

**Part 1            General****1.01            REFERENCES**

- .1    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.
- .2    Reference Standards:
  - .1       CSA Group
    - .1           CSA C22.1-15, Canadian Electrical Code, Part 1 (23<sup>rd</sup> Edition), Safety Standard for Electrical Installations including amendments of the Ontario Electrical Safety Code (26<sup>th</sup> Edition/2015).
  - .2       Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
    - .1           IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

**1.02            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2    Product Data:
  - .1       Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Shop drawings:
  - .1       Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  - .2       Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, accessories, and other items that must be shown to ensure co-ordinated installation.
  - .3       If changes are required, notify Departmental Representative of these changes before they are made.
- .4    Certificates:
  - .1       Provide CSA certified material.
  - .2       Where CSA certified material is not available, submit such material to authority having jurisdiction 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       Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

**1.03 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
  - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

**1.04 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 00 10 – General instructions. -

**Part 2 Products****2.01 MATERIALS AND EQUIPMENT**

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

**Part 3 Execution****3.01 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.02            INSTALLATION**

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

### **3.03            FIELD QUALITY CONTROL**

- .1 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
  - .1 Lightning System Grounding Impedance.
- .2 Carry out tests in presence of Departmental Representative.
- .3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .4 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

### **3.04            CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions.
- .3 Waste Management: separate waste materials for reuse in accordance with Section 01 00 10 – General instructions.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**Part 1            General**

**1.01            REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23<sup>rd</sup> Edition.

**1.02            ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

**1.03            DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with Section 26 05 00 – Common Work Result for Electrical.

**Part 2            Products**

**2.01            OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Weatherproof blank cover plates for boxes without wiring devices.

**2.02            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 35mm and pull boxes for larger conduits.

**Part 3            Execution**

**3.01            INSTALLATION**

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

**END OF SECTION**

**Part 1            General**

**1.01            REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
  - .2 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.

**1.02            ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures and Section 01 00 10 – General Instructions.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
  - .1 Submit conduit manufacturing data.

**1.03            WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for in accordance with Section 01 00 10 – General Instructions.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

**Part 2            Products**

**2.01            CONDUITS**

- .1 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal aluminum.

**2.02            CONDUIT FITTINGS**

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified.  
Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.

**2.03            FISH CORD**

- .1 Polypropylene.

**Part 3            Execution**

**3.01            MANUFACTURER'S INSTRUCTIONS**

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

**3.02            INSTALLATION**

- .1       Conceal conduits except in unfinished areas.
- .2       Use liquid tight flexible metal conduit.
- .3       Minimum conduit size for lighting and power circuits: 19 mm.
- .4       Install fish cord in empty conduits.
- .5       Remove and replace blocked conduit sections.
  - .1       Do not use liquids to clean out conduits.
- .6       Dry conduits out before installing wire.

**3.03            CONCEALED CONDUITS**

- .1       Run parallel or perpendicular to building lines.
- .2       Do not install horizontal runs in masonry walls.
- .3       Do not install conduits in terrazzo or concrete toppings.

**3.04            CLEANING**

- .1       Proceed in accordance with Section 26 05 00 – Common Work Results for Electrical.

**END OF SECTION**

**Part 1 General****1.01 RELATED REQUIREMENTS**

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

**1.02 REFERENCES**

- .1 CSA International
  - .1 CAN/CSA-B72-M87 (R2008), Installation Code for Lightning Protection Systems.

**1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit 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 Indicate materials and methods of attachment of conductors to air terminals and electrodes.

**1.04 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with Section 26 05 00 – Common Work Result for Electrical.

**Part 2 Products****2.01 MATERIALS**

- .1 Lightning Rods: Tinned copper solid rod.
- .2 Conductor:
  - .1 Stranded tinned copper conductor: 270 g/m and minimum diameter of tread 1mm;
  - .2 Tinned copper ribbon: 25 mm x 1.3 mm; or
  - .3 As indicated in table 3.1 of Standard CAN/CSA-B72.
- .3 Fastenings and attachment straps: Tinned copper.
- .4 Ground rods: surface 0.40 m<sup>2</sup> copper alloy.
- .5 Use tinned copper conductors, terminals, connectors and fastenings for buildings sheathed in other than aluminum.
- .6 If the tinned copper is incompatible with the materials with which it comes into contact, use aluminum equivalent devices.
- .7 The materials used in lightning protection must be chosen to avoid galvanic effect.



- .8 Bimetallic connectors in aluminum and bronze where required.
- .9 Connections: tinned copper inspectable wrought tinned copper compression connectors to IEEE 837.
- .10 Unless otherwise indicated, the materials used will be new, to quality and a minimum conductivity of 98%.
- .11 Inspection and grounding wells:
  - .1 High density polyethylene reinforced with heavy weave fibreglass construction;
  - .2 Bolt on cover;
  - .3 Enclosures and covers are rated for 10,000 lbs load;
  - .4 Minimal Dimensions: 300 mm Diameter and 450 mm long .
- .12 Materials specially designed for protection against lightning, that are compliant and exceed the minimum standards CAN/CSA-B72.
  - .1 All mechanical fastening flanges and mounting will be in bronze and tinned copper with a minimum capacity of 250 Newtons.

## **2.02 DESCRIPTION**

- .1 System to consist of metallic air terminals, lightning conductors connecting air terminals to ground and interconnected ground electrodes.
- .2 The requirements of a Category 1 system described in the Standard CAN/CSA-B72 must be applied.

## **2.03 REGULATORY REQUIREMENTS**

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

## **Part 3 Execution**

### **3.01 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for lightning protection installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

### **3.02 INSTALLATION**

- .1 Install lightning protection to CAN/CSA-B72.
- .2 Bond discharge conductors to non-current-carrying electrical parts.

- .3 Down conductors final location to be determined on site and with the Departmental Representative approval.
- .4 Submit certificate of installation to Departmental Representative.
- .5 Test all down ground wells resistivity before connecting new lightning protection system to it.
  - .1 All new grounding points to have a resistance to ground below 50 Ohms.
  - .2 Provide test results in written to Departmental Representative.

**3.03 INSPECTION**

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

**3.04 CLEANING**

- .1 Cleaning: clean in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Waste Management: in accordance with Section 26 05 00 – Common Work Results for Electrical.

**3.05 PROTECTION**

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

**END OF SECTION**