

## 1 GENERAL

- 1.1 Electrical design and installation shall comply with the Ontario Electrical Safety Code and the Ontario Building Code, latest edition, as well as local authority having jurisdiction.
- 1.2 Underground systems to be in accordance with *[CSA C22.3 # 1 and 3]* except where specified otherwise.
- 1.3 Obtain and pay for all necessary permits, licenses, inspections and fees required. On completion of work, furnish to Owner Certificates of Acceptance from Electrical Safety Authority and authorities having jurisdiction.
- 1.4 Equipment shall operate satisfactorily at 60 Hz within normal operating limits established by *[CAN/CSA-C235]*. All equipment shall be able to operate in extreme operating limits established in above standard without damage to equipment.
- 1.5 Provide equipment CSA approved and where applicable, ULC certified. All equipment shall be new.
- 1.6 Factory assemble all control panels and component assemblies.
- 1.7 Submit equipment shop drawings, product data and samples. Indicate details of construction, dimensions, capacities, weights and electrical performance characteristics. Where applicable include wiring and schematic diagrams.
- 1.8 On completion of the project provide accurate as-built condition record drawings in *[AutoCAD V.14]* showing all changes and modifications. The drawings are to be kept up to date as construction progresses.
- 1.9 Provide at completion of project operation and maintenance manuals. Include details of design elements, component function and maintenance requirements to effectively operate, maintain or repair any portion of the installation. Technical data, product data, component illustrations, technical descriptions and parts list, wiring and schematic diagrams, copies of all shop drawings, test and verification reports.
- 1.10 Provide training to operating personnel in the operation, care and maintenance of equipment. Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation. Provide these services for such periods and for as many visits as necessary to put equipment in operation. Ensure that operating personnel are conversant with all aspects of its care and operation. As a minimum, provide a one-day training session for each of the following systems. Obtain written confirmation from operating personnel that satisfactory training has been received.
  - 1.10.1 Fire Alarm system
  - 1.10.2 Distribution System
  - 1.10.3 Lighting System and Controls

- 1.10.4 Emergency Generator Systems
- 1.11 Shop finish metal enclosure surfaces applying rust resistant primer inside and outside, and at least two coats of enamel finish.
- 1.12 Identify electrical equipment with nameplates and labels as follows:
- 1.12.1 Lamicoid nameplates. 3 mm thick plastic engraving sheet, white face, black core, mechanically attached with self tapping screws.
- 1.12.2 Embossed plastic labels with 6 mm high letters unless specified otherwise. Wording on nameplates or labels approved by Owner prior to manufacture. Allow for average of 50 letters per nameplate and label. Identification in English.
- 1.13 Identify all wires with permanent indelible identifying numbers at both ends and at all junction boxes, splitters, cabinets and outlet boxes. Colour code wiring in accordance with [CAN/CSA-C22.1]. Maintain phase sequence and colour coding throughout. Use colour coded wires for fire alarm and communications cables.
- 1.14 Colour code conduits and metallic sheathed cables with plastic tape or paint at points where conduit or cable enters war ceiling or floor, and at 15 m intervals. Use colour strips 25 mm wide prime colour and 20 mm wide auxiliary colour and as follows:
- 1.14.1 Up to 250 V: Yellow.
- 1.14.2 Up to 600 V: Yellow and Green.
- 1.14.3 Telephone: Green.
- 1.14.4 Other communications systems: Green and blue.
- 1.14.5 Fire alarm: Red.
- 1.14.6 Security systems: Blue and yellow.
- 1.14.7 Emergency: Red and blue.
- 1.15 Lugs, terminals and screws, used for termination of wiring to be suitable for either copper or aluminum conductors.
- 1.16 Manufacturers and CSA labels to be visible and legible after equipment is installed.
- 1.17 Do not install outlets back to back in wall. Allow minimum 150 mm horizontal clearance between boxes. Change location of outlets at no cost or credit, providing distance does not exceed 3000 mm, and information is given before installation. Locate light switches on latch side of doors. Locate disconnect devices in mechanical and elevator rooms on latch side of door.
- 1.18 Mounting height for all equipment and devices is from finished floor to centreline of equipment, unless otherwise indicated.

- 1.18.1 Local switches: 1400 mm.
  - 1.18.2 Wall receptacles, general: 300 mm.
  - 1.18.3 Receptacles above top of counters or backsplash: 175 mm.
  - 1.18.4 Receptacles in mechanical rooms: 1400 mm.
  - 1.18.5 Panelboards: 1800 mm from the top of panel to floor. Bottom of panelboard minimum 150 mm above floor. Where multiple panelboards are mounted together, align tops or trims of all panelboards, with highest panelboard determining the height.
  - 1.18.6 General telephone, data and cable TV outlets: 300 mm.
  - 1.18.7 Wall mounted telephone and interphone: 1500 mm.
  - 1.18.8 Fire alarm stations: 1500 mm.
  - 1.18.9 Wall mounted fire alarm bells, horns, wall mounted speakers, clocks: 2100 mm.
  - 1.18.10 Emergency lighting battery units: 2400 mm.
  - 1.18.11 Wall mounted dry type transformers: 2400 mm from the bottom.
  - 1.18.12 Time switches: 1400 mm.
  - 1.18.13 Individual starters: 1500 mm from top. Where multiple starters are mounted together, align the tops of all starters with the highest starter determining the height.
  - 1.18.14 All mounting heights shall be confirmed and reviewed with the College. Certain areas will require mounting heights for barrier-free access.
- 1.19 Measure phase current to panelboards with normal loads (lighting) operating at the time of acceptance. Adjust branch circuit connections as required to obtain best balance of current between phases and record changes. Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment. At completion of work, submit report listing phase and neutral currents on panelboards, dry-type transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.
- 1.20 Protect electrical equipment from dust and dirt. Plug or cap openings in conduit, fixtures and equipment during construction with proper and approved materials.
- 1.21 Run conduits concealed in finished areas, except as otherwise authorized. Run exposed conduit neatly parallel to building lines, and maintain maximum headroom. Install lighting fixtures, cover outlets, plates and other visible items parallel to building lines. Line up all exposed raceways, parallel and at right angles to the building walls. Set, plumb and level equipment accurately and align hangar rods. Function and

appearance shall be to Owners satisfaction.

- 1.22 Support electrical equipment and components directly from structure. Each independent support fastening device and hangar capable of supporting the dead load of the equipment and components plus 100 kg. Fibre, wood or plastic inserts not acceptable.
- 1.23 Electrical systems to conform with requirements for barrier free access.
- 1.24 Provide and implement Commissioning Plan in accordance with Section 01800: Commissioning.

***End of Section***