

PART 1 - GENERAL

- 1.1 GENERAL .1 This Section covers items common to Sections of Division 26 and 33. This section supplements requirements of Division 01 specifications.
- 1.2 RELATED WORK .1 Direct Buried Underground Cable Ducts: Section 33 65 76
- 1.3 REFERENCES .1 CSA-C22.1-2015, Canadian Electrical Code, Part 1.  
.2 CAN/CSA C22.2 No. 0.1-M1985(R2013), General Requirements for Double-Insulated Equipment.  
.3 CAN/CSA-C22.3 No. 1-2010, Overhead Systems.  
.4 CSA-C22.3 No. 7-2010, Underground Systems.  
.5 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50 000 V.  
.6 EEMAC Y1-2-1979, Standard for Performance Specification for Finishing Systems for Outdoor Electrical Equipment.  
.7 EEMAC 2Y-1-1958, Standard for CEMA Light Gray Colour for Indoor Switchgear.
- 1.4 SCOPE OF WORK .1 Supply, install, and test new lighting.  
.2 Disconnect, remove, and dispose of existing lighting as indicated.  
.3 Provide all necessary mounting hardware, wiring, and conduit as required to provide a fully functioning lighting system.  
.4 Supply and install new underground electrical ductbanks as noted on the Drawings and in accordance with Section 33 65 76.  
.5 Provide and install required cable glands, conduit, conduit fittings and required mounting hardware.  
.6 Provide and install all grounding necessary to satisfy the CEC - Part 1 and the local provincial inspection authority.

1.4 SCOPE OF WORK  
(Cont'd)

- .7 Safely store all electrical equipment awaiting installation on site.
- .8 Protect all installed electrical equipment during construction.
- .9 Procure, erect, maintain and remove all scaffolding necessary to complete the works.
- .10 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 must include all material, labour and other fees.
- .11 It is the responsibility of the Contractor to obtain "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.

1.5 CODES AND  
STANDARDS

- .1 Do complete installation in accordance with the Canadian Electrical Code, CSA C22.1, and local regulations except where specified otherwise.
- .2 Do overhead systems in accordance with the Canadian Electrical Code, 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.
- .4 Abbreviations for electrical terms: to CSA Z85.

1.6 CARE, OPERATION  
AND START-UP

- .1 Instruct 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, including but not limited to overload relays, motor circuit protectors, circuit breakers, electronic motor soft starters.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in

1.6 CARE, OPERATION .3  
AND START-UP  
(Cont'd)

(Cont'd)  
operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.7 VOLTAGE RATINGS .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.

1.8 PERMITS, FEES .1  
AND INSPECTION

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 The Contractor shall 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. The permits are to be properly displayed on the work site.
- .4 Upon specific request, the Departmental Representative will provide to the Contractor, 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

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- 1.8 PERMITS, FEES .5 (Cont'd)  
AND INSPECTION  
(Cont'd)
- .6 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.
- .7 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.
- 1.9 MATERIALS AND .1  
EQUIPMENT
- .1 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.
- .2 Factory assemble control panels and component assemblies.
- 1.10 ELECTRIC MOTORS, .1  
EQUIPMENT AND  
CONTROLS
- .1 Coordinate supplier and installer responsibility for mechanical and process equipment specified in other specification divisions to ensure complete and functioning systems.
- .2 Confirm location of mechanical and process equipment and associated control devices specified in other divisions. All device locations may not be necessarily shown on the electrical drawings.
- 1.11 FINISHES .1
- .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 new shop-painted equipment scratched or marred during shipment or installation, to match original paint to the satisfaction of the Departmental Representative. If not acceptable, replace equipment at no additional cost to the contract.
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| <u>1.11 FINISHES</u><br>(Cont'd) | .3 | Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting. |
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| <u>1.12 FASTENERS AND EQUIPMENT MOUNTING</u> | .1 | Fastening devices for all equipment and components, including bolts, nuts, washers, and screws shall be stainless steel throughout except as follows:<br>.1 In the electrical room or other dry areas, steel fastening devices are permitted.<br>.2 In the mechanical rooms and other non-hazardous damp areas, galvanized or stainless steel fastening devices are permitted.                  |
|  | .2 | Where there is no wall for mounting control panels, major junction boxes, instrumentation, transmitter/analyzer, etc., supply and install an 8 mm thick aluminum plate or stainless steel (316) plate for mounting this equipment. Secure mounting plate to back-to-back U-shaped strut as specified. Remove all sharp edges on aluminum plate. Refer to the drawings for installation details. |
|  | .3 | In electrical rooms and mechanical rooms, wall mount electrical equipment on 21mm thick plywood backboards that are fastened directly to the wall. Plywood shall be painted with two coats of fire retardant paint to match wall colour.  |
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| <u>1.13 EQUIPMENT IDENTIFICATION</u> | .1 | Identify electrical equipment with nameplates and labels as specified herein.  |
|                                      | .2 | Identification:<br>.1 All switchboards, panels, disconnect switches, MCC's, receptacles, transformers, control panels, fire alarm devices, magnetic starters, TOL's, etc. are to be provided with "lamicoid" nameplates as further described herein. Care is to be taken to ensure that all plates are affixed true and level, and plumb in all instances.<br>.2 Nameplates are to be affixed to all "metal" surfaces with steel type "pop-rivets".<br>.3 Nameplates are to be affixed to other types of surfaces with contact type cement.<br>.4 Nameplates are to be affixed to building "exterior" surfaces with nylon inserts and self tapping screws unless specifically indicated otherwise.<br>.5 Contact type cement is to be applied (buttered) to complete rear side of plate, as opposed to several locations or areas on same. |
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1.13 EQUIPMENT  
IDENTIFICATION  
(Cont'd)

- .2 Identification:(Cont'd)
- .6 Lamicoid nameplates installed on distribution panelboards, motor control centres, transformers, and splitters shall 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.
- PANEL C - 100 AMPS  
120/208V - 3PH - 4W  
FED FROM PANEL B
- .7 Lamicoid nameplates installed on combination starters, magnetic starters, manual starter and all various systems controls, control panels, disconnect switches, etc., shall contain the following information:
- .1 Designated name of equipment or equipment being fed, whichever is applicable.
  - .2 Designated name of power source.
  - .3 Branch circuit breaker number(s) where possible.
  - .4 Voltage(s) and phase.
- FAN NO. 5                      SUPPLY FAN NO. 3  
PANEL H - CKT. 17          M.C.C. NO. 1  
120V - 1 PH                600V - 3 PH
- .8 Lamicoid nameplates installed on fusible type disconnect switches are to also indicate the maximum designated/designed fuse size.
- .9 Lamicoid nameplates are to be installed on all junction and pull boxes sized 150 mm x 150 mm and larger indicating name of system, designated panel name and electrical characteristics where applicable.
- .10 Lamicoid nameplates are to be installed adjacent to each overcurrent device located in switchboards, CDP panels, etc. They need only indicate designated name and/or number of equipment they feed. Unused O.C. devices are to be identified as spare(s).
- .11 Lamicoid nameplates are to be installed above all types of receptacles and abutted directly to tops of their respective device plates. Identification is to indicate respective panel source complete with associated circuit breaker number(s). Lamicoid plate to be 1.5 mm thick x 13 mm high complete with 6 mm black letters on white core, directly above all flush receptacles. Plate to be identical width as finish device plate.
- .12 Lamicoid nameplates above 120V receptacles protected by GFCI circuit breakers, or GFCI type

1.13 EQUIPMENT  
IDENTIFICATION  
(Cont'd)

.2 Identification:(Cont'd)

.12 (Cont'd)

receptacles are to be identified as per the following:

.1 1.5mm thick x 19mm wide complete with 6 mm black letters on white core above all receptacles. Identical width as finish device plate (EXAMPLE: GFCI Protected Panel H-26).

.13 Lamicoid nameplate(s) for voice/data/CATV/CCTV/multimedia outlets shall be applied directly to face of finish plate.

.1 1.5mm thick x 19mm wide complete with 6mm black letters on white core above all receptacles. Identical width as finish device plate.

.14 All fire alarm devices (addressable and non-addressable) are to be lamicoid identified.

.1 Lamicoid identification is to be chain hung on mechanical items (pressure switches, supervisory switches, etc.).

.2 Manual pull station lamicoid plate to be similar to typical receptacle lamicoid plate.

.3 Lamicoid wording to match physical location and annunciator display address.

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

.16 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.

.17 1.5 mm thick nameplates above receptacles as previously indicated, with top left and right corners to be rounded off.

.18 Lettering on lamicoid nameplates shall 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 shall be as indicated in the following chart.

NOMINAL NAMEPLATE SIZES

Size 1	10mm x	50mm	1 line	5mm high letters
Size 2	13mm x	75mm	1 line	6mm high letters
Size 3	16mm x	75mm	2 lines	5mm high letters
Size 4	19mm x	90mm	1 line	10mm high letters
Size 5	50mmx	90mm	2 lines	13mm high letters
Size 6	25mm x	100mm	1 line	13mm high letters
Size 7	25mm x	100mm	2 lines	6mm high letters
Size 8	50mm x	150mm	2 lines	13mm high letters
Size 9	50mm x	100mm	3 lines	10mm high letters

.3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

.4 Identification to be English.

1.13 EQUIPMENT  
IDENTIFICATION  
(Cont'd)

- .5 Lamicoid nameplates shall be provided and installed on, or adjacent to, all various systems' control panels and/or cabinets complete with information as indicated. Nameplates are to reflect individual system's assigned name, and where applicable, shall also indicate both designated panel name and associated branch circuit breaker number(s).
  - .1 Fire alarm panels
  - .2 Security (intrusion) panels
  - .3 Control Panels
- .6 Control Transformers:
  - .1 Concealed control transformers located within ceiling spaces are to have lamicoid nameplates installed adjacent to same indicating their identified system, primary power source including designated panel name, complete with associated branch circuit breaker number(s).
  - .2 A second plate with identical information is to be installed on underside of room grid system or access opening frame directly below control transformer, so as to identify its concealed location directly above same.
  - .3 All control transformers installed in either control cabinets or on walls adjacent to same, are to be identified with lamicoid nameplates containing information as previously indicated.
- .7 Co-ordinate names of equipment and systems with other trades to ensure that equipment identification is consistent.
- .8 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.
- .9 Electrical junction boxes and pull boxes are to be colour coded as follows:
  - .1 Apply colour coding prior to pulling conductors into boxes are to be colour coded as follows:
  - .2 Where primary colour only is indicated:
    - .1 Colour inside and outside of box.
    - .2 Colour all cover plates.
  - .3 Where primary and secondary colours are indicated:
    - .1 Paint inside and outside of box with the primary colour.
    - .2 Diagonally apply to each half of the cover plate the primary and secondary colours.
- .10 Provide clearly visible marking on electrical equipment to warn persons of potential electrical



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| <u>1.13 EQUIPMENT IDENTIFICATION (Cont'd)</u> | <ul style="list-style-type: none"><li>.10 (Cont'd) shock and arc flash hazards as specified in Section 2 of the Canadian Electrical Code.</li><li>.11 Terminal boxes, panels and miscellaneous equipment fed from two or more sources shall be provided with a warning nameplate prominently displayed: "CAUTION - MORE THAN ONE SOURCE VOLTAGE".</li><li>.12 Terminal boxes, panels and miscellaneous wire ways containing intrinsically safe circuits shall be provided with a warning nameplate prominently displayed: "INTRINSICALLY SAFE CIRCUIT".</li></ul>  |
| <u>1.14 WIRING IDENTIFICATION</u>             | <ul style="list-style-type: none"><li>.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. Panduit PLD-1 and PLD-2 or approved equivalent.</li><li>.2 Maintain phase sequence and colour coding throughout.</li><li>.3 Colour code: to CSA C22.1.</li><li>.4 Use colour coded wires in communication cables, matched throughout system.</li><li>.5 Indicate panel and circuit number on all phase conductors (i.e., Panel A, ckt 3) at the device and at any intermediate junction/pull boxes.</li><li>.6 Identify all neutral conductors to indicate the phase conductor with which they are associated and at any intermediate junction/pull boxes.</li></ul> |
| <u>1.15 WIRING TERMINATIONS</u>               | <ul style="list-style-type: none"><li>.1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.</li></ul>   |
| <u>1.16 MANUFACTURERS AND CSA LABELS</u>      | <ul style="list-style-type: none"><li>.1 Visible and legible after equipment is installed.</li></ul>   |
| <u>1.17 WARNING SIGNS</u>                     | <ul style="list-style-type: none"><li>.1 As specified and to meet requirements of Electrical Inspection Department.</li></ul>  |

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- 1.17 WARNING SIGNS (Cont'd) .2 Decal or Porcelain enamel signs, minimum size 180 mm x 250 mm.
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- 1.18 LOCATION OF EQUIPMENT .1 Locate outlets in accordance with the Drawings and these Specifications.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of equipment at no extra cost or credit, providing distance does not exceed 3 m and information is given before installation.
- .4 Locate light switches on latch side of doors.
- .5 Locate disconnect devices on latch side of doors.
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- 1.19 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: 1200 mm.
- .2 Wall receptacles:
- .1 General: 1200mm.
- .2 Elevated mounting in process areas: 1200mm.
- .3 Above top of counters or counter splash backs: 150mm.
- .4 Outdoors: 1200mm above finished grade.
- .3 Panelboards: as required by Code or as indicated.
- .4 Wall mounted telephone, data and CATV outlets:.
- .1 General: 450mm.
- .2 Elevated mounting in process areas: 1200mm.
- .3 Above top of counters or counter splash backs: 150mm.
- .4 Outdoors: 1200mm above finished grade.
- .5 Thermostats: 1500 mm AFF.
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1.20 CONDUIT AND  
CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Arrange and pay for holes through exterior walls; provide flashings and make weatherproof.
- .4 Install conduits to be embedded or plastered over, neatly and close to the building structure so furring can be kept to a minimum.

1.21 FIELD QUALITY  
CONTROL

- .1 Conduct and pay for following tests:
  - .1 Circuits originating from branch distribution panels.
  - .2 Lighting and its control.
- .2 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
- .3 Insulation resistance testing:
  - .1 Megger circuits, feeders and distribution equipment up to 350 V with a 500 V instrument.
  - .2 Megger 350-600 V circuits, feeders and distribution equipment with a 1000 V instrument.
  - .3 Check resistance to ground before energizing.
  - .4 Provide a type written tabular report indicating test results.
- .4 Provide a type written tabular report indicating the normal field measured load current for all motors, indicating the motor circuit protector trip setting or fuse type/rating, the overload heater element sizes and/or settings. Indicate the motor nameplate current.
- .5 Advise Departmental Representative of dates when testing will take place. Provide five (5) days notice of such tests.
- .6 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .7 Submit test results for Departmental Representative's review and approval.

1.22 QUALITY  
ASSURANCE

- .1 Applicable standards:
  - .1 All electrical work to conform with 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 shall govern.
  - .2 In no instance shall the standard established by this specification be reduced 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 Illuminating Engineering Society (I.E.S.).
  - .6 Institute of Electrical and Electronics Engineers (I.E.E.E.).
  - .7 Instrument Society of America (I.S.A.).
  - .8 American Society for Testing Materials (A.S.T.M.).
  - .9 Certified Ballast Manufacturers (C.B.M.).
  - .10 Insulated Power Cable Engineers Association (I.P.C.E.A.).
  - .11 Electrical Equipment Manufacturer's Association of Canada (E.E.M.A.C.).
  - .12 National Fire Protection Association (N.F.P.A.).
  - .13 Underwriter's Laboratories of Canada (U.L.C.).
  - .14 Joint Industrial Council (J.I.C.).
  - .15 All local and provincial codes and ordinances.

1.23 RECORD  
DRAWINGS

- .1 Record Drawings:
  - .1 After award of Contract, Departmental Representative will 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 Departmental Representative.
  - .2 Identify drawings as "Project Record Copy". Maintain on site and in new condition and make available for inspection on site by Departmental Representative.
  - .3 On completion of Work and prior to final inspection, submit record documents to Departmental Representative.

1.24 WASTE  
MANAGEMENT AND  
DISPOSAL

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- .1 Remove from site and dispose of all debris and waste materials at appropriate disposal/recycling facilities.
- .2 Separate and recycle waste materials in accordance with applicable Construction/Demolition Waste Management And Disposal Regulations.
- .3 Refer to Division 01 specifications for additional requirements for disposal and recycling.