
Part 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 00 - Common Work Results for Electrical.
- .2 Section 26 09 43 - Network Lighting Controls.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI).
 - .1 ANSI C78.377-2008, Specifications for the Chromacity of Solid State Lighting Products.
 - .2 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE).
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 ASTM International Inc.
 - .1 ASTM F1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
- .4 Canadian Standards Association (CSA International).
 - .1 CSA C22.2 n° 74, Equipment for Use with Electric Discharge Lamps.
- .5 ICES-005-07, Radio Frequency Lighting Devices.
- .6 Underwriters' Laboratories of Canada (ULC).
- .7 United States of America, Federal Communications Commission (FCC).
 - .1 FCC (CFR47), EM and RF Interference Suppression.
- .8 National Electrical Manufacturers Association (NEMA).
 - .1 NEMA SSL 1-2010, Electronic Drivers for Led Devices, Arrays, or Systems.
 - .2 NEMA SSL 3-2011, High-Power White LED Binning for General Illumination.
- .9 Illuminating Engineering Society (IES).
 - .1 IES LM 79-2008, Approved Method: Electrical and Photometric Measurement of Solid State Lighting Products.
 - .2 IES LM 80-2008, Approved Method: Measuring Lumen Maintenance of LED Light Sources.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by Departmental Representative.
 - .3 Photometric data to include:
 - .1 Polar diagram of light intensity distribution;
 - .2 Luminaire efficiency;
 - .3 Utilization factor;
 - .4 Type and finishes of lenses and louvers;
 - .5 Spacing criterion;
 - .6 Photometric Calculation by software.
- .3 Mock-ups.
 - .1 Supply, install, and connect temporarily lighting fixtures required in mock-ups for Work, as indicated and in accordance with section 01 45 00 - Quality Control.
 - .1 Construct mock-ups in the following locations:
 - .1 Lighting fixtures integrated in handrail columns of pedestrian bridge (4 luminaires, 2 on each side);
 - .2 Lighting fixtures on the north façade and the attic between axis 10 and 11;
 - .3 Lighting fixtures in the multipurpose room between axis 10 and 11;
 - .4 Lighting fixtures in the hall between axis 10 and 11.
 - .2 Perform night tests and take illumination levels measurements to submit to the Departmental Representative. Adjust position of fixtures as needed.
 - .3 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative, connect permanently to incorporate in final Work, according to section 01 45 00 - Quality Control.
- .4 Quality Assurance Submittals: provide following in accordance with Section 01 45 00 - Quality Control.
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

- .3 Packaging Waste Management: remove for recycling of packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .4 Divert unused metal materials from landfill to metal recycling facility.
- .5 Disposal and recycling of fluorescent lamps as per local regulations.
- .6 Disposal of old PCB filled ballasts.

1.5 ACCEPTABLE PRODUCTS AND MATERIALS

- .1 Where a particular brand name is stipulated, see Instructions to Bidders for procedure for requesting approval of substitute materials and products.
- .2 Proposition of other luminaires as replacement products to include technical sheets for the proposed products and lighting level calculation by software.

Part 2 Products

2.1 LAMPS

- .1 Fluorescent lamps T8 with the following features:
 - .1 Rapid start;
 - .2 Form T-8;
 - .3 32 W;
 - .4 3,100 initial lumens;
 - .5 CRI 86;
 - .6 Color temperature: 4,100 K;
 - .7 24,000 hours minimum lamp life.
 - .8 Acceptable products:
 - .1 Philips.
 - .2 Osram.
 - .3 Replacement materials or products: approved by addendum according to Instructions to bidders.
- .2 Fluorescent lamps T5 with the following features:
 - .1 Rapid start;
 - .2 Form T-5;
 - .3 28 W;
 - .4 2,950 initial lumens;
 - .5 CRI 86;
 - .6 Color temperature: 4,100 K;
 - .7 30,000 hours minimum lamp life.

- .8 Acceptable products:
 - .1 Philips.
 - .2 Osram.
 - .3 Replacement materials or products: approved by addendum according to Instructions to bidders.
- .3 Fluorescent lamps T5HO with the following features:
 - .1 Rapid start;
 - .2 Form T-5HO;
 - .3 28 W;
 - .4 Initial lumens: as indicated;
 - .5 CRI 86;
 - .6 Color temperature: 4,100 K;
 - .7 30,000 hours minimum lamp life.
 - .8 Acceptable products:
 - .1 Philips.
 - .2 Osram.
 - .3 Replacement materials or products approved by addendum according to Instructions to bidders.
- .4 Lamps with light emitting diodes (LEDs):
 - .1 LED lighting components to ANSI C78-377, NEMA SSL 3 IES LM 79, and LM 80.
 - .2 LED lamp assembly to be replaceable independently of the luminaire.
 - .3 Power: as indicated.
 - .4 Initial luminous flux: as indicated.
 - .5 Color rendering index of 86.
 - .6 Color temperature 4,000 K.
 - .7 Minimum life of 50,000 hours.
 - .8 Light output after 50,000 hours: 70% of the initial luminous flux.
 - .9 Color changing lamps to be able to provide a full spectrum of using red LEDs, blue, green, and white.
 - .10 Acceptable products:
 - .1 Cree.
 - .2 Philips.
 - .3 Osram.
 - .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

2.2 BALLASTS

- .1 Fluorescent ballast: CBM and CSA certified, energy efficient type, IC electronic.
 - .1 Rating: 120 V, 60 Hz, for use with two T-8, T-5, or T-5HO lamps, as indicated.
 - .2 Input voltage range: $\pm 10\%$ of nominal.
 - .3 Totally encased and designed for 40 C ambient temperature.
 - .4 Ambient temperature: the ballast to start the lamp to a minimum ambient temperature of 10°C;
 - .5 Power factor: minimum 95% with 95% of rated lamp lumens.
 - .6 Current crest factor: 1.7 maximum.
 - .7 Harmonics: 10% maximum THD.
 - .8 Operating frequency of electronic ballast: 20 kHz minimum.
 - .9 Sound rated: Class A.
 - .10 Mounting: integral with luminaire.
 - .11 Electromagnetic emission: not to exceed Class A, as defined by FCC Part 18, 15C, regarding interference (EMI) and radio frequency (RFI);
 - .12 Protection against transients: the ballast shall withstand transient voltages and electrical noise, as described in the ANSI C62.41 and IEEE 587, with and without lights in the secondary circuit;
 - .13 Thermal protection: the ballast shall have thermal protection, as defined in CSA C22.2 No. 74-1969, Section 1.6.7.3 or comply with the technical newsletter (TIL) No. 37 July 25, 1988;
 - .14 Ballasts: electronic type dimmable for fluorescent lighting, direct type, two conductors and filters, as indicated.
 - .15 Acceptable products:
 - .1 Advance.
 - .2 Philips.
 - .3 Motorola.
 - .4 Osram.
 - .5 Replacement materials or products approved by addendum according to Instructions to bidders.

2.3 DALI BALLASTS

- .1 Electronic ballasts for fluorescent lamps, dimmable and addressable DALI: CBM and CSA certified, low energy consumption.
 - .1 Communication protocol: DALI.
 - .2 Rating: 120 V, 60 Hz, for use with two T-8, T-5, or T-5HO lamps, as indicated.
 - .3 Input voltage range: $\pm 10\%$ of nominal.
 - .4 Totally encased and designed for 40°C ambient temperature.
 - .5 Power factor: minimum 90% for the whole range of dimming.
 - .6 Current crest factor: 1.7 maximum.

- .7 Harmonics: 10% maximum THD.
- .8 Sound rated: Class A.
- .9 Dimming: 100 - 3%.
- .10 DALI ballast integrated in luminaire.
- .2 Acceptable Products:
 - .1 Model ROVR of Advance.
 - .2 Model Quicktronic DALI of Osram-Sylvania.
 - .3 Model DALI PRO of Universal lighting technologies.
 - .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

2.4 LED DRIVER DALI

- .1 Addressable LED Driver features including the "On/Off", dimming, scene, and other DALI control standard functions.
- .2 Start: power lights in dimmed predefined level.
- .3 Dimming interval: 100% to 10%, unless otherwise indicated.
- .4 Operating Voltage: 120-347 VAC (+ 5% / -10%), according to the application requirements.
- .5 Communication protocol: DALI.
- .6 Power supply: from the DALI bus.
- .7 Protection: end of life of the lamp and the circuit limiting inrush current.
- .8 LED driver must provide the following programmable parameters:
 - .1 Ignition level;
 - .2 DALI address;
 - .3 Groups, number 16;
 - .4 Scenes, number 16;
 - .5 Minimum and maximum dimming levels;
 - .6 Fading time;
 - .7 System failure levels;
 - .8 Device type.
- .9 LED driver to provide following states:
 - .1 Real dimming level;
 - .2 State of the LED lamp;
 - .3 Lamp power.
- .10 DALI driver integrated in luminaire or provided separately, as indicated.
 - .1 Provide a box for separate drivers, unless indicated otherwise.

2.5 DALI CONVERTERS

- .1 Provide DALI to 0-10 V, DMX or ELV converters for dimming lighting fixture provided with 0-10 V, DMX or ELV control.
- .2 Communication via DALI network.
- .3 Mounting: integrated in the luminaire or in separate box.
- .4 Programming using group selector.
- .5 Wiring as recommended by the manufacturer, but not less than 16 AWG.
- .6 Acceptable Products:
 - .1 Cristal Control.
 - .2 Fifth Light of Cooper Lighting (Eaton).
 - .3 Encelium of Osram.
 - .4 Replacement materials or products: approved by addendum according to Instructions to bidders.

2.6 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.7 OPTICAL CONTROL DEVICES

- .1 As indicated in luminaire schedule.

2.8 LUMINAIRES

- .1 As indicated in luminaire schedule.

2.9 MOUNTING ACCESSORIES

- .1 Provide mounting accessories required to install lighting fixtures, including hooks, chains, rods, poles, and other appropriate materials for the specified mounting method. Pendant fixtures to be equipped with seismic supports.
- .2 Poles for outdoor decorative lamps, aluminum, with support for lighting fixture, as indicated.
 - .1 Provide bolting circles to "civil" division to manufacture concrete bases.

Part 3 Execution

3.1 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.
- .3 Install LED drivers and DALI converters that are not integral part of a luminaire in appropriate boxes.

3.2 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

- .1 For suspended ceiling installations support luminaires independently of ceiling in accordance with local inspection requirements.
- .2 For the installation of surface-mounted luminaires on suspended ceiling tile, provide a metal bar specially designed for the purpose, to place over the suspension to attach the fixture with screws with appropriate length.
- .3 In mechanical rooms, suspended luminaires to done with suspension chains and exact location to be determined on site.

3.4 LUMINAIRE ALIGNMENT

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .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.

END OF SECTION