Division 26 / Electrical

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA C22.10-10, Canadian Electrical Code, Part 1 (21st Edition) and modification of Quebec.

.2 CAN/CSA-C22.3 n° 7-10, Underground Systems.

.3 CAN3-C235-83 (R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC).

.1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

.3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC).

.1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.2 DEFINITIONS

.1 Electrical and Electronic Terms: Unless otherwise specified, terms used in these specifications and on drawings are those defined by IEEE SP1122.

1.3 DESIGN REQUIREMENTS

.1 Operating Voltages: To CAN3-C235 Standard.

.2 Control, and distribution devices and equipment to operate satisfactorily at 60 Hz within normal 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 and French.

.4 Use one nameplate for both official languages.

1.4 SUBMITTALS

.1 Product Data: Submit manufacturer’s instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Shop Drawings:

.1 Shop drawings for Work executed at site to be stamped and signed by professional engineer registered or licensed in Province of Quebec, Canada.

.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.

.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each piece of equipment.

.4 Drawing must indicate clearances for operation, maintenance, and replacement of operating equipment devices.

.5 Submit electronic version drawings and data sheets.

.6 If changes are required, notify Departmental Representative of these changes before they are made.

.3 Certificates:

.1 Provide CSA certified equipment and material.

.2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval prior delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: In accordance with General Conditions of Contract.

.4 Manufacturer's Field Reports: Submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in PART 3 - FIELD QUALITY CONTROL.

1.5 QUALITY ASSURANCE

.1 Qualifications: Electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices in accordance with authorities having jurisdiction.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store, and handle materials.

.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 off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.

.2 Store and protect materials from nicks, scratches, and blemishes.

.4 Replace defective or damaged materials with new.

1.7 DEMOLITION

.1 Remove all existing electrical equipment as indicated. Equipment to be removed at correct timing.

.2 All equipment to be removed:

.1 Shall be removed with all related cabling and mounting;

.2 Becomes the property of the Contractor who shall dispose it promptly, or, be delivered to Departmental Representative, as indicated.

.1 **All existing equipment to be delivered to Departmental Representative shall be cleaned and put in appropriate packaging.**

.2 **The lamp posts to provide the Ministry will later be reused. It is important to take all necessary measures during the removal, handling and transport to protect lamp posts and hand them to the customer Ministry in the best possible condition**

1.8 SYSTEM STARTUP

.1 Instruct operating personnel in operation, care and maintenance of systems, system equipment, and components.

.2 Provide one additional visit for one technician on site within the period of twelve months following the date of the substantial completion certificate.

.3 Date of visit to be coordinated with Departmental Representative.

1.9 OPERATING INSTRUCTIONS

.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 piece of equipment.

.2 Safety precautions.

.3 Procedures to be followed in event of equipment failure.

.4 Other instructions, as recommended by manufacturer of each system or equipment.

.3 Post instructions where directed.

.4 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.5 Ensure operating instructions will not fade when exposed to sunlight.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site.

2.2 WIRING TERMINATIONS

.1 Ensure lugs, terminals, and screws used for termination of wiring are suitable for copper conductors as well as aluminum conductors.

.2 Cable lugs to be compression type for the required size.

2.3 EQUIPMENT IDENTIFICATION

.1 Lamp post identification consists of preglued labels supplied by Owner to Contractor.

2.4 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered or self-adhesive coloured plastic tapes ("Pan-Quick" type), on both ends of phase conductors of feeders and branch circuit wiring, including neutral.

.2 Maintain phase sequence and colour coding throughout the installation.

.3 Colour Coding: To CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.5 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer, inside and outside, and at least two coats of finish enamel.

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 FIELD QUALITY CONTROL

.1 Conduct following:

.1 Circuits originating from branch distribution panels;

.2 Checking of earth continuity;

.3 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 1,000 V instrument.

.3 Check resistance to ground before energizing.

.2 Carry out tests in presence of Departmental Representative.

.3 Provide instruments, meters, equipment, and personnel required to conduct tests during and at conclusion of project.

.4 Submit testing results to the Departmental Representative.

3.4 CLEANING

.1 Clean and touch up surfaces of painted equipment scratched or marred during shipment or installation, to match original paint.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)/CSA International.

.1 CAN/CSA-C22.2, No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.

.2 CSA C22.2, No. 65-03 (R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).

.2 National Electrical Manufacturers Association (NEMA).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit manufacturer's instructions, printed product literature, and data sheets for wire and box connectors, and include product characteristics, performance criteria, physical size, finish, and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Submit required documents.

.2 Operation and Maintenance Data: Submit operation and maintenance data for wire and box connectors for incorporation into operation and maintenance manual.

1.5 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 off ground, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect wire and box connectors from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

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 Joint connectors for lighting fixtures, to current carrying copper elements, sized for copper conductors size 10 AWG or less.

.3 Bushing Stud Connectors: To NEMA to consist of:

.1 Connector body and stud clamp for round copper conductors.

.2 Clamp for stranded copper conductors.

.3 Stud clamp bolts.

.4 Bolts for copper conductors.

.5 Sized for conductors as indicated.

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 wire and box connectors installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

.1 Remove insulation carefully from ends of conductors and cables, and proceeding as following:

.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 CAN/CSA-C22.2 No. 65.

.3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

.4 Install bushing stud connectors in accordance with NEMA.

.5 Where required, provide grounding and bonding in accordance with CSA C22.2 No. 41.

3.3 CLEANING

.1 Perform cleaning during construction.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results for Electrical.

.2 Section 26 05 20 - Wire and Box Connectors (0 - 1,000 V).

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).

.1 CSA C22.2, No. 0.3-09, Test Methods for Electrical Wires and Cables.

.2 Underwriters Laboratories of Canada (ULC).

.1 ULC-S139-00, Method of Fire Test for Evaluation of Integrity of Electrical Cables.

1.3 PRODUCT DATA

.1 Provide product data.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: Stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper Conductors: Size as indicated, with 1,000 V insulation of cross-linked thermosetting polyethylene material rated or RWU90 XLPE.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform required tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors (0-1,000 V).

.2 Cable Colour Coding: To Section 26 05 00 - Common Work Results for Electrical.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:

.1 In conduit systems or in underground ducts.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results for Electrical.

1.2 REFERENCES

.1 CSA Group.

.1 CSA C22.2 No. 206-13, Lighting Poles.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit manufacturer's instructions, printed product literature and data sheets for roadway lighting and include product characteristics, performance criteria, physical size, finish, and limitations.

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 off ground, indoors, and in accordance with manufacturer's recommendations in clean, dry, and well-ventilated area.

.2 Store and protect roadway lighting from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 LAMP POST – TYPE A

.1 Aluminum Pole Shaft.

.1 Pole shaft: Shall be made from a 127 mm round extruded 6061-T6 aluminum tubing, having a 5.6 mm wall thickness, welded to both the bottom and top of the anchor plate.

.2 Maintenance opening: The pole shall have a 51 mm x 114 mm maintenance opening centered 508 mm from the bottom of the anchor plate, including a weatherproof aluminum cover and a copper ground lug.

.3 Base cover: Two piece square base cover made from formed aluminum, mechanically fastened with stainless steel screws.

.4 A tenon will be provided when the luminaire or bracket does not fit directly on pole shaft.

.5 Pole weight: 25.9 kg.

.6 Wiring: Gauge (#14) TEW/AWM 1015 or 1230 wires, 152 mm minimum exceeding from luminaire.

.7 Hardware: All exposed screws shall be stainless steel with ceramic primer-seal basecoat to reduce seizing of the parts. All seals and sealing devices are made and/or lined with EPDM and/or silicone and/or rubber.

.8 Finish: Color to be black textured RAL9005TX (BKTX) and in accordance with the AAMA 2603 Standard. Application of polyester powder coat paint (4 mils/100 microns) with ± 1 mils/24 microns of tolerance. The Thermosetting resins provide a discoloration resistant finish in accordance with the ASTM D2244 Standard, as well as luster retention in keeping with the ASTM D523 Standard and humidity proof in accordance with the ASTM D2247 Standard.

.9 The surface treatment achieves a minimum of 2,000 hours for salt spray resistant finish in accordance with testing performed and per ASTM B117 Standard.

.10 LED products manufacturing standard: The electronic components sensitive to electrostatic discharge (ESD), such as light emitting diodes (LEDs), are assembled in compliance with IEC61340-5-1 and ANSI/ESD S20.20 Standards so as to eliminate ESD events that could decrease the useful life of the product.

.11 Quality control: The manufacturer must provide a written confirmation of its ISO 9001-2008 and ISO 14001-2004 International Quality Standards Certification.

.12 Certification: The manufacturer will have to supply a copy of approval products certificate, CSA or UL.

.2 Fixture.

.1 Finial: Decorative cast 356 aluminum, mechanically assembled.

.2 Hood: A spun aluminum dome, mechanically assembled to the cast aluminum heat sink.

.3 Guard: In a round shape with two arms, this guard is a one-piece cast 356 aluminum mechanically assembled to the fitter.

.4 Access-mechanism: Two-integrated hinges on hood with stopper and a captive screw shall offer access to the inside of the luminaire and to the lamp. An embedded memory-retentive gasket shall ensure weatherproofing.

.5 Globe (PC-CS): Made of one-piece seamless injected-moulded satin clear polycarbonate. The globe is assembled on the access-mechanism.

.6 Lamp (LED Module): LED type Philips Lumileds Rebel ES. Composed of 49 high-performance white LEDs, 90 W. Color temperature of 4000 Kelvin nominal, 70 CRI. Operating lifespan after which the system emits 70% of its original lumen output, all of those parameters are tested for 100% of light engines. Use of a metal core board ensures greater heat transfer and longer lifespan of the light engine.

.7 Optical system (LE3): IES type III (asymmetrical). Composed of high-performance acrylic collimators, optimized with varying beam angles to achieve desired distribution. Performance shall be tested per LM-63 and LM-79 (IESNA) certifying its photometric performance. Street-side indicated.

.8 Heat sink: Made of cast aluminum optimising the LEDs efficiency and life. Product does not use any cooling device with moving parts.

.9 Driver: High power factor of 90%. Electronic driver, operating frequency range 50/60 Hz. Auto-adjusting to a voltage between 120 and 277 V c.a., class II, THD of 20% maximum. Maximum ambient operating temperature from -40°C to 55°C. Certified in compliance to cUL requirement. Dry and damp location. Assembled on a unitized removable tray with Tyco quick disconnect plug resisting to 105°C.

.10 The current supplying the LEDs will be reduced by the driver if the internal driver temperature exceeds 85°C, as a protection to the LEDs and the electrical components. Output is protected from short circuits, voltage overload and current overload, automatic recovery after correction.

.11 Surge protector: Tested in accordance with ANSI/IEEE C62.45 per ANSI/IEEE C62.41.2 Scenario I Category C High Exposure 10kV/10kA waveforms for Line-Ground, Line-Neutral and Neutral-Ground, and in accordance with U.S. DOE (Department of Energy) MSSLC (Municipal Solid-State Street Lighting Consortium) model specification for LED roadway luminaires electrical immunity requirements for High Test Level 10kV / 10kA.

.12 Fitter (SF80): Cast 356 aluminum c/w 4 set screws 3/8-16 UNC. Slip-fits on a 102 mm outside diameter x 102 mm long tenon.

2.2 LAMP POST – TYPE B

.1 Lamp posts to deliver to the customer in all respects identical to type A but with operating voltage to 347 volts.

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 roadway lighting installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 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 Install poles true and plumb, complete with brackets, in accordance with manufacturer's instructions.

.2 Install luminaires on poles and install lamps.

.3 Check luminaire orientation, level, and tilt.

.4 Connect luminaire to lighting circuit.

.5 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

3.3 CLEANING

.1 Perform cleaning during construction.

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools, and equipment.

END OF SECTION