Note to the Designer/Architect/Engineer: These Specifications are basic minimum criteria to be met in preparing the final project specifications for this section, which is the responsibility of the Designer

York University Building Standards

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1.0 GENERAL

1.1 Guideline Principles

1 The lighting design should conform to green and sustainable standard and
shall include the following:

.1 The use of daylight harvesting for office space, atria, classrooms, laboratories and other application shall be strongly encouraged

.2 The use of linear fluorescent light sources such as T8 fluorescent lamp technology with electronic ballasts. Alternatives such as Light Emitting Diodes LED shall also be considered where the use of such technologies is practical and economically viable in the long run

.3 Where the use of LED lighting is deemed to be economically viable

.4 The use of bent or U T8 or T12 shaped fluorescent lamps is not acceptable

.5 Whereas, linear T5 Fluorescent lamps are not generally stocked by York University Stores. T5 High Output (HO) solutions are acceptable

.6 Incandescent lighting (halogen) is not permitted for any major renovation, or new construction with the exception of certain theatre and fine arts arrays. The planned use of incandescent lighting shall be reviewed with the university project representative.

.7 Lighting control in offices, classrooms, lecture theatres and other areas shall be integrated within the buildings existing building automation system (Metasys)

.8 Where it is not technically or economically viable to integrate lighting controls within the building automation system (Metasys), the use of occupancy sensors and photocells shall be strongly encouraged

.9 Interior lighting shall be supplied from 347 volts power

.10 Please note, that while acknowledging that student residences and on site campus apartments are subject to different standards and regulatory requirements and accepting the fact that this standard was originally intended for the development of new or major renovations to academic and administrative buildings. The general guideline principles contained herein are also applicable to student housing and apartment applications.

1.2 Conditions

.1 This section defines relevant York University standards related to indoor lighting including lamps, and luminaries

1.3 Sustainable Design Requirements

.1 Please refer to latest edition of IESNA for applicable and environmentally sustainable lighting solutions

1.4 Scope of Work

1. Section includes:

1. Interior lighting fixtures, lamps and ballasts
2. Emergency Exit lighting
3. Lighting fixture supports
4. Retrofit kits for florescent lighting fixtures

1.5 Related York University Standards and Guidelines

.1 Discussion Paper on Classroom Design Guidelines (January 2001)

1.6 Performance Standards References

.1 Comply with all applicable municipal, provincial, federal building codes and trade standards in this specification, unless more stringent requirements are given herein.
.1.1 Ontario Electrical Code

.2 Canadian Standards Association (CSA)
.2.1 CAN/CSA – C22.2 No. 74-96 (R2000) Equipment for use with electric discharge lamps.
.2.2 CAN/CSA – C22.2 No. 9 (R2002) General requirements for luminaries
.2.3 CAN/CSA – C22.2 No. 84-95 (R2004) Incandescent lamps

.3 Energy Efficiency Standards (CSA)
.3.1 CAN/CSA-C654-M91 (Amended 2001) Fluorescent Lamp Ballast Efficacy Measurements
.3.2 CAN/CSA-C819-95 (R2001) Performance of General Service Fluorescent Lamps
.3.3 CAN/CSA-C860-11 Performance of Internally Lighted Exit Signs
.3.4 CAN/CSA-C862 Performance of incandescent Reflector Lights

.3.5 CAN/CSA C863-04 Energy Efficiency of high-intensity discharge (HID) and low-pressure sodium (LPS) lamps
3.6 ANSI C62.41 IEEE Guide for Surge Voltages in Low – Voltage AC Power Circuits
.3.7 ANSI C82.11 High-frequency fluorescent lamp ballasts
.3.8 CAN/CSA C871 Performance of LED Replacement Lamps (March 5, 2013)

.4 The Illumination Engineering Society of North America published standards and handbook (latest edition)
.5 ASTM F1137-11e1 Standard Specification for Phosphate/Oil Corrosion Protective Coatings for Fasteners
.6 ASHRAE 90.1 Energy Standard for Buildings Except Low-rise residential Buildings
.7 Products must bear CSA or ULC labeling

1.7 Submittals

.1 Provide aiming diagrams for luminaries, and require that the contractor aim the luminaries. The York University project representative shall witness the aiming.
.2 Show and identify lighting luminaries on the electrical drawings
.3 Photometric data prepared by an independent testing laboratory shall be submitted for luminaries under review for the project. Include lamp and ballast data where applicable
.4 Photometric data shall include luminance data and spacing criterion

1.8 Mock Ups

.1 For large renovation projects[1] and for all new construction projects, the contractor shall install sample fixtures of all types indicated in the luminaire schedule for the project, in mock-up ceiling. Include cost of mock-up in project price. Locate mock-ups on project site

1.9 Waste Management and Disposal

.1 Contractors shall separate and recycle all waste materials from major renovations or new construction project site
.2 Handle waste and recyclables in accordance with applicable provincial and municipal regulations in place for these

[1] *A "large" renovation project is one that has a total project budget of $1 million or more*

materials

.3 For materials defined as hazardous or toxic handle in accordance with existing municipal, provincial or other regulatory requirements having jurisdiction and separate from main waste stream through designated containers

.4 Disposal of fluorescent lamps shall be in accordance with local municipal, provincial and other regulations having jurisdiction.

.5 Follow York University's dedicated fluorescent lamp disposal Standard Operating Procedure, CSBO

.6 Disposal of PCB containing ballasts from renovation projects shall be in accordance with existing York University PCB storage and disposal protocol CSBO, and in accordance with applicable municipal, provincial and federal regulations having jurisdiction

1.10 Energy Management

.1 The most energy efficient lighting sources and luminaries that the University or the project can afford should be specified

.2 Lighting design for interior spaces should make use of natural lighting (daylight) where such uses are appropriate

.3 Considerations must be given to lighting controls that in conjunction with efficient luminaries improve the efficiency of lighting solutions. Multi level lighting, occupancy, motion or photo sensors controlled lighting and/or lighting controls integrated within the buildings' automated controls should be considered

.4 Light Emitting Diodes (LED) and other energy efficient lighting solutions should be considered only after a cost benefit analysis has been undertaken for the project

.5 Where LED lamps are used as replacement to incandescent and reflector lamps, the LED lamps used must meet or exceed energy efficiency and performance requirements defined in CAN/CSA C871

1.11 Illumination Guidelines for Interior Space

.1 All interior lighting shall be appropriate for the designated task(s) and location; a general lighting approach is not acceptable.

.2 Task lighting shall follow latest edition of the Illuminating Engineering Society of North America (IESNA), which defines lighting levels for relevant task lighting

2.0 PRODUCTS

2.1 Lamps

.1 Acceptable lamp types for indoor use include:
Fluorescent lamps (T8, T5)
Compact fluorescent
Light Emitting Diode lamps (LED) including MR16
Metal Halide (High Intensity Discharge) Lamps
Also acceptable for indoor lighting use: Light Emitting Plasma (LEP) and fixtures

.2 Unacceptable lamps include:
Incandescent lamps
T12 fluorescent lamps are being phased out and should not be specified for any new construction and/or major renovation project
U shaped T8 or T12 fluorescent lamps

.3 Fluorescent lamps (T8, T5) shall be 48” (121.92 cm) in length no exceptions are permitted

2.2 Colour

.1 All lamps of a particular type shall have the same colour temperature and colour rendering index (CRI)

.2 Unless otherwise noted, the following colour features must be provided for lamps:

Lamp Type	Corrected Colour Temperature (CCT) in Kelvin	Colour Rendering Index (CRI)
Fluorescent T8	3,500	82
Fluorescent T5	3,500	82
Compact Fluorescent	3,500	82
Metal Halide (HID)	4,100 to 4,500	75
Light Emitting Diodes	3,000	80

2.3 Lamp Life

.1 All lamps provided for the project shall be new

.2 Fluorescent lamps used in conjunction with building automation controls (Metasys) shall be burned in for 100 hours prior to connectivity to the lighting control

.3 Average rate life is based on the Illuminating Engineering

Society of North America (IESNA) Approved test methods (i.e., IESNA Approved Method for Life Testing of Fluorescent Lamps (IESNA LM-40-01)

.4 The following lamp life table provides the minimum lamp life requirements for each applicable lap type

Lamp Type	Minimum Lamp Life (in hours)
Fluorescent T8	20,000
Fluorescent T5	20,000
Compact Fluorescent	10,000
Metal Halide (HID) large wattage	20,000
Light Emitting Diode (MR11 and MR16)	25,000
Light Emitting Diode (PAR 20, 30 and 38)	40,000

2.4 Light Optical Control Devices (Lenses/Reflectors)

.1 Where required by the indoor luminaire use metal parabolic direct or indirect metal diffusers

.2 Plastic K13 acrylic lenses or K12 virgin acrylic lenses are only permitted in mechanical or storage rooms

2.5 Environmental Impact

.1 All fluorescent lamps (T8, T5 and Compact Fluorescent lamps) shall meet TCLP Toxicity Characteristic Leaching Procedure (TCLP) Federal EPA … specifically SW-846 Method 1311 TCLP, 6010 for Metals and 7470/7471 for Mercury compliant requirements for solid waste content:

.1 have low mercury content (1.7 mg or lower of Hg for T8)

.2 have welded bases, or use lead free solder

2.6 Exit Signs

.1 Building Exit Signs shall be illuminated using Light Emitting Diode (LED), with high intensity type lamps, no exceptions are possible

.2 Exit signs shall be powered by 120 volts from emergency

power panels, having batteries or capacitors as back up power source

.3 To help prevent damage, all necessary parts for the LED illuminated Exit signs shall be mounted in such a way as to permit flush mounting of the exit display lens to ceiling

2.7 Standard Warranties and Extended Warranties (S.W. / E.W.)

.1 All lamps and luminaries shall carry a 3 year minimum product warranty covering failure of all electrical components

2.8 Spare Lamps

.1 Provide 10% spare lamps of each type installed for the project

2.9 Products

.1 Acceptable lamp types include: T-8: all lamps must be 80 CRI or greater which is a 8 series lamp such as 841, 835 and 830 warm white.
.2 Attempts should be made to standardize on series 835
.3 Acceptable manufacturers: Philips, Osram, Sylvania (example: Octron 800 XP Supersaver Ecologic 3)
.4 Alternative lamp types and manufacturers must be evaluated by CSBO Project Representative, CSBO Manager Facilities Operations, Cost Accounting & Stores and, CSBO Director of Maintenance
.5 Written authorization to substitute acceptable lamp types and manufacturers is required from the CSBO Project Representative

3.0 **EXECUTION**

3.1 Coordination

.1 Coordinate with York University project representative, as well as York University **Electrical Standard** for electric wiring requirements and for proper installation of electronic hardware, including the wiring conduits and connections

3.2 Installation

.1 A professional lighting engineer or service provided shall provide a room by room, computer generated photometric lighting design for approval by the University Project Representative. All calculations and data shall be presented

in the design development and construction documents. Also provide tabulated results of lighting power density calculations showing the actual, the ASHRAE 90.1 Energy Standard for Buildings Except Low-rise residential Buildings allowable, and the York University Energy Savings target (applicable only in the case of major renovation projects)

.2 The standard indoor lighting application is T8 or T5 lamps, applications other than these lamps require presentation to the University, use of specialty lamps requires approval in writing from the University

.3 Lay-in type fluorescent fixtures must have supports to structure at two opposing corners at a minimum

.4 Outlet boxes for lighting shall feed up to four light fixtures individually so that each fixture can be taken out of services individually without affecting the remainder of the circuit. Do not daisy chain light fixtures

.5 Require in-line fuses in fixtures that are not locally switched, or where lighting circuit should not be turned off for safety reasons (i.e. in stairwells)

.6 Install luminaries in accordance with manufacturers specification

.7 Lighting installation must be in compliance with the Ontario Electrical Code

3.3 Indoor Luminaries

.1 General Requirements: include a corridor night light system in the design

.2 Lighting Criteria: determine Lux levels per the latest IES recommendations

.3 Fixture Lenses: Metal Halide (HID) luminaries shall have tempered glass or high-impact safety lenses. Refer to … lamps section

.4 Fixture Mounting: provide details of supports for lighting luminaries on the drawing

.5 Lighting Controls

.5.1 The Lighting Engineer / Lighting Consultant / Lighting Designer in coordination with York University stakeholders shall develop a lighting control strategy that incorporates a number of technologies such as occupancy and photo sensors, multiple setting controls, and integration within the University's building automation system as well as coordination with Student Information System (SIS) to optimize lighting levels in relation to classroom lecture hall

schedule shall be developed

.5.2 The Lighting Engineer / Lighting Consultant / Lighting Designer
shall review and determine how many automatic controls for lighting are needed based upon the amount of natural daylight

.5.3 Mount occupancy sensors on the ceilings (or as defined by the manufacturer), and integrate them in the control schemes of classrooms, restrooms and office areas that have multiple occupants. Use occupancy sensors with combined ultrasonic/infrared technology, and are provided with an integrated over-ride manual switch

3.4 Interior Lighting standard

Use of Area	Type of Fixture	Lamps	Fixture Efficiency	Recommended average light levels
Classroom, lecture theatre, library, office	To be defined by Lighting Engineer or Architect ideally lensed or parabolic louvered luminary (K12 lens is not acceptable) fluorescent or LED	2 – T8 or T5 (17 28, or 32 watt) 3500K to 4100K or LED 4000K	Fluorescent ≥80% LED≥90LPW	Classrooms and lecture halls 500LUX at work surface height, at 100% illumination, 67% and 33% illumination levels also required. No more than 100LUX required for projection screen. Administrative offices 500LUX at work surface level
Kitchen, machine shop, laboratory	To be defined by Lighting Engineer or Architect, ideally lensed or wrap around	2 – T8 or T5 (17, 28, or 32 watt) 3500K to 4100K or LED 4000K	Fluorescent ≥80% LED≥90LPW	538 LUX to 700 LUX at work surface

	fluorescent, or LED			
Conference and meeting rooms	To be defined by Lighting Engineer or Architect ideally parabolic louvered lensed luminary fluorescent or LED Or recessed can fluorescent or LED	2 – T8 or T5 (17 28, or 32 watt) 3500K to 4100K or LED 4000K CFL 4100K LED 4000K	Fluorescent ≥80% LED≥90LPW CFL ≥60% LED≥40LPW	376 LUX to 484 LUX at work surface
Lobby, lounge, reception, exhibit hall, dining halls, food court, lockers, study and common areas	To be defined by Lighting Engineer or Architect, ideally lensed or louvered Fluorescent or LED	2 – T8 or T5 (17 28, or 32 watt) 3500K to 4100K or LED 4000K	Fluorescent ≥80% LED≥90LPW	215 LUX to 377 LUX at work surface
Washrooms	To be defined by Lighting Engineer or Architect, ideally lensed fluorescent or LED	2 – T8 or T5 (17 28, or 32 watt) 3500K to 4100K or LED 4000K	Fluorescent ≥80% LED≥90LPW	215 LUX to 269 LUX at floor level
Stairways and corridors	To be defined by Lighting Engineer or Architect, ideally lensed fluorescent or LED	2 – T8 or T5 (17, 28 or 32 watt) 3500K to 4100K or LED 4000K	Fluorescent ≥80% LED≥90LPW	161 LUX to 269 LUX at floor level
Storage, mechanical and electrical rooms	Industrial fluorescent	2 – T8 or T5 (17, 28 or 32 watt) 3500K to 4100K	Fluorescent ≥80%	215 LUX to 323 LUX at floor level

Computer room	To be defined by Lighting Engineer or Architect, ideally high performance parabolic louvered fluorescent luminary	2 – T8 (17, 28, 32 watt) 3500K to 4100K	Fluorescent ≥80%	376 LUX to 484 LUX at work surface

3.5 Verification and Adjustments

.1 The Lighting Engineer, or Lighting Designer shall verify the installation meets the design intent and operates as per manufacturers specifications unless a commissioning agent assumes the responsibility for lighting review and verification

3.6 Maintenance

.1 The Lighting Engineer or Lighting Designer, shall provide written maintenance information to the University Project Representative for all lighting systems installed as part of the project. This maintenance information shall cover at a minimum the following:
.1 detailed cleaning schedule for lamps and luminaries
.2 re-lamping schedule

End of Section

The compilation of this standard is based on York University's past and existing building specifications, information from subject matter experts, and industry best practices