

## 1 General

### 1.1 RELATED SECTIONS & SUMMARY

- .1 The General Conditions, Supplements and Amendments shall govern this Section (read in conjunction with Instructions to Tenderers / Bidders). This Section covers items common to all electrical sections and is intended to supplement the requirements of Division 01.
- .2 Reference to "Electrical Division" shall mean all related Electrical Sections and components including Division 26.
- .3 The word "Provide" shall mean "Supply and Install" the product and services specified. "As indicated" means that the item(s) specified are shown on the drawings.
- .4 Provide materials, equipment and devices of specified design, performance and quality; and, current models with published certified ratings for which replacement part are readily available. Provide project management and on-site supervision to undertake administration, meet schedule, ensure timely performance, ensure coordination and establish orderly completion and the delivery of a fully commissioned installation.
- .5 The most stringent requirements of this section, other electrical sections and drawings shall govern.
- .6 All work shall be in accordance with the PROJECT Drawings and Specifications and their intents, complete with all necessary components, including those not normally shown or specified but required for a complete installation.

### 1.2 CODES AND STANDARDS

- .1 Do complete installation in accordance with Canadian Electrical Code, CSA C22.1-2012.
- .2 Comply with CSA Certification Standards and Electrical Bulletins in force at time of tender at time of tender submission.
- .3 Perform work in accordance with CSA Z426 - Workplace Electrical Safety and Worksafe BC.

### 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 PERMITS, FEES**

- .1 Submit to Electrical Inspection Department necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Obtain and pay for an electrical permit to cover all electrical, communications and fire alarm work.
- .4 Submit a copy of electrical permit to the Departmental Representative prior to commencement of work on site.
- .5 Departmental Representative will provide drawings and specifications required by Electrical Inspection Department at no cost.
- .6 Notify Departmental Representative of changes required by Electrical Inspection Department prior to making changes.
- .7 Furnish Certificates of Acceptance from Electrical Inspection Department on completion of work to Departmental Representative.

**1.5 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES**

- .1 Submit shop drawings, product data and samples in accordance with Division 01 requirements. The submission shall be reviewed, signed and processed as described in Division 01.
- .2 Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment or material.
- .3 Where applicable, include wiring, single line and schematic diagrams. Include wiring drawings or diagrams showing interconnection with work of other sections.
- .4 Content
  - .1 Shop drawings submitted title sheet.
  - .2 Data shall be specific and technical.
  - .3 Clearly identify the equipment or material that is supplied on the shop drawings. Un-marked shop drawings will be rejected.
  - .4 The project and equipment designations shall be identified on each document.
- .5 Provide number of copies indicated in Section Division 01 with a minimum of 2 copies to be retained by the Departmental Representative.
- .6 Keep one (1) copy of shop drawings and product data, on site, available for reference.

**1.6 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Division 01 – Quality Control.

- .2 Qualifications: all 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 and/or Territorial ACT respecting manpower vocational training and qualifications.
- .3 Site Meetings: in accordance with Division 01 – Construction Progress Schedule.
- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Division 01 – Health and Safety Requirements.

#### **1.7 MAINTENANCE MATERIALS**

- .1 Provide maintenance materials in accordance with Section 01 01 50.
- .2 Additional maintenance material requirements are included under various other Sections.

#### **1.8 OPERATION AND MAINTENANCE DATA**

- .1 Provide operation and maintenance data for incorporation into operation and maintenance manual specified in Section 01 01 50.
- .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, component illustrations, exploded views, technical descriptions of items, and parts 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.
  - .6 Final electrical inspection report.
  - .7 Letter of assurance re seismic bracing if applicable.
  - .8 Copy of updated type written panel schedules.
  - .9 Warranty certificates applicable.
  - 10. One CD containing PDF files of all the material included in the manual.

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

- .1 Instruct the Departmental representative and operating personnel in the operation, care and maintenance of equipment.
- .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.

**1.10 VOLTAGE RATINGS**

- .1 Operating voltages: to CAN3-C235-83 (R1996).
- .2 Motors, electric heating, control and distribution devices and 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.

**1.11 MATERIALS AND EQUIPMENT**

- .1 Equipment and material to be new and CSA certified, and manufactured to standard quoted.
- .2 Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Inspection Department.

**1.12 EQUIPMENT IDENTIFICATION**

- .1 Identify electrical equipment with nameplates as follows:
- .2 Nameplates:
  - .1 Lamicoid 3 mm thick plastic engraving sheet, white face and black core unless indicated otherwise attached with Loctite 414 adhesive. Pre-gummed labels are not acceptable.

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

- .3 Wording on nameplates and labels to be approved by departmental representative prior to manufacture.
- .4 Allow for average of twenty-five (25) letters per nameplate.
- .5 Identification to be English.
- .6 Nameplates for junction boxes to indicate system and/or voltage characteristics.
- .7 Nameplates for pull boxes to indicate system and type of cable.

**1.13 WIRING IDENTIFICATIONS**

- .1 Identify wiring with permanent indelible identifying markings, numbered plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

- .2 Maintain phase sequence and colour coding for 120/208V and 347/600V wiring throughout.
- .3 Identify Telecommunications cabling as indicated.

**1.14 WIRING TERMINATIONS**

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

**1.15 MANUFACTURERS AND CSA LABELS**

- .1 Visible and legible after equipment is installed.

**1.16 WARNING SIGNS**

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

**1.17 LOCATIONS OF OUTLETS**

- .1 Locate outlets as indicated on drawings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3 m, and information is given before installation.

**1.18 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 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Local switches: 1200 mm.
  - .2 Wall receptacles: 400 mm.
  - .3 Voice and Data outlets: 400 mm.
  - .4 Other devices: As indicated on the drawings.

**1.19 PROTECTION**

- .1 Protect exposed live equipment during construction for personnel safety.

- .2 Shield and mark live parts "LIVE 120 VOLTS", or with appropriate voltage.

#### **1.20 CONDUIT AND CABLE INSTALLATION**

- .1 Refer to drawings and other specification sections for type of conduit and cable to be used.
- .2 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete; schedule 40 plastic pipe, sized for free passage of conduit, and protruding 50 mm.
- .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.

#### **1.21 FIRESTOPPING**

- .1 Where cables or conduits pass through floors and fire rated walls, pack space full with a ULC approved firestopping system.

#### **1.22 FIELD QUALITY CONTROL**

- .1 Conduct and pay for testing, commissioning, demonstration and training of the following where applicable:
  - .1 Uninterruptible Power System.
  - .2 Circuits originating from branch distribution panels.
  - .3 Lighting and associated controls.
  - .4 Voice and data cabling and jacks.
- .2 Refer to each Section for additional testing requirements.
- .3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .4 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that each system is taken out of service the shortest possible amount of time.
- .5 Submit test results for Departmental Representative review.

#### **1.23 CLEANING**

- .1 Do final cleaning in accordance with Section 01 01 50.
- .2 At time of final cleaning, clean lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dust and dirt.

#### **1.24 RECORD DRAWINGS**

- .1 Refer to Section 01 01 50 - Closeout Submittals.

- .2 Indicate conduit and cable runs, junction boxes and circuit numbers.
- .3 Indicate communication voice/data outlet numbers where applicable.
- .4 Additional record drawing requirements are included under various other Sections.

**1.25 ENVIRONMENTAL PROTECTION AND WASTE MANAGEMENT**

- .1 Refer to Section 01 01 50 - Environmental Protection.
- .2 Refer to Section 01 01 50 - Waste Management.

**2 Products**

2.1 Not Used.

**3 Execution**

3.1 Not Used.

**END OF SECTION**

**1 General**

**1.1 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 01 50.

**1.2 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 01 50.
- .2 Collect and separate for recycling paper, plastic, polystyrene, corrugated cardboard, and packaging material.
- .3 Divert unused wiring materials to metal recycling facility.

**2 Products**

**2.1 BUILDING WIRES**

- .1 Conductors: stranded for 10 AWG and larger, minimum size 12 AWG.
- .2 Copper conductors with 600 V insulation of chemically cross-linked thermosetting polyethylene material type RW90 rated for not less than 90°C.
- .3 All conductor shall have FT4 type outer jacket to comply with all applicable regulations and bylaws.

**2.2 TECK CABLE**

- .1 Conductors:
  - .1 Grounding conductor: Copper
  - .2 Circuit conductors: copper, size as indicated.
- .2 Insulation: Chemically cross-linked thermosetting polyethylene, type RW90, rated 600V.
- .3 Inner jacket: polyvinyl chloride material.
- .4 Armour: interlocking aluminum.
- .5 Overall covering: poly chloride material FT-4 flame test rated.
- .6 Connectors: watertight, approved for Teck cable installation.

**2.3 ARMOURED CABLE**

- .1 Type: AC 90.
- .2 Armour: flexible interlocked aluminum.

**3 Execution**

**3.1 INSTALLATION GENERAL**

- .1 Unless specifically indicated otherwise, all wiring shall be installed in conduit. Use flexible conduits for final connections to suspended or recessed luminaires and vibrating equipment.
- .2 Before pulling wire, ensure conduit is dry and clean. If moisture is present, thoroughly dry out conduits; vacuum if necessary. Use only recognized manufactured wire pulling lubricants to facilitate wire pulling.
- .3 Installation to be free of opens and grounds. Before energization, measure insulation resistance and comply with the Canadian Electrical Code. Submit data sheet with values measured.

**3.2 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34.
- .2 Provide a green insulated bond conductor in all conduits sized in accordance with CSA C22.1-2012, Canadian Electrical Code, Part 1.

**3.3 INSTALLATION OF ARMoured CABLE**

- .1 Unless specifically noted otherwise, use armoured cables only for:
  - .1 Final connections from a junction box above accessible suspended ceilings to recessed light fixtures to a maximum length of 1500mm.

**END OF SECTION**

**1 General**

**1.1 REFERENCES**

- .1 CSA C22.1-2012 Canadian Electrical Code, Part 1.

**1.2 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 01 01 50 - Submittal Procedures.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Refer to Section 01 01 50 - Waste Management.

**1.4 ENVIRONMENTAL PROTECTION**

- .1 Refer to Section 01 01 50 - Environmental Protection.

**2 Products**

**2.1 RECESSED OUTLET AND CONDUIT BOXES**

- .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.

**2.2 SURFACE CONDUIT AND DEVICE BOXES**

- .1 Cast aluminium, one or two gang FS or FD or octagonal boxes with factory threaded hubs and mounting feet.

**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 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

**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 and armoured cable connections. Reducing washers are not allowed.

**END OF SECTION**

**1 General**

**1.1 LOCATION OF CONDUIT**

- .1 Drawings do not show all conduits. Those shown are in diagrammatic form only.

**1.2 CONDUIT SIZES**

- .1 Note that conduit sizes referenced in the 2012, Canadian Electrical Code are used.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Refer to Section 01 01 50 - Waste Management.

**1.4 ENVIRONMENTAL PROTECTION**

- .1 Refer to Section 01 01 50 - Environmental Protection.

**2 Products**

**2.1 CONDUITS**

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .2 Flexible metal conduit and Liquid-Tight flexible metal conduit: to CSA C22.2 No. 56.
- .3 Minimum conduit size to be 21mm diameter.

**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 Channel type supports for two or more conduits at 2 m on centre.
- .3 Threaded rods, 6 mm diameter, to support suspended channels.

**2.3 CONDUIT FITTINGS**

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 EMT couplings and connectors shall be malleable steel, set screw type. Connectors shall have insulated throats. Cast fittings are not acceptable.
- .3 Watertight connectors and couplings for all exterior mounted EMT conduit, Rigid metal conduit and Liquid-Tight metal conduit.

**2.4 FISH CORD**

- .1 Polypropylene.

**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, electrical and telecom rooms and in unfinished areas.
- .3 Unless otherwise indicated, all wiring is to be in EMT and Liquid-Tight flexible metal conduit.
- .4 Use liquid-tight flexible conduit for final connection to all mechanical equipment.
- .5 Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.
- .6 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .7 Mechanically bend steel conduit over 21 mm diameter.
- .8 Dry conduits out before installing wire.
- .9 Install fish cord in empty conduits.

**3.2 SURFACE CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Run conduits in flanged portion of structural steel.
- .3 Group conduits wherever possible on surface channels.
- .4 Do not pass conduits through structural members except as indicated.
- .5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum 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**

## **1. General**

### **1.1 RELATED SECTIONS**

- .1 Section 01 01 50 – General Instructions for Submittal Procedures.
- .2 Section 01 01 50 – General Instructions for Environmental Procedures.
- .3 Section 26 05 00 – Common Work Results - Electrical.

### **1.2 REFERENCES**

- .1 Canadian Standard Association (CSA International)
  - .1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Moulded-Case Switches and Circuit Breaker Enclosures (Tri-national Standard with UL 489, tenth edition and the second edition of NmX-J-266-ANCE).

### **1.3 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 01 50 – General Instructions for Submittal Procedures.
- .2 Indicate time-current characteristic curves for breakers with ampacity of 100A and over or with interrupting rating capacity of 22,000 A symmetrical (rms) and over at system voltage.

### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Refer to Section 01 01 50 – Waste Management and Disposal.

## **2. Products**

### **2.1 BREKERS - GENERAL**

- .1 Moulded-case circuit breaker, and ground-fault interrupters, and accessory high-fault protectors: to CSA C22.2 No. 5.
- .2 Bolt-on moulded-case circuit breaker: quick-make, quick-break type for manual and automatic operation for with temperature compensation for 40
- .3 Plug-in moulded-case circuit breakers shall not be used.
- .4 Common-trip breakers: with single handle for multi-pole application.

- .5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
  - .1 Trip setting on breakers with adjustable trips to range from 3-8 times current rating
- .6 Circuit breakers with interchangeable trips as indicated.
- .7 Interrupting rating capacity as indicated on the drawings. Where new circuit breakers are added to an existing panelboard, rating to match existing circuit breakers.

## **2.2 THERMAL MAGNETIC BREAKERS**

- .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.

## **3. Execution**

### **3.1 INSTALLATION**

- .1 Install circuit breakers as indicated.

**END OF SECTION**

**1. General**

**1.1 RELATED SECTIONS**

- .1 Section 01 01 50 – General Instructions for Submittal Procedures.
- .2 Section 01 01 50 – General Instructions for Environmental Procedures.
- .3 Section 26 05 00 – Common Work Results - Electrical.

**1.2 PRODUCT DATA**

- .1 Submit product data in accordance with Section 01 01 50 – General Instructions for Submittal Procedures.

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Refer to Section 01 01 50 – Waste Management and Disposal.

**2. Products**

**2.1 DISCONNECT SWITCHES**

- .1 Fusible, non fusible, horsepower rated disconnect switch in CSA Enclosure, size as indicated.
- .2 Provision for padlocking in off switch position by three locks.
- .3 Mechanically interlocked door to prevent opening when handle in ON position.
- .4 Fuses: size as indicated.
- .5 Fuseholders: suitable without adaptors for type and size of fuses indicated.
- .6 Quick-make, quick-break action.
- .7 ON-OFF switch position indication on switch enclosure cover.
- .8 Weatherproof type for outdoor use where indicated on drawings.

**2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results – Electrical.

**3. Execution**

**3.1 INSTALLATION**

- .1 Install disconnect switches complete with fuses if applicable.

**END OF SECTION**