

**PART 1 GENERAL****1.1 REFERENCE STANDARDS**

- .1 CSA Group
  - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
- .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.

**1.2 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.

**1.3 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 Quebec, Canada.
    - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
    - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
    - .4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
    - .5 Submit number of copies size drawings.
    - .6 If changes are required, notify Departmental Representative of these changes before they are made.
  - .4 Certificates:
    - .1 Provide CSA certified material and equipment.
    - .2 Where CSA certified material and equipment is not available, submit such equipment to 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.
  - .5 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.
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## **1.4 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.
  - .2 Operating instructions to include following:
    - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
    - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
    - .3 Safety precautions.
    - .4 Procedures to be followed in event of equipment failure.
    - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
  - .3 Post instructions where directed.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance 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.

## **PART 2 PRODUCTS**

### **2.1 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 for control items in French.

### **2.2 MATERIALS AND EQUIPMENT**

- .1 Provide equipment in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Equipment to be CSA certified. Where CSA certified equipment and material are 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.
  - .3 Factory assemble control panels and component assemblies.
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## 2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

## 2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of Departmental Representative.
- .2 Decal signs, minimum size 175 x 250 mm.

## 2.5 WIRING TERMINATIONS

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

## 2.6 EQUIPMENT IDENTIFICATION

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

- .2 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .3 Allow for minimum of twenty-five (25) letters per nameplate.
- .4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .5 The nameplates of safety switch, starters and contactors must indicate the controlled device and the voltage.
- .6 The nameplates of terminal boxes and pull boxes must indicate the network and the voltage.

## 2.7 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, 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 coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

## 2.8 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.

Type	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Red	
Other Security Systems	Red	Yellow

## 2.9 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 indoor switchgear and distribution enclosures light gray.

## PART 3 EXECUTION

### 3.1 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.

### 3.2 INSTALLATION

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

### 3.3 NAMEPLATES AND LABELS

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

### 3.4 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
- .2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

### 3.5 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 150 mm 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.
- .4 Locate light switches on latch side of doors.
  - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

### 3.6 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: 1000 mm.
  - .2 Wall receptacles:
    - .1 General: 400 mm.
    - .2 In mechanical rooms: 1400 mm.
  - .3 Telephone and interphone outlets: 400 mm.

### 3.7 COORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

### 3.8 FIELD QUALITY CONTROL

- .1 Conduct following tests.
    - .1 Power distribution system including phasing, voltage, grounding and load balancing.
    - .2 Circuits originating from branch distribution panels.
    - .3 Lighting and its control.
    - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
    - .5 Systems: fire alarm.
    - .6 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.
  - .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.
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- .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.

### **3.9 SYSTEM STARTUP**

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

### **3.10 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .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 74 00 - Cleaning.

**END OF SECTION**

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## **PART 1 GENERAL**

### **1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

### **1.2 DEFINITIONS**

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by Federal Hazardous Products Act (RSC 1985) including latest amendments.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Action Submittals: Provide in accordance with Section 01 33 00- Submittal Procedures before starting work of this Section:
  - .1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with other Sections.

### **1.4 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.
- .2 Scheduling: Account for Departmental Representative's continued occupancy requirements during selective demolition and schedule staged occupancy and worksite activities as a defined Activity in Section 01 32 16.19 - Construction Progress Schedule - Bar (GANTT) Chart.

### **1.5 QUALITY ASSURANCE**

- .1 Regulatory Requirements: Perform work of this Section in accordance with:
    - .1 Federal Workers' Compensation Service.
    - .2 Government of Canada, Labour Program: Workplace Safety.
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## **1.6 SITE CONDITIONS**

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition at time of site examination before tendering.
- .2 Existing Hazardous Substances: Departmental Representative performed a hazardous substances assessment and it is not expected that hazardous substances will be encountered in Work.
- .3 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform following activities:
  - .1 Refer to Section 01 41 00 - Regulatory Requirements for directives associated with specific material types.
  - .2 Hazardous substances will be as defined in Hazardous Products Act.
  - .3 Stop work in area of suspected hazardous substances.
  - .4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
  - .5 Hazardous substances will be removed by Departmental Representative under a separate contract or as a change to Work.
  - .6 Proceed only after written instructions have been received from Departmental Representative.

## **1.7 SALVAGE AND DEBRIS MATERIALS**

- .1 Demolished items become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Departmental Representative's property.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 General Patching and Repair Materials: Refer to Section 02 41 00.08 – Demolition – Minor Works for listing of patching and repair materials incidental to removal or demolition of components associated with work of this Section.
- .2 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed.
- .3 Fire stopping Repair Materials: Use fire stopping materials compatible with existing fire stopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; Departmental Representative will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.
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### 3.2 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
  - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
  - .2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
  - .3 Prevent debris from blocking drainage inlets.
  - .4 Protect mechanical systems that will remain in operation.
- .2 Protection of Building Occupants: Sequence demolition work so that interference with the use of the building by the Departmental Representative and users is minimized and as follows:
  - .1 Prevent debris from endangering safe access to and egress from occupied buildings.
  - .2 Notify Departmental Representative and cease operations where safety of occupants appears to be endangered and await additional instructions before resuming demolition work specified in this Section.

### 3.3 EXECUTION

- .1 Demolition and removal: Coordinate requirements of this Section with information contained in 02 41 00.08 – Demolition – Minor Works and as follows:
  - .1 Disconnect electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent Work.
  - .2 Remove existing luminaires, electrical devices and equipment including associated conduits, boxes, wiring, and similar items [unless specifically noted otherwise].
  - .3 Perform demolition work in a neat and workmanlike manner:
    - .1 Remove tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
    - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
  - .4 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.
  - .5 Seal open ends of conduit with silicone sealant and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

### 3.4 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use in new construction.
- .2 Hazardous Substances Disposal: Arrange for disposal of hazardous substances in accordance with requirements of Section 02 81 00- Hazardous Materials.

### END OF SECTION

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## **PART 1 GENERAL**

### **1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CAN/CSA-C22.2 No.18-98 (R2003), Outlet Boxes, Conduit Boxes and Fittings.
  - .2 CAN/CSA-C22.2 No.65-03 (R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMJ-J-543-ANCE-03).
- .2 National Electrical Manufacturers Association (NEMA)

### **1.2 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 for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

### **1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance 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 wire and box connectors from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse of crates, packaging materials as specified in Construction Waste Management Plan.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
  - .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
  - .3 Clamps or connectors for flexible conduit, and armoured cable, as required to: CAN/CSA-C22.2 No.18.
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**PART 3 EXECUTION****3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors 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.

**3.2 INSTALLATION**

- .1 Remove insulation carefully from ends of conductors cables and:
  - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
  - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
  - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .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 74 00 - Cleaning.

**END OF SECTION**

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**PART 1 GENERAL****1.1 PRODUCT DATA**

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

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Packaging Waste Management: remove for reuse of crates and packaging materials in accordance with Construction Waste Management.

**PART 2 PRODUCTS****2.1 BUILDING WIRES**

- .1 Conductors shall be copper with cross-linked polyethylene type RW90 - 40° or TW75 insulation as specified, good for 600 Vac. Conductors shall be solid for sizes 12 and 10 and stranded for other sizes.
- .2 Unless specifically indicated otherwise materials used for the manufacture of the conductors shall be copper throughout, and insulation conductors must carry the appropriate CSA designation. Except otherwise specified, sizes are in accordance with copper conductor.
- .3 Conductor application
  - .1 Distribution and branch circuits
    - .1 RW90 indoor and above ground outside;
    - .2 RWU90 outdoor and buried;
    - .3 Size No. 12 AWG minimum.
  - .2 Control circuits
    - .1 TW75 indoor;
    - .2 TWU75 outdoor and buried;
    - .3 Size No. 14 AWG minimum;
    - .4 Stranded type.
  - .3 Grounding conductor in same conduit with other conductors
    - .1 TW75 or RW90 (green) indoor;
    - .2 TWU75 or RWU90 (green) outdoor or buried;
    - .3 Size 12 AW minimum.
- .4 Fire alarm circuits, according to article "Detection and Fire Alarm".
- .5 The following information shall be permanently marked, at regular intervals, on extra-low voltage conductors.
  - .1 The size followed by a blank for copper conductors.
  - .2 The conductor insulation type.
  - .3 The name of the manufacturer.
  - .4 FT-1 or FT-6 category, where applicable

**2.2 ARMoured CABLES**

- .1 Conductors: insulated, copper, size as indicated.
  - .2 Type: AC90.
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- .3 Armour: interlocking type fabricated from aluminum strip.
- .4 Connectors: anti short connectors.
- .5 Application: in hanged ceilings, dry walls and dry location. For connection of lighting fixtures and switches, from a junction box on a horizontal distance not exceeding 3 m (10').

## **PART 3 EXECUTION**

### **3.1 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

### **3.2 GENERAL CABLE INSTALLATION**

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .3 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

### **3.3 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
  - .2 In surface and lighting fixture raceways in accordance with Section 26.

### **3.4 INSTALLATION OF ARMOURED CABLES**

- .1 Group cables wherever possible on channels.

## **END OF SECTION**

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**PART 1 GENERAL****1.1 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 for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance 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 hangers and supports from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**PART 2 PRODUCTS****2.1 SUPPORT CHANNELS**

- .1 U shape, size 41 x 41 mm, 2.5 mm thick, suspended and surface mounted set in poured concrete walls and ceilings.

**PART 3 EXECUTION****3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hangers and supports 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.

**3.2 INSTALLATION**

- .1 Secure equipment to poured concrete with expandable inserts.
  - .2 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
  - .3 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
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- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 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.
- .6 For surface mounting of two or more conduits use channels 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.

### 3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .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 74 00 - Cleaning.

**END OF SECTION**

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**PART 1 GENERAL****1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for recycling and reuse in accordance with Section 01 74 19 - Waste Management and Disposal.

**PART 2 PRODUCTS****2.1 JUNCTION AND PULL BOXES**

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on turned edge covers.

**PART 3 EXECUTION****3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION**

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.
- .3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

**3.2 IDENTIFICATION**

- .1 Equipment Identification: to Section 26 05 00 - Common Work Results for Electrical.
- .2 Identification Labels: size 2 indicating voltage, phase and system name or as indicated.

**END OF SECTION**

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**PART 1 GENERAL****1.1 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for recycling and reuse in accordance with Section Construction Waste Management and Disposal.

**PART 2 PRODUCTS****2.1 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 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 347 V outlet boxes for 347 V switching devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.
- .7 Outlet boxes for telecommunication shall be single gang for a maximum of four (4) cables and double gang for five (5) to eight (8) cables. When boxes are used, they shall have a minimum depth of 64 mm, two (2) gangs.

**2.2 GALVANIZED STEEL OUTLET BOXES**

- .1 One-piece electro-galvanized construction.
- .2 Single or multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .4 Extension and plaster rings for flush mounting devices in finished tile walls.

**2.3 CONDUIT BOXES**

- .1 Cast FD or FS aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.
-

**2.4 BOITES EXTERIEURES**

- .1 Weatherproof designed for covers with four screws and for surface mounting.

**2.5 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.

**PART 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, 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**

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**PART 1 GENERAL****1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .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. 56-2017, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .3 CSA C22.2 No. 83-M1985 (R2017), Electrical Metallic Tubing.
  - .4 CSA C22.2 No. 211.2-2006 (R2016), Rigid PVC (Unplasticized) Conduit.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling and reuse in accordance with Construction Waste Management and Disposal.
- .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****2.1 CABLES AND REELS**

- .1 Provide cables on reels or coils.
  - .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.

**2.2 CONDUITS**

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83.
  - .2 Rigid pvc conduit: to CSA C22.2 No. 211.2.
  - .3 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal, aluminum.
  - .4 Application :
    - .1 Electric metallic tubing (EMT)
      - .1 For utilization and distribution panel feeders;
      - .2 For branch circuits and auxiliary systems;
      - .3 In suspended ceilings, masonry and dry walls.
    - .2 PVC conduits
      - .1 For outdoor installation on roofs;
-

- .2 For underground installation and in corrosive environments.
- .3 Flexible and watertight PVC covered metallic conduits
- .1 For connection to motors and other equipment generating vibration.

## 2.3 CONDUIT FASTENINGS

- .1 One hole malleable iron straps to secure surface conduits 53 mm and smaller.
  - .1 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 on centre.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

## 2.4 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 27 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.

## 2.5 FISH CORD

- .1 Polypropylene.

# PART 3 EXECUTION

## 3.1 MANUFACTURER'S INSTRUCTIONS

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

## 3.2 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.
  - .3 Minimum conduit size for lighting and power circuits: 21 mm.
  - .4 Bend conduit cold:
    - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
  - .5 Mechanically bend steel conduit over 21 mm diameter.
  - .6 Install fish cord in empty conduits.
  - .7 Remove and replace blocked conduit sections.
    - .1 Do not use liquids to clean out conduits.
  - .8 Dry conduits out before installing wire.
-

**3.3 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 or 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.

**3.4 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.

**3.5 CLEANING**

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

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**PART 1 GENERAL****1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
  - .2 CAN/CSA C22.2 No.42.1 (R2013), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
  - .3 CSA C22.2 No.55 (R2015), Special Use Switches.
  - .4 CSA C22.2 No.111-2018, General-Use Snap Switches (Bi-national standard, with UL 20).

**1.2 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 for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance 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 wiring devices from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**PART 2 PRODUCTS****2.1 SWITCHES**

- .1 15 A, 120 V, single pole switches to: CSA C22.2 No.111.
  - .2 Manually-operated general purpose AC switches with following features:
    - .1 Terminal holes approved for No. 10 AWG wire.
    - .2 Silver alloy contacts.
    - .3 Urea or melamine moulding for parts subject to carbon tracking.
    - .4 Suitable for back and side wiring.
    - .5 Ivory toggle.
  - .3 Switches of one manufacturer throughout project.
-

## 2.2 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
  - .1 Ivory urea moulded housing.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Break-off links for use as split receptacles.
  - .4 Eight back wired entrances, four side wiring screws.
  - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout project.

## 2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Stainless steel, vertically brushed cover plates for wiring devices mounted in flush-mounted outlet box.
- .3 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

## 2.4 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

# PART 3 EXECUTION

## 3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices 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.

## 3.2 INSTALLATION

- .1 Switches:
  - .1 Install single throw switches with handle in "UP" position when switch closed.
  - .2 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical.
  - .3 Use switches with red levers on emergency circuits.
- .2 Receptacles:
  - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
  - .2 Use red receptacles on emergency circuits.
  - .3 Install ground fault circuit interrupter (GFCI) in the elevator pit and mechanical room.

- .3 Cover plates:
  - .1 Install suitable common cover plates where wiring devices are grouped.
  - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

### **3.3 IDENTIFICATION**

- .1 Each switch and power outlet must be identified using 1-size nameplates
- .2 Nameplates must be installed above switch plates and power sockets.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .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 74 00 - Cleaning.

### **3.5 PROTECTION**

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

**END OF SECTION**

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**PART 1 GENERAL****1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide fuse performance data characteristics for each fuse type and size above. Performance data to include: average melting time-current characteristics.

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Ship fuses in original containers.
- .2 Do not ship fuses installed in switchboard.
- .3 Store fuses in original containers in moisture free location.

**PART 2 PRODUCTS****2.1 FUSES - GENERAL**

- .1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.
- .2 Fuses: product of one manufacturer.
- .3 Fuses conform to CSA C22.2 No. 106.

**2.2 FUSE TYPES**

- .1 Class J fuses.
  - .1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
  - .2 Type J2, fast acting.
  - .3 High rupturing capacity (HRC) fuses 200kA RMS symmetrical.

**PART 3 EXECUTION****3.1 INSTALLATION**

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically matched mounting devices.
- .3 Ensure correct fuses fitted to assigned electrical circuit.

**END OF SECTION**

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## **PART 1 GENERAL**

### **1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA C22.2 No. 5-2016, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

### **1.2 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 for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.

### **1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance 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 circuit breakers in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

## **PART 2 PRODUCTS**

### **2.1 BREAKERS GENERAL**

- .1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation.
  - .2 Common-trip breakers: with single handle for multi-pole applications.
  - .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
    - .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
  - .4 When breakers are supplied in existing panels, supply a model of the same manufacturer's that has rupture capacity equal or superior to the existing breakers in this panel. Refer to the panels details and drawings. Those breakers shall be new except otherwise noted.
  - .5 Authentication of new breakers (not counterfeited)
    - .1 Except otherwise noted, all breakers installed in panels (new or existing) shall be new and obtained exclusively from a distributor authorized by manufacturer.
    - .2 Submit with breaker shop drawings, a copy of the purchase order to the distributor. Quantities, models and sizes shown on the purchase order shall correspond to those indicated on the shop drawings.
-

- .3 Retain all packing slips of material delivered to the job site and provide one copy to the Engineer. All packing slips shall bear one signature attesting receiving by the Contractor.
- .4 In case of default to the requirement of this article, the Engineer may request a verification by the manufacturer of breakers. Costs related to this verification will be at Contractor's expense.

## **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.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Install circuit breakers as indicated.

### **3.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .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 74 00 - Cleaning.

**END OF SECTION**

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**PART 1 GENERAL****1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CAN/CSA C22.2 No.144-M91 (R2015), Ground Fault Circuit Interrupters.
- .2 National Electrical Manufacturers Association (NEMA)
  - .1 NEMA PG 2.2-2014, Application Guide for Ground Fault Protection Devices for Equipment.

**1.2 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 for ground fault circuit interrupters and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance 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 ground fault circuit interrupters from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**PART 2 PRODUCTS****2.1 MATERIALS**

- .1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA C22.2 No.144.
- .2 Components comprising ground fault protective system to be of same manufacturer.

**2.2 GROUND FAULT CIRCUIT INTERRUPTER RECEPTACLE**

- .1 Ground fault circuit interrupter receptacle, to circuit of 15 A, 120 V and including the following:
    - .1 Heavy commercial grade.
    - .2 Ground fault detection, from semiconductors.
    - .3 "Test" and "reset" buttons .
    - .4 CSA Enclosure 1, surface or flush mounted with stainless steel cover plate.
  - .2 Receptacles for elevator pit and mechanical room must be ground fault circuit interrupter type.
-

- .3 Use ivory-colour for receptacles connected on normal circuits.
- .4 Use red-colour for receptacles connected on emergency circuits.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

- .1 Do not ground neutral on load side of ground fault relay.
- .2 Pass phase conductors including neutral through zero sequence transformers.
- .3 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

#### **3.2 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Arrange for field testing of ground fault equipment by Contractor before commissioning service.
- .3 Demonstrate simulated ground fault tests.

#### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .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 74 00 - Cleaning.

**END OF SECTION**

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**PART 1 GENERAL****1.1 REFERENCE STANDARDS**

- .1 CSA Group
  - .1 CAN/CSA-C22.2 No.4-2016, Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).
  - .2 CSA C22.2 No.39-13, Fuseholder Assemblies.

**1.2 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 for disconnect switches - fused and non-fused and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance 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 disconnect switches - fused and non-fused from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**PART 2 PRODUCTS****2.1 DISCONNECT SWITCHES**

- .1 Fusible, disconnect switch in CSA enclosure to CAN/CSA-C22.2 No.4 size as indicated.
  - .2 Provision for padlocking in on switch position by 3 locks.
  - .3 Mechanically interlocked door to prevent opening when handle in ON position.
  - .4 Fuses: size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.
  - .5 Fuseholders: to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse indicated.
  - .6 Quick-make, quick-break action.
  - .7 ON-OFF switch position indication on switch enclosure cover.
  - .8 Safety switches for elevator controllers shall be fitted with one type C auxiliary contact. Connect this contact to the elevator controller with two (2) No. 14 AWG conductor inside a 16 mm conduit.
-

**2.2 MAINTENANCE SWITCHES**

- .1 Without fuse in a NEMA type 3R enclosure.
- .2 Complete with facility to lock the lever in the "closed" or "open" position.
- .3 Heavy duty construction.
- .4 Application: air conditioning unit outdoors.

**2.3 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

**PART 3 EXECUTION****3.1 INSTALLATION**

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

**3.2 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .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 74 00 - Cleaning.

**END OF SECTION**

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**PART 1 GENERAL****1.1 REFERENCE STANDARDS**

- .1 Illuminating Engineering Society (IES)
  - .1 Photometric tests in accordance with IES LM-79 *Approved Method: Electrical and Photometric Measurements of Solid-State Lighting Products*.
  - .2 Light depreciation determined according to IES LM-80 *Approved Method: Measuring Lumen Maintenance of LED Light Sources*.
  - .3 Long-term light depreciation determined according to IES TM-21 *Projecting Long Term Lumen Maintenance of LED Light Sources*.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1 ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 UL 8750 *Light Emitting Diode Equipment for Use in Lighting Products*.
- .4 UL 1310 Class 2 Power Units or equivalent CSA.
- .5 FCC Title 47 CFR Part 18 *Electronic Code of Federal Regulations – Telecommunication – Industrial, Scientific, and Medical Equipment*.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Identify the type of fixture on each technical data.
  - .3 Fixtures must adapt to the ceilings of the architectural drawings. Before installation, ensure that the fixtures are compatible with the types and space available in the ceiling.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
  - .3 Divert unused metal materials from landfill to metal recycling facility.
  - .4 Disposal and recycling of fluorescent lamps as per local regulations.
  - .5 Disposal of old PCB filled ballasts.
-

**PART 2 PRODUCTS****2.1 LIGHT EMITTING DIODE DEVICES (LED)**

- .1 All LED devices and their components must, at minimal meet all reference standards listed above.
- .2 Each fixture must be equipped with a compatible factory installed driver.
- .3 Supply units shall be equipped with colour connectors determined in accordance with the standard requirements ANSI C82.11.
- .4 Caractéristiques techniques des blocs d'alimentation :
  - .1 120 V  $\pm$ 5 %, 60 Hz .
  - .2 Power factor: 90 % minimum.
  - .3 Total harmonic distortion: 20 % maximum.
  - .4 Class A nominal sound volume.
  - .5 Operation ambient temperature: 10 to 40 °C, 90 % R.H.
  - .6 The housing temperature: 0 at 62 °C, 90 % R.H.
  - .7 Must tolerate without damage a condition of open circuit or short circuit without use of fuses or other external protection devices.
  - .8 Must not contain any PCB.
- .5 Minimum 5-year warranty, parts and labor, for the device. This includes, without limitation, diodes, connectors, driver and all other components necessary for the proper functioning of the device.

**PART 3 EXECUTION****3.1 INSTALLATION**

- .1 Locate and install luminaires as indicated.
  - .2 Connect fixtures to lighting circuits as shown.
  - .3 Install lighting fixtures after all other works, which may damage or soil them have been finished.
  - .4 All others division's drawings shall be examined when installing lighting fixtures.
  - .5 Where there are no suspended ceilings, hang lighting fixtures with appropriate length rods and install them between pipes, ducts, girders or other obstacles in such a manner as not to obstruct the light flux from the fixture.
  - .6 Check the nature of the ceiling when installing recessed fixtures and use proper anchors. Plaster rings shall be installed in plaster or gypsum ceilings.
  - .7 When a fixture is surface mounted, the outlet box shall be of a type, which will be completely covered by the fixture after its installation.
  - .8 Consult the architect's suspended ceiling drawings for the exact location of the lighting fixtures and consult the Engineer if discrepancies are noted.
  - .9 Wait until the equipment in electrical and mechanical rooms is installed before installing lighting fixtures. Take into account the location of all obstacles when installing lighting fixtures.
  - .10 Fixtures installed from an inclined surface shall be suspended with adjustable rods and ball joints unless noted otherwise.
-

- .11 Lighting fixtures weighting 7 kg. (15 lbs) and more which are anchored to exterior walls shall be anchored to the building structure.
- .12 Permanent lighting fixtures shall be used for temporary lighting with proper authorization only.
- .13 Lighting fixtures installed on acoustic tiles shall be suspended from the metallic "T" ceiling grid using metal supports supplied by the lighting fixture supplier.
- .14 Lighting fixtures, diffusers and lamps shall be cleaned, at the end of the work, to remove any construction dust which may have accumulated.

### **3.2 CLEANING**

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

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