

## **PART 1 GENERAL**

### **1.1 GENERAL**

- .1 This section supplements requirements of Division 1.

### **1.2 CODES AND STANDARDS**

- .1 Do complete installation in accordance with CSA C22.1-2015, Canadian Electrical Code except where specified otherwise.
- .2 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50 000V.

### **1.3 CARE, OPERATION AND START-UP**

- .1 Instruct operating personnel in the 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 all aspects of its care and operation.

### **1.4 VOLTAGE RATINGS**

- .1 Operating voltages: to CAN3-C235.
- .2 Electrical equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

## **1.5 PERMITS, FEES AND INSPECTION**

- .1 Permits and inspections are the Contractor's responsibility.
- .2 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .3 Pay associated fees.
- .4 Departmental Representative will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.
- .5 Notify Departmental Representative of changes required by Electrical Inspection Department prior to making changes.
- .6 Furnish Certificates of Acceptance from Electrical Inspection Department on completion of work to Departmental Representative.

## **1.6 MATERIALS AND EQUIPMENT**

- .1 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 Department.
- .2 Factory assemble control panels and component assemblies.

## **1.7 FINISHES**

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two (2) coats of finish enamel.
- .2 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

- .3 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

## **1.8 EQUIPMENT IDENTIFICATION**

- .1 Terminal cabinets and pull boxes: indicate system and voltage.

## **1.9 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.

## **1.10 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>Prime</u>	<u>Auxiliary</u>
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Other	Green	Blue

## **1.11 WIRING TERMINATIONS**

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

- .2 Wiring terminations to be torqued as per manufacturer requirements and retightened 24 hours after initial termination. Do retorquing in the presence of the Departmental Representative.

#### **1.12 MANUFACTURERS AND CSA LABELS**

- .1 Visible and legible, after equipment is installed.

#### **1.13 WARNING SIGNS**

- .1 As specified and to meet requirements of Electrical Inspection Department and Departmental Representative.
- .2 Signs, minimum size 175 x 250 mm.

#### **1.14 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.

#### **1.15 CONDUIT AND CABLE INSTALL**

- .1 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .2 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

#### **1.16 FIELD QUALITY CONTROL**

- .1 Have all electrical work 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 will be 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 Have the work of this division carried out by a contractor who holds a valid Master Electrical contractor license as issued by the Province that the work is being constructed.
- .3 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .4 Insulation resistance testing:
  - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
  - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
  - .3 Check resistance to ground before energizing.
- .5 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .6 Submit test results for Departmental Representative.

**PART 2 PRODUCTS**

**2.1 NOT USED**

- .1 Not applicable.

**PART 3 EXECUTION**

**3.1 NOT USED**

- .1 Not applicable.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Materials and installation for connectors and terminations.

**1.2 PRODUCT DATA**

- .1 Submit product data in accordance with Section 26 05 00.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .2 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling facility as approved by Departmental Representative.

**PART 2 PRODUCTS**

**2.1 CONNECTORS AND TERMINATIONS**

- .1 Copper compression connectors to applicable CSA C22.2 as required sized for conductors.

**PART 3 EXECUTION**

**3.1 NOT USED**

- .1 Not applicable.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 REFERENCES**

- .1 CSA C22.2 No. 0.3-09(R2014), Test Methods for Electrical Wires and Cables.

**1.2 PRODUCT DATA**

- .1 Submit product data in accordance with Section 26 05 00

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21.
- .2 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
- .3 Fold up metal banding, flatten and place in designated area for recycling.

**PART 2 PRODUCTS**

**2.1 BUILDING WIRES**

- .1 Conductors: stranded for 12 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.
- .3 Copper conductors: size as indicated, with thermoplastic insulation type rated at 600 V.

**PART 3 EXECUTION**

**3.1 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 35.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Fold up metal banding, flatten and place in designated area for recycling.

**PART 2 PRODUCTS**

**2.1 SUPPORT CHANNELS**

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, surface mounted suspended.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Secure equipment to masonry, tile and plaster surfaces with lead anchors.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .4 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.
  
- .5 Suspended support systems.
  - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
  - .2 Support two (2) or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
  
- .6 For surface mounting of two or more conduits use channels at 1 m on centre spacing.
  
- .7 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
  
- .8 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
  
- .9 Do not use wire lashing or perforated strap to support or secure raceways or cables.
  
- .10 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 Representative.
  
- .11 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**

**PART 1 GENERAL**

**1.1 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
  - .2 CSA C22.2 No. 211.2-06(R2011), Rigid PVC Conduit.
  - .3 CSA C22.2 No. 45.1-07(R2012), Rigid Metal Conduit: Steel.

**1.2 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21.

**PART 2 PRODUCTS**

**2.1 CONDUITS**

- .1 Beam clamps to secure conduits to exposed steel work.
- .2 Rigid galvanized steel conduit (RGS): to CSA C22.2 No. 45.1.

**2.2 CONDUIT FASTENINGS**

- .1 One hole steel straps to secure surface conduits 50 mm and smaller. Two (2) 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 1.5m oc.
- .4 Threaded rods, 9mm 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 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

## **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 in unfinished areas.
- .3 Use rigid galvanized steel conduit (RGS) unless otherwise noted.
- .4 Minimum conduit size for lighting and power circuits: 21mm.
- .5 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .6 Mechanically bend steel conduit over 19mm dia.
- .7 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .8 Install fish cord in empty conduits. Label each conduit end and mark on as-built.
- .9 Dry conduits out before installing wire.

### **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.
- .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.

**END OF SECTION**

## **PART 1 GENERAL**

### **1.1 SECTION INCLUDES**

- .1 Materials and installation for wire and box connectors.

### **1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA C22.2 No. 65-13, Wire Connectors.

### **1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 21.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material, in appropriate on-site bins for recycling in accordance with Waste Management Plan.

## **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, copper alloy sized to fit copper conductors 10 AWG or less.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

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

- .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No.65.
- .2 Install fixture type connectors and tighten. Replace insulating cap.

**END OF SECTION**