

SECTION 16510 - INTERIOR LUMINARIES

PART 1 - GENERAL

1. Related Requirements Specified Elsewhere:  
Section 16010-Basic Electrical Requirements
2. **Normal Lighting:** 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 in accordance with the values recommended by the latest edition of the Illuminating Engineering Handbook.
3. **Night Lighting:** Lighting meant to remain on at all times to assure minimum illumination for security and other purposes. This lighting is generally along building circulation routes and may, for example, consist of a single, low wattage down light at each end of a corridor. This maximizes potential lighting energy and long range maintenance savings by allowing all other lighting to be turned off during unoccupied periods. Night lighting is NOT the same as emergency lighting or standby lighting.
4. Lighting design for new or renovated spaces shall meet the current New Hampshire Energy Code, IECC 2006. 1.0 watts/ft<sup>2</sup> or less.
5. Choice of fixtures should be made with the following considerations:
  - a. Energy efficiency and sound rating
  - b. Quality of lighting
  - c. Ease of installation and installation flexibility
  - d. Ease of maintenance
  - e. Suitability for the specific application
  - f. Replacement parts availability
  - g. Consideration of potential abuse
6. 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 fluorescent adjustable task lighting is encouraged in partitioned work stations
7. Fixtures:
  - A. Interior Direct Luminaries,
    - a. 2 x 4 recessed troffers with, High Performance (HP)T-8's, or T-5's or T-5 HO lamps shall be the standard for suspended ceiling and surface-mount applications.
    - b. 2 x 2 recessed troffers or surface-mount fixtures with T-5 or T-5 HO's lamps shall be utilized in limited areas for specific applications.
    - c. Parabolic lenses and/or direct/indirect fixtures either basket type or volumetric illumination shall be used in areas in which VDT's dominate the activity. Where

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parabolic fixtures are selected cell number and size shall be selected for the specific application.

- d. Lenses shall meet IES standard RP-1-04 glare control recommendations, for maximum allowable candlepower for VDT intensive and VDT normal use area.
  - e. 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.
  - f. Fixtures shall be tandem-wired whenever possible to minimize energy consumption.
- B. Indirect Luminaries,
- a. Shall be considered for areas which contain VDT's or audio-visual equipment and have unobstructed reflective ceilings of appropriate height, and other appropriate areas.
  - b. Fixtures shall utilize HP T-8s, T-5 and T-5HO lamps.
  - c. Fixtures shall be tandem-wired whenever possible to minimize energy consumption. 3 and 4 lamp fixtures shall be tandem wired to inboard and outboard for lamp configuration. 2 Lamp fixtures shall be tandem wired to allow for each row within the fixture to be switched independently.
- C. High Abuse Luminaries,
- a. High abuse luminaries shall be used in areas which are susceptible to acts of vandalism.
  - b. High abuse luminary lenses shall have a lifetime warranty.
- D. Special Application,
- a. Including pendant-mount fixtures, accent light, wall sconces and fiber-optic systems shall use high-efficiency fixtures, and shall receive approval in writing from FD&C.
  - b. Heating Tunnel Fixtures.
- E. 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.
- F. Exit Signs: See Section 16613, Emergency power supplied systems for exit signs and emergency egress lighting Part 2-Products.

8. Lamps:

- A. Fluorescent,
- a. Straight fluorescent T-5's and T-5 HOs shall be acceptable for new construction and new fixtures.
  - b. Straight fluorescent (HP) T-8's, T-5's and T-5HOs, shall be 3500K with a CRI greater than 80.
  - c. Straight fluorescent (HP)T-8's T-5's and T-5HOs shall be of low mercury content less than 5 mg of mercury per four foot lamp.

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- d. Medium bipin U-bent fluorescent lamps **are not acceptable** for use in new construction.
  - e. All Lamps shall be low mercury, and shall pass the EPAs Toxicity Characteristic Leaching Procedure (TCLP).
- B. Compact Fluorescent,
- a. Electronically ballasted, 4 pin, 3500K.
  - b. Screw-in compact fluorescents, 3500K.
  - c. PL triple four-pin fluorescent lamps other than 26W, 32W and 42W are to be utilized only in specific circumstances and with prior approval from FD&C.
  - d. PL long fluorescent lamps, 18 to 50 watts **are not acceptable** for use in new construction.
- C. HID Metal Halide Pulse Start,
- a. 3700K with a CRI greater than 65.
  - b. CRI of 90 for specific applications.
- D. Incandescent and halogen lamps are to be used only with written permission from Facilities Design and Construction (FD&C).**
9. Ballasts:
- A. Fluorescent Electronic Ballasts,  
Straight Fluorescent Lamps, 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 be used with permission in writing by FD & C and only in those applications where program start ballasts cannot be utilized.
  - b. Ballast shall be program start HP T-8, T-5 and T05 HO.
  - c. Ballast shall be instant start for T-8's and program start for T-5's.
  - d. Total harmonic shall be 10% or less.
  - e. Power factor shall be 95% and greater.
  - f. Ballast shall have a sound rating of A+.
  - g. Ballasts shall be free of PCB's.
  - h. **Warranty** shall be for a period of five years.
- B. 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+.
  - a. Light level output shall be continuous, smooth and flicker-free over the entire dimming range.
  - b. **Warranty** shall be for a period of five years.
- C. HID Ballasts Pulse Start only Potted Core for interior applications,
- a. Linear Reactor: 277 Volt only
  - b. Constant Wattage Auto transformation (CWA)

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- c. **Warranty** two years or greater.
- D. Electronic Ballasts-Cold Application to -20F
  - a. Electronic Ballast: Rated for Cold Applications.
  - b. **Warranty** shall be for a period of five years.
- 10. Switches:
  - A. Individual wall-mounted switches shall be installed to control only the lighting within individual spaces. Pull chain fixtures shall not be installed.
  - B. Switches shall be installed so that light fixtures along windows are controlled by a separate switch; day-lighting control shall be provided whenever economically justified.
- 11. Occupancy Sensors:
  - A. Occupancy sensors shall be wired to the line side of the lighting circuit.
  - B. Classrooms and conference room spaces shall utilize Dual-Technology occupancy sensor(s).
  - C. Bathrooms, Stairwells, Corridors and Open Office Spaces shall utilize ultrasonic occupancy sensor(s). Ultrasonic sensors shall not be used when ceiling heights exceed 12-14'.
  - D. Ultrasonic Sensors shall be mounted at least 6-8' away from any air supply registers.
  - E. Perimeter Offices and Laboratories Shall Utilize Passive Infrared occupancy sensor(s).
  - F. Special areas shall utilize technology per manufacturer's recommendation.
  - G. All 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.
  - H. Storage Closets, Equipment Rooms, Janitors Closets and Mechanical Rooms shall utilize Digital Time Switch(s). Time switch shall be adjustable from 5 minutes to 12 Hour time period. Time switch shall utilize optional flash-warn and audible alert prior to timing out. Mechanical Room Time Switches shall be set for 8 hours for initial installations.
  - I. Bathrooms in residence halls shall meet special conditions as outlined by the Department of Housing.
  - J. All sensors shall have readily accessible, user adjustable settings for time-delay and sensitivity.
  - K. Sensors shall be installed in quantity and located properly per manufacturer's recommendation to provide appropriate room coverage.
  - L. Unless Specified otherwise, the contractor shall set all time-delay settings to no-less than 15 (Fifteen Minutes).
  - M. Powerpacks shall utilize Zero-Crossing Circuitry to protect from the effects of inrush current and increase product longevity.
  - N. Occupancy Sensor layouts will be reviewed and approved by the manufacturer to ensure appropriate technology, location and number of sensors for each project.
  - O. **Warranty** shall be for a period of five years.

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12. Daylight Harvesting Controls:
- A. When installing open-loop daylight harvesting control systems, upon completion of the installation, the system shall be commissioned by a manufacturer's authorized technician who will verify all adjustments and photocell placement to ensure a trouble-free operation of daylighting control system.
  - B. All photocells and daylight harvesting control products shall be installed in quantity and located properly per manufacturer's recommendations, and reviewed in advance by the manufacture prior to installation.
13. Automatic Lighting Control Systems: When used in specific applications, shall comply with the following:
- A. 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.
  - B. 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.

PART 2 – PRODUCTS

- A. Fixtures, Acceptable Manufacturers:
- |                                   |                                     |
|-----------------------------------|-------------------------------------|
| Cooper                            | SPI                                 |
| Kenall                            | Advent                              |
| Hubbell (Columbia and Prescolite) | Lite Control                        |
| Lithonia                          | Bega                                |
| Genlyte                           | Visa                                |
| Or Owner-approved equal.          | Canlet (Heating Tunnel Application) |
- B. Fluorescent Straight & Compact Lamps, Acceptable Manufacturers: Low Mercury
- GE
  - Osram/Sylvania
  - Philips
  - Or Owner-approved equal.
- C. Metal Halide Pulse Start Lamps, Acceptable Manufacturers:
- GE
  - Osram/Sylvania
  - Philips
  - Venture
  - Or Owner-approved equal.

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- D. Fluorescent Electronic Ballasts, Acceptable Manufacturers: Program Start for all linear fluorescent with lamps wired in parallel  
Electronic Non-Dimming:  
Advance  
GE  
**Warranty** shall be for a period of five years.  
Or Owner-approved equal.
- E. Fluorescent Dimming Ballasts, Acceptable Manufacturers:  
Advance  
Lutron  
Sylvania  
**Warranty** shall be for a period of five years.  
Or Owner-approved equal.
- F. HID Metal Halide Pulse Start Ballasts, Acceptable Manufacturers:  
Venture  
GE  
Osram/ Sylvania  
Advance  
**Warranty** two years or greater.  
Or Owner-approved equal.
- G. Occupancy Sensors, Acceptable Manufacturers:  
Watt Stopper  
**Warranty** shall be for a period of five years.  
Or Owner-approved equal.

END OF SECTION