SECTION 26 50 00 - INTERIOR LIGHTING

PART 1 – GENERAL

1.1. SUMMARY:
A. This standard is intended to establish a basis of design for building lighting in new construction and existing facility renovations such that the University may achieve a level of quality and consistency in the design and construction of their facilities.

B. Related Sections:
   1. Section 01301 - Design Guidelines for Energy and Environment
   2. Section 01701 - Building Systems Identification and Labeling
   3. Section 265200 - Emergency Lighting
   4. Section 265600 - Exterior Lighting

1.2. REFERENCED PUBLICATIONS:
A. The documents or portions thereof listed in this section, shall be considered part of the requirements of this Standard (utilize latest Rhode Island adopted editions):
   1. International Energy Conservation Code (IECC)
   2. ASHRAE 90.1 – Energy Standard for Buildings Except Low Rise Residential Buildings

1.3. SUBMITTALS:
A. Submit the following for reference:
   1. Lighting Fixture cut sheets
   2. Lighting Control System: cut sheets, Bill of Materials, Interconnection wiring diagrams, Circuit schedules/Zone Control schedules, applicable control interfaces to other systems, such as fire alarm, security controls and standby power systems.
   3. Complete installation, operation, troubleshooting and maintenance manuals.

1.4. WARRANTY:
A. Lighting controls, fixtures and standard ballasts: 1 year after date of acceptance or manufacturer’s standard, whichever is greater.
B. Dimming type ballasts – 5 years.

1.5. GENERAL DESIGN GUIDELINES:
A. Lighting levels shall be in accordance with the guidelines outlined in the IESNA Handbook. Lighting levels within athletics sporting facilities shall also conform to NCAA lighting requirements. Light levels shall be closely coordinated with the University.
B. Lighting calculations shall be developed to verify that the light levels meet the IESNA requirements and other requirements noted herein.
C. Lighting design shall meet the target lighting power densities of the ASHRAE 90.1 while meeting the recommended IESNA illumination levels.

D. Selection of lighting fixtures shall minimize the number of different lamp types utilized and required to be stocked by Operations staff.

E. Proper lighting design includes review and verification of the following:
   1. Foot-candle requirements by type of space
   2. Appropriate light source technology: fluorescent vs. incandescent, etc.
   3. Control Strategies (circuiting, switching, timers, building central lighting control system).
   5. User needs (Multi-media spaces, Research lab spaces, etc.)

F. Include dedicated space within the building for spare lamp /spent lamp storage and for fixture spare parts storage.

1.6. EMERGENCY LIGHTING:

A. Emergency egress lighting is required to illuminate a minimum of 2 foot candles (maintained) along all paths of egress, stairways, egress doorways and exterior paths leading to a public way.

B. Emergency egress lighting shall be powered by the Life Safety branch automatic transfer switch (ATS) in buildings where a standby generator is installed. In buildings where no generator or Life Safety branch circuits are installed, utilize central inverter(s) or emergency lighting battery units. Use of battery units requires written approval from FM Director of Operations.

C. Fluorescent emergency ballasts (“Bodine”-brand ballasts) are not allowed.

D. In addition to Code–required locations, provide Emergency lighting in all large classrooms, places of assembly, public bathrooms serving assembly spaces, research labs, central building mechanical and electrical rooms, and any areas where hazardous tasks are performed.

1.7. LAMP TYPES:

A. The use of incandescent lighting is discouraged and shall only be used with prior approval; applications include theatrical and special-purpose lighting only.

B. Fluorescent lighting shall utilize T-5, T-8, biax, or compact-fluorescent lamps; fluorescent “U”–lamps, “circline”-lamps, 6-foot and 8-foot straight lamps are not acceptable.

C. Metal halide is acceptable for certain high–ceiling and specialty applications; avoid their use on Emergency or Life safety circuits.

D. Light Emitting Diode (LED).

E. Do not use low pressure sodium or mercury vapor lamps.
1.8. **LAMP COLOR:**

Lamp color temperature shall be consistent within a building; exceptions only for specialty use in specific open labs and workshops, i.e. 5000K “daylight” bulbs for print shops or graphics studios.

A. 3,000 K: typical for Residential facilities.
B. 3,500K: typical for libraries and dining facilities.
C. 4,100K: typical for classroom, office and Research facilities.

1.9. **SWITCHING AND OCCUPANCY CONTROLS:**

A. Each area enclosed by ceiling height partitions shall have at least one accessible lighting control to independently control lighting within the area. Controls may be toggle switches, low-voltage switches or multi-scene dimming controls.

B. Enclosed areas larger than 500 square feet shall have multiple level lighting controls so that general lighting may be reduced by at least one half throughout the area. Examples include separate switching of ceiling and wall fixtures, 2-level (or 3-level) switching of multi-lamp fixtures, row switching of fixtures or fixture dimming.

C. Enclosed areas shall include at least one accessible lighting control per 500 square feet, exceptions being made for large assembly spaces used as a whole, spaces served by automatic or programmable lighting controls, and controls for security or safety.

D. Utilize occupancy sensors for offices, restrooms, classrooms, and other areas of intermittent use. Occupancy sensors are not allowed in areas where hazardous tasks are being performed; reference ASHRAE 90.1.

E. Ceiling-mounted, dual-technology (PIR and ultrasonic) occupancy sensors, are preferred for new construction; dual-technology wall switches are acceptable for existing renovations. 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).

F. Lighting within building common areas, assembly spaces, large meeting rooms, public spaces and large central corridors shall be controlled via a lighting control system. Lighting control system to have provisions for manual switch inputs /scene controls, time of day control for various connected lighting circuits, and occupancy sensors.

G. Locate lighting control stations and relay cabinets in readily accessible, floor-level locations, such as in electrical closets: installation above suspended ceilings is not considered an accessible location.

1.10. **DAYLIGHT HARVESTING:**

A. Daylight harvesting / lamp dimming shall be investigated for all non-research spaces.
B. Daylight sensors shall be listed as compatible with fixture dimming ballasts.
1.11. FIXTURES:

A. Lighting fixtures for use in University buildings shall be commercially available, commercial-grade, standard models. Fixtures shall be UL-listed as an assembly and approved for use in the application to which they are specified.

B. Custom designed/built fixtures shall not be used when standard models similar in appearance and performance are available. Where deemed essential by the Architect, limited use of custom fixtures shall be permitted provided they are designed, constructed and installed in conformance with the following criteria:

1. The fixtures utilize standard lamps available from all manufacturers.
2. The fixtures are readily serviceable for lamp and ballast replacement without major disassembly or removal of fixture. Lenses shall be well secured and readily replaceable.
3. Ballasts are approved for the application. Approval shall be in writing from the manufacturer of the ballast.
4. Custom fixtures shall be UL-listed assemblies approved for use in the application to which they are specified.

1.12. BALLASTS:

A. Fluorescent ballasts shall be electronic, instant or rapid start, high power factor type (>0.9 pf), low temperature rise, “Class P” indicating approved integral ballast protection, unless specifically indicated to the contrary.

B. Electronic ballasts shall be specified to have less than 10% total harmonic distortion when available. Programmed start fluorescent ballasts shall be used on systems controlled by occupancy sensors in hallways and egress spaces.

C. Coordinate ballast selection and lamp holder types with the requirements of dimming controls.

D. Provide identical ballasts within each fixture type unless otherwise noted.

E. Provide ballasts having the lowest sound rating available for the lamps specified and clearly showing their respective sound ratings.

F. For outdoor use and wherever ballasts are used outside of a heated environment, provide ballasts capable of lamp starting at any temperature down to 0°F.

G. Ballasts for HID lamps:

1. Multi-tap, encased and potted, thermally protected, high power factor (90 percent or greater), constant wattage regulating. Ballasts shall be compatible to the lamps chosen for specific burning position, and compensate for the loss in efficiency.
2. Provide isolation mounting and insulation of HID ballasts to reduce sound transmission or radiation.
3. Include a fast-acting primary inline fuse built into the fixture assembly by the manufacturer.
4. Metal Halide lamps and ballasts shall be pulse start only.
1.13. **DETAILED LIGHTING DESIGN REQUIREMENTS:**

A. Exercise care in the selection and location of fixtures installed above hard ceilings or suspended acoustical ceilings to allow for ready access of components that require regular service or replacement.

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

C. Lay-in type fluorescent fixtures must have supports to structure at two opposing corners minimum. These supports are to be attached to the fixture housing. Ceiling supports are in addition to these supports.

D. Stairwell light fixtures shall be located such that they may be reached safely with no more than an 8-foot ladder; alternative access means require FM operations approval.

E. All mechanical/electrical/plumbing utility room and stock room fixtures shall include wire guard.

F. No “open type” high intensity discharge lighting fixtures should be used indoors.

G. Lighting contactors shall be electrically actuated, mechanically held.

**PART 2   PRODUCTS**

2.1 **LIGHTING FIXTURES:**

A. Approved lighting fixture manufacturers:
   1. Day-Brite
   2. Day-O-Lite
   3. Hubbell
   4. Lightolier
   5. Spectrum
   6. I.C.E.
   7. New England Lighting

B. Other regionally - based manufacturers subject to FM approval.

2.2 **LAMPS:**

A. Phillips

B. Specialty lamps and LEDs’s - as required subject to FM approval.

2.3 **OCCUPANCY SENSORS:**

A. Sensor-Switch

B. Watt-Stopper

2.4 **BALLASTS:**

A. Advance

B. Magnetek
2.5 DIMMING BALLASTS:
   A. Lutron

2.6 DIMMING SYSTEMS /MASTER LIGHTING CONTROLS:
   A. Lutron
   B. Watt-Stopper

PART 3 EXECUTION

3.1 INSTALLATION:
   A. Install materials and systems in accordance with manufacturer's instructions and approved submittals. Install materials and systems in proper relation with adjacent construction and with uniform appearance.
   B. Install fixtures with sufficient clearance from other utilities, ducts, piping, etc. to allow for ready access to fixture components for servicing.
   C. Restore or replace damaged components and finishes. Test for proper operation. Clean and protect work from damage.
   D. Lighting fixtures shall be labeled with the manufacturer, model number and lamp type, in addition to the source panel, circuit number and voltage.

3.2 DOCUMENTATION – CLOSEOUT DATA:
   A. Provide a complete list of fixture, lamp and ballast data, organized by building and room area, for use in procuring spare parts inventories. The tabulation shall be in a spreadsheet format consistent with FM - Lighting Fixture Inventory data. Required information includes:
      1. Building
      2. Room Number
      3. Fixture Description
      4. Fixture Model Number
      5. Fixture Quantity
      6. Color/K temp
      7. Lamp Part Number
      8. Lamp Quantity
      9. Ballast Part Number
      10. Occupancy Sensor Part Number
      11. Tamper Proof Tool Required? Y/N
      12. Lamp location over 12ft High? Y/N
      13. Installation Date
      14. Fixture Warranty Expiration Date
      15. Lamp Warranty Expiration Date
      16. Ballast Warranty Expiration Date
   B. Include the following Operations & Maintenance information for building lighting systems:
      1. As-built drawings of the lighting and control system including locations of all
lighting controllers,
2. Recommended relamping program,
3. Schedule for inspecting and recalibrating lighting controls,
4. Complete narrative of how each lighting control system is supposed to operate, including its recommended settings.

3.3 SPARE PARTS:

A. Provide spare lamps and ballasts in quantities equal to 5 percent of the amount used on the project. The Architect shall provide lockable space within the building for the storage of spare lamps and spent lamps to be recycled.

B. For special lamps, provide attic stock of six spare lamps.

END OF SECTION