

**Electrical Modifications
Sir Humphrey Gilbert
St. John's, NL
F6839-210677**

ISSUED FOR TENDER

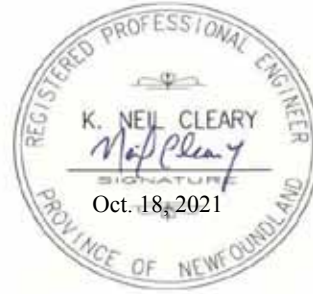
DATE

October 18, 2021


MECHANICAL PERMIT

	PROVINCE OF NEWFOUNDLAND PERMIT HOLDER Class "A" This Permit Allows
	CROSBIE ENGINEERING LIMITED
<hr/>	
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>2021</u> .	

MECHANICAL STAMP



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ELECTRICAL STAMP



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CIVIL

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MECHANICAL

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ELECTRICAL

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Section 01 11 00 – Summary of Works

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PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 Electrical Modifications Sir Humphrey Gilbert, St. John's, NL.
- .2 Contractor use of premises.
- .3 Departmental Representative occupancy.

1.2 **WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises of electrical services for the supply, installation and commissioning of Electrical Equipment, Sir Humphrey Gilbert Building, St. John's, NL.
- .2 COVID 19
 - .1 Due to the COVID-19 pandemic all provincial safety and personal guidelines must be adhered to.
- .3 Dust Control Procedures: provide and maintain Dust Control Barriers as required to carry out the work in locations designed and in accordance with Section 01 35 99 – Dust Control Procedures. All core drilling inside building to be completed by qualified contractor and completed in accordance with the above specification section.
- .4 The Contractor must attain permits and approved by the Authorities Having Jurisdiction (AHJs) - Municipal/Service NL.
- .5 Work includes but not limited to:
 - .1 Supply and installation of new wiring, conduit, panels, transformers, etc. as indicated. Conduit to be color matched in areas as indicated.
 - .2 Supply and installation of new junction boxes, circuit breakers and disconnects as indicated.
 - .3 Supply and installation of new Lightning Protection system as indicated. System to be installed as per Manufacturer's installation instructions. Commissioning to be provided by Manufacturer's representative and letter provided indicating system is fully commissioned and in working order. 3" steel hot dipped galvanized steel u-guard including brackets to be color matched with exterior of building.
 - .4 The emergency generator and automatic transfer switch will be supplied, installed and commissioned by Departmental Representative. This contractor to run wiring and conduit only. All terminations to the generator and ATS will be done by Departmental Representative.
 - .5 Waveguide entry port to be installed in Penthouse Storage Room, exact location to be coordinated with Departmental Representative. Waveguide entry port to be supplied by CCG.

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- .6 Supply and installation of new split system, outdoor unit to be wall mounted, indoor unit to be ceiling cassette type located in Penthouse equipment room.
- .7 The new radar equipment located in Penthouse equipment rooms will be supplied and installed by Departmental Representative. Equipment to include TX#1, TX#2, UPS, equipment racks, radar antenna, platform, etc.
- .8 All trenching and concrete work for new generator pad, grounding and lightning protection system as indicated.
- .9 Contractor to provide all cutting, patching and painting to match existing. Coordinate on site.
- .10 All other work indicated in this specification and on drawings.

1.3 CONTRACTOR USE OF PREMISES

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

1.4 DEPARTMENTAL REPRESENTATIVE OCCUPANCY

- .1 Departmental Representative will occupy premises during entire construction period for execution of normal operations.
- .2 Cooperate with Departmental Representative in scheduling operations to minimize conflict and to facilitate Departmental Representative usage.

1.5 RELATED WORK

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

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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)

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 Departmental'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 Departmental's Representative 72 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions to a 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 **SUMMARY**

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

1.2 **RELATED SECTIONS**

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

1.3 **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 Departmental Representative that are not required in order to meet other Project requirements but may offer advantage to General Contractor or Departmental Representative. No substitutions for convenience are permitted.

1.4 **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 Departmental Representative 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.
 - .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 Departmental's Representative Action: If necessary, Departmental's Representative will request additional information or documentation for evaluation within five (5) working days of receipt of a request for substitution. Departmental'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 Departmental's Representative Supplemental Instructions for minor changes in the Work.
 - .2 Use product specified if Departmental's Representative does not issue a decision on use of a proposed substitution within time allocated.

1.5 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.

1.6 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: Departmental's representative will consider General Contractor's request for substitution when the following conditions are satisfied. If the following conditions are not satisfied, Departmental'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)**

Equal or Substitute Product Request Form

Request Phase Pre-Tender ☐ Post Tender ☐
 (If Pre-tender only) Current Tender Due Date: _____ Request No.: _____ Dated: _____
 Project No.: _____ Contract No.: _____
 Project Name/Location: _____

References:	Specification(s):	Section(s): _____	Paragraph(s): _____
	Drawing(s):	Drawing(s) No.(s): _____	Detail(s) No.(s): _____
Contractually		Specified	Product: _____
Contractor		Proposed	Product: _____
Proposed Product is: Equal: <input type="checkbox"/> Substitute: <input type="checkbox"/>			

*See attached data for **both** specified and proposed products as required by Section 01 61 00.*

Data attached: Drawings: ☐ Product Data: ☐ Reports: ☐ Samples: ☐
 Tests: ☐ Other: _____

Reason(s) for not providing the Specified Product:

Similar Installation:	
Project:	Architect:
Address:	Owner:
	Date Installed:

Post-Tender:

Will proposed substitution impact other parts of the Work? No ☐ Yes ☐

If yes attach explanation by

Will proposed substitution increase Contract Time? No ☐ Yes ☐
number of Days. _____

Actual Dollar Savings if substitution is accepted: \$ _____

The undersigned Certifies that the proposed Request for an Equal or Substitute conforms to all of the requirements of Division 01 General Requirements, Section 01 25 00 Substitution Procedures.

Request Submitted By General Contractor:

(Firm's Name)

Equal or Substitute Product Request Form

By: _____
(Print Name) (Title) (Signature) (Date)

Departmental's Representative Review – This Substitution Request is:

Request Received on (Date): _____

- ☐ **Approved:** *(Submittals in accordance with Div. 01 General Requirements, Section 01 33 00 Submittal Procedures.)*
- ☐ **Approved as Noted:** *(Submittals in accordance with Div. 01 General Requirements, Section 01 33 00 Submittal Procedures.)*
- ☐ **Rejected:**

Use Specified Materials.

- ☐ **Rejected:**

Request Not Received Within Specified Time Period – Use Specified Materials.

Reviewed issue By:

(Print Name) (Signature) (Date)

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Section 01 31 00 - Project Management and Coordination

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PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

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

1.2 **RELATED SECTIONS**

- .1 Section 01 11 00 - Summary of Work.

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 Departmental Representative.

1.4 **PROJECT MEETINGS**

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

1.5 **CONSTRUCTION ORGANIZATION AND START-UP**

- .1 Within 10 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 Delivery schedule of specified equipment in accordance with Section 01 32 00 - Construction Progress Documentation.
 - .5 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.

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- .6 Record drawings in accordance with Section 01 78 00 - Closeout Submittals.
- .7 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.
- .8 Take-over procedures, acceptance, and warranties in accordance with Section 01 77 00 - Closeout Procedures and 01 78 00 - Closeout Submittals.
- .9 Monthly progress claims, administrative procedures, photographs, and holdbacks.
- .10 Appointment of inspection and testing agencies or firms in accordance with Section 01 45 00 - Quality Control.
- .4 Comply with Departmental Representative's allocation of mobilization areas of site; for field offices, for access, traffic, and parking facilities.
- .5 During construction coordinate use of site and facilities through Departmental Representative's procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.

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 Departmental Representative coordinated with Departmental Representative's project schedule. Schedule to show anticipated progress stages and final completion of work within time period required by contract documents.
- .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 Departmental Representative.

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1.8 SUBMITTALS

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

1.9 COORDINATION DRAWINGS

- .1 Provide information required by Departmental Representative for preparation of coordination drawings.
- .2 Review and approve revised drawings for submittal to Departmental Representative.
- .3 Departmental Representative may furnish additional drawings for clarification. These additional drawings have same meaning and intent as if they were included with plans referred to in contract documents.

1.10 CLOSEOUT PROCEDURES

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

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PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

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Section 01 32 00 - Construction Progress Documentation

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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 Product Delivery Schedule.
 - .4 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 10 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 Departmental Representative.
- .4 Departmental Representative will review schedule and return review copy within 10 days after receipt.
- .5 Resubmit finalized schedule within 7 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 10 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 all major elements of construction.
 - .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 and product data.
 - .2 Indicate dates for submitting, review time, resubmission time, last date for meeting fabrication schedule.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

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Section 01 33 00 – Submittal Procedures

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PART 1 **GENERAL**

1.1 SECTIONS INCLUDE

- .1 Shop drawings and product data.

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 Departmental 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 Departmental 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 Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.
- .6 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work is coordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental 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 Departmental Representative review of submission, unless Departmental Representative gives written acceptance of specific deviations.
- .10 Make any changes in submissions which Departmental Representative may require consistent with Contract Documents and resubmit as directed by Departmental Representative. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .11 Notify Departmental Representative, in writing, when resubmitting, of any revisions other than those requested by Departmental 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 10 days for Departmental Representative review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change contract price. If adjustments affect value of Work, state such in writing to Departmental Representative 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 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .7 Submissions shall include:

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- .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.
- .8 After Departmental Representative review, distribute copies.
- .9 Submit 3 prints plus one electronic copy in PDF format of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .10 Submit electronic copy in PDF format of product data sheets or brochures for requirements requested in Specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .11 Delete information not applicable to project.
- .12 Supplement standard information to provide details applicable to project.
- .13 Cross-reference product data information to applicable portions of Contract Documents.
- .14 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of work may proceed. If shop drawings are rejected, noted copy will be

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returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of work may proceed.

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 Departmental Representative is for the sole purpose of ascertaining conformance with the general concept. This review shall not mean that Departmental 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.

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

END OF SECTION

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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 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.

1.3 **SUBMITTALS**

- .1 At least 10 (ten) working days prior to commencing any site work: submit to Departmental Representative copies of:
 - .1 A complete Site Specific Health and Safety Plan.

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- .2 Acceptance of the Site Specific Health and Safety Plan and other submitted documents by the Departmental Representative shall only be viewed as acknowledgement that the contractor has submitted the required documentation under this specification section.
- .3 Departmental 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 Departmental 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).
- .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 Departmental Representative.
- .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 workplan 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, and
 - .5 A personal protected equipment (PPE) Program which shall detail PPE:
 - .1 Selection criteria based on site hazards.

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- .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 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.
- .9 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.
- .10 A health and safety training program which includes a safety training matrix.
- .11 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 Departmental 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

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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.
- .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.
- .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 First Aid Regulations.

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1.6 CONTRACTORS SAFETY OFFICER

- .1 The contractor shall employ a Contractor's Safety Officer (CSO) who shall have as a minimum:
 - .1 Completed training in hazardous materials management and response/protocols.
 - .2 Completed training in the use, maintenance of fall protection systems certified by WHSCC at a minimum.
 - .3 Completed training in the erection and inspection of scaffolding.
 - .4 Completed training in confined space entry protocols, techniques and rescue plans, certified by WHSCC at a minimum.
 - .5 Completed supervisory training.
 - .6 Completed training in records and statistics.
 - .7 Completed training in hazard identification, inspections, analysis and control.
 - .8 Completed training in WHMIS.
 - .9 Completed training in health and safety program content.
 - .10 Completed training in investigations and reporting.
 - .11 Completed training in occupational health/hygiene.
 - .12 Completed training in employee training and communication.
 - .13 Completed training in Emergency Preparedness and First Aid.
 - .14 A working knowledge of occupational safety and health legislation and regulations (specific to Newfoundland and Labrador).
 - .15 A working knowledge of safe work practices required for execution of the work and operation of equipment specific to the project.
 - .16 A working knowledge of site safety and house keeping.
 - .17 A working knowledge of preventative maintenance program for Construction Site Equipment.
- .2 The CSO shall:
 - .1 Be responsible for 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.
 - .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 Departmental 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

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- .5 Maintain a daily log of inspections, meetings, infractions and mitigating measures. Log is to be filed daily and copied to be the site superintendent and Departmental 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.

1.8 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 life 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 Departmental 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.
 - .3 Limitations, use, maintenance and disinfection-decontamination of personal protective equipment associated with completing work.

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

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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 Departmental Representative.

1.13 HEALTH AND SAFETY MONITORING

- .1 Periodic inspections of the contractor's work may be carried out by the Departmental 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 Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop work if non-compliance of health and safety regulations is not corrected.

1.16 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.
- .2 Deliver copies of relevant Material Safety Data Sheets (MSDS) to job site and the Departmental 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.

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- .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.
- .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 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.
- .3 Conduct and document daily inspections of scaffolding by trained and certified Competent Scaffold Inspectors or Erectors.
- .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.

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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.
- .3 Prior to working at height workers shall be instructed in a Contractor SWP for working at height and associated rescue plan for working at height developed specific to the work, 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.
- .3 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.
- .4 Provide workers and up to five (5) visitors to the site with CSA approved hard hats meeting the CSA Z94.1.
- .5 Provide high visibility apparel as defined in Occupational Health and Safety Regulations.
- .6 Provide CSA approved safety boots meeting CSA Z195.
- .7 Provide other personal protective equipment, as may be required by the Departmental Representative, 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.

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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 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 HAZARDOUS MATERIALS

- .1 Should material resembling hazardous materials (e.g. asbestos/mould) not previously identified/documented be encountered during the execution of work and notify Departmental Representative. Do not proceed until written instructions have been received from Departmental 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.

1.25 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 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

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PART 1 **GENERAL**

1.1 **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.

1.2 **NOTIFICATION**

- .1 Departmental 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 Departmental Representative of proposed corrective action and take such action as approved by Departmental Representative.
- .2 Departmental 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.

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

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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 Departmental's Representative for review if hot work is required in an occupied building.

1.2 **RELATED WORK**

- .1 Division 01 – General Requirements.

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.

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PART 2 PRODUCTS NOT APPLICABLE TO THIS SECTION

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 Departmental'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 Departmental'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 Departmental'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.

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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.
 - .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.

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- .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 Departmental'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.
 - .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.

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- .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

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Section 01 41 00 – Regulatory Requirements

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PART 1 **GENERAL**

1.1 **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.

1.2 **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 Departmental Representative. Do not proceed until written instructions have been received from Departmental 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 Departmental Representative. Do not proceed until written instructions have been received from Departmental Representative.

1.3 **BUILDING SMOKING ENVIRONMENT**

- .1 Comply with smoking restrictions.

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

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 American National Standards Institute (ANSI).
 - .2 Canada Labour Code.
 - .3 Electrical and Electronic Manufacturers' Association of Canada (EEMAC).
 - .4 Environment Canada (EC).
 - .5 Health Canada - Workplace Hazardous Materials Information System (WHMIS).
 - .6 Institute of Electrical and Electronics Engineers (IEEE).
 - .7 International Standards Organization (ISO).
 - .8 Insulated Cable Engineers Association, Inc. (ICEA)
 - .9 National Building Code of Canada (NBC).
 - .10 National Electrical Manufacturers Association (NEMA).

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- .11 National Research Council Canada (NRC).
- .12 Newfoundland Occupational Health and Safety Act.
- .13 Province of Newfoundland and Labrador Building Accessibility Regulations.
- .14 Telecommunications Distribution Methods Manual (TDMM).
- .15 Telecommunications Industries Association (TIA).
- .16 Underwriters' Laboratories Inc. (UL).
- .17 Underwriter's Laboratories of Canada (ULC).
- .18 Canadian Electrical Code (Latest Edition).

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

END OF SECTION

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Section 01 45 00 – Quality Control

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PART 1 **GENERAL**

1.1 **SECTIONS INCLUDE**

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Mock-ups.
- .3 Equipment and system adjust and balance.

1.2 **RELATED SECTIONS**

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

1.3 **INSPECTION**

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative's 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 Departmental 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, Departmental Representative shall pay cost of examination and replacement.

1.4 **ACCESS TO WORK**

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

1.5 **PROCEDURES**

- .1 Notify appropriate agency and Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.

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- .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.

1.6 REJECTED WORK

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

1.7 REPORTS

- .1 Submit 3 copies of inspection and test reports to Departmental 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 Operation and Maintenance Manuals.

1.8 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 Departmental Representative as specified in specific Section.
- .3 Prepare mock-ups for Departmental 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 Departmental Representative

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- .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.

1.9 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment reports for all new electrical and other building equipment systems installed under this contract.
- .2 Electrical – Coordinate with electrical division.

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

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Section 01 56 00 Temporary Barriers and Enclosures

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PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

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

1.2 **INSTALLATION AND REMOVAL**

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

1.3 **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.

1.4 **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.

1.5 **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.

1.6 **FIRE ROUTES**

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

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Section 01 56 00 Temporary Barriers and Enclosures

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1.7 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.

1.8 PROTECTION OF BUILDING FINISHES

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

PART 2 PRODUCTS (NOT APPLICABLE)

PART 3 EXECUTION (NOT APPLICABLE)

END OF SECTION

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Section 01 61 00 – Common Product Requirements

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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 Departmental Representative based upon requirements of Contract Documents.
- .4 Within 7 (seven) days of written request by Departmental 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,

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

1.6 **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 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .5 Touch-up damaged factory finished surfaces to Departmental Representative satisfaction. Use touch-up materials to match original. Do not paint over name plates.

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.

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

1.9 **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 Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.10 **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 all new conduits and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.12 **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 ELECTRICAL DEVICES**

- .1 Consider location of electrical devices indicated as approximate.

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- .2 Inform Departmental Representative of conflicting installation. Install as directed.
- .3 Submit field drawings to indicate relative position of various services and equipment when required by Departmental 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 Departmental 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.
- .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 Departmental 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.

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- .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 Departmental 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 Departmental 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 Departmental 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.
- .3 Departmental 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 Departmental 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 **Prior to Tender** closing bidders may propose addition of other manufacturer’s names to those listed in the tender documents providing requests are made in writing at least 7

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days prior to tender closing date or bid depository where bid depository is used. Departmental Representative will inform all prospective bidders of decision by addendum, issued at least 5 days prior to the tender closing date.

Where no manufacturer's names are listed, the onus is on contractor to provide material and equipment to meet performance specification.

- .2 **After Contract award** substitutions of material or equipment, other than as selected by Contractor from those specified, will be considered by Departmental Representative only if:
 - .1 material or equipment selected from those specified are not available
 - .2 delivery date of material or equipment selected from those specified would unduly delay completion of the Contract; or
 - .3 alternative material or equipment to those specified, provided they are determined by the Departmental Representative to be equivalent to or better than those specified, will result in a credit to the Contract amount.
- .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 Departmental Representative and the Contract amount will be reduced accordingly.

PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

END OF SECTION

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Section 01 71 00 – Examination and Preparation

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PART 1 **GENERAL**

1.1 **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 Departmental Representative of findings.

1.2 **LOCATION OF EQUIPMENT AND FIXTURES**

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

1.3 **RECORDS**

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

1.4 **SUBMITTALS**

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

1.5 **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 Departmental 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 Departmental Representative 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 Departmental Representative 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 Departmental 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 any new 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, conduit, and other penetrations through surfaces.
- .11 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material.
- .12 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest intersection; for an assembly, refinish entire unit.
- .13 Conceal all new conduits 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.

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

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.

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 Departmental Representative 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 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .4 Provide on-site containers for collection of waste materials and debris.
- .5 Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.
- .6 Store volatile waste in covered metal containers and remove from premises at end of each working day.
- .7 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

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 Departmental Representative or other Contractors.
- .5 Remove waste materials from the site at regularly scheduled times or dispose of as directed by the Departmental Representative. Do not burn waste materials on site.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 Leave the work broom clean before the inspection process commences.
- .8 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

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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Section 01 74 21 – Construction/Demolition Waste Management and Disposal Page 1 of 4

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 Departmental 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 Departmental Representative and consistent with applicable fire regulations.

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- .1 Mark containers or stockpile areas.
- .2 Provide instruction on disposal practices.
- .2 On-site sale or distribution of salvaged materials to third parties is not permitted.

END OF SECTION

PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 01 74 11 - Cleaning.
- .2 Section 01 78 00 - Closeout Submittals.

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 Departmental Representative in writing of satisfactory completion of the Contractor's Inspection and that corrections have been made. Request an Departmental Representative's Consultant's Inspection.
- .2 Departmental Representative's Inspection: Departmental 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 Operation of systems have been demonstrated to Departmental personnel.
 - .5 Work is complete and ready for Final Inspection.
- .4 Final Inspection: When items noted above are completed, request final inspection of Work by the Departmental Representative, and the Contractor. If Work is deemed incomplete by the Departmental Representative, complete outstanding items and request a reinspection.
- .5 Declaration of Substantial Performance: When the Departmental 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.
- .6 Commencement of Lien and Warranty Periods: The date of 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 Departmental Representative considers final deficiencies and defects have been corrected and it appears requirements of the

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Section 01 77 00 – Closeout Procedures

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Contract have been totally performed, make application for certificate of Total Performance. 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 Departmental Representative due to failure of work to comply with Contractor's claims for inspection, Departmental Representative 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

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PART 1 **GENERAL**

1.1 **SECTION INCLUDES**

- .1 As-built 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.

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.

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 Departmental 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 Departmental 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.
- .10 Organize data in the form of an instructional manual.
- .11 The contractor shall compile O&M manuals for every piece of equipment and building operating or electrical system being commissioned and as required by the project specifications with the following format:
 - .1 **Binder:** Must be in a “D” Ring binder no larger than 2” and no more than 2/3 full. The binder must be labeled on the front cover and on the binder edge with the following information: “Building Name”, “Address”, “Project Name”, “Project Number”, “Completed Date” i.e. October 2009, and “Submitted By”. Dividers with permanently marked tabs shall separate each section and sub section. Tab labels shall not be hand written. Four copies are required. An electronic format that is compatible with the Departmental system is required.
 - .2 **Title Page :** O&M manual for building name, address, date
 - .3 **Project Information:** building name, address, date, principal contractor’s information: name, address & phone numbers, consultant: name, address & phone numbers. If the binder is one of many for the project, the volume must be noted i.e. Volume 1 of 3
 - .4 **Table of Contents:** Table of contents of first binder to include all sections in all binders (volumes). Each binder shall contain a table of contents for that binder’s. Sections are to be as follows;
 - .5 **A -** Signed Letter of warranty’ for each piece of equipment carrying a warranty. General contractor to provide a “letter of Warranty” to cover workmanship as defined in the specification. Warranties to be: dated, identify project by name, project number, location as well as warranty period. Any extended warranty of equipment only must be identified also.
 - .6 **B -** Contact information for all sub-contractors & suppliers.
 - .7 **C -** Reports: copy of all TAB reports, pre-functional tests, startup reports, functional test reports, completed performance verification forms, cabling verifications, ESA (Electronic Systems Associate) certification, pressure vessel certification, fire alarm certifications and all other required certifications required by National Building Code or Provincial Regulations. Reports to be organized together by piece of equipment i.e. TAB, pre-functional, start-up etc to be together for a specific piece of equipment
 - .8 **D –** As built drawings
 - .9 **E -** Sequence of operation: outline how the system is designed to work.
 - .10 **F, G, H ... –** Tab for each piece of new equipment to include:
 - .11 Copy of approved shop drawing – all drawings must note which model has been installed if several are shown on one sheet

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- .12 Copy of Specific Service and Maintenance manual for each.
- .13 **Last Tab :** misc.

1.4 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 date of submission; names,
 - .2 addresses, and telephone numbers of Consultant and Contractor with name of responsible parties;
 - .3 schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to 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.

1.5 AS-BUILTS

- .1 In addition to requirements in General Conditions, maintain at the site for Departmental 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 and product data.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents 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.

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- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents available for inspection by Departmental Representative.

1.6 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of blue line opaque drawings, provided by Departmental 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.
 - .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 or alternatively transfer to CAD files in DWG format. Submit DWG files, also with electronic files in PDF format as part of the Closeout Submittals.

1.7 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.

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- .2 Panel board circuit directories: Provide new if circuits are altered.
- .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.
- .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 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .9 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .10 Additional requirements: As specified in individual specification sections.

1.8 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.

1.9 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.

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

1.10 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.
- .4 Receive and catalogue all items. Submit inventory listing to Departmental Representative. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.11 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 Departmental Representative. Include approved listings in Maintenance Manual.

1.12 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 Departmental Representative.

1.13 WARRANTIES AND BONDS

- .1 Provide copy of all warranties in Operation and Maintenance Manuals.

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PART 2 **PRODUCTS (NOT APPLICABLE)**

PART 3 **EXECUTION (NOT APPLICABLE)**

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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 **SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .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 Section 01 33 00 - Submittal Procedures: 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 Section 01 78 00 - Closeout Submittals.
 - .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.

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- .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.
 - .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 one (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 reproduces, revising reproduces 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

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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.

1.3 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.4 MAINTENANCE

- .1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:
 - .1 One casing joint gasket for each size pump.
 - .2 One head gasket set for each heat exchanger.
 - .3 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.5 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 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

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

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PART 3 **EXECUTION**

3.1 **PAINTING, REPAIRS AND RESTORATION**

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

3.2 **CLEANING**

- .1 Clean interior and exterior of all systems including strainers. Protect open ends of ducts, diffusers, grilles and registers during construction to prevent ingress of dust and dirt into interior of ducts. If dust or dirt is detected prior to startup, vacuum interior of all ducts and air handling units. Prior to vacuuming use video camera to record condition of ductwork. Also use video camera to record condition of ducts after cleaning.

3.3 **FIELD QUALITY CONTROL**

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.
 - .1 Submit tests as specified in other sections of this specification.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.4 **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.

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- .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

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Section 23 07 19 - HVAC Piping Insulation

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PART 1 **GENERAL**

1.1 **SUMMARY**

- .1 Section Includes:
 - .1 Thermal insulation for piping and piping accessories in commercial type applications.

1.2 **RELATED SECTIONS**

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

1.3 **REFERENCES**

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1, Energy Efficient Design of New Buildings Except Low-Rise Residential Buildings (Including all Addenda).
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM B209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.
 - .2 ASTM C335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C449/C449M, Standard Specification for Mineral Fibre-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C533 Standard specification for Calcium Silicate Insulation Block and Pipe.
 - .6 ASTM C547 Standard Specification for Mineral Fibre Pipe Insulation.
 - .7 ASTM C795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .8 ASTM C921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
 - .9 ASTM D1784, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

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- .2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts
- .4 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), c. 37.
 - .2 Canadian Environmental Protection Act, (CEPA), c. 33.
 - .3 Transportation of Dangerous Goods Act (TDGA), c. 34.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets.
- .6 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
- .8 National Energy Code of Canada for Buildings (NECB).

1.4 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as defined herein.
- .2 TIAC ss:
 - .1 CRF: Commercial Rectangular Finish
 - .2 CPF: Commercial Piping Finish.

1.5 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Safety Data Sheets (SDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Shop Drawings:

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- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix label beneath sample indicating service.
- .5 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions to Owner.

1.6 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: certified in performing work of this Section and qualified to standards of TIAC.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to site in original factory packaging, labeled with manufacturer's name, address.
- .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.
 - .3 Store at temperatures and conditions required by manufacturer.
- .3 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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- .2 Place excess or unused insulation and insulation accessory materials in designated containers.
- .3 Divert unused metal materials from landfill to metal recycling facility approved by Owner.
- .4 Dispose of unused adhesive material at official hazardous material collections site approved by Owner.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.

2.2 INSULATION

- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 °C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code A-6: Flexible unicellular tubular elastomer.
 - .1 Insulation: with vapour retarder jacket to ASTM C534.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: 0.039 W/m – °C.
 - .4 To be certified by manufacturer to be free of potential stress corrosion cracking corrodants
 - .5 Flame spread index less than 25, and smoke developed index less than 50.

2.3 INSULATION SECUREMENT

- .1 Tape: Self-adhesive, aluminum, plain reinforced, 50 mm wide minimum.
- .2 Contact adhesive: Quick setting.
- .3 Canvas adhesive: Washable.
- .4 Tie wire: 1.5 mm diameter stainless steel.
- .5 Bands: Stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

- .1 Thermal insulating and finishing cement:

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- .1 Hydraulic setting or air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

- .1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 OUTDOOR VAPOUR RETARDER FINISH

- .1 Vinyl emulsion type acrylic, compatible with insulation.
- .2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².

2.8 JACKETS

- .1 Polyvinyl Chloride (PVC):
 - .1 One-piece moulded type and sheet to ASTM D1784 with pre-formed shapes as required.
 - .2 Colours: to match adjacent finish paint. Confirm colour with Owner.
 - .3 Minimum service temperatures: -20°C.
 - .4 Maximum service temperature: 65°C.
 - .5 Moisture vapour transmission: 0.02 perm.
 - .6 Thickness: 0.55 mm.
 - .7 Fastenings:
 - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
 - .2 Tacks.
 - .3 Pressure sensitive vinyl tape of matching colour.
 - .8 Special requirements:
 - .1 Indoor: flame spread rating 25, smoke developed rating 50.
 - .2 Outdoor: UV rated material at least 0.5 mm thick.
- .2 Canvas:
 - .1 220gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
 - .2 Lagging adhesive: Compatible with insulation.
- .3 Aluminum:
 - .1 To ASTM B209.
 - .2 Thickness: 0.50 mm sheet.
 - .3 Finish: Embossed or corrugated.

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- .4 Joining: Longitudinal and circumferential slip joints with 50 mm laps.
- .5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
- .6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.
- .4 Stainless steel:
 - .1 Type: 304 or type 316.
 - .2 Thickness: 0.25 mm.
 - .3 Finish: Smooth.
 - .4 Joining: Longitudinal and circumferential slip joints with 50 mm laps.
 - .5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

2.9 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS

- .1 Caulking.

PART 3 EXECUTION

3.1 MANUFACTURE'S INSTRUCTIONS

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

3.2 PRE- INSTALLATION REQUIREMENT

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
- .2 Surfaces to be clean, dry, free from foreign material.

3.3 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturers instructions and this specification.
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.

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- .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 INSTALLATION OF ELASTOMERIC INSULATION

- .1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

3.5 PIPING INSULATION SCHEDULES

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified. Insulate vent pipes 3.0 m from roof penetration.
- .2 TIAC Code: A-6.
 - .1 Insulation securements: as per manufacturer's recommendation.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code: 1501-CA.
- .3 Thickness of insulation to be as listed in following table.
 - .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
 - .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp °C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
	<i>Run out</i>			<i>to 1</i>	<i>1 1/4 to 2</i>	<i>2 1/2 to 4</i>	<i>5 to 6</i>	<i>8 & over</i>
Refrigerant hot gas, liquid, suction	4-13	A-6	25	25	25	25	25	25
Refrigerant hot gas, liquid, suction	below 4	A-6	25	25	25	25	25	25

- .4 Finishes:
 - .1 Exposed indoors: PVC jacket.
 - .2 Exposed in mechanical rooms: PVC jacket.
 - .3 Concealed, indoors: canvas on valves, fittings. No further finish.

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- .4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
- .5 Outdoors: Water-proof Aluminium, or SS jacket.
- .6 Finish attachments: SS screws or bands, at 150 mm oc. Seals: wing or closed.
- .7 Installation: To appropriate TIAC code CPF/1 through CPF/5.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 00 – Cleaning.
- .2 Upon 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 **SUMMARY**

- .1 Section Includes:
 - .1 Materials and installation for copper tubing and fittings for refrigerant.

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.
- .4 Section 01 78 00 - Closeout Submittals.

1.3 **REFERENCES**

- .1 American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.22, Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings.
 - .2 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, and Threaded Rod 60,000 PSI Tensile Strength.
 - .3 ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
 - .4 ASME B31.5, Refrigeration Piping and Heat Transfer Components.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM B 280, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- .3 Canadian Standards Association (CSA)
 - .1 CSA B52, Mechanical Refrigeration Code.
- .4 Environment Canada (EC)
 - .1 EPS1/RA/1, Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.
- .5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Safety Data Sheets (SDS).

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- .6 Province of Newfoundland and Labrador Boiler, Pressure Vessel and Compressed Gas Regulations

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .4 Instructions: submit manufacturer's installation instructions.
- .5 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 QUALITY ASSURANCE

- .1 Pre-Installation Meeting:
 - .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 29.06 - Health and Safety Requirements.
- .3 Trades people to be journeyperson and graduate from a recognized college refrigeration trade program.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

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- .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 (WMP).
- .4 Separate for reuse and recycling and place in designated containers, steel, metal, plastic waste in accordance with Waste Management Plan (WMP).
- .5 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.

PART 2 PRODUCTS

2.1 TUBING

- .1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.
 - .1 Hard copper: to ASTM B280, type ACR B (nitrogenized).
 - .2 Annealed copper: to ASTM B280, with minimum wall thickness as per CSA B52 and ASME B31.5.

2.2 FITTINGS

- .1 Service: design pressure 2070 kPa and temperature 121° C.
- .2 Brazed:
 - .1 Fittings: wrought copper to ASME B16.22.
 - .2 Joints: silver solder, 45% Ag - 80% Cu - 5% P and non-corrosive flux for copper to steel or brass; Silfoss-15 for copper to copper.
- .3 Flanged:
 - .1 Bronze or brass, to ASME B16.24, Class 150 and Class 300, tongue and groove type.
 - .2 Gaskets: suitable for service.
 - .3 Bolts, nuts and washers: to ASTM A307, heavy series.
- .4 Flared:
 - .1 Bronze or brass, for refrigeration, to ASME B16.26.

2.3 PIPE SLEEVES

- .1 Hard copper or steel, sized to provide 6.0 mm clearance between sleeve and uninsulated pipe or between sleeve and insulation.

2.4 VALVES

- .1 7/8 ODS and under: Class 500, 3.5 MPa, globe or angle non-directional type, diaphragm,

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packless type, with forged brass body and bonnet, moistureproof seal for below freezing applications, brazed connections.

- .2 Over 7/8 ODS: Class 375, 3 MPa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and forged brass bonnet, moisture-proof seal for below freezing applications, brazed connections, non-rotating, self aligning swivel disc, Teflon seat, -40⁰ C - 163⁰ C.
- .3 Ball valves 7 3/8 ODS to 3 1/8 ODS: maximum WP 4MPa, -40⁰ C to 149⁰ C, live loaded stem seal, double “O” ring hermetically sealed body, blowout proof stem, seal cap “O” ring sealed, valve position indicators, forged brass body bonnet, brass cap, triple sealed plated steel item, Teflon ball seals and gasket, extended copper connections, helium leak test to maximum 0.28 g/yr.
- .4 Check valves 7/8 ODS to 3 1/8 ODS cast bronze body, brass bonnet, Teflon seat, internal parts removable minimum opening pressure 3.5 kPa, maximum WP 3.5 kPa - 29⁰ C to 149⁰ C, UL and CSA approved.
- .5 Check valves 3/8 ODS to 7/8 ODS: brass construction, Teflon seal, removable piston, maximum WP 3.5 kPa, -40⁰ C to 149⁰ C, suitable for high side, low side and hot gas. UL and CSA approved, maximum opening pressure 3.5 kPa.

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 **GENERAL**

- .1 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5.

3.3 **BRAZING PROCEDURES**

- .1 Bleed inert gas into pipe during brazing.
- .2 Remove valve internal parts, solenoid valve coils, sight glass.
- .3 Do not apply heat near expansion valve and bulb.

3.4 **PIPING INSTALLATION**

- .1 General:

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- .1 Soft annealed copper tubing: bend without crimping or constriction, hard drawn copper tubing: do not bend. Minimize use of fittings.
- .2 Hot gas lines:
 - .1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.
 - .2 Provide trap at base of risers greater than 1800 mm high and at each 6000 mm thereafter.
 - .3 Provide inverted deep trap at top of risers.
 - .4 Provide double risers for compressors having capacity modulation.
 - .1 Large riser: install traps as specified above.
 - .2 Small riser: size for 5.1 m/s at minimum load. Connect upstream of traps on large riser.

3.5 PRESSURE AND LEAK TESTING

- .1 Close valves on factory charged equipment and other equipment not designed for test pressures.
- .2 Leak test to CSA B52 before evacuation to 2 MPa and 1 MPa on high and low sides respectively.
- .3 Test Procedure: Build pressure up to 35 kPa using nitrogen leave for 8 hours.

3.6 FIELD QUALITY CONTROL

- .1 Site Tests/Inspection
 - .1 Close service valves on factory charged equipment.
- .2 Ambient temperatures to be at least 13 degrees C for at least 12 hours before and during dehydration.
- .3 Use copper lines for largest practical size to reduce evacuation time.
- .4 Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5 Pa absolute and filled with dehydrated oil.
- .5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.
- .6 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:
 - .1 Twice to 14 Pa absolute and hold for 4 h.
 - .2 Break vacuum with refrigerant to 14 KPa.
 - .3 Final to 5 Pa absolute and hold for at least 12 h.

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- .4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.
- .5 Submit test results to Departmental Representative.
- .7 Charging:
 - .1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.
 - .2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.
 - .3 Re-purge charging line if refrigerant container is changed during charging process.
- .8 Checks:
 - .1 Make checks and measurements as per manufacturer's operation and maintenance instructions.
 - .2 Record and report measurements to Departmental Representative.
- .9 Manufacturer's Field Services:
 - .1 Have manufacturer of products, supplied under this Section, review work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of work with Contract.
 - .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, at stages listed:
 - .1 After delivery and storage of products, and when preparatory work, or other work, on which the work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of work at 25% and 60% complete.
 - .3 Upon completion of the work, after cleaning is carried out.
 - .4 Obtain reports, within three (3) working days of review, and submit, immediately, to Departmental Representative.

3.7 DEMONSTRATION

- .1 Instructions:
 - .1 Post instructions in frame with glass cover in accordance with Section 01 78 00 – Closeout Submittals and CSA B52.
 - .1 Perform cleaning operations as specified in Section 01 74 00 – Cleaning and in accordance with manufacturer's recommendations.

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- .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 **GENERAL**

- .1 This Section covers items common to Sections of Division 26. This section supplements requirements of Division 01.

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 Departmental'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, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in

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extreme operating conditions established in above standard without damage to equipment.

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 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.
- .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
- .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
- .5 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 Departmental's Representative.
- .6 Manufacturer's Field Reports: submit to Departmental'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.
- .7 Shop Drawings:
 - .1 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or materials.
 - .2 Where applicable, indicate wiring, single line and schematic diagrams.
 - .3 Include wiring drawings or diagrams showing interconnection with work of other sections.
 - .4 Each shop drawing will be stamped and signed by the Contractor before submitting, stating that he has checked the drawings against the requirements as called for in the Contract Documents and also in the case where the equipment is attached to or connects to other equipment, that is has been properly coordinated with this equipment, whether supplied under Division 26 or under other Divisions.
 - .5 Each shop drawing for non-catalogue items shall be prepared specifically for

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this project. If brochures are submitted for catalogue items, the brochures shall be marked deficiently indicating the item or items to be supplied.

- .6 Work shall not be proceeded with on any of the equipment until final review of shop drawings received by the Contractor.
- .7 Shop drawing review is for general compliance with Contract Documents. No responsibility is assumed by the Departmental's Representative for correctness of dimensions or details. Corrections or comments, or lack thereof, made on the shop drawings during the Departmental Representative's review does not relieve the Contractor from compliance with the requirements of the drawings and specifications.
- .8 If changes are required, notify Departmental's Representative of these changes before they are made.
- .8 Operation and Maintenance Data:
 - .1 Provide operation and maintenance data for incorporation into operation and maintenance manuals. Manuals shall be supplied to Section 01 78 00.
 - .2 Include in operations and maintenance data:
 - .1 Details of design elements, construction features, component function and maintenance requirements to permit effective start-up operation, maintenance, repair, modification, extension and expansion of any portion or feature of installation.
 - .2 Technical data, product data, supplemented by bulletins, exploded views, technical description of items and part lists. Advertising or sales literature not acceptable.
 - .3 Wiring and schematic diagrams and performance curves.
 - .4 Names and addresses of local suppliers for items included in maintenance manuals.
 - .5 Copy of reviewed shop drawings.
- .9 As-Built Drawings: Submit in accordance with 01 78 00 – Closeout Submittals.

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 Departmental's Representative will provide drawings and specifications required by Electrical Inspection Division and Supply Authority at no cost.
- .4 Notify Departmental's Representative of changes required by Electrical Inspection Division prior to making changes.

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- .5 Furnish Certificates of Acceptance from Electrical Inspection Division or authorities having jurisdiction on completion of work to Departmental'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.
- .4 Where interference occurs, Departmental'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 Departmental's Representative shall decide the extent of relocation required.

1.8 CUTTING AND PATCHING

- .1 Definitions
 - .1 Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
 - .2 Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.
- .2 Quality Assurance
 - .1 Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
 - .2 Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
 - .3 Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
 - .4 Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and

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replace construction that has been cut and patched in a visually unsatisfactory manner.

- .5 Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

- .3 Warranty

- .1 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

- .4 Materials

- .1 In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
 - .1 If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

- .5 Examination

- .1 Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - .1 Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
 - .2 Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

- .6 Preparation

- .1 Temporary Support: Provide temporary support of Work to be cut.
 - .2 Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
 - .3 Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
 - .4 Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to minimize interruption to occupied areas.

- .7 Performance

- .1 General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

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- .1 Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- .2 Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
 - .1 In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - .2 Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 - .3 Concrete and Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 - .4 Excavating and Backfilling: Comply with requirements in applicable Sections where required by cutting and patching operations.
 - .5 Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
 - .6 Proceed with patching after construction operations requiring cutting are complete.
- .3 Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
 - .1 Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 - .2 Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 - .1 Clean piping, conduit, and similar features before applying paint or other finishing materials.
 - .2 Restore damaged pipe covering to its original condition.
 - .3 Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - .1 Where patching occurs on a painted surface, apply primer compatible with existing paint type (oil or latex) to allow

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complete adherence to latex finished coatings. Apply intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

- .4 Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
- .5 Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.
- .4 Plaster around all gypsum board penetrations smoke tight.
- .5 Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

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 Departmental Representative will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications but will not execute quality control. The Contractor shall be responsible for the execution of his work in conformity with the construction documents and with the requirements of the inspection authority.

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1.12 SCHEDULING OF WORK

- .1 Work shall be scheduled and coordinated with Departmental Representative.
- .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.

1.14 DELIVERY, STORAGE AND HANDLING

- .1 Material Delivery Schedule: provide Departmental's Representative with schedule within 2 weeks after award of Contract.

1.15 SYSTEM START-UP

- .1 Instruct Departmental's Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.16 WASTE MANAGEMENT & DISPOSAL

- .1 Separate and recycle waste materials in accordance with Division 01.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

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- .3 Collect and separate for disposal: paper, plastic, polystyrene and corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
- .4 Divert unused wiring and metal materials from landfill to metal recycling facility as approved by Departmental's Representative.
- .5 Place materials defined as hazardous or toxic waste in designated containers.
- .6 Ensure emptied containers are sealed and stored safely for disposal.
- .7 Unused materials must not be disposed of into sewer system, streams, lakes, onto ground or in other locations, where it will pose health or environmental hazard.
- .8 Do not dispose of preservative treated wood through incineration. Dispose of treated wood, end pieces, wood scraps and sawdust at sanitary landfill approved by Departmental's Representative.
- .9 Divert unused batteries and antifreeze to appropriate recycling facilities as approved by Departmental's Representative.

1.17 EQUIPMENT SUPPORTS AND HOUSEKEEPING PADS

- .1 Equipment supports supplied by equipment manufacturer are specified elsewhere in Division 26.
- .2 Fabricate equipment supports not supplied by equipment manufacturer from structural grade steel meeting requirements of Division 5. Submit structural calculations with shop drawings. Ensure that supports meet the requirements of the National Building Code.
- .3 Mount base mounted equipment on chamfered edge housekeeping pads, minimum of 100 mm high and 50 mm larger than equipment dimensions all around.

1.18 ANCHOR BOLTS AND TEMPLATES

- .1 Supply anchor bolts and templates for installation by other divisions.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- .1 Provide materials and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .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.

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- .3 Factory assemble control panels and component assemblies.

2.2 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.

2.3 WARNING SIGNS

- .1 As specified and to meet requirements of Electrical Inspection Department and Departmental's Representative.
- .2 Porcelain enamel decal signs, minimum size 175 x 250 mm.
- .3 Install adhesive backed polyester arc flash hazard labels on all major electrical components including the service entrance switchboard, bus duct breakers, panelboards, disconnects, splitters and master control centers/starters.

2.4 WIRING TERMINATIONS

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

2.5 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 Wordings on nameplates and labels to be approved by Departmental's Representative prior to manufacture.

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- .4 Allow for average of twenty-five (25) letters per nameplate and label.
- .5 Identification to be English.
- .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.
- .10 Panelboards: indicate name, voltage, capacity and upstream panel serving mains.

2.6 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.

2.7 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

2.8 MATERIAL SPECIFIED

- .1 Where additional manufacturers are named under Articles entitled "Approved Manufacturers", the selection of a named manufacturer, in reference to a particular article, shall be the Contractor's responsibility.

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- .2 Materials or products specified without the clauses "or approved equal" or "approved manufacturers" shall be supplied as specified and no proposed substitution will be considered.
- .3 Where approvals are granted for the use of other equipment, any and all changes or additions required for the installation or operation of the approved equipment will be made by the Contractor at their own expense and no claims will be approved for any such changes, notwithstanding approval of shop drawings. Equipment that is accepted and installed and then does not perform as represented by original submitted data shall be replaced by the Contractor with equipment as specified at no charge to the Departmental.
- .4 Trade names are given as a standard of quality and configuration.

2.9 EXAMINATION OF OTHER WORK

- .1 This Division requires the examination of the material and work for all other Divisions under which the work of this Section depends for proper completion. Any defect in work, levels or materials shall be reported to the Departmental's Representative. The work of this Division shall not commence until such defects have been corrected. This also applied to existing work installed under other Contracts.

2.10 CUTTING, PATCHING, SLEEVES AND PLATES

- .1 All drilling for hangers, rod, inserts and work of similar nature shall be done by Division 26.
- .2 Have core drilled openings installed in foundation walls to accommodate the work of this Division. Seal conduit or cable through the cored opening using industrial duty round compression seals sized to suit diameter of conduit or cable. Cable seals to be Rextec RS type or approved equal.

2.11 HANGERS AND EQUIPMENT SUPPORTS

- .1 All equipment provided under the Electrical Division shall be complete with all necessary supports and hangers required for a safe and workmanlike installation and to avoid strain on conduit, etc. Auxiliary supports where required shall be provided under this Division.
- .2 Hammer driven hanger supports, eg. staples, nails, etc. will not be used.
- .3 Expansion bolts, inserted after concrete has been poured are acceptable.
- .4 Paint all hangers, eg. U-bolts, trapeze hangers, etc. BEFORE INSTALLATION.
- .5 Wire is not an acceptable conduit support.

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2.12 TESTING, ACCEPTANCE AND GUARANTEE

- .1 The work of this Contract shall be tested and installed and any defects in operation shall be remedied immediately. Tests required by local authorities shall be the responsibility of the Contractor. When the work is completed, it shall be tested in its entirety and shall be in good working order before the Departmental's Certificate of Acceptance shall be issued.
- .2 A written guarantee shall be supplied to the Departmental by the Contractor covering the prompt making good of any and all defects in material and workmanship for the period of one (1) year from the date of acceptance and the making good of any such defects shall be completely the responsibility of the Contractor.

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 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.

3.3 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.

3.4 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.5 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

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permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks – the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.

- .2 The work of this division to be carried out by a contractor who holds a valid Code 1 Electrical Contractor License as issued by the Province.
- .3 Perform tests in Accordance with this section as noted.
- .4 Contractor to conduct and pay for the costs the following tests:
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
- .5 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .6 Insulation resistance testing.
 - .1 Measure and record circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Measure and record 350 – 600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing and record value.
- .7 Carry out tests in presence of Departmental's Representative.
- .8 Provide instruments, meters, equipment and personnel required to conduct tests during and conclusion of project.

3.6 PREPERATION FOR FIRESTOPPING

- .1 Prepare the space between conduits and adjacent sleeve or fire separation for the use of fire proofing material.
- .2 Where cables or conduits pass through fire rated walls or ceilings, sleeve with steel conduit and prepare the opening for fire and smoke sealing and seal with proper fire and smoke rated material.
- .3 Where conduits pass through fire or smoke rated partitions, install a junction box in the conduit just prior to exiting the space. Use this junction box to install smoke stopping material.

3.7 PAINTING

- .1 Apply at least one coat of corrosion resistant primer paint to ferrous supports and site fabricated work.

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- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes that have been damaged too extensively to be primed and touched up.

3.8 TESTS

- .1 Give 24 h written notice of date for tests. Conceal work only after testing and approval by Consultant. Conduct tests in presence of Consultant. Bear costs including re-testing and making good.
- .2 Equipment: test as specified in relevant sections.
- .3 Prior to tests, isolate all equipment or other parts that are not designed to withstand test pressures or test medium.

3.9 DRAWINGS, CHANGES, ACCESSIBILITY

- .1 The drawings shall be considered to show the general character and scope of work and not the exact details of the installation.
- .2 The installation shall be complete with all supports and accessories required for a complete operative and satisfactory installation.
- .3 The location, arrangement and connection of equipment and materials as shown on the drawings represent a close approximation to the intent and requirements of the Contract.
- .4 The right is reserved by the Departmental's Representative to make reasonable changes required to accommodate conditions arising during the progress of the work. Such changes shall be done at no extra cost to the Departmental unless the location, arrangement or connection is more than 3.0 m from that shown.
- .5 Actual location of existing services shall be verified in the field where necessary before work is commenced.
- .6 Changes and modifications necessary to ensure co-ordination and to avoid interference or conflicts with other trades, or to accommodate existing conditions, shall be made at no extra cost to the Departmental.

3.10 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.

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- .3 Complete final cleaning of equipment and work area as acceptable to Departmental's Representative.
- .4 At time of final cleaning, clean lighting, reflectors, lenses and other lighting surfaces that have been exposed to construction dust and dirt.

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 NMJ-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.

PART 3 **EXECUTION**

3.1 **INSTALLATION**

- .1 Remove insulation carefully from ends of conductors and:

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Section 26 05 20 - Wire and Box Connectors 0-1000 V

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- .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

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Section 26 05 21 – Wire and Cables (0-1000V)

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PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.
- .2 Refer to drawings for wiring type required under different applications.

1.2 **REFERENCES**

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No .0.3, Test Methods for Electrical Wires and Cables.

PART 2 **PRODUCTS**

2.1 **BUILDING WIRES**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper 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 **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 Departmental's Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

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Section 26 05 21 – Wire and Cables (0-1000V)

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3.2 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.

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.

END OF SECTION

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Section 26 05 29 – Hangers and Supports for Electrical Systems

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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 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 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.
- .6 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.
- .7 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.
- .8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

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Section 26 05 29 – Hangers and Supports for Electrical Systems

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- .10 Do not use wire lashing, wood blocking, plastic strap or perforated strap to support or secure raceways or cables.
- .11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental's Representative.
- .12 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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Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets

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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.

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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Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings

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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 **CONDUIT BOXES**

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

2.3 **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.

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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. Reducing washers are not allowed.
- .5 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.

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.

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- .3 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .4 Surface mount conduits except in finished areas or as indicated.
- .5 Use rigid hot dipped galvanized steel threaded conduit for exposed work below 2.4 m above finished floor.
- .6 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.
- .7 Use rigid PVC conduit underground and buried in or under concrete slab on grade.
- .8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .9 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .10 Mechanically bend steel conduit over 21 mm dia.
- .11 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .12 Install fish cord in empty conduits.
- .13 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.
- .14 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.
- .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.

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- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 00 – 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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Section 26 05 43.01 – Installation of Cables in Trenches and in Ducts

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PART 1 **GENERAL**

1.1 **RELATED SECTIONS**

- .1 Division 01.
- .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 **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.

3.2 **MARKERS**

- .1 Install warning tape entire length of trench 200 mm below surface.

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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.
 - .3 High Potential (Hipot) Testing.
 - .1 Conduct hipot testing at 100% of original factory test voltage in accordance with manufacturer's recommendations.
 - .4 Leakage Current Testing.
 - .1 Raise voltage in steps from zero to maximum values as specified by manufacturer for type of cable being tested.
 - .2 Hold maximum voltage for specified time period by manufacturer.
 - .3 Record leakage current at each step.
- .7 Provide Departmental'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 12 16.01 – Dry Type Transformers Up to 600 V Primary

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PART 1 GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SECTION INCLUDES

- .1 Materials and components for dry type transformers up to 600 V primary, equipment identification and transformer installation.
- .2 This Section includes the following types of dry-type transformers rated 600 V and less, with capacities up to 1000 kVA:
 - .1 Distribution transformers.

1.3 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 26 05 00 – Common Work Results - Electrical.

1.4 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-C22.2 No.47, Air-Cooled Transformers (Dry Type).
 - .2 CSA C9, Dry-Type Transformers.
- .2 National Electrical Manufacturers Association (NEMA)

1.5 SUBMITTALS

- .1 Product Data for each type and size of transformer indicated.
 - .1 Physical: Include rated nameplate data, capacities, weights, dimensions, minimum clearances, installed devices and features.
 - .2 Product warranty.
 - .3 Details of contributions to LEED, including Energy & Atmosphere credits.
 - .1 Provide proposed energy savings in Annual kWh and Peak Demand kW compared to a NEMA TP-1 efficiency baseline for the transformers on the project.
 - .4 Efficiency Data
 - .1 No load and full load losses per NEMA TP-1.
 - .2 Linear load Efficiency data @ 1/6, 1/4, 1/2, 3/4, & full load.

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- .3 Linear Load Efficiency @ 35% loading tested per NEMA TP-2.
- .4 Efficiency under K7 load profile at 15%, 25%, 50%, 75%, 100% of nameplate rating.
- .2 Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - .1 Wiring Diagrams: Power, signal, and control wiring.
- .3 Qualification Data: For testing agency.
- .4 Source quality-control test reports.
- .5 Field quality-control test reports.
- .6 Operation and Maintenance Data: For transformers to include in emergency, operation, and maintenance manuals.

1.6 QUALITY ASSURANCE

- .1 Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
 - .1 Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- .2 Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7.
- .3 Source Limitations: Obtain each transformer type through one source from a single manufacturer.
- .4 Electrical Components, Devices and Accessories: Listed and labelled as defined in NFPA 70, Article 100, and to Canadian Electrical Code (CEC), by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- .5 Comply with IEEE C57.12.91, "Test Code for Dry-Type Distribution and Power Transformers."
- .6 Comply with IEEE C57.110-1998-IEEE recommended practise for establishing transformer capability when feeding non-sinusoidal load currents.

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1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Temporary Heating: Apply temporary heat according to manufacturer's written instructions within the enclosure of each ventilated-type unit, throughout periods during which equipment is not energized and when transformer is not in a space that is continuously under normal control of temperature and humidity.

1.8 COORDINATION

- .1 Coordinate size and location of concrete bases with actual transformer provided. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and form work requirements are specified in Division 03.
- .2 Coordinate installation of wall-mounting and structure-hanging supports with actual transformer provided.

Part 2 PRODUCTS

2.1 GENERAL TRANSFORMER REQUIREMENTS

- .1 Description: Factory-assembled and tested, air-cooled units for 60 Hz service
- .2 Cores: Grain-oriented, non-aging silicon steel.
- .3 Coils: Continuous windings without splices except for taps.
 - .1 Internal Coil Connections: Brazed or pressure type.
 - .2 Coil Material: Copper.

2.2 DISTRIBUTION TRANSFORMERS

- .1 Provide a product with a 25-year pro-rated Manufacturer's Warranty.
- .2 Comply with NEMA ST 20, and list and label as complying with UL 1561.
- .3 Cores: One leg per phase.
- .4 Enclosure: Ventilated, NEMA 250, Type 2.
 - .1 Core and coil shall be impregnated within resin compound, sealing out moisture and air.
- .5 Transformer Enclosure Finish: Comply with NEMA 250.
 - .1 Finish Color: Manufacturer's Standard.
- .6 Taps for Transformers smaller than 3 kVA: None.

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- .7 Taps for Transformers 7.5 to 24 kVA: One 5 percent tap above and one 5 percent tap below normal full capacity.
- .8 Taps for Transformers 25 kVA and larger: Two 2.5 percent taps above and four 2.0 percent taps below normal full capacity.
- .9 Insulation Class: 220 deg C, UL-component-recognized insulation system with a maximum of 130 deg C rise above 40 deg C ambient temperature.
- .10 Energy Efficiency for Transformers Rated 15 kVA and larger:
 - .1 Comply with 10 CFR Part 430, July 29, 2004, FEDERAL Register – US Department of Energy, Office of Energy Efficiency and Renewable Energy. Energy Conservation Program for Commercial and Industrial Equipment: Energy Conservation Standards for Distribution Transformers; Proposed Rule.
 - .2 Meet or exceed DOE 10 CFR Part 430 CSL3 Efficiency, tested per NEMA TP-2:
 - .1 15kVA: 97.6%
 - .2 30kVA: 98.1%
 - .3 45kVA: 98.3%
 - .4 75kVA: 98.6%
 - .5 112.5kVA: 98.8%
 - .6 150kVA: 98.9%
 - .7 225kVA: 98.9%
 - .8 300kVA: 99.0%
 - .9 500kVA: 99.1%
 - .10 750kVA: 99.2%
- .11 K-Factor Rating: Transformers shall be K-Factor 7 or higher rated and comply with UL 1561 requirements for non-sinusoidal load current-handling capability to the degree defined by designated K-factor.
 - .1 Unit shall not overheat when carrying full-load current with harmonic distortion corresponding to designated K-factor.
 - .2 Indicate value of K-factor on transformer nameplate.
- .12 Electrostatic Shielding: Each winding shall have an independent, single, full-width copper electrostatic shield arranged to minimize inter-winding capacitance.
 - .1 Arrange coil leads and terminal strips to minimize capacitive coupling between input and output terminals.
 - .2 Include special terminal for grounding the shield.
 - .3 Shield Effectiveness:
 - .1 Capacitance between Primary and Secondary Windings: Not to exceed 33 picofarads over a frequency range of 20 Hz to 1 MHz.

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- .2 Common-Mode Noise Attenuation: Minimum of minus 120 dB at 0.5 to 1.5 kHz; minimum of minus 65 dB at 1.5 to 100 kHz.
- .3 Normal-Mode Noise Attenuation: Minimum of minus 52 dB at 1.5 to 10 kHz.
- .13 Wall Brackets: Manufacturer's standard brackets.
- .14 Fungus Proofing: Permanent fungicidal treatment for coil and core.
- .15 Low-Sound-Level Requirements: NEMA ST 20 standard sound levels when factory tested according to IEEE C57.12.91.

2.3 OPTIONS TO ADDRESS NFPA 70E/CSA-Z462 ARC FLASH STANDARD

- .1 Integrated Infrared Inspection Window
 - .1 Allows Safe External Thermal Imaging of Fully Energized Electrical Components without removing the transformer cover.
 - .2 IP65/NEMA 4 rated both open and closed.
- .2 Lockable Hinged Front Access Doors
 - .1 Allows safe and rapid access to the transformer without the need to undo multiple screws and handle heavy metal cover plates that are in close proximity to live electrical points.
 - .2 Doors shall be able to be secured using a padlock.

2.4 IDENTIFICATION DEVICES

- .1 Nameplates: Engraved, laminated-plastic or metal nameplate for each distribution transformer, mounted with corrosion-resistant screws. Name-plated label products are specified in Division 26 Section "Identification for Electrical Systems".

2.5 SOURCE QUALITY CONTROL

- .1 Test and inspect transformers according to IEEE C57.12.91.
- .2 Factory Sound-Level Tests: Conduct sound-level tests on equipment for this Project.

Part 3 EXECUTION

3.1 EXAMINATION

- .1 Examine conditions for compliance with enclosure and ambient temperature requirements for each transformer.
- .2 Verify that field measurements are as needed to maintain working clearances required by CEC-2009 and manufacturer's written instructions.

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- .3 Examine walls, floors, roofs, and concrete bases for suitable mounting conditions where transformers will be installed.
- .4 Verify that ground connections are in place and requirements in Division 26 Section “Grounding and Bonding for Electrical System’s have been met. Maximum ground resistance shall be 5 ohms at location of transformer.
- .5 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 Install wall-mounting transformers level and plumb with wall brackets fabricated by transformer manufacturer.
 - .1 Brace wall-mounting transformers as specified in Division 26 Section “Vibration and seismic Controls for Electrical Systems”.
- .2 Construct concrete bases and anchor floor-mounting transformers according to manufacturer’s written instructions, seismic codes applicable to Project, and requirements in Division 26 Section “Vibration and Seismic Controls for Electrical Systems”.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests and inspections and prepare test reports.
 - .1 Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- .2 Tests and Inspections:
 - .1 Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - .2 Test transformers for losses and efficiency. Verify results are consistent with the loss data provided on the submittal documenting compliance with DOE CSL 3 class efficiency.
- .3 Remove and replace units that do not pass tests or inspections and retest as specified above.
- .4 Infrared Scanning: Two months after Substantial Completion, perform an infrared scan of transformer connections.
 - .1 Use an infrared-scanning device designed to measure temperature or detect significant deviations from normal values. Provide documentation of device calibration.

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- .2 Perform 2 follow-up infrared scans of transformers, one at 4 months and the other at 11 months after Substantial Completion.
- .3 Prepare a certified report identifying transformer checked and describing results of scanning. Include notation of deficiencies detected, remedial action taken, and scanning observations after remedial action.
- .5 Test Labelling: On completion of satisfactory testing of each unit, attach a dated and signed "Satisfactory Test" label to tested component.

3.4 ADJUSTING

- .1 Record transformer secondary voltage at each unit for at least 48 hours of typical occupancy period. Adjust transformer taps to provide optimum voltage conditions at secondary terminals. Optimum is defined as not exceeding name plate voltage plus 10 percent and not being lower than name plate voltage minus 3 percent at maximum load conditions. Submit recording and tap settings as test results.
- .2 Output Settings Report: Prepare a written report recording output voltages and tap settings.

3.5 CLEANING

- .1 Vacuum dirt and debris; do not use compressed air to assist in cleaning.

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 26 05 00 – Common Work Results - Electrical.
- .3 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 and 600 V panelboards: bus and breakers rated for 14,000 and 18,000 A (symmetrical) minimum interrupting capacity respectively 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.

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- .6 Tin plated aluminum bus with neutral of same ampere rating as mains.
- .7 Mains: suitable for bolt-on breakers.
- .8 Trim with concealed front bolts and hinges.
- .9 Trim and door finish: baked grey enamel.
- .10 All panels to be EEMAC 2 (sprinkler proof) rated.

2.2 BREAKERS

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
- .4 Provide lock-on devices as per panel schedules.

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. 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.

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- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

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Section 26 28 16.02 – Moulded Case Circuit Breakers

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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.

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.
- .5 250 Volt circuit breakers to have 14,000 minimum of symmetrical rms interrupting capacity rating. 600 Volt circuit breakers to have 18,000 minimum of 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 new circuit breakers in new panels as indicated.

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Section 26 28 23 – Disconnect Switches – Fused and Non-Fused

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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 Fuseholders: suitable without adaptors, for type and size of fuse indicated.
- .5 Quick-make, quick-break action.
- .6 ON-OFF switch position indication on switch enclosure cover.
- .7 Heavy duty rated. EEMAC 2 (for interior use) 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.

END OF SECTION

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Section 26 41 13 – Lightning Protection for Structures

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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.

1.2 **REFERENCES**

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
 - .1 ANSI/IEEE 837, Standard for Qualifying Permanent Connections Used in Substation Grounding.
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA-B72, Installation Code for Lightning Protection Systems.

1.3 **DESCRIPTION OF SYSTEM**

- .1 System to consist of dynasphere, mast, brackets, down conductor, ground rods, bus bar, termination kit, etc. as indicated on drawings.

1.4 **SUBMITTALS**

- .1 Indicate materials and methods of attachment of conductors.

1.5 **REGULATORY REQUIREMENTS**

- .1 System subject to: approval by authority having jurisdiction.

PART 2 **PRODUCTS**

2.1 **MATERIALS**

- .1 Mast as indicated on drawings.
- .2 Down conductor as indicated on drawings.
- .3 Fastenings and attachment straps: see drawings for details
- .4 Electrodes: 3 m x 19 mm diameter copper coated steel.
- .5 Connections: copper connections formed by thermit process.

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PART 3 EXECUTION

3.1 INSTALLATION

- .1 Install lightning protection to CAN/CSA-B72.
- .2 Bond discharge conductors to service mast or other non-current-carrying electrical parts.
- .3 Submit certificate of installation to Departmental Representative.
- .4 Complete system shall be installed as per manufacturer's installation guidelines.
Commissioning and training to be by manufacturer's factory trained technicians.

3.2 INSPECTION

- .1 Obtain inspection certificate from Departmental Representative for discharge conductor passing through any fire supporting membrane.

END OF SECTION

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Section 26 80 00 – Commissioning of Electrical Systems

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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 Departmental'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 Departmental Approval.

1.6 **COMMISSIONING**

- .1 The purpose of the commissioning process is to fully test new electrical equipment including all 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.

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Section 26 80 00 – Commissioning of Electrical Systems

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- .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.
- .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 Departmental 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.

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Section 26 80 00 – Commissioning of Electrical Systems

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- .5 Conduct presentation on Departmental's premises. Departmental will provide space.

1.10 FINAL REPORT

- .1 This trade shall assemble all testing data and commissioning reports and submit them to the Departmental.
- .2 Each form shall bear signature of recorder, and that of supervisor of reporting organizer.

END OF SECTION

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Section 33 65 73 - Concrete Encased Duct Banks

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PART 1 **GENERAL**

1.1 RELATED SECTIONS

- .1 Section 26 05 00 – Common Work Results - Electrical.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA),
 - .1 CAN/CSA-A3000, Cementitious Materials Compendium. Includes:
 - .1 CAN/CSA-A5, Portland Cement
 - .2 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
 - .3 CSA G30.3, Cold-Drawn Steel Wire for Concrete Reinforcement.
 - .4 CSA G30.5, Welded Steel Wire Fabric for Concrete Reinforcement.
 - .5 CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
- .2 American Society for Testing and Materials (ASTM),
 - .1 ASTM D1056, Specification for Flexible Cellular Materials – Sponge or Expanded Rubber.

1.3 SUBMITTALS

- .1 Submit manufacturer's test data and certification at least 2 weeks prior to commencing work.
- .2 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 duct bank materials, maintenance and operating instructions in accordance with Section 01 78 00 – Closeout Submittals.

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Section 33 65 73 - Concrete Encased Duct Banks

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PART 2

PRODUCTS

2.1 PVC DUCTS AND FITTINGS

- .1 Rigid PVC duct and conduit for exterior underground site lighting circuits and wiring below interior concrete floor slabs, size as indicated to CSA C22.2, with moulded fittings and minimum wall thickness at any point of 2.8 mm. Nominal length: 3 m plus or minus 12 mm.
- .2 Rigid PVC split ducts as required.
- .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.
- .5 Rigid PVC 5° angle couplings.
- .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 GROUNDING

- .1 Ground rods in accordance with Division 26.

2.4 CABLE PULLING EQUIPMENT

- .1 Pull rope: 6 mm stranded nylon polypropylene, tensile strength 5 kN, continuous throughout each duct run with 3 m spare rope at each end.

2.5 MARKERS

- .1 Provide 150 mm wide, 4 mil, polyethylene marker tape in all trenches. Use red colored tape. Install at depth as per drawings.

2.6 DUCT SPACERS

- .1 As required for installation at 900 mm center – center.

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PART 3 **EXECUTION**

3.1 **INSTALLATION GENERAL**

- .1 Install underground duct banks including formwork.
- .2 Build duct bank on undisturbed soil or on well compacted granular fill not less than 150 mm thick, compacted to 95% of maximum proctor dry density.
- .3 Prior to laying ducts, construct "mud slab" not less than 75 mm thick.
- .4 Install ducts at elevations and with slope as indicated and minimum slope of 1 to 400.
- .5 Install base spacers at maximum intervals of 900 mm levelled to grades indicated for bottom layer of ducts.
- .6 Lay ducts with configuration as indicated with preformed interlocking, rigid plastic intermediate spacers to maintain spacing between ducts at not less than 75 mm horizontally and vertically. Stagger joints in adjacent layers at least 150 mm and make joints watertight. Encase duct bank with 100 mm thick concrete cover. Use epoxy coated galvanized steel conduit (i.e. corroguard) for sections extending above finished grade level.
- .7 Make transpositions, offsets and changes in direction using 5-degree bend sections, do not exceed a total of 20 degree with duct offset.
- .8 Use bell ends at duct terminations in buildings.
- .9 Use conduit to duct adapters when connecting to conduits.
- .10 Terminate duct runs with duct coupling set flush with end of concrete envelope when dead ending duct bank for future extension.
- .11 Cut, ream and taper end of ducts in field in accordance with manufacturer's recommendations, so that duct ends are fully equal to factory-made ends.
- .12 Allow concrete to attain 50% of its specified strength before backfilling.
- .13 Use anchors, ties and trench jacks as required to secure ducts and prevent moving during placing of concrete. Tie ducts to spacers with twine or other non-metallic material. Remove weights or wood braces before concrete has set and fill voids.
- .14 Clean ducts before laying. Cap ends of ducts during construction and after installation to prevent entrance of foreign materials.
- .15 Immediately after placing of concrete, 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. Avoid disturbing or damaging

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Section 33 65 73 - Concrete Encased Duct Banks

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ducts where concrete has not set completely. Pull stiff bristle brush through each duct immediately before pulling-in cables.

- .16 Install four 3 m lengths of 15M reinforcing rods, one in each corner of duct bank when connecting duct to buildings. Wire rods to 10M dowels at building and support from duct spacers. Place concrete down sides of duct bank filling space under and around ducts. Rod concrete with flat bar between vertical rows filling voids.
- .17 In each duct install pull rope continuous throughout each duct run with 3 m spare rope at each end.

3.2 MARKERS

- .1 Provide drawings showing locations of markers.

3.3 INSPECTIONS

- .1 Inspection of duct will be carried out by Departmental's Representative prior to placing. Placement of concrete and duct cleanout to be done when Departmental's Representative present.

END OF SECTION

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APPENDIX "A" - COVID-19 – Standardized Protocols for All Construction Sites



COVID-19 - Standardized Protocols for All Canadian Construction Sites

Version 5
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For inquiries: Contact Zack Mullins
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COVID-19 - STANDARDIZED PROTOCOLS FOR ALL CANADIAN CONSTRUCTION SITES

The Standardized Protocols for All Canadian Construction Sites outlines the best practices for construction sites in order to maintain the health and safety of all workers required to perform duties during the COVID-19 crisis. The protocols, which include prevention, detection and response measures, will minimize the impacts of the crisis and ensure business continuity in the construction industry. This is not a legal document. Some provinces and municipalities have implemented stricter measures than those found in this document, and contractors are responsible for compliance with the rules, regulations and practices required by the applicable authorities. At the end of this document, there are links to information from some of our partner associations and other industry stakeholders that are further tailored to province specific requirements.

The objectives of the Standardized Protocols are to:

- Prioritize the health and safety of workers and of their surrounding communities;
- Apply recommendations and best practices from federal, provincial, and municipal public health authorities to construction site procedures;
- Establish and maintain a common COVID-19 Pandemic Response Plan across construction sites; and
- Foster open communication amongst stakeholders and ensure a respectful work environment.

Standardized Protocols for All Canadian Construction Sites

Prevention measures

Communication and awareness

- Clear signage is posted at entry points on the construction site and outline the commitment of the contractor to maintain health and safety measures during the COVID-19 crisis, with relevant updates from appropriate jurisdictions' public health authorities and self-identification screening tools.
- Worksite policies as they relate to the COVID-19 crisis are communicated to workers and made available on site.
- All workers exercise the following recommended practices for reducing the risk of transmission as identified by the Public Health Agency of Canada (PHAC), Health Canada, and Centers for Disease Control and Prevention:
 - o Avoid touching eyes, nose and mouth with unwashed hands;
 - o When coughing or sneezing:
 - Cough or sneeze into a tissue or the bend of your arm, not your hand;
 - Dispose of any tissues you have used as soon as possible in a lined waste basket and wash your hands afterwards;
 - o Non-medical face-coverings (such as homemade cloth masks) should be worn as a potential mitigant to catching and transmitting the virus, but are not to be treated as substitutes for proper handwashing, physical distancing, and other protective measures. Masks should not be worn where they put an



individual at risk (e.g. when it may get caught in machinery). Face-coverings should be created and used in line with the guidelines provided by PHAC, found here: canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/prevention-risks/instructions-sew-no-sew-cloth-face-covering.html;

- o Clean and disinfect frequently touched objects and surfaces, including all reusable personal protective equipment (PPE);
- o Do not share personal items or supplies such as phones, pens, notebooks, tools, PPE, etc.;
- o Use and remove PPE with care, being mindful of which surfaces may be contaminated. Individuals must clean their hands after handling any used PPE;
- o Avoid common physical greetings, such as handshakes;
- o Maintain a minimum physical distance of two metres from others; and
- o Wash hands often with soap and water for at least 20 seconds after using the washroom, before handling food, after blowing nose, coughing, or sneezing, and before smoking. If hands are not visibly soiled, and soap and water are unavailable, alcohol-based hand sanitizer can be used.

Business-related travel

- Non-essential business travel is not authorized. Business travel is limited and on an exceptional basis only.
- All individuals returning from out of country must undergo a 14-day self-isolation period, as mandated by the federal government and outlined here: canada.ca/en/public-health/services/diseases/2019-novel-coronavirus-infection/latest-travel-health-advice.html.
- As some provincial governments impose similar restrictions for inter-provincial travel, any such requirements for self-isolation must be obeyed as applicable.

Working remotely

- Where practical, all office employees supporting a project work remotely. Meetings are held through teleconferencing or videoconferencing.

Access and movement to/from construction site

- Wherever possible, workers travel to site using individual modes of transportation (e.g., personal vehicle or bicycle). Additional parking arrangements are made as required.
- Workers are encouraged to change out of work clothes before entering their vehicle at the end of their shift. Work clothes should be handled carefully and washed upon arriving home.
- Entering and exiting of the worksite is monitored and controlled to ensure that the minimum physical distancing is not broken when shifts begin and end. Shift start and end times are staggered in five-minute intervals to accommodate this if needed.
- All non-essential individuals are not permitted access to the site.

Monitoring the status of workers

- Detailed tracking of worker's status on-site and off-site are kept at all times (e.g. fit to work, sick, off-work for family caring duties, etc.). A list of all quarantined workers is updated daily, with their privacy maintained.
- Records are kept of which individuals work together and when.



Construction site and site trailer cleaning protocols

- All offices and jobsites implement additional cleaning measures of common areas. All door handles, railings, ladders, switches, controls, eating surfaces, shared tools and equipment, taps, toilets, and personal workstation areas are wiped down at least twice a day with a disinfectant, such as disinfectant wipes. Individuals are responsible for cleaning and disinfecting their workstations.
- Additional sanitary measures are implemented on site: hand washing stations with a posted hand washing protocol, hand sanitizer stations, provision of disinfectant wiping products. These types of facilities are made available at site entries, exits, washrooms, eating areas, offices, and any other areas with commonly touched surfaces.
- Commonly touched surfaces on vehicles and equipment are thoroughly cleaned and disinfected at the end of shifts and between users.
- All cleaning and disinfecting is carried out per PHAC's recommendations here: canada.ca/en/public-health/services/publications/diseases-conditions/cleaning-disinfecting-public-spaces.html.

Limiting and removing internal touch point areas

- Limit access and use of shared devices like coffee machines, water fountains, microwave ovens, and similar. Means to clean and disinfect such devices between uses is provided.
- Limit use of common pens for sign-in sheet to construction site.
- Washroom modifications - Install more sinks and sinks with physical separation between users where feasible. Change out taps, paper towel dispensers and garbage cans to hands-free models.
- Remove doors/door handles - Look at all reasonable opportunities to remove doors or replace handles with hands-free options, such as foot-pull devices.
- Where touch points like door handles and water coolers remain, paper towels are provided to allow users to avoid skin contact.
- Gloves are worn whenever possible while on the worksite, but are treated the same as bare hands in terms of minimizing unnecessary touching of anything on site and the user's face.

Compartmentalization

- The construction site is to be segregated to the extent possible in zones or other methods to keep different crews/trades physically separated at all time. This promotes physical distancing and supports the containment of propagation should it arise.
- Eating is restricted to clearly identified dedicated eating areas with handwashing stations, cleaning and disinfectant materials, and adequate space to maintain minimum physical distancing.
- Upper limits are put on the number of people allowed in each zone and in facilities like washrooms, trailers, and eating areas at once to allow for the recommended minimum physical distancing.
- One-way staircases are established wherever practical to minimize worker contact.
- Freight elevators are operated/occupied by only one individual at a time or where feasible, by respecting the minimum physical distancing guidelines.



Working in close proximity

- Alternate arrangements are made as necessary to ensure workers avoid breaking the minimum physical distance with others for prolonged periods. Where this is not possible due to task-specific safety risks, a risk assessment is done to identify controls to protect the health and safety of the workers. This can include methods to minimize the duration or proximity of the task, use of physical controls (such as the use of clear plastic barriers), and as a last resort, PPE.
- A record is kept of all tasks requiring close-proximity work, including the task-specific safety risks that justify close-proximity and all the control measures implemented to protect workers from the risk of infection. The record should be reviewed regularly to determine if there are any additional safety measures that can be implemented for each task.

Site operation

- The number of in person meetings is minimized. If required, meetings should involve only necessary individuals and include six people or fewer. Minimum physical distancing is maintained, and meetings are held in open spaces when possible. If needed, 'Toolbox Talks' and similar meetings/updates are held in multiple sessions to accommodate this.
- The worksite is rearranged to reduce high-traffic areas and allow for the minimum physical distancing.
- Site teams are encouraged to put forward split/alternating shifts to avoid extensive intermingling. Voluntary shift offset and implementing time gaps between shifts are highly encouraged.
- Vehicles, equipment, and tools are assigned to a single individual, or, to the minimum number of operators needed for safe use.
- Where work is done in crews, the work is planned to minimize or eliminate the crossover of workers between crews.
- Project teams stagger break and lunch schedules to minimize the number of people in close proximity to one another. Enclosed lunchrooms are only made available during inclement weather.
- Work schedules are adjusted to provide time for proper cleaning and disinfecting as required.

Deliveries

- Delivery zones are clearly identified and limited to receivers and deliverers only.
- When possible, nothing is passed between the deliverer and the receiver (e.g. shipment documents and pens for signatures). Deliveries are unloaded solely by receivers using proper PPE, while deliverers remain in their vehicles.

Work in occupied spaces

- When working in spaces currently occupied (e.g. private residences), the minimum physical distancing with any occupants is strictly enforced. Where possible, workers and occupants are segregated in different rooms.
- Non-emergency work should not be done in any occupied spaces where an occupant is suspected to have contracted COVID-19 or is under self-isolation (per the directions of the applicable authorities). Emergency work can be carried out provided workers are equipped with nitrile gloves, Tyvek suits or coveralls, and facial/respiratory protection.



- Hands and tools are thoroughly cleaned before entering the workplace and after leaving, and any surfaces or equipment in the occupied space are disinfected before work is done on them.

Protocol auditing

- The jobsite's safety officer is responsible for ensuring appropriate health and safety measures have been implemented, and that directions of the appropriate health authorities are followed with respect to workers returning to work following a presumed or confirmed case of COVID-19.
- Contractors are to conduct periodic audits (frequency to be determined based on project scale and scope) to verify that the appropriate measures have been implemented and are maintained.

Other

- Any other measures deemed to increase the safety or limit the propagation of the virus.

Detection measures

Screening at entry of construction site

- Before entering the site, individuals must confirm that:
 - o They are not currently exhibiting flu-like symptoms such as fever, tiredness, coughing, or congestion;
 - o They have not returned from outside of Canada within the past 14 days;
 - o To the best of their knowledge, they have not been in contact with someone with a confirmed or probable case of COVID-19; and
 - o They have not been working on a site that was shut down due to the virus.
- Individuals who are at increased risk of serious illness (due to age, pregnancy or other medical condition) are not to be permitted on site.
- Any responses or results of any screening measures, whether they permit an individual on site or not, are to be kept private and treated as sensitive medical information.
- Workers who are not authorized to access the site are to be safely transported directly back home, or to a preferred location of self-isolation. When unable to do so themselves, a vehicle and driver will be arranged for them.
- When transporting a potentially ill individual, both driver and passenger are to be given masks and nitrile gloves. The passenger is to sit in the backseat, and the driver is to open and close the doors for them.

Response measures

Possible cases of COVID-19

- Individuals who have been potentially exposed to the virus, or who are exhibiting flu-like symptoms such as fever, tiredness, coughing, or congestion are instructed to:



- o Not come to work;
- o Contact their supervisor and/or human resources department;
- o Stay at home and self-isolate; and
- o Contact local health authorities for further direction.

Such individuals are required to follow the directions of the local health authority and may not return to work until given approval by the proper health authorities.

- Individuals who begin to display flu-like symptoms on site are instructed to avoid touching anything, take extra care to contain coughs and sneezes, and return home immediately to undergo self-isolation as directed by the local health authority..
- All areas on site potentially infected by a confirmed or probable case are barricaded to keep individuals two metres away until the area is properly cleaned and disinfected.

Response plans

- All contractors are to complete an integrated continuity plan to respond to partial or complete shutdown of construction sites or in the case of a severe limitation of site operations.

Other

- Refer to canada.ca/en/public-health/services/diseases/coronavirus-disease-covid-19.html for the latest information.

The situation related to COVID-19 is changing rapidly. This Protocol will be updated on an as required basis to reflect the latest broadly adopted measures.

For province specific guidance, please review the resources linked below. Questions on province-specific health and safety matters can be directed to the listed contacts.

British Columbia

British Columbia Construction Association

bccassn.com/media/Guidance%20to%20Construction%20Sites%20Operating%20During%20COVID19.pdf

BC Construction Safety Alliance

Mike Mckenna, Executive Director

mmckenna@bccsa.ca

Tammy Oliver, Senior Director

toliver@bccsa.ca



Alberta

Alberta Construction Association

albertaconstruction.net/wp-content/uploads/2020/04/PANDEMIC-PLANNING-FOR-THE-CONSTRUCTION-INDUSTRY.pdf

Alberta Roadbuilders and Heavy Construction Association

279e5ecb-ae4a-4a97-bda5-1b2fe77f0894.filesusr.com/ugd/77f1bc_683524748e3c482aac8a8f59e5a86218.pdf?index=true

Alberta Construction Safety Association

Dan MacLennan, CEO

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Saskatchewan

Saskatchewan Construction Association

scaonline.ca/third-party-information-bulletins.html

Saskatchewan Construction Safety Association

Thomas Archer, VP of Operations

thomasa@scsaonline.ca

Collin Pullar, President

collinp@scsaonline.ca

Heavy Construction Safety Association of Saskatchewan

Al Goldstone, Safety Director

alg@hcsas.sk.ca

Manitoba

Winnipeg Construction Association

togetherwebuild.ca/

Construction Safety Association of Manitoba

Sean Scott, Executive Director

sean@constructionsafety.ca

Derek Pott, Director of Operations

derek@constructionsafety.ca

Manitoba Heavy Construction Association

Don Hurst, Director

don@mhca.mb.ca



Ontario

ORBA / OGCA / RESCON / OSPE / OHBA

orba.org/wp-content/uploads/2020/03/ORBA-branded-COVID19-resource-and-best-management-practices-document-Final.pdf

Infrastructure Health & Safety Association

Enzo Garritano, President egarritano@ihsa.ca

Paul Casey, Vice President pcasey@ihsa.ca

Quebec

L'Association de la construction du Québec

acq.org/coronavirus/sante-securite-du-travail/

Commission des normes, de l'équité, de la santé et de la sécurité du travail

cnesst.gouv.qc.ca/salle-de-presse/covid-19/Pages/trousse.aspx?utm_source=CNESST&utm_medium=Carrousel-accueil&utm_campaign=Trousse_doutils

ASP Construction

Sylvie L'Heureux, Executive Director slheureux@asp-construction.org

New Brunswick

New Brunswick Construction Association

nbcsa.ca/wp-content/uploads/2020/04/Construction-Site-COVID-19-Prevention-Procedures.pdf

New Brunswick Construction Safety Association

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Nova Scotia

Construction Association of Nova Scotia

cans.ns.ca/covid-19-managing-covid-19-on-the-worksite/

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Prince Edward Island*Construction Association of PEI*capei.ca/member_access/LiveEditor/images/Public%20Health%20Order%20-%20March%202020.pdf**Newfoundland and Labrador***Newfoundland and Labrador Construction Association*nlca.ca/critical-information-covid-19/*Newfoundland and Labrador Construction Safety Association*

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