

**Part 1 General**

**1.1 RELATED REQUIREMENTS**

- .1 Section commons to Division 26 sections.
- .2 Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
  - .2 CSA C22.3 No.7 – Underground Systems,.
  - .3 CAN/CSA-C22.3 No. 1- Overhead Systems.
  - .4 CAN3-C235, 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 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
  - .1 IEEE SP1122-[2000], The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.
- .4 International electrical Testing Association (NETA) - Maintenance Testing Specifications for Electrical Power Distribution Equipment and Systems

**1.3 DEFINITIONS**

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

**1.4 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. labels for control items in English and French.
- .4 Use one nameplate and label for both languages.

**1.5 SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop drawings:

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .2 Submit 2 number of copies of 600 x 600 mm minimum size drawings and product data to inspection authorities for plan reviews.
- .3 If changes are required, notify Departmental Representative of these changes before they are made.
- .3 Quality Control
  - .1 Provide CSA certified equipment and material.
  - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for approval before delivery to site.
  - .3 Submit test results of installed electrical systems and instrumentation.
  - .4 Permits and fees: in accordance with General Conditions of contract.
  - .5 Where required, submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.
- .4 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 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction as per the conditions of Provincial Act respecting manpower vocational training and qualification.
  - .1 Employees registered in provincial 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.
- .2 Site Meetings:
  - .1 Site Meetings: as requested by Departmental Representative.
- .3 Health and Safety Requirements: 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 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.
- .2 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling.

## **1.8 SYSTEM STARTUP**

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

- .2 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.

## **1.9 OPERATING INSTRUCTIONS**

- .1 Provide for each principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
  - .1 Safety precautions.
  - .2 Procedures to be followed in event of equipment failure.
  - .3 Other items of instruction as recommended by manufacturer of each item of equipment.

## **Part 2 Products**

### **2.1 MATERIALS AND EQUIPMENT**

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment is not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

### **2.2 WARNING SIGNS**

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction inspection authorities and Departmental Representative.
- .2 Decal signs, minimum size 175 x 250 mm.

### **2.3 WIRING TERMINATIONS**

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

### **2.4 EQUIPMENT IDENTIFICATION**

- .1 Identify electrical equipment with nameplates as follows:
  - .1 Nameplates: plastic laminate 3 mm thick plastic engraving sheet, black matt 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
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- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO. (\_\_\_\_)" as directed by Departmental Representative.

## **2.5 WIRING IDENTIFICATION**

- .1 Identify wiring with permanent indelible identifying markings, numbered coloured plastic tapes, on both ends of phase conductors of feeders.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.

## **2.6 CONDUIT AND CABLE IDENTIFICATION**

- .1 Colour code boxes and metallic sheathed cables.
- .2 Colours: [25] mm wide prime colour and [20] mm wide auxiliary colour.

Prime	Auxiliary	
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red

## **2.7 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 light gray to EEMAC 2Y-1.

## **Part 3 Execution**

### **3.1 INSTALLATION**

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

### **3.2 NAMEPLATES AND LABELS**

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

### **3.3 FIELD QUALITY CONTROL**

- .1 Conduct following tests in accordance with Section 26 91 13 – General Commissioning (CX) Requirements.

- .1 Visual and Mechanical Inspection
- .2 Phase Rotation Verification
- .3 Insulation resistance test
  - .1 Low frequency tests (hi-pot).
- .4 Shield-continuity tests
  - .1 Verify resistance to ground before energizing.
  - .2 Verify cable connection integrity
- .5 Load permissible tests to verify the cables, splices and terminations are capable to carry the rated capacity.
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- .2 Carry out tests by certified high voltage testing technicians in presence of Departmental Representative.
- .3 Perform low frequency tests to verify the cables supplied by PWGSC are in good condition prior to installation.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 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 CLEANING**

- .1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

**END OF SECTION**