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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | February 19, 2010 | Modified ‘Related Sections’ and approved suppliers |
| 3 | March 23, 2011 | Minor edits |
| 4 | June 10, 2013 | Final Draft – Consolidated Comments Spec Update Project |
| 5 | June 19, 2013 | Incorporation of new Commissioning Specification cross reference. Incorporated several aspects of the NL building specifications. Addition of reference to IENSA manual. |
| 6 | July 30, 2014 | Changes to reflect renaming of commissioning specification and final review (AV) |
| 7 | February 9, 2015 | Updated, Finalized Specification – Reference eDOCS #5630516 v7 (AV) |
| **8** | **September 19, 2016** | **Draft Phase 2 update incorporating LED lighting systems. IAM comments reflected. (AV)** |

NOTE:

This is a CONTROLLED Document. Any documents appearing in paper form are not controlled and should be checked against the on-line file version prior to use.

**Notice:** This Document hardcopy must be used for reference purpose only.

**The on-line copy is the current version of the document.**

# GEneral

## Related Sections

### Section 01250 – Substitutions

### Section 01300 – Submittals

### Section 01425 – Computerized Maintenance Management System Data Requirements

### Section 01450 – Quality Control

### Section 01810 – Equipment Testing and Facility Commissioning

### Section 16010 – Electrical General Requirements

### Section 16031 – Inspection and Testing

### Product requirements for [item]... for installationunder this Section.

## References

*[Delete .1 if Section 01060 – Regulatory Requirements is included in Contract Documents.]*

### Comply with the latest edition of the following statutes, codes, standards and all amendments thereto:

#### American National Standards Institute (ANSI)

##### ANSI/ASHRAE/IESNA Standard 90.1-2013

##### NEMA/ANSI C82.1:2004, American National Standard for Lamp Ballasts – Line Frequency Fluorescent Lamp Ballasts.

##### NEMA/ANSI C82.4:2002, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps (multiple supply type).

##### Applicable ANSI standards for LED lighting systems

##### Applicable ANSI standards for magnetic induction lighting systems

#### CSA

##### CAN/CSA 22.2 NO. 250.13-14 Light Emitting Diode (LED) Equipment for Lighting Applications

#### Certified Ballast Manufacturers' Association (CBMA)

##### [*Consultant to specify applicable CBMA standards]*

#### Underwriters Laboratories Canada (ULC)

##### [*Consultant to specify applicable ULC standards]*

#### NEMA

##### NEMA SSL 1-2010 Electronic Drivers for LED Devices, Arrays, or Systems

##### NEMA SSL 6-2010 Solid State Lighting for Incandescent Replacement – Dimming

##### NEMA SSL 3-2011 High-Power White LED Binning for General Illumination

#### Canadian Standards Association (CSA)

##### [*Consultant to specify applicable CSA standards]*

#### Illuminating Engineering Society of North America (IESNA)

##### Lighting Handbook, 10th Edition

##### Lighting Controls for Energy Management

##### ANSI/ASHRAE/USGBC/IES 189.1-2014 Standard for the Design of High-Performance Green Buildings-Except Low-Rise Residential Buildings

##### LM-79-08, Electrical and Photometric Measurements of Solid-State lighting Products.

##### LM-80-15, Projecting Long Term Lumen Maintenance of LED Light Sources \_ Addendum B.

#### American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)

##### ANSI/IEEE C62.41.1-2002, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits

##### ANSI/IEEE C62.41.2-2002, IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and less) AC Power Circuits.

#### United States of America, Federal Communications Commission (FCC)

##### CFR 47 EM and RF Interference Suppression

#### American Society for Testing and Materials (ASTM)

##### ASTM F1137-11e1, Standard Specification for Phosphate/Oil Corrosion Protective Coatings for Fasteners.

## Measurement and Payment

*[Choose one of the following payment language provisions that best suits the individual project.*

*If this Section is not specifically referenced by an item in the Bid Form, please use the following language:*

### The work of this Section will not be measured separately for payment. All costs associated with the work of this Section shall be included in the Contract Price.

*OR If this Section is specifically referenced in the Bid Form, use the following language and identify the relevant item in the Bid Form:*

### All costs associated with the work of this Section shall be included in the price(s) for Item No(s). \_\_\_ in the Bid Form.

*[If the work of this Section is to be measured and paid for by several different methods, Consultant must amend the standard wording given above to reflect the different methods of measurement and payment.*]

## Shop Drawings and Product Data

### Submit shop drawings in accordance with Section 01300 – Submittals.

### Submit complete photometric data prepared by an independent testing laboratory [approved by the Consultant] for luminaires where specified in the Contract Documents. Photometric data to be reviewed and approved by the Consultant.

### Photometric data shall include: [Visual Comfort Probability Table] [spacing criterion].

### Provide the manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

### Quality assurance submittals: Provide the following:

#### Manufacturer's instructions: provide the manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures and re-lamping schedule.

#### Relevant equipment information in an electronic format suitable for upload to the Region’s CMMS (Maximo) in accordance with Section 01425 - Computerized Maintenance Management System Data Requirements.

## Job Mock-up

### Submit mock-ups in accordance with Section 01450 – Quality Control.

### Install [\_\_\_\_\_\_] sample fixtures, design [\_\_\_\_\_\_] in mock-up ceiling.

# PRODUCTS

## General

### Supply and install lighting fixtures of the type and number as shown on the lighting fixtures schedule that is part of the Contract Documents. *[Consultant to ensure the lighting fixture schedule is included in the Contract Documents]* Refer to Section 16010 – Electrical General Requirements.

## LED Emergency Lighting

### All signs must be CSA-approved and conform to CSA standard C22.2-141-10, “Emergency Lighting Equipment”.

### Approved Suppliers:

#### Lumacell Inc. a Division of Thomas & Betts Ltd.

#### EmergiLite, a Division of Thomas & Betts Ltd.

#### Approved Equivalent.

## LED Lamps for Hardwired CFL Lamp Replacement

### Measure applies to LED lamps designed to replace compact fluorescent lamps with external ballast and plug-in bases.

### Lamps shall only be used in accordance with manufacturer instructions.

### Lamps must be CSA-approved or satisfy the inspectors and the approving authorities who have jurisdiction.

### Total luminous flux (lumens) must be measured as per IES LM-79-08.

### Minimum initial efficacy of 70 lumens per watt. *[Consultant to amend as required]*

### Projected lifetime must be reported as per IES-TM-21-11 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 25,000 hours at minimum.

## LED Lamps for Metal Halide (MH) High Intensity Discharge (HID) Lamp Replacement

### General requirements

#### Measure applies to LED lamps designed to replace HID probe and/or pulse start metal halide ANSI compliant lamps with magnetic ballast.

#### Lamps shall only be used and installed in accordance with manufacturer instructions.

#### Lamps must be CSA-approved to CAN/CSA 22.2 NO. 250.13-14 Light Emitting Diode (LED) Equipment for Lighting Applications or satisfy the inspectors and the approving authorities who have jurisdiction.

#### Total luminous flux (lumens) must be measured as per IES LM-79-08.

#### Minimum initial efficacy of 80 lumens per watt.

#### Projected lifetime must be reported as per IES-TM-21-11 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 45,000 hours at minimum.

## LED Lamps for Fluorescent T8 Lamp Replacement

### Measure applies to LED lamps designed to replace T8 fluorescent lamps. Lamps must work with T8 electronic ballasts as per ANSI C82.11-2011.

### Self-ballasted line voltage lamps are excluded.

### Lamps shall only be used with T8 electronic ballasts specified by manufacturer.

### Lamps must be CSA-approved or satisfy the inspectors and the approving authorities who have jurisdiction.

### Total luminous flux (lumens) must be measured as per IES LM-79-08.

### Projected lifetime must be reported as per IES-TM-21-11 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 45,000 hours at minimum.

## Line Voltage LED Lamps

### Measure applies to new LED screw-in or plug-in replacement lamps, which are designed for 120-347 volts and have self-contained drivers.

### All new LED lamps must be CSA-approved.

### Projected lifetime must be reported as per IES-TM-21-11 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 25,000 hours at minimum.

### Total luminous flux (lumens) must be measured as per IES-79-08

### Lamps with screw-in or plug-in bases are eligible.

### Lamps must be permanently marked by molded imprint or ink with manufacturer name, model number, electrical rating, and approval agency (CSA, ULC, etc.).

## Low Voltage LED Lamps

### Measure applies to LED screw-in or plug-in replacement lamps, which are designed for 12-24 volts.

### Projected lifetime must be reported as per IES-TM-21-11 calculations and based on IES-LM-80-08 measurements. Lamp lifetime should be 25,000 hours at minimum.

### Total luminous flux (lumens) must be measured as per IES-79-08.

## LED High Bay Lighting

### High quality LED within step binning ensuring colour consistency:

#### LED low maintenance cost lighting with 120,000 hours minimum of service life, 70% lumen maintenance and driven of 700 mA in 25oC ambient temperature.

#### Replacement LED lighting for high bay fixtures lux (lumens per unit area) shall be equivalent to existing high bay lighting output (halogen).

#### Replacement LED lighting colour temperature shall be equivalent to existing high bay lighting colour temperature or 3,000 K whichever is higher.

#### [Nominal Lumen Output: 9,000 lm of 110W or 11,000 lm of 143W.] *[Consultant to amend as required]*

### LED lighting systems shall not interfere with the facility’s instrumentation devices, instrumentation telemetry, PAC’s, VFD’s, Wide Area Radio Network (WARN) and others as applicable and shall comply with FCC CFR47. *[Consultant to amend list as required]*

### *[Consultant to ensure specification is amended to properly reflect flicker issues, dimming, colour issues, longevity issues and other issues related to LED lighting in industrial facilities]*

### LED lighting to be incorporated into a lighting control system which reflects lighting requirements for attended/unattended facilities and is designed for optimizing energy use related to lighting and described in the Process Narrative which is part of the Contract Documents. *[Consultant to provide Process Narrative which details lighting levels and lighting control in the Contract Documents].*

## Optical Control Devices

### As indicated in the luminaire schedule on the Contract Drawings. *[Consultant to ensure that the luminaire schedule exists in the Drawings]*

### *[OR INSERT THE FOLLOWING]*

## Occupancy Sensors

### Principle of operation must be on the basis of passive IR energy, ultrasonic energy response, or a combination of both and be of commercial quality only.

### Occupancy sensor layout and arrangement must be in accordance with individual manufacturer’s recommendations. To avoid having to refer to an instruction manual, identify all necessary adjustments on the sensor.

### For situations where an “off” option is required during room occupancy where ceiling-mounted sensors are used, a wall switch is suggested to electronically switch off the occupancy sensor.

### This measure accepts the use of two or more sensor switches, suitably interconnected as a system, for spaces such as highly irregular areas, partitioned work station areas, and very large areas, etc.

### Sensors must have adequate inrush current capability for the subjected application, particularly for electronic ballasts.

### Switch format must be either a wall-mounted type for the replacement of conventional wall switches or a ceiling-mounted version. Switch contacts must be suitable for fluorescent and HID lighting systems. Sensor switches used in conjunction with approved low voltage systems will also be permitted. Switch must have no minimum loading requirement to stay activated.

### Sensor switches must have “off-automatic” selector modes with no “on” position and be conveniently located on the faceplate.

### Sensor switches can have an optional ambient light-sensing feature with an adjustable range that results in a lighting system not being turned “on” during occupancy with generous daylight contribution. This feature must have an adjustable time delay.

### An adjustable “on” timer must be provided with a minimum continuous range of one to 15 minutes. Occupancy “scan” frequency must be at least once every two seconds, with automatic timing function reset. LED indicator must show activity detection.

### All sensors must have a sensitivity adjustment feature to “tune in” for proper operation for a variation of room or area geometrics.

### Switch to have humidity-resistant circuitry and components.

## Finishes

### Light fixture finish and construction shall meet ULC listings and CSA certifications related to the intended installation.

# EXECUTION

## Installation

### Locate and install luminaires as indicated in the Contract Documents. Install lamps in all fixtures.

### Special installation: as shown in the Contract Drawings.

### Provide adequate support and safety components for the installation of luminaires in ceiling walls, etc.

## Wiring

### Connect luminaires to lighting circuits:

#### Directly for luminaire designs [\_\_\_\_\_\_].

#### Through flexible or rigid conduit for luminaire designs [\_\_\_\_\_\_].

## Luminaire Supports

### For suspended ceiling installations [support luminaires independently of ceiling] [support luminaires from ceiling grid in accordance with local inspection requirements].

## Luminaire Alignment

### Align luminaires mounted in continuous rows to form a straight uninterrupted line.

### Align luminaires mounted individually parallel or perpendicular to building grid lines.

#### Conduit connecting luminaires is not permitted unless approved by the Consultant.

## Field Quality Control

### Perform tests in accordance with Section 16031 – Inspection and Testing.

### Perform tests in accordance with Section 01810 - Equipment Testing and Facility Commissioning.

## Commissioning

### For all commissioning activities on systems where components of this Section are integral to functionality, refer to Section 01810 – Equipment Testing and Facility Commissioning. All inspection and testing activities shall be completed in accordance with the commissioning plan that shall be provided to the Consultant prior to the commencement of commissioning activities.

**END OF SECTION**