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### 265100 - Interior Lighting

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## SECTION 26 5100 - INTERIOR LIGHTING

### PART 1 – GENERAL

#### 1.1 Summary

##### A. Related Requirements Specified Elsewhere:

1. Chapter 5, Division 26, Section 260100.
2. See Chapter 5, Division 01, Section 017700.1.1.B.1.i Closeout Procedures - Project Record Documents for equipment list requirements for all equipment provided in this section.

##### B. Lighting design for new or renovated spaces shall meet or exceed the current New Hampshire Energy Code, and most recently adopted edition of IECC.

##### C. A building's normal lighting system necessary to provide lighting for the intended occupation and use of the facility under normal operating conditions. Lighting levels are to be designed to be adequate without over lighting. DO NOT OVER ILLUMINATE.

#### 1.2 Control of Lighting

##### A. Night Lighting: Night lighting is meant to remain on at all times to assure minimum illumination for security and other purposes. Night lighting is NOT the same as emergency lighting. Night lighting is generally to be avoided but may need further consideration depending upon specific circumstances. For example, corridors and stairwells in residential buildings should be controlled so that they can remain on 24/7 when the buildings are occupied and be shut off during semester breaks. Residential building restrooms should have one light that remains on 24/7.

##### B. The following are intended to describe the most common types of spaces that need light control:

1. Public spaces such as corridors, stairs, restrooms and common areas should have ceiling or wall type occupancy sensors. Utilize UL924 emergency bypass relays for emergency lighting. Corridors and stairwells in residential buildings should be controlled so that they can remain on 24/7 when the buildings are occupied and be shut off during semester breaks. Residential building restrooms should have one light that remains on 24/7.
2. Vestibules and exterior canopy or wall lights should be on emergency power with photocell control and UL924 emergency bypass relay. These lights stay on at night, are off during the day, and emergency lights come on full bright during any power outage, day or night, as required by code.
3. Offices, small conference rooms, bedrooms and single occupant restrooms, where switches are in line-of-sight, should have manual-on/auto-off occupancy sensor type



wall switches with dimming control. Generally, these spaces do not require emergency lighting.

4. Larger spaces such as conference rooms and open offices should have ceiling type occupancy sensors and dimmer switches. This generally requires the use of a small room controller that can take multiple inputs. Generally, these spaces have emergency lighting. If so, utilize UL924 emergency bypass relays.
5. For classroom lighting controls see Chapter 3, Classroom Standards
6. Electrical rooms should have auto on/off occupancy sensors or timer switches. In addition manual bypass switches shall be provided in parallel with the control components so that, per NEC, workers can bypass the occupancy sensor or timer switch when working inside panels or switchgear. This bypass switch should be key-type and located in an obvious location but not necessarily where a switch would normally be located. Labeling of the bypass switch is critical so workers understand its purpose. Lighting in electrical rooms and closets shall be on an emergency lighting circuit. Utilize UL924 emergency bypass relays.
7. Mechanical rooms should have timer switches adjustable from 5 minutes to 12 Hour time period, and be set for 8 hours for initial installations to decrease the likelihood that the lights shut off while workers are in the space. Timer switches shall utilize optional flash-warn and audible alert prior to timing out. Manual bypass is not required.
8. All operations closets (i.e. electrical, mechanical, machine, storage, housekeeping, tel/data) should have auto or manual-on occupancy sensors or timer control. Manual bypass is not required.
9. Daylight harvesting is encouraged as appropriate. Switches shall be installed so that light fixtures along windows are controlled by a separate switch; Multi-level daylighting control shall be provided whenever economically justified.

C. Occupancy Sensors:

1. Ceiling mounted occupancy sensors shall use Dual Technology (Passive Infrared (PIR) and ultrasonic).
2. Occupancy sensors shall be installed per manufacturer's instructions. Sensors should be properly placed and shielded so they are activated when a person is in the room, but not inadvertently by movement outside the door(s) or window(s).
3. All classrooms, conference rooms, and similar spaces, occupancy sensors shall have an internal additional isolated relay with Normally Open, Normally Closed, and Common Outputs for use with HVAC Control, Data Logging and other control options.
4. All sensors shall have readily accessible, user adjustable settings for time-delay and sensitivity.
11. Sensors shall be installed in quantity and located properly per manufacturer's recommendation to provide appropriate room coverage.
12. Unless Specified otherwise or code requires, the contractor shall set all time-delay settings to 10 (Ten Minutes).
13. Unless Specified otherwise, the contractor shall set all sensors to VACANCY mode, requiring manual activation to the "on" position.



14. Powerpacks shall utilize Zero-Crossing Circuitry to protect from the effects of inrush current and increase product longevity.
15. Warranty shall be for a period of five years.

D. Automatic Lighting Control Systems: When used in specific applications, shall comply with the following:

1. Microprocessor-based lighting control systems shall be compatible with the Andover Controls Building Automation System. A separate microprocessor-based control system for local lighting is not acceptable. Electrical engineers shall coordinate lighting controls with the DDC (Direct Digital Control) system specified by mechanical engineers for HVAC equipment within the occupied space.
2. Building Automation system control panels shall contain an LED pilot light and integral self-reporting, hand-off-auto override switch for each lighting output control point within the occupied space.

### 1.3 Lighting Fixtures

A. Choice of fixtures should be made with the following considerations:

1. Fixtures must be DLC or DLC Premium Listed.
2. Quality of lighting.
3. Ease of installation and installation flexibility.
4. Access for lamp and ballast/driver replacement.
5. Suitability for the specific application.
6. Replacement parts availability.
7. Consideration of potential abuse.
8. Selection of lighting fixtures shall minimize the number of different lamp types utilized and required to be stocked by UNH Facilities.

B. Where partitions will result in uneven or substandard lighting (based upon Illuminating Engineering Society Recommended Lighting Levels), fixtures shall be relocated and/or additional fixtures shall be installed. The use of energy efficient adjustable task lighting is encouraged in partitioned work stations.

C. Direct Luminaries:

1. 2 x 4 or 2 x 2 fixtures with dimmable LEDs shall be the standard for suspended ceiling and surface mount applications. T-8 or T-5 fluorescent lamps can only be used with UNH Facilities approval.
2. LED fixtures shall be used in high bay applications.
3. Appropriate lenses shall be selected for each application in accordance with IES RP-1-04. Glare shall be a consideration in determining the quality of the light, and shall meet recommended IES standards for glare control for each space depending upon the use.

- D. Indirect Luminaries
    - 1. Shall be considered for areas which contain monitors or audio-visual equipment and have unobstructed reflective ceilings of appropriate height, and other appropriate areas.
    - 2. Fixtures shall utilize Low Wattage LEDs.
  - E. High Abuse Luminaries
    - 1. High abuse luminaries shall be used in areas susceptible to acts of vandalism.
    - 2. High abuse luminary lenses shall have a lifetime warranty.
  - F. Special Application
    - 1. Including pendant-mount fixtures, accent light, wall sconces and fiber-optic systems shall use high-efficiency fixtures, and shall receive UNH Facilities approval.
    - 2. Heating Tunnel Fixtures.
  - G. Light fixtures in a suspended ceiling shall be supported from the building structure. Independent fixture support is required for life safety purposes in the event of ceiling grid failure.
  - H. Exit Signs: See Chapter 5, Division 26, Section 263323 for exit signs and emergency egress lighting.
- 1.4 Lamps:
- A. Lamp Color Temperature: all interior lighting shall be 3500K regardless of the light source. When a selected fixture is not available in 3500K, 3000K is acceptable.
  - B. 2. LED lighting is required for all new installations. UNH must provide written permission for all exceptions. Minimum of 50,000 hrs. rating, a minimum 5 year warranty, rated IC, universal driver 120/277 volt, match our color standards 3500K, have dimming capabilities, 2014 RoHS (Restriction of Hazardous Substances) compliant, meets the DLC (Design Lights Consortium) and NEEP (Northeast Energy Efficiency Partnership) Qualified products lists, at least be rated for damp location, have an emergency lighting option, and be listed.
  - C. Fluorescent: (when approved)
    - 1. Straight fluorescent T-5's and T-5 HOs
    - 2. shall be 3500K with a CRI greater than 85.
    - 3. shall be of low mercury content less than 5 mg of mercury per four foot lamp.
    - 4. Medium bipin U-bent fluorescent lamps are not acceptable for use in new construction.
    - 5. All Lamps shall be low mercury, and shall pass the EPA's Toxicity Characteristic Leaching Procedure (TCLP).



- 6. Compact fluorescent lamps are NOT acceptable, except in situations where an LED alternative is not available or where the fixture swap-out would be cost prohibitive.
  - D. Incandescent, halogen, compact fluorescent, and MH lamps are NOT acceptable, and are to be used only with UNH Facilities approval.
- 1.5 Ballasts and Drivers:
- A. LED drivers shall be UL Class 2 recognized, constant current design, with high power factor minimum efficiency of 90%. The driver shall have over-heat protection and be rated for damp locations.
  - B. Fluorescent Electronic Ballasts:
    - 1. Straight Fluorescent Lamps, normal HP T-8's, T-5's and T-5 Hos:
      - a. Electronic ballasts shall be Program Start and provide for parallel wiring of lamps. Rapid Start Ballasts shall not be used.
      - b. Total harmonic distortion shall be 10% or less.
      - c. Power factor shall be 95% and greater.
      - d. Ballast shall have a sound rating of A.
      - e. Ballasts shall be free of PCB's.
      - f. Warranty shall be for a period of five years.
    - 2. Dimming Ballast Straight and Compact Fluorescent:
      - a. Shall dim from 100% to 5% of full lamp output for HP T-8's, T-5's, and 100% to 5% for linear fluorescent and compact fluorescent.
      - b. Power factor shall be greater than 95%.
      - c. Total harmonic distortion less than 10%.
      - d. Sound rating A.
      - e. Light level output shall be continuous, smooth and flicker-free over the entire dimming range.
      - f. Warranty shall be for a period of five years.
    - 3. HID Ballasts Pulse Start only Potted Core for interior applications,
      - a. Linear Reactor: 277 Volt only
      - b. Constant Wattage Auto transformation (CWA)
      - c. Warranty two years or greater.
    - 4. Electronic Ballasts-Cold Application to -20F:
      - a. Electronic Ballast: Rated for Cold Applications.
      - b. Warranty shall be for a period of five years.

PART 2 – PRODUCTS



PLANNING, DESIGN AND CONSTRUCTION GUIDELINES

October 2018

2.1 All below lighting fixtures and ballasts datasheets shall be submitted to the client for approval:

- A. Fixtures, Acceptable Manufacturers:
  - Cooper Encounter Series
  - Kenall
  - RAB
  - RemPhos
  - Lithonia
  - Hubbell (Columbia and Prescolite)
  - Canlet (Heating Tunnel Application)
  - Or UNH Facilities-approved equal.
  
- B. LED Lamps and Retrofit Lamps
  - RemPhos
  - Topaz Lighting
  - GE
  - Philips
  - Osram/Sylvania
  - Or UNH Facilities approved equal
- C. Fluorescent Straight & Compact Lamps, Acceptable Manufacturers: Low Mercury
  - GE
  - Osram/Sylvania
  - Philips
  - Or UNH Facilities-approved equal.
  
- D. Metal Halide Pulse Start Lamps, Acceptable Manufacturers:
  - GE
  - Osram/Sylvania
  - Philips
  - Venture
  - Or UNH Facilities-approved equal.
  
- E. Fluorescent Electronic Ballasts, Acceptable Manufacturers: Program Start for all linear fluorescent with lamps wired in parallel, Electronic Non-Dimming:
  - Advance
  - GE
  - Osram/Sylvania
  - UNH Facilities-approved equal.
  - Warranty shall be for a period of five years
  
- F. Fluorescent Dimming Ballasts, Acceptable Manufacturers:
  - Advance
  - Lutron
  - Osram/Sylvania
  - Warranty shall be for a period of five years or UNH Facilities-approved equal.

F. HID Metal Halide Pulse Start Ballasts, Acceptable Manufacturers:



Venture  
GE  
Osram/ Sylvania  
Advance  
Warranty two years or greater or UNH Facilities-approved equal.

G. Occupancy Sensors, Acceptable Manufacturers:

Watt Stopper  
Cooper  
Leviton  
Warranty shall be for a period of five years or UNH Facilities approved equal.

END OF SECTION 26 5100