

OUTLET BOXES, CONDUIT BOXES AND FITTINGS

1. GENERAL

1.1 Work Included

- .1 Provide a complete system of boxes for the installation of wiring and equipment.

1.2 References

- .1 CSA C22.1-Canadian Electrical Codes, Part 1.

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 for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 Outlet Boxes for Metal Conduit

- .1 Materials:
 - .1 Surface or recessed concealed type: Die formed steel, hot dip galvanized, 1.25 oz/sq. ft. minimum zinc coating.
 - .2 Surface mounting exposed: Cast ferrous for threaded conduit, with attached lugs, corrosion resistant two coats finish.
- .2 Components:
 - .1 Ceiling outlets, surface mounting, concealed:
 - .1 101 mm square, depth 54 mm, Iberville 52171 series.
 - .2 119 mm square, depth 54 mm, Iberville 72171 series.

OUTLET BOXES, CONDUIT BOXES AND FITTINGS

- .3 Wall outlets, concealed non-masonry construction, with plaster finish: For one or two gangs used with switches, receptacles, etc., use 54 mm deep Iberville 52171 series, with matching plaster covers, depth to suit. Alternately, use 119 mm square boxes, Iberville 72171 series and covers as required. For more than two gangs use solid boxes Iberville GSB series with GBC series cover, or special boxes as required.
- .4 Wall outlets, surface, exposed mounting or used for outdoor outlets: One or more gang, Crouse-Hinds FS series or FD series, conduit.

2.3 Conduit Boxes

- .1 Cast FS aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacle.

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 connections. Reducing washers are not allowed.
- .5 Install all outlets flush and surface mounted as required for the installation.
- .6 Surface mount above suspended ceilings, or in unfinished areas.
- .7 Do not distort boxes during installation. If boxes are distorted, replace with new boxes
- .8 Do not use sectional boxes.
- .9 Provide boxes sized as required by the Canadian Electrical Code.
- .10 Install vapour barrier material to surround and seal all outlet boxes located on exterior walls of building. Maintain wall insulation.
- .11 Ceiling outlet boxes shall be provided for every surface mounted fixture or row of fixtures installed on suspended "hard" ceilings.

END OF SECTION

WIRING DEVICES

1. GENERAL

1.1 Work Included

- .1 Provide and connect all wiring devices for the complete installation.

2. PRODUCTS

2.1 Manufacturer

- .1 Wiring devices to be of one manufacture throughout project.
- .2 Manufacturers shall be Hubbell, Leviton, Smith and Stone, Bryant or Pass & Seymour, commercial specification grade.

2.2 Devices

- .1 The catalogue numbers shown below are for the particular manufacturer's series and all necessary suffixes shall be added for the requirements as stated. All devices shall be specification grade minimum and wherever possible shall be of the same manufacture.
- .2 Devices to be ivory with stainless steel coverplates in all but mechanical areas unless noted otherwise. Use galvanized steel coverplates in mechanical areas and for surface mounted devices.

2.3 Switches

- .1 347 volt, 15 amp. single and double pole, three and four-way: As Hubbell No. 18221, 18222, 18223 and 18224.
- .2 120-277 volt, 20 amp, single and double pole, three and four-way: As Hubbell No. 1221, 1222, 1223 and 1224.
- .3 Manually - operated general purpose AC switches shall have the following features:
 - .1 Terminal holes approved by AWG #10 wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine molding for parts subject to carbon tracking.
 - .4 Suitable for back and/or side wiring.

2.4 Receptacles

- .1 Duplex 15 ampere, 120 volt, 3 wire, ivory, U-ground, as Hubbell No. 5252, with the following features:
 - .1 Ivory urea molded housing.

WIRING DEVICES

- .2 Suitable for #10 AWG for back and side wiring.
 - .3 Eight back wired entrances, four side wiring screws.
 - .4 Break-off links for use as split receptacles.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Duplex 15 ampere, 120 volt, 3 wire, ivory, U-ground ground fault receptacle, as Hubbell No. GF-5261. Refer to Section 16496 - Ground Fault Circuit Interrupters.

2.5 Coverplates

- .1 Provide coverplates for all wiring devices.
- .2 Use sheet steel utility box cover for wiring devices installed in surface mounted boxes.
- .3 Use nylon coverplates on all wiring devices mounted in flush-mounted outlet boxes unless otherwise specified.
- .4 Weatherproof double lift spring - loaded cast aluminum coverplates, complete with gaskets for single receptacles or switches.
- .5 Use gasketed DS cast covers on FS and FD type boxes.

3. EXECUTION

3.1 Installation

- .1 Install single throw switches with handle in the "UP" position when switch closed.
- .2 Install switches vertically in gang type outlet box when more than one switch is required in one location.
- .3 Mount switches on the latch side of the doorway as close as possible to door frame unless otherwise indicated on drawings.
- .4 Install receptacles vertically in gang type outlet box when more than one receptacle is required in one location.
- .5 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .6 Install suitable common coverplates where wiring devices are grouped. Do not distort plates by tightening screws excessively.

WIRING DEVICES

- .7 Do not use coverplates meant for flush outlet boxes on surface mounted boxes.
- .8 Wherever possible, mount equipment in a straight line at a uniform mounting height, coordinated with other equipment and materials.

END OF SECTION

FASTENINGS AND SUPPORTS

1. GENERAL

1.1 Work Included

- .1 Supply and install all hangers, supports and inserts for the installation shown on the drawings and specified herein, as necessary to fasten electrical equipment securely to the building structure.

2. PRODUCT

2.1 Framing and Support System

- .1 Materials:
 - .1 Intermediate duty supporting structures shall employ P1000 Unistrut or equal together with the manufactures connecting components and fasteners for a complete system.
 - .2 Heavy duty supporting structures to be fabricated and welded from steel structural members and prime painted before installation.
- .2 Finishes:
 - .1 Outdoors, wet locations: Hot dipped galvanized.
 - .2 Indoors, dry locations: Galvanized when available, prime painted if not available.
 - .3 Nuts, bolts, machine screws: Cadmium plated.
- .3 Unistrut:
 - .1 Section P1000 or as required for load and span, with mounting screws, or approved. P1000 or equal is a minimum standard for supporting conduits 50 mm and larger.

2.2 Concrete and Masonry Anchors

- .1 Materials: Hardened steel inserts, zinc plated for corrosion resistance. All anchor bolts must be galvanized.
- .2 Components: non-drilling anchors for use in predrilled holes, sized to safely support the applied load with a minimum safety factor of four.
- .3 Manufacturer: Hilti (Canada) Limited or approved equal.

FASTENINGS AND SUPPORTS

2.3 Non-Metallic Anchors

- .1 Material: Plastic anchors for sheet metal screws.
- .2 Manufacturer: Fischer.

2.4 Conduit Supports

- .1 Masonry, concrete, stone, etc.: Anchors.
- .2 Metal studs, ceiling hangers, etc.: "Caddy-Clips"
- .3 Unistrut: Unistrut conduit clamps.

2.5 Cable Supports and Clamps

- .1 General: As per conduit supports, except that for single conductor cables, suitable non-ferrous, or approved stainless steel or aluminum clamps shall be used.

3. EXECUTION

3.1 General

- .1 Do not cut or drill beams, joists or structural steel unless written permission of the Consultants is obtained.
- .2 Distance between conduit or cable supports not to exceed code requirements.
- .3 Supports to be suitable for the real loads imposed by equipment.
- .4 Supports to be securely fastened, free from vibration and excessive deflection or rotation. Maximum deflections are 4 mm over a 1 meter span and 8 mm over a 2 meter span.
- .5 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .6 Provide conduit rack with 25% spare capacity for multiple runs.
- .7 Provide channel support with fittings for vertical runs of conduit and cables.

3.2 Installation

- .1 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members

FASTENINGS AND SUPPORTS

- .2 Fasten exposed conduit or cables to building construction or support system using straps.
 - .1 One-hole malleable iron or 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.
- .3 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.
 - .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .4 Use plastic anchors for light loads only. Use metal anchors for all other loads.
- .5 Use round or pan head screws for fastening straps, boxes, etc.
- .6 Do not support heavy loads from the bottom chord of open web steel joists.
- .7 Support outlet boxes, junction boxes, panel tubs, etc., independent of conduits running to them. Support conduits within 600 mm of outlet boxes. Support surface mounted panel tubs with a minimum of four 6 mm fasteners.
- .8 For surface mounting of two or more conduits use channels at 1.5 m oc spacing.
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the Consultant.

END OF SECTION

OVERHEAD SERVICE

1. GENERAL

1.1 References

- .1 CAN/CSA-C83 – Communication and Power Line Hardware.
- .2 CAN/CSA C22.1.

1.2 Coordination with Power Supply Authority

- .1 Coordinate and meet requirements of power supply authority. Ensure availability of power when required.

1.3 Scope

- .1 Installations for 750 volt or less. Refer to Canadian Electrical Code.

2. PRODUCTS

2.1 Material

- .1 Service Mast: Rigid steel conduit minimum 100mm trade size suitable for attachment of support clamps, insulator rack, weatherhead, service drop fittings.
- .2 Other means accepted by local authority.
- .3 Insulator Rack: To CAN/CSA-C83, one, two, three, four wire, medium, heavy duty to requirements of local supply authority.
- .4 Weatherhead: Rain tight and cast metal. To the approval of supply authority.
- .5 Meter base must be metal enclosure and meet Canadian Electrical Code and have the approval of the supply authority.

3. EXECUTION

3.1 Installation

- .1 Install service mast, insulator rack, weatherhead as per methods in compliance with Canadian Electrical Code and local approved methods.
- .2 Install metal meter base and conduit in locations in Canadian Electrical Code or locally approved locations. Meter must be located as close as practical to the service where practical.
- .3 Install service drop conductors as per methods in Canadian Electrical Code or local approved methods.

OVERHEAD SERVICE

- .4 Conductor length for connection to supply shall be a minimum of 1000 mm and shall be provided with adequate conductor length for drip loops.
- .5 Make grounding connections in accordance with Section 16450 – Grounding – Secondary, Canadian Electrical Code and instructions from local authority.

3.2 Testing

- .1 Perform tests in accordance with Section 16980 – Testing, Adjusting and Balancing of Electrical Equipment and Systems.
- .2 Perform additional tests if required by authority having jurisdiction.

END OF SECTION

SERVICE ENTRANCE BOARD

1. GENERAL

1.1 Shop Drawings and Product Data

- .1 Submit shop drawings and product data in accordance with Section 16010 – Electrical General Requirements.
- .2 Indicate on shop drawings.
 - .1 Anchoring method.
 - .2 Dimensioned cable entry and exit locations.
 - .3 Dimensioned position and size of bus.
 - .4 Overall length, height and depth.
 - .5 Dimensioned layout of internal and front panel mounted components.
- .3 Include time-current characteristic curves for circuit breakers and fuses.
- .4 Submit for review by the consultant, shop drawings of all items specified in this Section.

1.2 Maintenance Data

- .1 Provide maintenance data for service entrance board for incorporation into manual specified in Section 16010 – Electrical General Requirements.

1.3 Source Quality Control

- .1 Perform all normal mechanical and electrical production tests as detailed in CSA Standards C22.1 and C22.2 in the factory prior to shipment, and as described in Section 16010.
- .2 Submit 4 copies of certified test results.

1.4 Electrical Services

- .1 Arrange with the local utility company to supply and install a new overhead power line from the existing transformer adjacent to the building as indicated on the drawings.
- .2 Be responsible for obtaining the correct location and for scheduling the installation of the transformer with the utility company.
- .3 Ascertain the electrical utility charges and include this amount in the contract price for the complete service.

SERVICE ENTRANCE BOARD

2. PRODUCTS

2.1 Service Entrance Equipment

- .1 Rating: 347/600 V, 3 phase, 4 wire, 200 A, short circuit current 42 kA (rms symmetrical).
- .2 200A 600V Main Breaker, 100% rated in separate enclosure as indicated on drawing.
- .3 Distribution section c/w hinged access panels with captive knurled thumb screws.
- .4 Bus bars and main connections; 99.3% copper.
- .5 Cable from load terminals of main breaker via lugs of automatic transfer switch to lugs of distribution section.
- .6 Identify phases with colour coding.
- .7 Submit shop drawings for service entrance equipment, panelboards, and motor control centres.

2.2 Moulded Case Circuit Breakers

- .1 Bolt-On Moulded Case Circuit Breaker: Quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .2 Common-Trip Breakers: With single handle for multi-pole applications.

2.3 Thermal Magnetic Breakers 200A and larger

- .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. Main breaker to be 100% rated

2.4 Finishes

- .1 Apply finishes in accordance with Section 16010 – Electrical General Requirements.
 - .1 Service entrance main breaker exterior: sand.
 - .2 600V distribution section exterior: sand.

2.5 Equipment Identification

- .1 Provide equipment identification in accordance with Section 16010 – Electrical General Requirements.
- .2 Nameplates:
 - .1 White plate, black letters.

SERVICE ENTRANCE BOARD

- .2 Main disconnect labeled: "Main Breaker".
- .3 Branch disconnects labeled: as indicated.

2.6 Arrangement

- .1 The arrangement shall be as indicated on drawings. Minor modifications to arrangement may be made to suit site conditions.

2.7 Housing Construction

- .1 Fabricate housing of metal enclosed dead front sections, made from code gauge sheet steel of formed and welded construction and built for 600 volts indoor rating.
- .2 For breaker unit, provide hinged access doors on front with concealed hinges and formed edges.
- .3 Mount pop rivet lamacoid nameplates on front of sections for each device, meter, switch, etc.

2.8 Bus Bars

- .1 For distribution section provide three phase, four wire, 600 volt horizontal and vertical bus. Design bus in accordance with NEMA Standard SG5-3-02 and amendments thereto. Use hard drawn copper bus with continuous ampere rating shown. Design cross section area of bus bars and connections so that temperature rise when carrying full rated current will not exceed 65°C, above an ambient temperature of 40°C. Adequately brace bus to withstand 22 kA RMS amperes symmetrical, three phase, 60 cycle short circuit at 600 volts. Silver flash all joints and connections. Use cadmium plated bolts, nuts and lock washers.
- .2 Provide ground bus for connection of equipment ground conductors.

3. APPROVED MANUFACTURER

- .1 Service equipment to be manufactured by Cutler Hammer, Schnieder Electric, Seimens or approved equivalent

4. EXECUTION

4.1 Installation

- .1 Provide and connect the main breaker and distribution system shown and specified. Make all necessary arrangements with the utility company for service entrance, energization and metering of the services.
- .2 Connect all systems neutrals as required.

SERVICE ENTRANCE BOARD

- .3 Run two (2) copper grounding conductors (#2 AWG) TWH green, from ground connection in main breaker enclosure to building AC system ground grid.
- .4 Check factory made connections for mechanical security and electrical continuity.
- .5 Connect incoming and outgoing cables.
- .6 Connect all system neutrals as required, and connect switchboard ground stud to provide switchboard grounding.

END OF SECTION

**DISCONNECT SWITCHES FUSED AND
NON-FUSED UP TO 600 V - PRIMARY**

1. GENERAL

1.1 Description

- .1 Provide disconnect switches for 347/600 volt and 120/208 volt distribution as indicated on the drawings, as manufactured by Cutler Hammer, Schnieder Electric or Seimens.

2. PRODUCTS

2.1 Disconnect Switches

- .1 Ratings: Voltage and Ampere ratings as shown on the drawings or to suit load requirements. For motors, use disconnect switches with HP ratings at least equal to motor HP.
- .2 Enclosures: CSA code gauge galvanized steel, hinged doors, external operating handles. Disconnect switches in dry locations shall be EEMAC-1, EEMAC-3 where exposed to weather and Class 1 Division 11 Group D where installed in classified areas. Provide ON-OFF switch position indication on switch enclosure cover.
- .3 Finish: One primer coat and one finish coat on all metal surfaces, colours as per Section 16010 - Electrical General Requirements.
- .4 Switch mechanisms: Quick make and quick break action with self wiping contacts, solderless pressure lug connectors. For switches 100 amperes and over, provide non-tracking arc shrouds. All switch poles to operate together from a common operating bar. Provide for padlocking disconnect switches in "Off" position. Doors to be interlocked and complete with defeat mechanism, to prevent opening when handle in ON position.

3. EXECUTION

3.1 Disconnect Switches

- .1 Mounting: Provide supports independent of conduits. Wall mount where possible, otherwise provide Unistrut frame support. Where switches are grouped mount in uniform arrangement.
- .2 Wiring: Connect line and load cable to all switches.
- .3 Identification: Provide lamaroid plate in accordance with Section 16010 – Electrical General Requirements.

END OF SECTION

**DRY TYPE TRANSFORMERS
UP TO 600 V PRIMARY**

1. GENERAL

- .1 Provide enclosed dry type transformers 600 volts primary to 120/208 volts.
- .2 Product Data – Three Phase, Four Wire Secondary
 - .1 Submit product data in accordance with Section 16010 – Electrical General Requirements.
- .3 Transformers to conform to CSA C57.12 and L2 standards, and are to be approved to CSA Code Part 2, Standard C22.2, No. 47 and CSA C9.

2. PRODUCTS

- .1 Transformers
- .2 General: Dry type, air cooled, self ventilated. Enclosures to be EEMAC-1 type, code gauge steel, complete with ventilating openings, access panels, mounting brackets, and solderless primary and secondary cable connectors. Enclosures to have zinc chromate prime coat and enamel finish coat per Section 16010. Transformers to be three phase as noted on the drawings. Dry type transformers shall be Cutler Hammer, Rex, Delta or approved equivalent.
- .3 Design
 - .1 Type: ANN
 - .2 3 phase, kVA rating as indicated on drawings, 600 V input, 120/208 V output, 60 Hz.
 - .3 Voltage primary taps: 2.5% Full capacity above and below normal
 - .4 Insulation: Class H.
 - .5 Basic Impulse Level (BIL): 10 kV B.I.L.
 - .6 Impedance at 170°C:
 - 6.0% max. up to 112½ kVA
 - 5.5% max. above 112½ kVA
 - .7 Enclosure: EEMAC 1, removable metal front panel
 - .8 Mounting: suitable for suspended mounting unless otherwise shown
 - .9 Finish: In accordance with Section 16010 – Electrical General Requirements.
 - .10 Three Phase Windings: Copper, arrange with three copper primary windings connected in delta and three copper secondary windings connected in wye.
 - .1 Max. Winding Temperature: 150°C rise with temperature continuous full load

**DRY TYPE TRANSFORMERS
UP TO 600 V PRIMARY**

- .12 Max. Lead Connection: 55°C rise with temperature continuous full load.

2.2 Equipment Identification

- .1 Provide equipment identification in accordance with Section 16010 – Electrical General Requirements.

3. EXECUTION

3.1 Installation

- .1 Mount dry type transformer suspended as indicated from building structure.
- .2 Ensure adequate clearance around transformer for ventilation.
- .3 Install transformers in level upright position.
- .4 Remove shipping supports only after transformer is installed and just before putting into service.
- .5 Loosen isolation pad bolts until no compression is visible.
- .6 Make primary and secondary connections in accordance with wiring diagram.
- .7 Do not use permanent distribution system dry type transformers for temporary power distribution without permission for the Consultant.
- .8 Mount transformers to reduce direct and transmitted noise. Mount core and coils of transformers on vibration and sound absorbing pads.
- .9 Record secondary voltage when transformers are carrying approximately 75% of full load. Adjust tap connections to give a continuous secondary voltage of 120 volts phase to neutral. Set tap connections for above 120 volts rather than below.
- .10 Connections to transformers shall be in flexible conduit and shall enter the enclosure below the coils.
- .11 Before energization, keep transformers or storage room enclosures above 10°C ambient.

END OF SECTION

PANELBOARDS - BREAKER TYPE

1. GENERAL

1.1 Shop Drawings

- .1 Submit shop drawings in accordance with Section 16010 – Electrical General Requirements.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

2. PRODUCTS

2.1 Panelboards

- .1 Panelboards: product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 347/600 V panelboards: bus and breakers rated for 22 kA (symmetrical) interrupting capacity or as indicated.
- .3 120/208 V panelboards: bus and breakers rated for 10 kA (symmetrical) interrupting capacity or as indicated.
- .4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating as mains.
- .8 Mains: suitable for bolt-on breakers.
- .9 Trim with concealed front bolts and hinges.
- .10 Trim and door finish: baked grey enamel

PANELBOARDS - BREAKER TYPE

2.2 Breakers

- .1 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

2.3 Equipment Identification

- .1 Provide equipment identification in accordance with Section 16010 – Electrical General Requirements.
- .2 Complete circuit directory with typewritten legend showing location and load of each circuit.

3. APPROVED MANUFACTURER

- .1 Panelboards to be manufactured by Cutler Hammer, Schnieder Electric, Seimens or approved equivalent

4. EXECUTION

4.1 Installation

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards painted with fire redardant paint grey in color. Where practical, group panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 16010 - Electrical General Requirements or as indicated.
- .4 Connect loads to circuits.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.

END OF SECTION

POWER SURGE PROTECTORS

1. GENERAL

1.1 Related Work

- .1 General Electrical Requirements: Section 16010

1.2 System Description

- .1 A transient voltage surge suppressor for the protection of downstream electronic equipment connected to the building power supply. The specified unit shall be compatible with non-linear loads and shall provide effective high-energy transient voltage suppression, surge current diversion and high-frequency electrical noise filtering while connected in parallel with a facility's distribution system. The filtering unit shall utilize non-linear voltage dependent metal oxide varistors or selenium cells. The suppression system's components shall not utilize gas tubes, spark gaps, or silicon avalanche diodes. The device shall be referred to as a TVSS filter for the purpose of this document and drawings.

2. PRODUCT

2.1 Operation and Environment

- .1 Voltage: The TVSS devices shall be suitable for the voltage and systems configuration as indicated on the single line diagram.
- .2 Maximum Continuous Operating Voltage (MCOV): The maximum continuous operating voltage of the suppressor unit shall be greater than 115% for 347/600 V systems.
- .3 Protection Modes: Transient voltage surge suppression paths shall be provided for all possible common and normal modes (between each line and ground, neutral and ground, line to line and each line and neutral). The primary suppression path shall not be to ground.

2.2 Suppression Component

- | | | | |
|----|--|----------------|------------------------------------|
| .1 | Peak surge Current per Phase | 240,000 Amps | (Main entrance panel applications) |
| .2 | Let Through Voltage (L-N) | 600 V Units | 1200 V |
| .3 | TVSS clamping components response time | : 1 nanosecond | |

POWER SURGE PROTECTORS

2.3 Filtering

- .1 TVSS shall contain a high frequency extended range tracking filter.
- .2 Noise attenuation ≥ 45 dB @ 1'00 kHz.
- .3 Main entrance panel application effective filtering bandwidth - 180 Hz to 50 Mhz.

2.4 General Features

- .1 Connectors: Terminals shall be provided for all the necessary input and output power and ground connections on the TVSS.
- .2 Enclosure: The specified system shall be provided in a heavy duty NEMA 12 dust tight enclosure with no ventilation openings for maintenance and branch panel applications. Indication of surge current module status shall be visible without opening the door.
- .3 Internal Connections: All surge current diversion connections shall be by way of low impedance wiring. Surge current diversion components shall be wired for reliable low impedance connections. No plug-in component modules, quick disconnect terminals or printed circuit boards shall be used in surge suppression paths.
- .4 Unit Status Indicators: Red status indicators shall be provided on the hinged front cover to indicate unit phase status. The absence of the red light shall reliably indicate that one or more surge current diversion phases have failed and that service is needed to restore full operation.
- .5 Fuses: The unit shall utilize internal fuses rated with a minimum interrupting capability of 2000,000 A or greater.
- .6 Identification: The unit shall include manufacturer's nameplate, UL rating, and a CSA approval on the exterior enclosure.
- .7 Warranty: The manufacturer shall provide a five-year warranty on the TVSS filter, a one-year warranty on the panelboard and circuit breakers, and a one-year warranty on individual equipment plug-in units. These warranties shall commence from date of substantial completion.
- .8 Testing: Testing at each unit shall include assurance checks, "Hi-Pot" test at two times rated voltage plus 1000 volts per UL requirements, and operation and calibration tests.

2.5 Approved Manufacturers

- .1 Cutler Hammer, Schneider Electric, Seimens, Current Technology, Leibert, Tycor.

POWER SURGE PROTECTORS

3. EXECUTION

3.1 Installation

- .1 Install with manufacturer's recommended conductors from the electrical service switchboard breaker distribution system. Conductors are to be as short and straight as possible. Input conductors to the TVSS shall be twisted together to reduce impedance during high frequency filtering.
- .2 The TVSS should be installed following the manufacturer's recommended practices as outlined in the manufacturer's installation and Maintenance Manual and in compliance with all applicable electrical codes.

END OF SECTION

GENERAL PROVISIONS FOR INTERIOR LIGHTING

1. GENERAL

1.1 Work Included

- .1 Supply and install lighting fixtures complete with lamps, ballasts and all necessary fittings.

1.2 Code Requirements

- .1 Installation of lighting equipment to conform to Section 30, Canadian Electric Code, Part 1, and as amended or supplemented by provincial, municipal or other regulatory agencies having jurisdiction.

1.3 Shop Drawings

- .1 Submit a complete list of the types of lighting fixtures, lamps, ballasts and accessories with catalogue illustrations, data sheets, etc. for review.
- .2 Submit complete photometric data, based on actual fixtures proposed for project. Substantiate brightness and efficiency requirements. Photometric data must be produced by a recognized independent laboratory.

1.4 Lamps Used for Temporary Lighting

- .1 Fluorescent lamps may be used for temporary light and lamps used for this purpose will be accepted when the project or portions of the work are turned over to the Owner. Spot relamp faulty or burned out lamps prior to this acceptance, without additional cost to Owner.
- .2 Metal halide, sodium, incandescent and quartz lamps are not to be used for temporary lighting, unless all lamps so used are replaced with new lamps immediately prior to completion at no additional cost to Owner.

2. PRODUCTS

- .1 Provide, wherever possible, commercially available stock lighting fixtures meeting specified requirements and as shown on the drawings.
- .2 Different fixtures may be supplied by different manufacturers. Similar fixtures shall be supplied by the same manufacturer.
- .3 Provide only lighting fixtures which are structurally well designed and constructed and which use new parts and materials of highest commercial grade available. Unless otherwise specifically noted, fixtures shall be of the quality stated in the manufacturer's catalogues and data sheets.
- .4 Refer to drawing luminaire schedule for details of fixtures and accessories.

GENERAL PROVISIONS FOR INTERIOR LIGHTING

- .5 Use cadmium plated chains for suspended fixtures.

3. EXECUTION

3.1 Installation

- .1 Install fixtures in accordance with the manufacturer's requirements, code requirements, and as shown on the drawings.
- .2 Ground lighting equipment to a separate grounding conductor.
- .3 Co-ordinate with other trades to avoid conflicts between luminaires, supports and fittings and mechanical and structural equipment.
- .4 Provide guards where fixtures are subject to mechanical damage as required by code or shown on the drawings.

3.2 Ballasts

- .1 All fluorescent lighting fixtures shall be equipped with rapid start high power factor, solid state, electronic ballasts (minimum of 0.95 lagging power factor), thermally protected, constant wattage design, and manufactured to perform in accordance with CSA Specification C82.1 with regard to light output, regulation, and other operating characteristics. Ballast to be less than 20% THD
- .2 Unless noted otherwise, all fluorescent ballasts shall be solid state, electronic type Osram/Sylvania, Phillips, Magnetek, or approved equal.
- .3 Unless otherwise noted, the ballasts for high intensity discharge (HID) lighting fixtures shall be as recommended by the fixture manufacturer and shall be compatible with the lamp specified. The manufacturer shall be responsible for the performance of the integrated unit (ballast and lamp).
 - .1 Ballast shall have high power factor (minimum 0.90 lagging power factor) with minimum 95% rated lumens.
 - .2 Ballast shall be constant wattage, auto-transformer type, or constant wattage type.
 - .3 Ballasts mounted exterior shall have temperature rating of -30°C to 40°C ambient temperature.

3.3 Lamps

- .1 Unless otherwise specified, all T8 fluorescent lamps shall be of the "low mercury" 32W T-8 3500 K with minimum CRI of 80, 'premium' quality unless otherwise specified by the Fixture Schedule and manufactured by Phillips, General Electric, or Osram/Sylvania.

**GENERAL PROVISIONS
FOR INTERIOR LIGHTING**

3.4 Workmanship

- .1 Completely clean all glassware, lamps, and hangers. Polish metal parts before completion.
- .2 Provide suitable extension couplings for row mounted fixtures.
- .3 Protect fixtures, hangers, supports, fastenings and accessory fittings at the site prior to and during installation. Unless fixtures are erected immediately, after delivery to site, deliver in original cartons or enclosed in air-tight plastic wrapping. Store in a dry and secure space on site. Protect hangers, supports, fastenings and accessory fittings against corrosion. Take care during installation to ensure that insulation and corrosion protection is not damaged.
- .4 Fixtures, which show evidence of corrosion, rough handling, scratching of finishes, etc. are to be replaced with new fixtures at no additional cost.
- .5 Hang and mount fixtures to prevent distorting fixture frame, housing, sides or lens frame, and permit correct alignment of several fixtures in a row.
- .6 Remove any noisy and faulty ballasts from the fixtures and replace at no additional cost to the Owner prior to completion.

END OF SECTION