

PART 1 - GENERAL

- 1.1 General .1 This Section covers items common to Sections of Division 25, 26. This section supplements requirements of Division 01.
- 1.2 Related Work .1 Direct Buried Underground Cable Ducts: Section 33 65 76
- 1.3 References .1 CSA-C22.1-15, Canadian Electrical Code, Part 1.
- .2 CAN/CSA C22.2 No. 0.1-M1985 (R2013), General Requirements for Double-Insulated Equipment.
- .3 CSA-C22.3 No. 7-15, Underground Systems.
- .4 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50 000 V.
- .5 EEMAC Y1-2-1979, Standard for Performance Specification for Finishing Systems for Outdoor Electrical Equipment.
- .6 EEMAC 2Y-1-1958, Standard for CEMA Light Gray Colour for Indoor Switchgear.
- 1.4 Scope of Work .1 General:
- .1 The electrical work of this contract consists of furnishing all materials, tools, equipment and labour, and performing the electrical services as indicated and as specified herein and on the Structural and Electrical Drawings.
- .2 Provide all required conduit and required mounting hardware.
- .3 On existing service mount shroud, remove and replace with new existing stainless steel 600V, 400 A Nema 4 fused disconnect service entrance switch, existing stainless steel 600V, 400 A Nema 4 circuit breaker in enclosure, existing Nema 4 600 V, 400A receptacle and back box, existing Current Transformer Cabinet and all conduit and

conductors between the fused disconnect and the 400A receptacle.

.4 Co-ordinate replacement of equipment with the owner and the local utility. Co-ordinate removal and installation of metering equipment in the new Current Transformer cabinet with the utility including all required shutdowns.

.5 Layout equipment to allow close nipple connections through wall between new Current Transformer Cabinet and 400 A Fused Disconnect and between new Current Transformer Cabinet and 400 A Enclosed Circuit breaker.

.6 Co-ordinate with utility and provide labour/material as required to connect existing meter enclosure to new Current Transformer cabinet.

.7 Contractor to supply and install new 3 M ground rod and connect to existing ground rod via bare 2/0 awg conductor buried 600 mm below grade. Contractor to remove and reinstate surface as required for ground wire and rod installation.

.8 Contractor to demolish existing concrete bases for the shroud and replace with new bases and anchor bolts.

.9 Contractor may supply equipment from same vendor as the equipment that is removed from the Service Shroud or provide alternate equipment. In the case where alternate equipment is supplied, the contractor is responsible to ensure the equipment fits on the existing Service Shroud and all new penetrations are the responsibility of the contractor.

.10 All new equipment and conduit mounted on the service mount shall be mounted with new stainless steel bolts and nuts.

.11 Supply and install new underground rigid PVC conduit feeding two exterior light standards for which new bases are to be installed.

.12 Reinstate all underground conduit that services these two lights removed or damaged during the installation of the new surfaces and reinstate the surfaces.

.13 Supply and install new underground conductors to match existing feeding two exterior light standards for which new bases were installed.

- .14 Reinstall and test existing light standards on new bases.
- .15 Obtain and pay for all required permits.
- .16 Provide all grounding necessary to satisfy the CEC - Part 1 and the local provincial inspection authority.
- .17 Document and test to satisfaction of the Departmental Representative and the electrical authority, electrical equipment as specified herein and on the drawings.
- .18 Safely store on site all electrical equipment awaiting installation.
- .19 Protect during construction all installed electrical equipment.
- .20 Repair/replace equipment damaged during construction, or otherwise deemed defective or non-compliant with this specification, at no additional expense to the Contract. These expenses include all material, labour and other fees.
- .21 Obtain any "scope of work" clarification prior to issuing their Tender. Any cost extras due to any misunderstanding/misinterpretation of the scope of work will not be entertained during the construction phase of the work.
- .22 Coordinate/schedule with other trades so that construction proceeds in a timely and efficient manner. Minimize disturbance to existing systems and provide access for plant operator for routine maintenance and inspection.

1.5 Codes and
Standards

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead systems in accordance with CAN/CSA-C22.3 No. 1 and underground systems in accordance with CSA C22.3 No. 7, except where specified otherwise.
- .3 Comply with all CSA electrical bulletins in force at the time of tender submission. While not identified or specified by reference number in this division, the bulletins shall be considered to form part of the related CSA part II standard.

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| 1.6 | Care,
Operation and
<u>Start-up</u> | .1 | Instruct operating personnel in the operation, care and maintenance of equipment. |
| | | .2 | Except where noted otherwise, 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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| 1.7 | <u>Voltage Ratings</u> | .1 | Operating voltages: to CAN3-C235. |
| | | .2 | Motors, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard. Equipment to operate in extreme operating conditions established in above standard without damage to equipment. |
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| 1.8 | Permits, Fees
<u>and Inspection</u> | .1 | Submit to the Electrical Inspection Department, Municipal Authority and Supply Authority the necessary number of drawings and specifications for examination and approval prior to commencement of work. Submit this information within ten (10) working days of the award of Tender and provide the Departmental Representative with written notice at the time this has been submitted. |
| | | .2 | Provide the Departmental Representative with a copy of the Electrical Inspection Department and Supply Authority Plans Review Report immediately upon receipt. No shop drawings will be reviewed prior to receipt of the Plans Review Report from the Contractor. |
| | | .3 | Obtain all necessary permits including an Electrical Wiring Permit for electrical work and Communications Cabling Permit for communications cabling work from the authority having jurisdiction prior to commencement of work. Provide a copy of each permit to the Departmental Representative upon receipt. Display the permits on the work site. |
| | | .4 | Upon specific request, the Departmental Representative will provide to the Contractor, |
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up to a maximum of three (3) copies of the drawings and specifications required for submittal to the Electrical Inspection Department and Supply Authority. These drawings and specifications will be provided to the Contractor at no cost, unless specified otherwise.

- .5 Arrange for all required inspections to be conducted by the authority having jurisdiction. Provide a copy of all inspection reports to the Departmental Representative immediately upon receipt. Notify the Departmental Representative immediately of changes required by the authority having jurisdiction prior to making changes. All changes must be approved by the Departmental Representative.
- .6 Furnish Certificates of Acceptance from authorities having jurisdiction upon completion of Work. Include a copy in the Operations and Maintenance Manual.
- .7 Pay all associated fees.
- .8 There will be a need to shut down the high voltage service to the building. Coordinate this work with the utility and pay all associated costs at no additional expense to the Contract. Shut down of the high voltage service may be required more than once to work within the operating schedule of the building.

1.9 Materials and
Equipment

- .1 Provide materials and equipment in accordance with Section 01 61 00.
- .2 Equipment and material to be CSA certified or certified by an agency recognized by the Electrical Inspection Department. Where there is no alternative to supplying equipment which is not certified, obtain special approval from Electrical Inspection Department and the Departmental Representative.
- .3 Factory assemble control panels and component assemblies.

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| 1.10 Electric Motors, Equipment and <u>Controls</u> | .1 | Coordinate location of mechanical and process equipment and associated control devices supplied by other divisions. All device locations may not be necessarily shown on electrical drawings. |
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| 1.11 <u>Finishes</u> | .1 | Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
.1 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.
.2 Paint outdoor electrical equipment green finish to EEMAC Y1-2. |
| | .2 | Clean and touch up surfaces of existing and new shop-painted equipment scratched or marred during shipment or installation, to match original paint to the satisfaction of the Departmental Representative, otherwise replace at no additional cost to the Contract. |
| | .3 | Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting. |
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| 1.12 Fasteners and <u>Equipment Mounting</u> | .1 | Fastening devices for all equipment and components, including bolts, nuts, washers, and screws shall be stainless steel throughout. |
| | .2 | Mount all wall mounted equipment (fused disconnect switches, circuit breaker enclosures, and receptacles directly on service mount using stainless steel hardware. |
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| 1.13 Equipment <u>Identification</u> | .1 | Identify electrical equipment with nameplates and labels. |
| | .2 | Identification:
.1 Provide all disconnect switches, receptacles, transformers, metering cabinets, etc. with "lamicoid" nameplates as further described herein. Take care to affix all plates true and level, and plumb in all instances. |
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.2 Affix nameplates to all "metal" surfaces with steel type "pop-rivets".

.3 Affix nameplates to other types of surfaces with contact type cement.

.4 Affix nameplates to building "exterior" surfaces with nylon inserts and self-tapping screws unless specifically indicated otherwise.

.5 Apply contact type cement to complete rear side of plate, as opposed to several locations or areas on same.

.6 Lamicoid nameplates installed on distribution panelboards, motor control centres, transformers, etc. to indicate the following:

.1 Designated name of equipment.

.2 Amperage of overcurrent protection device.

.3 Voltages, number of phases and wires.

.4 Designation of power source similar to example below:

FUSED DISCONNECT SERVICE ENTRANCE -
FDS-1 400 AMPS 600/347V - 3PH - 4W
FED FROM UTILITY TRANSFORMER

.7 Allow for an "average" of 40 letters for each lamicoid nameplate.

.1 Lamicoid 3 mm thick plastic engraving sheet, white face, black core, for all electrical systems except fire alarm systems which shall have red face with white core.

.2 1.5 mm thick nameplates above receptacles as previously indicated, with top left and right corners to be rounded off.

.3 Lettering on lamicoid nameplates must not "start", nor "end" nearer than 9 mm from either, or both ends of said plates. Size of lettering, including overall lengths of various plates to be as indicated in the following chart:

NAMEPLATE SIZES

Size 9 50mm x 90mm 3 lines 10mm high letters

- .3 Have wording on nameplates and labels approved by the Departmental Representative prior to manufacture.
- .4 Identification to be English.
- .5 Co-ordinate names of equipment and systems with other trades to ensure that equipment identification is consistent.
- .6 In addition to required nameplates and colour coding, junction boxes to have the panel and circuit numbers of all wiring contained within listed on the coverplate. List to be written using black indelible marker.
- .7 Identification of electrical junction boxes and pull boxes:
 - .1 Apply colour coding prior to pulling conductors into boxes.
 - .2 Where primary colour only is indicated:
 - .1 Colour inside of box.
 - .2 Colour all cover plates.
 - .3 Where primary and secondary colours are indicated:
 - .1 Paint inside of box with the primary colour.
 - .2 Diagonally apply to each half of the cover plate the primary and secondary colours.
- .8 Provide clearly visible marking on electrical equipment to warn persons of potential electrical shock and arc flash hazards as specified in Section 2 of the Canadian Electrical Code.

1.14 Wiring
Identification

- .1 Identify wiring with permanent indelible identifying markings, either numbered or 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 code: to CSA C22.1.

- .4 Use colour coded wires in communication cables, matched throughout system.
- .5 Indicate panel and conduit number on all phase conductors (i.e., Panel A, ckt 3) at the device and at any intermediate junction/pull boxes.
- .6 Identify all neutral conductors to indicate the phase conductor with which they are associated and at any intermediate junction/pull boxes.
- .7 Indicate MCC designation and section number or field mounted motor starter on all phase conductors at the device.
- 1.15 Conduit and Cable Identification
- .1 Colour code conduits, boxes and cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 19 mm wide auxiliary colour.
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| | <u>Prime</u> | <u>Auxiliary</u> |
| up to 600 V | yellow | green |
- .4 For power cables to electrical equipment, indicate designated name of equipment and designated name of power source (i.e., Fuel Pump #1 - fed from MCC #1).
- .5 Where more than one cable terminates at a device, add cable number (i.e., -1, -2) to end of cable identification.
- .6 Use Electrovert PVC K-marking sleeves (black on yellow), complete with PVC carrier strip and self-locking nylon cable ties (black) or approved equal.
- 1.16 Wiring Terminations
- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

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| .17 | <u>Manufacturers
and CSA Labels</u> | .1 | Visible and legible after equipment is installed. |
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| 1.18 | <u>Warning Signs</u> | .1 | Locate outlets in accordance with the Drawings and these Specifications. |
| | | .2 | Change location of equipment at no extra cost or credit, providing distance does not exceed 3 metres and information is given before installation. |
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| 1.19 | <u>Location of
Outlets</u> | .1 | Locate outlets in accordance with the Drawings and these Specifications. |
| | | .2 | Change location of equipment at no extra cost or credit, providing distance does not exceed 3 metres and information is given before installation. |
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| 1.20 | <u>Mounting Heights</u> | .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. |
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| 1.21 | <u>Conduit and
Cable
Installation</u> | .1. | Conduct and pay for following tests: |
| | | .1 | Power distribution system including phase rotation, voltage, and grounding |
| | | .2 | Insulation resistance testing: |
| | | .1 | Megger 350-600 V circuits, feeders and distribution equipment with a 1000 V instrument. |
| | | .2 | Check resistance to ground before energizing. |
| | | .3 | Provide a type written tabular report indicating test results. |
| | | .3 | Advise the Departmental Representative of dates when testing will take place. Provide five (5) days' notice of such tests. |
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- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
 - .5 Submit test results for the Departmental Representative's review and approval.
 - 1.23 Co-ordination of Protective Services
 - .1 The Departmental Representative will provide settings for new breakers. Set breaker settings accordingly and provide test results for the settings.
 - 1.24 Quality Assurance
 - .1 Instructions:
 - .1 Interferences: electrical drawings are generally of a diagrammatic nature. Plan and coordinate the work to eliminate interferences with other trades. Provide all necessary raceway offsets, fittings, and boxes, adjust all fixture and equipment boxes, adjust all fixture and equipment locations and provide all supporting materials required for a planned, coordinated and neat installation. Where interferences occur, the Departmental Representative will decide which item must be relocated regardless of which was installed first.
 - .2 Electrical workmanship: provide workmanship of the highest quality. Sub-standard work will not be accepted. Use only persons skilled in the trades involved.
 - .3 Electrical materials: provide all materials used in this work, unless particularly specified otherwise, that are new, free from flaws, or imperfections.
 - .4 Sleeves and inserts: furnish and locate all sleeves and inserts required for this work in accordance with drawings.
 - .2 Applicable standards:
 - .1 All electrical work must conform to the requirements and recommendations of the latest edition of the Canadian Electrical Code and all local codes and ordinances. In conflicts between codes, the more stringent requirements will govern.
 - .2 In no instance will the standard established by this specification be reduced
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by any of the codes or standards referred to in this specification.

.3 Standards: the specifications and standards of the following organizations are by reference made as part of these specifications and all electrical work, unless otherwise indicated, shall comply with their requirements and recommendations wherever applicable.

.4 Canadian Standard Association (CSA).

.5 Institute of Electrical and Electronics Engineers (I.E.E.E.).

.6 Instrument Society of America (I.S.A.).

.7 American Society for Testing Materials (A.S.T.M.).

.8 Certified Ballast Manufacturers (C.B.M.).

.9 Insulated Power Cable Consultants Association (I.P.C.E.A.).

.10 Electrical Equipment Manufacturer's Association of Canada (E.E.M.A.C.).

.11 National Fire Protection Association (N.F.P.A.).

.12 Underwriter's Laboratories of Canada (U.L.C.).

.13 Joint Industrial Council (J.I.C.).

.14 All local and provincial codes and ordinances.

1.25 Record Drawings

.1 Record Drawings:

.1 Provide a set of full-sized drawings for purpose of maintaining record drawings. Accurately and neatly record deviations from Contract Documents caused by site conditions and changes ordered by the Departmental Representative.

.2 Identify drawings as "Project Record Copy". Maintain in new condition and make available for inspection on site by the Departmental Representative.

.3 On completion of Work and prior to final inspection, submit record documents to the Departmental Representative.

- 1.26 Waste Management .1 Remove from site and dispose of all debris and
And Disposal waste materials at appropriate
disposal/recycling facilities.
- .2 Separate and recycle waste materials in
accordance with applicable
Construction/Demolition Waste Management and
Disposal Regulations.

PART 1 - GENERAL

- 1.1 Related Sections .1 Electrical General Requirements: Section 26 05 00

PART 2 - PRODUCTS

- 2.1 Wire and Box Connectors
- .1 Pressure type wire connectors: with current carrying parts of copper sized to fit copper conductors as required.
 - .2 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for copper conductors.
 - .2 Bolts for copper conductors.
 - .3 Sized for conductors as noted.
 - .3 Clamps or connectors for armoured cable, liquid tight, flexible conduit, as required.
 - .4 All wire connectors must be rated for operating voltage indicated.
 - .5 Tin-plated copper, colour-keyed, crimp type compression connectors (long barrel, two hole) with a straight, 45°, or 90° lug tongue configuration as required.

PART 3 - EXECUTION

- 3.1 Wire and Box Connectors Installation
- .1 Make all connections and terminations electrically and mechanically secure. Sizes of connectors must be as per manufacturer's recommendations for various sizes and combinations of wire sizes.
 - .2 Make all joints required in branch wiring #8 AWG and smaller utilizing "twist-on" type connectors as manufactured by "Ideal" (colour coded wirenut) or "Marrettes" #31, #33 or #35.

- .3 Make joints for wiring larger than #8 AWG utilizing colour keyed crimp type compression connectors (two hole, long barrel, tin-plated copper) complete with manufacturer approved compression tools. Provide a first layer of compound type tape followed by an additional layer of "Scotch" #33 vinyl tape. Bolt compression connectors together and torque in accordance with manufacturer's recommendation.
 - .4 Plier tighten marrette type connectors.
 - .5 Make wire connectors for connections to equipment not provided with lugs utilizing colour keyed, crimp type compression connectors (long barrel, two hole, tin-plated copper, straight lug tongue) complete with manufacturer approved compression tools. Alternate lug tongue configurations (45° and 90°) will be accepted where required by application.
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PART 1 - GENERAL1.1 Submittals

- .1 Submit shop drawings, and product data in accordance with Section 01 33 00 - Submissions/Shop Drawings

1.2 Related Sections

- .1 Conduits, Conduit Fastenings and Conduit Fittings: Section 26 05 34
- .2 Wire and Box Connectors (0 - 1000V): Section 26 05 20

1.3 References

- .1 CSA C22.1-15, Canadian Electrical Code.

PART 2 - PRODUCTS2.1 Building Wires

- .1 Conductors: stranded, copper. Minimum size #12 AWG.
- .2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene material rated RW90.
- .3 Colour code wiring in accordance with the Canadian Electrical Code.

PART 3 - EXECUTION3.1 Installation of Building Wires

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

PART 1 - GENERAL

1.1 Related Work .1 Electrical General Requirements: Section 26 05 00

PART 2 - PRODUCTS

- 2.1 Equipment
- .1 Clamps for grounding of conductor, size as required to grounding electrodes.
 - .2 Rod electrodes, copper clad steel, 21 mm diameter, 3 metres long.
 - .3 System and circuit, equipment, grounding conductors, bare stranded copper, un- tinned, soft annealed, size as indicated.
 - .4 Insulated grounding conductors: green, type RW90 in all conduits. Minimum size: #14 AWG or as indicated in Table No. 16 of C.E.C., whichever is larger.
 - .5 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .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.
 - .6 Copper crimp type compression connectors, (long barrel, two hole).
 - .7 Copper crimp type compression connectors (cable to cable, cable to ground rod, etc.)
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- 2.2 Manufacturers .1 Acceptable manufacturers: FCI - Burndy Corporation, Erico Inc., Thomas & Betts, Ilsco.

PART 3 - EXECUTION

- 3.1 Installation General .1 Install complete permanent, continuous, system and circuit, equipment, grounding system including, circuit, equipment, grounding systems including, conductors, connectors, accessories, as indicated, to conform to requirements of Departmental Representative, and local authority having jurisdiction over installation.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections and connections to electrodes using exothermic welding process or inspectable copper crimp type compression connectors.
- .5 Use mechanical connectors for grounding connections to equipment provided with grounding lugs.
- .6 Soldered joints not permitted.
- .7 Make grounding connections in radial configurations only, with connections terminating at single grounding point. Avoid loop connections.
- .8 Provide insulated copper bonding conductor in all conduit runs.
- 1.2 Electrodes .1 Bond separate, multiple electrodes together.
- .2 Bond separate, multiple electrodes together.

- .3 Use copper conductors, size as indicated, for connections to electrodes.
 - .4 Install grounding electrodes near the electrical service entrance and connect to electrical grounding system with copper conductor, size as indicated on the drawings.
 - 3.3 System and Circuit Grounding
 - .1 Install system and circuit grounding connections to neutral of secondary systems.
 - 3.4 Equipment Grounding
 - .1 Install grounding connections to typical equipment include in, but not necessarily limited to following list: Service equipment, conduit support system, circuit breakers, control panels, receptacles.
 - 3.5 Field Quality Control
 - .1 Perform tests in accordance with Section 26 05 00 - Electrical General Requirements
 - .2 Perform ground tests using method appropriate to site conditions and to approval of the Departmental Representative and local authority having jurisdiction over installation.
 - .3 Perform tests before energizing electrical system.

PART 1 - GENERAL

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| 1.1 <u>Location of Conduit</u> | .1 | Drawings do not show all conduits. Those shown are in diagrammatic form only. |
| 1.2 <u>Related Work</u> | .1 | Direct Buried Underground Cable Ducts:
Section 33 65 76 |
| 1.3 <u>References</u> | .1 | CSA-C22.2 No. 45.1-07(R2012), Rigid Metal Conduit - Steel. |
| | .2 | CSA-C22.2 No. 56-13, Flexible Metal Conduit and Liquid Tight Flexible Metal Conduit. |
| | .3 | CSA-C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing. |
| | .4 | CSA-C22.2 No. 211.2-06(R2011), Rigid PVC (Unplasticized) Conduit. |

PART 2 - PRODUCTS

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| 2.1 <u>Conduits</u> | .1 | Minimum conduit size for all areas: 21mm. |
| | .2 | Rigid Steel conduit for exterior installations under 300mm long. |
| | .3 | Rigid PVC conduit for exterior installations over 300mm long. |
| 2.2 <u>Conduit Fastenings</u> | .1 | Use one hole conduit straps to secure surface conduits 50 mm and smaller. Two hole conduit straps for conduits larger than 50 mm. |
| | .2 | Use pipe P-clamps to secure conduits to support channels. |
| | .3 | Provide isolators between dis-similar metals as required. |
| 2.3 <u>Conduit Fittings</u> | .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.

2.4 Expansion Fittings
For Rigid Conduit

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for linear expansion as required
- .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 building as required.
- .4 Provide expansion fittings at exit point (above-ground) of all underground services, and where indicated on the drawings.
- .5 Where rigid PVC conduit is used indoors or above ground, provide expansion fittings spaced in accordance with manufacturers' instructions and the Canadian Electrical Code.

2.5 Fish Cord

- .1 Polypropylene.

PART 2 - PRODUCTS

3.1 Conduit
Installation

- .1 General
 - .1 Install conduits to cause minimum interference in spaces through which they pass.
 - .2 Unless otherwise indicated, conduits must be surface mounted.
 - .3 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.
 - .4 Mechanically bend steel conduit over 19 mm dia.
 - .5 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
 - .6 Install polypropylene fish cord in all empty conduits.

- .7 Where conduits become blocked, remove and replace blocked section. Do not use liquids to clean out conduits.
 - .8 Dry conduits out before installing wire.
 - .9 Minimum conduit size: 21 mm diameter.
 - .10 Install conduits to prevent low pockets where moisture can accumulate. Install a combination breather and drain fitting at the lowest point of each above-grade conduit system, which is unbroken by sealing fittings on other obstructions.
 - .6 Surface conduits:
 - .1 Run parallel or perpendicular to building lines.
 - .2 Group conduits wherever possible on suspended or surface channels.
 - .3 Do not pass conduits through structural members except as indicated.
 - .4 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum 25 mm at crossovers.
 - .5 Fasten to flutes of metal roof deck when practical.
 - .6 Do not run conduits where they might obstruct lifting devices such as monorails.
 - .7 Conduits underground: slope conduits to provide drainage.
 - .8 Supply and install pull string in each spare conduit. Cap and seal conduit at each end.
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PART 1 - GENERAL

- 1.1. Related Work
- .1 Electrical General Requirements: Section 26 05 00
 - .2 Excavating, Trenching and Backfilling: Section 31 23 10

PART 2 - PRODUCTS2.1 NOT USED

- .1 Not applicable.

PART 3 - EXECUTION

- 3.1 Cable
Installation
In Ducts
- .1 Install cables as indicated in ducts.
 - .2 Do not pull spliced cables inside ducts.
 - .3 Install multiple cables in duct simultaneously.
 - .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
 - .5 To facilitate matching of colour coded multiconductor control cables, reel off in same direction during installation.
 - .6 Before pulling cable into ducts and until cables are properly terminated; seal ends of cables with moisture seal tape.
 - .7 After installation of cables, seal duct ends with duct sealing compound.

PART 1 - GENERAL1.1 REFERENCES

1. CSA International
2. CAN/CSA C22.2 No.94.1-[07], Enclosures for Electrical Equipment, Non Environment Considerations.
3. National Electrical Manufacturers Association (NEMA)
4. NEMA 250-[2008], Enclosures for Electrical Equipment (1000 Volts Maximum).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for electrical cabinets and enclosures and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: submit operation and maintenance data for electrical cabinets and enclosures for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .3 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
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- .2 Store and protect electrical cabinets and enclosures from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Current Transformer metering cabinet constructed with 2.7 mm thick minimum stainless steel, with weather and corrosion resistant finish to Nema 4X CAN/CSA C22.2.
- .2 Removable enclosure panels with formed edges, stainless steel external fasteners removable only from inside enclosure.
- .3 Door, with padlocking means.
- .4 CSA approved assembly.
- .5 Acceptable manufactures BEL AMC303010-SS or approved equivalent

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for electrical cabinet and enclosure installation in accordance with manufacturer's written instructions.
- .2 Visually inspect substrate in presence of Departmental Representative.
- .3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

- 3.2 INSTALLATION
- .1 Assemble enclosure in accordance with manufacturer's instructions and securely mount on building structure with channels, supports and fastenings.
 - .2 Mount equipment in enclosure.
 - .3 Label electrical cabinets and enclosure to Section 26 05 00 - Electrical General Requirements.
- 3.3 CLEANING
- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .2 Leave Work area clean at end of each day.
 - .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .4 Waste Management: separate waste materials and dispose of off site in accordance with Section 02 41 00 - Selective Site Removals.
 - .5 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
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PART 1 - GENERAL

- 1.1 Shop Drawing And Product Product Data .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submission/Shop Drawings.

PART 2 - PRODUCTS

- 2.1 Breakers General .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 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 5 to 10 x current rating.
- .3 Circuit breaker to have interrupting rating (momentary RMS symmetrical) with minimum rating of 18kA
- .4 Breaker to be housed in a Nema 4X stainless steel enclosure
- 2.2 Thermal Magnetic Breakers .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic by means of thermal and magnetic tripping devices to provide inverse time current tripping.
- .2 Provide ground fault interrupter type for circuits so marked.
- 2.3 Manufacturers .1 Acceptable manufacturers: Cutler-Hammer, Square D, Siemens.

PART 3 - EXECUTION

- 3.1 Installation .1 Install circuit breaker as indicated.

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 CAN/CSA-C22.2 No.4-Enclosed and Dead-Front Switches
 - .2 CSA C22.2 No.39-[13], Fuseholder Assemblies.
- 1.2 DELIVERY, STORAGE AND HANDLING
- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Material and Equipment and with manufacturer's written instructions.
 - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
 - .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect disconnect switches - fused and non-fused from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

- 2.1 DISCONNECT SWITCHES
- .1 Fusible, Service Entrance Rated disconnect switch in CSA stainless steel enclosure 4X, to CAN/CSA-C22.2 No. 4.
 - .1 Stainless steel to be 316L.
 - .2 Provision for padlocking in on-off switch position by 3 locks.
 - .3 Fuses: size as indicated.
 - .4 Quick-make, quick-break action.
 - .5 ON-OFF switch position indication on switch enclosure cover.

- .6 Incoming and outgoing switch lugs to be suitable for 2 X 2/0AWG connectors per phase and for neutral bus.
- .7 Switch to be complete with neutral bus and ground bus.

2.2 EQUIPMENT IDENTIFICATION

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

PART 3 - EXECUTION

3.1 INSTALLATION

- .5 Install disconnect switch complete with fuses.
- .6 Connect line side to existing conductors from 300 kVA transformer.
- .7 Co-ordinate installation of switch with utility as Utility outage is required for installation.