

PART 1 GENERAL

1.1 Summary

- .1 Section Includes:
 - .1 General requirements that are common to sections found in Division 26 – Electrical.
 - .2 This section supplements the requirements of Division 1.

1.2 References

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (21st Edition), Safety Standard for Electrical Installations.
 - .2 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
- .3 Within these specifications reference is made to the following standards:
 - .1 CSA - Canadian Standards Association.
 - .2 CEMA - Canadian Electrical Manufacturers Association.
 - .3 NEMA - National Electrical Manufacturers Association.
 - .4 IEEE - Institute of Electrical and Electronic Engineers.
 - .5 IPCEA - Insulated Power Cable Engineers Association.

1.3 Design Requirements

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.4 Drawings And Specifications

- .1 Should any discrepancies occur in the drawings and/or the specifications which leaves doubt as to the true intent and the meaning of the drawings and/or specifications, obtain a ruling from the Departmental Representative before submitting tender.
- .2 Electrical drawings indicate the location and route to be followed by conduit and/or wire and do not show all structural and mechanical details. In some cases, conduit or wiring is not shown or is shown diagrammatically on a schematic or riser diagram. Install each

conduit and wire to provide a complete operating component or system and to conserve head room within furring spaces, etc.

1.5 Submittals

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Submit test results of installed electrical systems and instrumentation.
 - .2 Permits and fees: in accordance with the General Conditions of this contract and:
 - .1 Contractor is responsible to submit to the Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
 - .2 Contractor will be responsible for paying associated fees.
 - .3 Submit, upon completion of Work, load balance report as described in this Section.
 - .4 Furnish Certificates of Acceptance from Electrical Inspection Department authorities having jurisdiction on completion of work to Departmental Representative.
- .3 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.6 Quality Assurance

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Qualifications: Electrical work to be carried out by qualified, licensed electricians or apprentices in accordance with authorities having jurisdiction and as per the conditions of Territorial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in Territorial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
 - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

PART 2 PRODUCTS

2.1 Uniformity Of Equipment

- .1 Unless otherwise specifically requested, uniformity of manufacture shall be maintained for any particular item or type of equipment throughout the building.

2.2 Materials And Equipment

- .1 Equipment or material specified by technical description only, to be of the best commercial quality obtainable for the purpose.

- .2 All electrical equipment, materials and systems specified and shown on the drawings shall be new and be certified by an accredited standards development organization (SDO) by the Standards Council of Canada (SCC). The local authorities having jurisdiction in the Northwest Territories must also recognize the certifying SDO.
- .3 Where authorized SDO certified equipment and material is not available, submit such equipment and material to authority having jurisdiction/ inspection authorities for special approval before delivery to site.
- .4 Factory assemble control panels and component assemblies.

2.3 Alterations

- .1 Additional work or deletions shall be resolved in the manner described in the General Conditions.
- .2 Any prices submitted for additional work or alterations shall include a price breakdown for all labour and material and where required, shall be justified by invoices, time sheets, etc. No extras will be allowed without prior written authorization from the Departmental Representative.

2.4 Electric Motors, Equipment and Controls

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: in accordance with Section 26 05 21 – Wires and Cables (0-1000 V) except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.5 Mechanical Equipment

- .1 Check mechanical drawings for sizes and locations of all motors, controls, and other equipment requiring electrical wiring and connections.
- .2 Review mechanical specifications to ensure compliance with all clauses requiring work by the electrical contractor.
- .3 Ensure tender price includes all requirements for electrical work noted in mechanical plans and specifications.

2.6 Wiring Terminations

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.7 Equipment Identification

- .1 Identify electrical equipment with nameplates and labels as follows:
 - .1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into 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

EXAMPLES

Size 1 - Manual Starter Designation Label

Size 2 - Junction Boxes, Cabinets, Circuit Distribution

Size 3 - Power Generator (Meter, Alarm, Indicating Lights and Minor Controls)

Size 4 - Disconnect Switches, Contactors

Size 5 - Power Generator (Alternator, Breakers, Program Selector Switch)

Size 6 - Reclosers

Size 7 - Transformers, Switchgear, Service Entrance Boards

- .2 Labels: Embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Allow for average of twenty-five (25) letters per nameplate and label.
- .4 Identification to be English.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .7 'ON/OFF' switches: indicate areas being served.
- .8 Distribution centres: identify distribution centres as shown on the drawings and main voltage or voltages if more than one.
- .9 All receptacles: indicate panel designation and circuit numbers. Identify receptacle circuits with clear self-adhesive mylar tape with black lettering.

2.8 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, red, black, blue with neutral white.

2.9 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.
- .1 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

<u>Description</u>	<u>Prime</u>	<u>Auxiliary</u>
up to 250 V	Gray	

PART 3 EXECUTION

3.1 Installation

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

3.2 Nameplates and Labels

- .1 Ensure manufacturer's nameplates, approved Standards Council of Canada SDO labels and identification nameplates are visible and legible after equipment is installed.

3.3 Conduit and Cable Installation

- .1 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.
- .2 Obtain prior approval from Departmental Representative before installing any equipment or conduit through roofing membrane. Provide pitch pockets or roof jacks where approval is given.

3.4 Location of Outlets

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation. Obtain information from Departmental Representative prior to rough-in of outlet.

3.5 Warranty

- .1 Furnish a written warranty to the Departmental Representative stating:
 - .1 That all Work will be free from defects for a period of one year or for a period as specified in individual sections of the work, from the date of Substantial Performance of the Work as defined by the Departmental Representative.

- .2 This section agrees to repair and replace at own expense, all such defective work and other work damaged which fails or becomes defective during the term of the guarantee provided that such failure is not caused by improper usage.
- .3 The period of the warranty specified above shall in no way supplant any other warranty of a longer period but shall be binding on work not otherwise covered.
- .2 Include original copy of warranty in operations and maintenance manual in accordance with this section.

3.6 Closeout Submittals

- .1 In accordance with Section 01 78 00 – Closeout Submittals.

3.7 Record Drawings

- .1 ‘As-built’ Record drawings: in accordance with Section 01 78 00 – Closeout Submittals.

3.8 Cleaning

- .1 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
- .2 At all times during construction, keep the site free from debris boxes, packing, etc., resulting from the work of the Divisions 26.
- .3 At the completion of the Work, the electrical installation shall be left in a clean and finished condition to the satisfaction of the Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.1 Abbreviations

- .1 PVC: polyvinyl chloride.

1.2 Product Data

- .1 Submit product data in accordance with Section 26 05 00 – Common Work Results – Electrical.

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 chemically cross-linked thermosetting polyethylene material rated RW90.

2.2 Armoured Cables

- .1 Type: AC90.
- .2 Conductors: insulated, copper size as indicated, minimum #12 AWG.
- .3 Armour: interlocking type fabricated from aluminum strip.

2.3 Non-metallic Sheathed Cable

- .1 Not Permitted.

PART 3 EXECUTION

3.1 Installation Of Building Wires

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34.

3.2 Installation Of Armoured Cables

- .1 Group cables wherever possible.
- .2 Armoured cables are only allowed for light fixture drops in suspended ceilings or applications specifically indicated elsewhere within the contract documents.

3.3 Installation Of Control Cables

- .1 Install control cables in conduit.

- .2 Ground control cable shield at one end only.

END OF SECTION

PART 1 GENERAL

1.1 Shop Drawings And Product Data

- .1 Submit shop drawings and product data for cabinets in accordance with Section 26 05 00 – Common Work Results – For Electrical.

PART 2 PRODUCTS

2.1 Splitters

- .1 Not Used.

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 Not Used.

2.4 Equipment 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.

PART 3 EXECUTION

3.1 Junction, Pull Boxes And Cabinets Installation

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Install pull boxes so as not to exceed 30 m of conduit run between pull boxes and as per the requirement of the Canadian Electrical Code.

END OF SECTION

PART 1 GENERAL

1.1 References

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA C22.2 No. 18-04, Outlet Boxes, Conduit Boxes, and Fittings and Associated Hardware.
 - .2 CSA C22.2 No. 45-M1981 (R2003), Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83-M1985 (R2003), Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2-06, Rigid PVC (Unplasticized) Conduit.
 - .6 CSA C22.2 No. 211.1-M1984, Rigid Type EB1 PVC Conduit.
 - .7 CSA C22.2 No. 211.1-M1984, Rigid Type DB2/ES2 PVC Conduit
 - .8 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT).

PART 2 PRODUCTS

2.1 Conduits

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

2.2 Conduit Fastenings

- .1 One hole steel straps to secure surface conduits 53 mm and smaller. Two hole steel straps for conduits larger than 53 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 2 m oc.
- .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° bends are required for 27 mm and larger conduits.
- .3 Set screw connectors and couplings for EMT except where not allowed by the Canadian Electrical Code. Water-tight fittings for all outdoor and weatherproof EMT requirements.

2.4 Fish Cord

- .1 Polypropylene.

PART 3 EXECUTION

3.1 Installation

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and areas of open structure.
- .3 Where surface conduits are used in finished areas of open ceiling structure, conduit is to be inconspicuous and tucked neatly along structural members – hidden if possible. Finish of conduit and boxes in these areas to match architectural finish of ceiling.
- .4 Use electrical metallic tubing (EMT) except where subject to mechanical injury.
- .5 Install and attach surface mounted conduit with clamps for exposed runs.
- .6 Use liquid tight flexible metal conduit for connections to motors or vibrating equipment.
- .7 Minimum conduit size unless indicated otherwise: 21 mm.
- .8 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .9 Mechanically bend steel conduit over 21 mm diameter.
- .10 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .11 Install fish cord in empty conduits.
- .12 Install separate conduit(s) for power, lighting and each equipment circuit.
- .13 Clean out conduit before installation of conductors. Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.
- .14 Alter routing to avoid structural obstructions keeping crossovers to a minimum.
- .15 Seal conduit with fibreglass where conduits leave heated area and enter unheated area.
- .16 All conduits shall enter properly and be secured to all fittings, outlet boxes, panel tubs, etc., by means of locknuts and bushings. All unused openings shall be sealed with a threaded plug.

3.2 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 surface 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.

3.3 Concealed Conduits

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.
- .4 Where conduit is located in wall cavities in occupied spaces, route to avoid contact with plumbing and other services to the drywall and studs. The plumbing and other services are being installed clear of drywall and studs and electrical conduit can provide a solid connection to transmit noise from the plumbing to the drywall if routed without adequate clearance.

END OF SECTION

PART 1 GENERAL

1.1 Scope

- .1 Work includes the coordination of all equipment and devices as required for project completion in accordance with mechanical scope of the project.

PART 2 PRODUCTS

2.1 Materials

- .1 Install humidistats for Mechanical heating/cooling equipment provided by Division 23 where specifically indicated on the drawings and/or indicated on the Mechanical drawings.
- .2 Electrical shall supply and install all wiring, connections and control apparatus required for satisfactory completion of work as outlined in drawings and specifications.
- .3 Mechanical trades will provide as required any necessary wiring diagrams required for equipment.
- .4 Refer to Mechanical drawings and specs for wiring requirements with reference to humidistat and control wiring of ventilation equipment.

END OF SECTION