

July 30, 2014

PART 1 - GENERAL

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| <u>1.1 GENERAL</u> | .1 | This Section covers items common to Sections of Division 26. This section supplements requirements of Division 1. |
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| <u>1.2 REFERENCES</u> | .1 | Canadian Standards Association (CSA International)
.1 CSA C22.1-09, Canadian Electrical Code, Part 1 (21st Edition), Safety Standard for Electrical Installations. |
| | .2 | Abbreviations for electrical terms: to CSA Z85-1983. |
| | .3 | Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122 |
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| <u>1.3 CARE, OPERATION AND START-UP</u> | .1 | Instruct Departmental Representative and operating personnel in the operation, care and maintenance of equipment. |
| | .2 | Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components. |
| | .3 | Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation |
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| <u>1.4 DESIGN REQUIREMENTS</u> | .1 | Operating voltages: to CAN3-C235. |
| | .2 | Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal |

July 30, 2014

1.4 DESIGN
REQUIREMENTS
(Cont'd)

- .2 (Cont'd)
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 and labels for
control items in English.

1.5 PERMITS, FEES
AND INSPECTION

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

1.6 QUALITY
ASSURANCE

- .1 Quality Assurance: in accordance with Section
01 45 00 - Testing and Quality Control.
- .2 Qualifications: Electrical Work to be carried
out by qualified, licensed electricians who
hold valid Master Electrical Contractor
license or apprentices in accordance as per
the conditions of Provincial Act respecting
manpower vocational training and
qualification.
 - .1 Employees registered in provincial
apprentices program: permitted, under direct
supervision of qualified licensed electrician,
to perform specific tasks.

July 30, 2014

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| <u>1.6 QUALITY ASSURANCE (Cont'd)</u> | .2 | Qualifications:(Cont'd)
.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties. |
| | .3 | Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements. |
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<u>1.7 DELIVERY, STORAGE AND HANDLING</u> |
.1 |
Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract. |
| | .2 | Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal. |
|
<u>1.8 SYSTEM STARTUP</u> |
.1 |
Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components. |
| | .2 | Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation. |
|
<u>1.9 OPERATING INSTRUCTIONS</u> |
.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. |
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July 30, 2014

1.9 OPERATING
INSTRUCTIONS
(Cont'd)

- .2 (Cont'd)
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

PART 2 - PRODUCTS

2.1 SUSTAINABLE
REQUIREMENTS

- .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .2 Do verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification.

2.2 MATERIALS AND
EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from Electrical Inspection Department before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.

July 30, 2014

2.3 ELECTRIC
MOTORS, EQUIPMENT
AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: in accordance with Section 26 29 03 - Control Devices except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of authority having jurisdiction and 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 and labels as follows:
 - .1 Nameplates: Lamicoid 3mm thick plastic engraving sheet, matt white finish face, black core, mechanically attached with self tapping screws.
 - .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

July 30, 2014

2.6 EQUIPMENT
IDENTIFICATION
(Cont'd)

(Cont'd)

- .2 Labels: embossed plastic labels with 6mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO." as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.
- .9 Transformers: indicate capacity, primary and secondary voltages.

2.7 WIRING
IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, [numbered] [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.

July 30, 2014

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 15m intervals.
- .3 Colours: 25mm wide prime colour and 20mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other	Green	Blue
Communication Systems		
Fire Alarm	Red	
Emergency	Red	Blue
Voice		
Other	Red	Yellow
Security Systems		

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

3.2 NAMEPLATES AND
LABELS

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

3.3 CONDUIT AND
CABLE INSTALLATION

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

July 30, 2014

3.4 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 150mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000mm, 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.

3.5 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: 1200mm.
 - .2 Wall receptacles:
 - .1 General: 400mm.
 - .2 Above top of continuous baseboard heater: 200mm.
 - .3 Above top of counters or counter splash backs: 150mm.
 - .4 In mechanical rooms: 1200mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 300mm.
 - .5 Wall mounted telephone and interphone outlets: 1200mm.
 - .6 Fire alarm stations: 1200mm.
 - .7 Fire alarm bells: 2100mm.
 - .8 Television outlets: 400mm.
 - .9 Wall mounted speakers: 2100mm.
 - .10 Clocks: 2100mm.
 - .11 Door bell pushbuttons: 1200mm.

July 30, 2014

3.6 CO-ORDINATION
OF PROTECTIVE
DEVICES

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

3.7 FIELD QUALITY
CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .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 system.
 - .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.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

July 30, 2014

3.7 FIELD QUALITY .5
CONTROL
(Cont'd)

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 - 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 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.8 CLEANING .1

- Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

PART 1 - GENERAL

1.1 SECTION
INCLUDES

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

1.2 RELATED
REQUIREMENTS

- .1 General Instructions: Division 1.
- .2 Common Work Results for Electrical - Section 26 05 01 Electrical

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No.18-98, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2 No.65-03(R2008), Wire Connectors.
- .2 National Electrical Manufacturers Association (NEMA)

1.4 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper, plastic, corrugated cardboard packaging for recycling in accordance with Waste Management Plan.
- .4 Divert unused wiring materials from landfill to metal recycling facility as approved by. Departmental Representative.

July 30, 2014

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Pressure type wire connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
 - .2 Fixture type splicing connectors to: CSA C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
 - .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for stranded copper conductors.
 - .2 Clamp for stranded round copper conductors.
 - .3 Stud clamp bolts.
 - .4 Bolts for copper [conductors] [bar].
 - .5 Bolts for aluminum [conductors] [bar].
 - .6 Sized for conductors as indicated.
 - .4 Clamps or connectors for armoured cable as required to: CAN/CSA-C22.2 No.18.

PART 3 - EXECUTION

- 3.1 INSTALLATION
- .1 Remove insulation carefully from ends of conductors 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 CSA C22.2 No.65.
 - .3 Install fixture type connectors and tighten. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.

July 30, 2014

PART 1 - GENERAL

- 1.1 REFERENCES .1 CSA C22.2 No. 0.3-96, Test Methods for Electrical Wires and Cables.
- 1.2 RELATED WORK .1 Common Work Results for Electrical: Section 26 05 01.

PART 2 - PRODUCTS

- 2.1 BUILDING WIRES .1 Conductors: to be copper; stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.
- 2.2 TECK CABLE .1 Conductors:
- .1 Grounding conductor: copper.
- .2 Circuit conductors: copper, size as indicated.
- .2 Insulation:
- .1 Type: Chemically cross-linked thermosetting polyethylene rated type RW90, 600 V.
- .3 Inner jacket: polyvinyl chloride material.
- .4 Armour: interlocking aluminum.
- .5 Overall covering: thermoplastic polyvinyl chloride material, type LFS/LGE, meeting requirements of Vertical Tray Fire Test to CSA C22. 2 No. 0.3 with maximum flame travel of 4 feet.
- .6 Fastenings:
- .1 One hole zinc plated steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
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July 30, 2014

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- 2.2 TECK CABLE
(Cont'd)
- .6 Fastenings:(Cont'd)
.2 Channel type supports for two or more
cables at 1.5 m centers.
.3 6 mm diam threaded rods to support
suspended channels.
- .7 Connectors:
.1 Approved for TECK cable.
- 2.3 ARMOURED CABLES
- .1 Conductors: insulated, copper, size as
indicated, minimum #12 AWG.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from
aluminum strip.
- .4 Connectors: steel type, T&B TC Series;
malleable type not acceptable.
- .5 Cable ties to Section 26 05 29: Fastening and
Supports.
.1 6 mm diam threaded rods to support
suspended channels.
- 2.4 CONTROL CABLES
- .1 Type LVT: 2 soft annealed copper conductors,
sized as indicated, with thermoplastic
insulation, outer covering of thermoplastic
jacket, and armour of closely wound aluminum
wire.
- .2 Low energy 300 V control cable: stranded
annealed copper conductors sized as indicated,
with PVC insulation type TW 75 with shielding
where required by Vendor.
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July 30, 2014

PART 3 - EXECUTION

3.1 INSTALLATION
OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34.

3.2 INSTALLATION
OF TECK CABLE 0 -
1000 V

- .1 Install cables.
- .2 Group cables wherever possible on channels.
- .3 Terminate cables in accordance with Section 26 05 20.
- .4 Install in accordance with Installation of Cables: general.

3.3 INSTALLATION
OF ARMoured CABLES

- .1 Group cables wherever possible.
 - .2 Terminate cables in accordance with Section 26 05 20.
 - .3 Use of armoured cable is permitted only for final fixture drops as follows:
 - .1 All types of "armoured" cables are to be installed concealed, parallel and perpendicular to building lines and shall be adequately secured to the building structure at not less than 1.5 m intervals or as otherwise indicated, in such manner as to ensure they are protected from potential types of mechanical damage occurring. Install independent supports for cabling in ceiling spaces, and do not use those of other trades. Do not secure cables to mechanical systems piping or ducts, suspended ceiling support wires. The laying of "unsupported" cables directly atop ceiling grid system is strictly prohibited.
 - .2 A maximum of four fixture drops from any one lighting zone box is permitted, unless fixtures have an approved junction box rated for through wiring. Maximum distance of 5 m from lighting zone box for any single drop.
 - .4 Install in accordance with Installation of Cables: General, as detailed in item 3.5.
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July 30, 2014

3.4 INSTALLATION
OF CONTROL CABLES

- .1 Install control cables in E.M.T.
- .2 Ground control cable shield where required.

3.5 INSTALLATION
OF CABLES: GENERAL

- .1 Cables to be supported independently of supports used for equipment of other trades; do not support from or secure cables to ductwork, piping and ceiling hanger wires.
- .2 Do not lay cables on top of suspended ceiling grids and tiles.
- .3 Install cables in a neat and professional manner, so as to conserve headroom.
- .4 Install cables parallel and perpendicular to building lines.
- .5 Secure cables to underside of metal decking wherever practicable.
- .6 Grouping or bundling of cables is restricted as follows:
 - .1 Maximum of (8) eight current carrying conductors in any bundle.
 - .2 Maximum spacing of supports is 1.5 m.
 - .3 Mid point strapping of cable bundle at 750 mm from support is provided.

July 30, 2014

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | IEEE 837-1989 (R1996), Qualifying Permanent Connections Used in Substation Grounding. |
| | .2 | Grounding equipment to CSA C22.2 No. 41. |

PART 2 - PRODUCTS

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| <u>2.1 EQUIPMENT</u> | .1 | Grounding conductors: bare stranded copper, soft annealed, size as indicated. |
| | .2 | Insulated grounding conductors: green, type TW75. |
| | .3 | Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to: <ul style="list-style-type: none">.1 Grounding and bonding bushings..2 Protective type clamps..3 Bolted type conductor connectors..4 Thermit welded type conductor connectors..5 Bonding jumpers, straps..6 Pressure wire connectors. |

PART 3 - EXECUTION

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| <u>3.1 INSTALLATION</u>
<u>GENERAL</u> | .1 | Install complete permanent, continuous grounding system including, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit. |
| | .2 | Connect to existing building grounding system. |
| | .3 | Install connectors in accordance with manufacturer's instructions. |
| | .4 | Protect exposed grounding conductors from mechanical injury. |
| | .5 | Use mechanical connectors for grounding connections to equipment provided with lugs. |

July 30, 2014

3.1 INSTALLATION
GENERAL

(Cont'd)

- .6 Soldered joints not permitted.
- .7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .9 Connect building structural steel and metal siding to ground by welding copper to steel.
- .10 Make grounding connections in radial configuration only, with connections terminating at single grounding point on street side of water pipe. Avoid loop connections.
- .11 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.
- .12 Ground secondary service pedestals.

3.2 SYSTEM AND
CIRCUIT GROUNDING

- .1 Install system and circuit grounding connections to neutral of secondary systems.
- .2 For feeder conductors and associated overcurrent devices rated 200 amps or larger, use a minimum ground conductor size of #3/0 AWG.

3.3 EQUIPMENT
GROUNDING

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, frames of motors, starters, control panels, building steel work, distribution panels, metallic waste water piping systems, metallic rain water leader systems, metallic gas fuel piping systems.

July 30, 2014

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- 3.4 GROUNDING BUS .1 Install copper grounding bus mounted on insulated supports on wall of electrical room.
- .2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 2/0 AWG.
- 3.5 COMMUNICATION SYSTEMS .1 Install grounding connections for telephone, sound, fire alarm, security and data systems as follows:
- .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
- .2 Sound, fire alarm, security and data systems as indicated.
- 3.6 FIELD QUALITY CONTROL .1 Perform tests in accordance with Section 26 05 01.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

July 30, 2014

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS .1 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

1.2 WASTE MANAGEMENT AND DISPOSAL .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS .1 U shape, size 41.3 mm x 41.3 mm, 25 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings unless otherwise indicated.

2.2 CABLE TIES .1 Nylon flame retardent, low smoke cable tie. Size as required.
.2 Nylon flame retardant, low smoke cable tie mounting bracket. Mechanical fastening type only; adhesive mounts not acceptable.

PART 3 - EXECUTION

3.1 INSTALLATION .1 Secure equipment to solid masonry, tile and plaster surfaces with lead anchors or nylon shields.
.2 Secure equipment to poured concrete with expandable inserts.
.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
.4 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.

July 30, 2014

3.1 INSTALLATION
(Cont'd)

- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 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.
- .7 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.
- .8 For surface mounting of two or more conduits use channels at 1524 mm on centre 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 Departmental Representative.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

July 30, 2014

PART 1 - GENERAL

PART 2 - PRODUCTS

2.1 JUNCTION AND
PULL BOXES

- .1 Type C: welded steel construction, hinged cover, catch with hasp. Provision for locking. Surface mounting.
- .2 Type D: welded steel construction with screw-on flat covers for surface mounting. Surface or flush mounting as indicated.
- .3 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes.

2.2 CABINETS

- .1 Type E: sheet steel, hinged screw-to-lock, door and return flange overlapping sides, handle, and catch, for surface mounting.

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 1981.2 mm above finished floor.
- .3 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30.48 m of conduit run between pull boxes.
- .4 Where located above accessible ceiling systems, locate enclosures within 762 mm of ceiling.
- .5 Suspend enclosures on 9.5 mm ϕ plated steel threaded rod or rods secured to enclosure with one flat washer and one nut on both sides of box.
- .6 Provide number of threaded rod supports as follows:
boxes up to 142.8 mm square: 1 rod.

July 30, 2014

3.1 JUNCTION, PULL .6 (Cont'd)
BOXES AND CABINETS
INSTALLATION
(Cont'd)

boxes from 142.8 mm to 200 mm square: 2
rods.
boxes with dimensions above 200 mm: 4 rods.

- .7 Concealed junction or outlet boxes feeding a
maximum of two fixture drops shall not be
sized smaller than 100 mm square.

3.2 IDENTIFICATION .1 Provide equipment identification in
accordance with Section 26 05 01.

July 30, 2014

PART 1 - GENERAL

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| <u>1.1 REFERENCES</u> | .1 | CSA C22.1-98 Canadian Electrical Code, Part 1. |
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PART 2 - PRODUCTS

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|---|----|---|
| <u>2.1 OUTLET AND
CONDUIT BOXES
GENERAL</u> | .1 | Size boxes in accordance with CSA C22.1. |
| | .2 | 101.6 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 | 347 V outlet boxes for 347 V switching devices. |
| | .6 | Combination boxes with barriers where outlets for more than one system are grouped. |
| | .7 | Sectional type boxes are not to be used with rigid galvanized steel conduit, (thickwall) type PVC, or thinwall EMT. Sectional type boxes are only to be used with flexible conduits, AC-90 and/or other types of pliable cables, including those associated with other systems rated less than 50V. |
| <u>2.2 SHEET STEEL
OUTLET BOXES</u> | .1 | Electro-galvanized steel single and multi gang flush device boxes for flush installation, minimum size 76.2 mm x 50.8 mm x 38.1 mm or as indicated. 101.6 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required. |
| | .2 | Electro-galvanized steel utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 101.6 mm x 54 mm x 47.6 mm. |
| | .3 | 101.6 mm square or octagonal outlet boxes for lighting fixture outlets. |

July 30, 2014

2.2 SHEET STEEL OUTLET BOXES (Cont'd)	.4	101.6 mm square outlet boxes with extension and plaster rings for flush mounting devices in finished walls.
2.3 MASONRY BOXES	.1	Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.
2.4 CONCRETE BOXES	.1	Electro-glavanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.
2.5 CONDUIT BOXES	.1	Cast FS or FD feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of switches, receptacle, thermostats and similar devices mounted under 2438.4 mm A.F.F. Matching steel type 'FS' metal device plates unless specifically indicated otherwise.
2.6 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 34.9 mm and pull boxes for larger conduits.
	.4	Double locknuts and insulated bushings on sheet metal boxes.

July 30, 2014

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 6.36 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.
- .5 Install flush mounted boxes in all finished areas unless otherwise indicated.
- .6 Install surface mounted boxes in service rooms, workshops, service areas, and above ceilings unless otherwise indicated.
- .7 Install flush mounted boxes in outside of exterior walls unless otherwise indicated.
- .8 Install type FS or FD boxes for all outlets to be surfaced mounted.
- .9 Install concealed boxes in accessible locations.
- .10 Concealed boxes located in ceiling spaces shall not be installed at greater than 762 mm above finished ceiling elevations.
- .11 Flush installed 101.6 mm or 119.1 mm square box being used as a pull box or junction box shall have installed a single or double gauge tile ring and blank cover installed on the box.
- .12 The use of either corner pulling "Ells" or corner pulling "Elbows" in lieu of acceptable "condulet" fittings is prohibited.
- .13 Condulet fittings (LB, LL, LR) and their respective covers/plates are to be painted,

July 30, 2014

3.1 INSTALLATION
(Cont'd)

.13 (Cont'd)
(colour coded) and where concealed, have
locations identified with appropriate colour
coded self-adhering disks applied directly to
T-bar splines and/or access opening frames in
same manner as required for identifying
concealed junction and/or pull boxes.

July 30, 2014

PART 1 - GENERAL

1.1 LOCATION OF CONDUIT .1 Drawings do not indicate all conduit runs.
Those indicated are in diagrammatic form only.

1.2 TRADE SIZE .1 The following are Metric trade sizes and
Imperial trade size equivalent based on CEC
Metric Units.

<u>Metric (mm)</u>	<u>Imperial (inch)</u>
12	3/8
16	1/2
21	3/4
27	1
35	1-1/4
41	1-1/2
53	2
63	2-1/2
78	3
91	3-1/2
103	4
129	5
155	6

1.3 RELATED WORK .1 Fastenings and Supports: Section 26 05 29.

PART 2 - PRODUCTS

2.1 CONDUITS .1 Rigid aluminum threaded conduit, fittings and
connectors: to CSA C22.2 No. 45.

.2 Electrical metallic tubing (EMT) with steel
set screw couplings: to CSA C22.2 No. 83.

.3 Rigid pvc conduit, fittings; couplings and
connectors: to CSA C22.2 No. 211.2.

.4 Flexible aluminum conduit and liquid-tight
flexible metal conduit: to CSA C22.2 No. 56.

July 30, 2014

2.1 CONDUITS
(Cont'd)

- .5 Electrical non metallic tubing (ENT): with couplings, adapters and connectors to CSA C22.2 No. 227.3.

2.2 CONDUIT
FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits at 1.5 m oc.
- .4 6 mm dia threaded rods to support suspended channels.

2.3 CONDUIT
FITTINGS

- .1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.
- .2 Factory "ells" where 90° bends are required for 25 mm and larger conduits.
- .3 Connectors and couplings for EMT: steel set-screws are acceptable. T&B TK Series.
- .4 Raintight EMT connectors and couplings are to be used on vertical portions of conduit runs where terminating into tops of electrical equipment. T&B Series 5123 and Series 5120.

2.4 EXPANSION
FITTINGS FOR RIGID
CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 200 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

July 30, 2014

2.5 FISH CORD .1 Polypropylene: minimum 3 mm diameter.

PART 3 - EXECUTION

3.1 INSTALLATION .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits in finished areas.

.3 Use rigid aluminum threaded conduit for all exterior applications except in cast concrete or where otherwise specified.

.4 Use electrical metallic tubing (EMT) for all interior applications except in cast concrete, hazardous locations, or where otherwise specified.

.5 Use rigid pvc conduit underground: minimum size 27 mm dia.

.6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment.

.7 Use explosion proof flexible connection for connection to explosion proof motors.

.8 Install conduit sealing fittings in hazardous areas. Fill with compound.

.9 Minimum conduit size for lighting and power circuits: 21 mm.

.10 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.11 Mechanically bend steel conduit over 19 mm dia.

.12 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.13 Install fish cord in empty conduits.

.14 Run 2-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel. Terminate

July 30, 2014

3.1 INSTALLATION
(Cont'd)

- .14 (Cont'd)
these conduits in 150 mm x 150 mm x 100 mm
junction boxes in ceiling space or in case of
an exposed concrete slab, terminate each
conduit in flush or surface type box as
indicated.
- .15 Where conduits become blocked, remove and
replace blocked section. Do not use liquids to
clean out conduits.
- .16 Dry conduits out before installing wire.
- .17 Install insulated copper bonding conductor in
all EMT, ENT, PVC, and flexible conduit runs.
Minimum size: #12 AWG or Table 16 of C.E.C.
which ever is larger.

3.2 SURFACE
CONDUITS

- .1 Run parallel or perpendicular to building
lines.
- .2 Locate conduits behind infrared or gas fired
heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural
steel.
- .4 Group conduits wherever possible 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.
- .7 Fasten to flutes of metal roof deck where
practicable.

3.3 CONCEALED
CONDUITS

- .1 Run parallel or perpendicular to building
lines.
- .2 Do not install horizontal runs in masonry
walls.
- .3 Do not install conduits in terrazzo or
concrete toppings.

July 30, 2014

3.4 CONDUITS IN
CAST-IN-PLACE
CONCRETE

- .1 Locate to suit reinforcing steel. Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Where conduits pass through waterproof membrane provide oversized sleeve before membrane is installed. Use cold mastic between sleeve and conduit.
- .5 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.
- .8 Coordinate locations of saw cutting and patching with architectural and structural.
- .9 Conduits in slab shall only be permitted as indicated.
- .10 Coordinate with Division 01 for location of floor slab cutting required.

PART 1 - GENERAL

<u>1.1 SECTION INCLUDES</u>	.1	Switches, receptacles, wiring devices, cover plates and their installation.
<u>1.2 RELATED REQUIREMENTS</u>	.1	Section 01 33 00 - Submittal Procedures.
	.2	Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
	.3	Section 26 05 01 - Common Work Results - Electrical.
<u>1.3 REFERENCES</u>	.1	Canadian Standards Association (CSA International) .1 CSA-C22.2 No.42-99(R2002), General Use Receptacles, Attachment Plugs and Similar Devices. .2 CSA-C22.2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D). .3 CSA-C22.2 No.55-M1986(July 2001), Special Use Switches. .4 CSA-C22.2 No.111-00, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).
<u>1.4 SHOP DRAWINGS AND PRODUCT DATA</u>	.1	Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
<u>1.5 WASTE MANAGEMENT AND DISPOSAL</u>	.1	Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

PART 2 - PRODUCTS

- 2.1 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 Duplex receptacles, CSA type 5-20 R, 125 V, 20 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.
 - .3 Duplex receptacles, CSA type 5-20 R, 125 V, 20 A, U ground, GFCI 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 Eight back wired entrances, four side wiring screws.
 - .4 Triple wipe contacts and rivetted grounding contacts
 - .4 Other receptacles with ampacity and voltage as indicated.
 - .5 Receptacles of one manufacturer throughout project.
 - .6 Acceptable materials:
 - .1 Hubbell
 - .2 Pass & Seymour
 - .3 Arrow Hart
 - .4 Leviton
 - .5 Bryant

-
- 2.2 COVER PLATES
- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
 - .2 Cover plates from one manufacturer throughout project.
 - .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
 - .4 Ivory cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.
 - .5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
 - .6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
 - .7 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 01 - Common Work Results - Electrical as indicated.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .2 Cover plates:
 - .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

July 30, 2014

PART 1 - GENERAL

- | | | |
|---|----|--|
| <u>1.1 PRODUCT DATA</u> | .1 | Submit product data in accordance with Section 01 33 00. |
| | .2 | Include type, quantity of all breakers used and time-current characteristic curves for breakers with ampacity of 225 A and over. |
| <u>1.2 OPERATION AND MAINTENANCE DATA</u> | .1 | Provide operation and maintenance materials to be incorporated into the manual specified in Section 01 78 00. |

PART 2 - PRODUCTS

- | | | |
|--|----|---|
| <u>2.1 BREAKERS
GENERAL</u> | .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 | Multiple breakers shall have single handle. |
| | .3 | Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating. |
| | .4 | Circuit breakers with interchangeable trips as indicated. |
| | .5 | Circuit breakers to have interrupting capacity as indicated on the Drawings. |
| <u>2.2 THERMAL
MAGNETIC BREAKERS</u> | .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. |

July 30, 2014

2.3 MAGNETIC
BREAKERS

- .1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 OPTIONAL
FEATURES

- .1 Include:
 - .1 On-off locking device for 10% of branch breakers.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install circuit breakers as required.
- .2 Provide 10% spare breakers in panels.

PART 1 - GENERAL

- | | | |
|--|----|---|
| <u>1.1 REFERENCES</u> | .1 | American National Standards Institute (ANSI)
.1 ANSI C82.1-04, Lamp Ballasts-Line
Frequency Fluorescent Lamp Ballast. |
| | .2 | Underwriters' Laboratories of Canada (ULC) |
| <u>1.2 ACTION AND
INFORMATIONAL
SUBMITTALS</u> | .1 | Provide submittals in accordance with Section
01 33 00 - Submittal Procedures. |
| | .2 | Product Data:
.1 Provide complete photometric data
prepared by independent testing laboratory for
luminaires where specified, for approval and
review by Departmental Representative.
.2 Photometric data to include: VCP Table
where applicable and spacing criterion. |
| | .3 | Quality assurance submittals:
.1 Manufacturer's instructions: provide
manufacturer's written installation
instructions and special handling criteria,
installation sequence, cleaning procedures and
maintenance. |

PART 2 - PRODUCTS

- | | | |
|---------------------|----|--|
| <u>2.1 LAMPS</u> | .1 | Fluorescent lamps to be - T8, 32 Watt, medium
bi-pin, rapid-start, 3500 K, 30,000 hour lamp
life, 2950 initial lumens, CRI 77; or as
indicated. Warm white. |
| | .2 | Compact fluorescent lamps to be - 32 Watt,
G24q-2 base, 12,000 hour lamp life, 12,000
initial lumens, 4100 K, CRI 85; or as
indicated. |
| <u>2.2 BALLASTS</u> | .1 | Fluorescent ballast: CBM and CSA certified,
energy efficient type.
.1 Rating: 120V, 60 Hz for use with 3-32 W
or 1-32 watt rapid start T8 lamp(s). |

July 30, 2014

-
- 2.2 BALLASTS
(Cont'd)
- .1 (Cont'd)
 - .2 Totally encased and designed for a maximum 15°C temperature rise over 40°C ambient temperature.
 - .3 Power factor: minimum 95% with 95% of rated lamp lumens.
 - .4 Current crest factor: 1.7 maximum.
 - .5 Harmonics: less than 10% maximum THD.
 - .6 Operating frequency of electronic ballast: 20 kHz minimum.
 - .7 Total circuit power: 62 Watts.
 - .8 Ballast factor: greater than 0.90.
 - .9 Sound rated: Class A.
 - .10 Mounting: integral with luminaire.
 - .2 Compact Fluorescent dimming ballast.
 - .1 120 volt, 32 watt
 - .2 Triple Tube 4-Pin
 - .3 100-3% dimming
- 2.3 FINISHES
- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.
- 2.4 OPTICAL CONTROL DEVICES
- .1 As indicated in luminaire schedule.
- 2.5 LUMINAIRES
- .1 As indicated in luminaire schedule.
- PART 3 - EXECUTION
- 3.1 INSTALLATION
- .1 Locate and install luminaires as indicated.
 - .2 Provide adequate support to suit ceiling system.
- 3.2 WIRING
- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.
-

July 30, 2014

-
- | | | |
|----------------------------|----|--|
| 3.3 LUMINAIRE
SUPPORTS | .1 | For suspended ceiling installations support
luminaires independently of ceiling. |
|
 | | |
| 3.4 LUMINAIRE
ALIGNMENT | .1 | Align luminaires as indicated on drawings. |
| | .2 | Align luminaires mounted individually
parallel or perpendicular to building grid
lines. |
|
 | | |
| 3.5 CLEANING | .1 | Clean in accordance with Section 01 74 11 -
Cleaning.
.1 Remove surplus materials, excess
materials, rubbish, tools and equipment.
.2 Waste Management: separate waste
materials for reuse and recyclingt in
accordance with Section 01 74 21 -
Construction/Demolition Waste Management and
Disposal. |

July 30, 2014

PART 1 - GENERAL

1.1 SECTION
INCLUDES

- .1 Materials and installation for emergency lighting systems.

1.2 RELATED
REQUIREMENTS_

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 26 05 21 - Wires and Cables (0-1000 V).
- .3 Section 26 05 34 - Conduits, Conduit Fastenings and Fittings.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International)
.1 CSA C22.2 No.141-M1985(R1999), Unit Equipment fo Emergency Lighting.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Data to indicate system components, mounting method, source of power and special attachments.

1.5 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management And Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative Consultant.

July 30, 2014

1.5 WASTE
MANAGEMENT AND
DISPOSAL
(Cont'd)

- .5 Dispose of unused batteries at official hazardous material collections site approved by Departmental Representative Consultant.
- .6 Fold up metal banding, flatten and place in designated area for recycling.

1.6 WARRANTY

- .1 For batteries, the 12 months warranty period prescribed in subsection GC32.1 of General Conditions "C" is extended to 120 months, with no-charge replacement during the first 5 years and pro-rate charge on the second 5 years.

PART 2 - PRODUCTS

2.1 EQUIPMENT

- .1 Emergency lighting equipment: to CSA C22.2 No.141.
- .2 Supply voltage: 120 V, ac.
- .3 Output voltage: 12 24 V dc.
- .4 Operating time: 72 watt for 30 minutes unless indicated otherwise.
- .5 Battery: sealed, maintenance free.
- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Signal lights: solid state, life expectancy 100,000 hrs. minimum for 'AC Power ON' and 'High Charge'.
- .10 Lamp heads: integral on unit or remote, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type:MR166 LED 12V-5W.
- .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for

July 30, 2014

2.1 EQUIPMENT
(Cont'd)

- .11 Cabinet:(Cont'd)
conduit. Removable or hinged front panel for
easy access to batteries.
- .12 Finish: white baked enamel.
- .13 Auxiliary equipment:
 - .1 Test switch.
 - .2 Time delay relay.
 - .3 Battery disconnect device.
 - .4 AC input and DC output terminal blocks
inside cabinet.
 - .5 Shelf Bracket.
 - .6 Cord and single twist-lock plug
connection for AC.
 - .7 RFI suppressors.

2.2 WIRING OF
REMOTE HEADS

- .1 Conduit: type EMT, in accordance with Section
26 05 34 - Conduits, Conduit Fastenings and
Fittings.
- .2 Conductors: RW90 type in accordance with
Section 26 05 21 - Wires and Cables 0-1000 V,
in accordance with manufacturer's
recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Mount 2500mm from finished floor or at
ceiling level when less than 2500mm.
- .2 Install unit equipment and remote mounted
fixtures as indicated.
- .3 Wire remote heads using R90 wire in EMT
conduit.
- .4 Direct heads as indicated.
- .5 Test each unit for 30 minutes on emergency.
- .6 Connect exit lights to unit equipment as
indicated.

July 30, 2014

3.2 SELF-POWERED
FLUORESCENT INVERTOR
INSTALLATION

- .1 Factory or field installed in fixture and
wired in accordance with manufacturer's
instructions.
- .2 The unsqitched lighting circuit must be field
wired to the invertor input.
- .3 Test each unit for 30 minutes on emergency.

PART 1 - GENERAL

1.1 RELATED
REQUIREMENTS

- .1 Section 26 05 21 - Wires and Cables (0-1000 V).
- .2 Section 26 05 34 - Conduits, Conduit Fastenings and Fittings.
- .3 Section 26 52 00 - Emergency Lighting.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No.141-02, Unit Equipment for Emergency Lighting.
 - .2 CSA C860-01(December 2002), Performance of Internally-Lighted Exit Signs.
- .2 National Fire Protection Association (NFPA)
 - .1 NFPA 101-2006, Life Safety Code.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

PART 2 - PRODUCTS

2.1 STANDARD UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
 - .2 Metal construction using Canadian cold rolled steel.
 - .3 Face plate: robust clear poly-carbonate panels with an opaque border coloured factory-white. Each face plate shall come standard with two legend films for pictogram and directional directions.
 - .4 Frame and backplate shall each be of a one-piece steel construction.
 - .5 Long life white LED light source.
-

July 30, 2014

- 2.1 STANDARD UNITS
(Cont'd)
- .6 Operation: designed for over 100,000 hours of continuous operation without relamping.
 - .7 "Running Man" pictogram.
 - .8 Self powered model delivers standard two hours of back up lighting.
 - .9 Easy access to wiring entry for all mounting options.
 - .10 Universal 2-wire AC input voltage from 120 to 347VAC at less than 2.5W and universal 2-wire DC input voltage from 6 to 24VDC at 1W consumption for single and double face signs..
 - .11 Canopy mounting system designed specifically for ease of installation.

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 exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
 - .2 Connect fixtures to exit light circuits.
 - .3 Connect emergency lamp sockets to emergency circuits.
 - .4 Ensure that exit light circuit breaker is locked in on position.

- 3.3 CLEANING
- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
 - .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.