.
- .8 Rate of chlorine application to be proportional to rate of water entering pipe.
- .9 Chlorine application to be close to point of filling water main and to occur at same time.
- .10 Operate valves, hydrants and appurtenances while main contains chlorine solution.
- .11 Flush line to remove chlorine solution after 24 hours.
- .12 Measure chlorine residuals at extreme end of pipe-line being tested.
- .13 Perform bacteriological tests on water main, after chlorine solution has been flushed out. Take samples daily for minimum of two days. Should contamination remain or recur during this period, repeat disinfecting procedure. Specialist contractor to submit certified copy of test results.
- .14 Take water samples at hydrants and service connections, in suitable sequence, to test for chlorine residual.
- .15 Co-ordinate flushing disinfection with Owner's Representative.
- .16 Provide certification of test acceptance.

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**3.11 SURFACE RESTORATION**

- .1 After installing and backfilling over water mains, restore surface to original condition as directed by Owner's Representative.

**3.12 QUALITY ASSURANCE**

- .1 Provide copies of all inspections and test results for Commissioning Manuals.

**END OF SECTION**

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Section 33 65 76 – Direct Buried Underground Cable Ducts

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**PART 1**      **GENERAL**

1.1            RELATED SECTIONS

- .1            Section 01 33 00 - Submittal Procedures.
- .2            Section 01 74 21 – Construction/Demolition Waste Management and Disposal.
- .3            Section 26 05 00 – Common Work Results - Electrical.

1.2            REFERENCES

- .1            Canadian Standards Association (CSA)
  - .1            CSA C22.2 No. 211.1, Rigid Types EBI and DB2/ES2 PVC Conduit.
  - .2            CSA C22.2 No. 211.3, Reinforced Thermosetting Resin Conduit RTRC and Fittings (Bi-national standard, with UL 1684).

1.3            SUBMITTALS

- .1            Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada, and Health and Welfare Canada for solvent cement. Indicate VOC content.
- .2            Submit manufacturer's data and certification at least 2 weeks prior to commencing work.
- .3            Submit manufacturer's information data sheets and instructions.

1.4            DELIVERY, STORAGE AND HANDLING

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

1.5            RECORD DRAWINGS

- .1            Provide record drawings, including details of pipe and cable duct materials, maintenance and operating instructions.

**PART 2**      **PRODUCTS**

2.1            PVC DUCTS AND FITTINGS

- .1            Rigid PVC duct: to CSA C22.2 No. 211.1, type rigid PVC for direct burial with minimum wall thickness at any point of 2.8 mm. Nominal length: 3.0 m plus or minus 12 mm. Type DB2 (thinwall) PVC conduits unacceptable.
- .2            Rigid PVC split ducts as required.

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- .3 Rigid PVC bends, couplings, reducers, bell end fittings, plugs, caps, adaptors same product material as duct, to make complete installation.
- .4 Rigid PVC 90° and 45° bends as required.
- .5 Rigid PVC 5° angle couplings as required.
- .6 Expansion joints as required.
- .7 Preformed, interlocking intermediate duct spacers for duct size as indicated.

2.2 SOLVENT WELD COMPOUND

- .1 Solvent cement for PVC duct joints.

2.3 CABLE PULLING EQUIPMENT

- .1 Use 6 mm stranded nylon pull rope tensile strength 5 kN.

2.4 MARKERS

- .1 150 mm wide, 4 mil, polyethylene marker tape in all trenches. Use red colored tape. Install at depth as per drawings.

**PART 3**      **EXECUTION**

3.1 INSTALLATION

- .1 Install duct in accordance with manufacturer's instructions.
- .2 Clean inside of ducts before laying.
- .3 Ensure full, even support every 1.5 m throughout duct length.
- .4 Slope ducts with 1 to 400 minimum slope.
- .5 During construction, cap ends of ducts to prevent entrance of foreign materials.
- .6 Pull through each duct wooden mandrel not less than 300 mm long and of diameter 6 mm less than internal diameter of duct, followed by stiff bristle brush to remove sand, earth and other foreign matter. Pull stiff bristle brush through each duct immediately before pulling-in cables.
- .7 In each duct install pull rope continuous throughout each duct run with 3 m spare rope at each end.
- .8 Install markers as required.