

SECTION 16515

LIGHTING

PART 1 -Design Directives

- 1.1 No lighting fixtures, circuiting, or switching shall be put on the DD or CD plans until the A/E team has met with the Dartmouth College planning team to review:
 - A. Foot-candle requirements by type of space
 - B. Appropriate light source technology: fluorescent vs. incandescent, etc.
 - C. Control Strategies (circuiting, switching, timers, Energy Mgmt. System)
 - D. Access for lamp and ballast replacement
 - E. Classroom needs (include DC Instructional Services rep)
- 1.2 The Architect and Engineer shall create a schedule from the discussion at the initial meeting to be included on the design development drawings that lists each room, fixture type and control strategy. This schedule shall become the controlling design document for all lighting systems and will be adjusted as the design is refined to reflect changes made and incorporate additional information to include: the quantity of each fixture specified including the manufacturers part number and the model number and the type and quantity of ballasts and lamps used in each fixture. All design and construction revisions shall be dated and distributed to all key DC team members, including the user group.
- 1.3 Fixtures for use on campus shall be commercially available, standard models. Custom designed/built fixtures shall not be used when standard models similar in appearance and performance are available.
- 1.4 Maintained light levels shall conform to the guidelines included below:

Area	Foot Candle (f.c.) level
Hallways and Stairwells	10 ±5
Offices-Desks	50 ±10
Offices-Adjacent areas	30 ±5
Classrooms	50 ±10
Laboratories	75 ±15
Intricate Work	100 ±20
Tel/Data Closets	60 ±10

- 1.5 In situations where the A/E feels that fluorescent or HID sources are not suitable and that the use of higher-energy consumption incandescent sources is highly preferable, the A/E must use the Spec Variance Form to formally petition to FPO for incandescent approval. A variance will be considered only if a well-designed fluorescent or HID source option has been produced and thoroughly evaluated in each instance.
- 1.6 When appropriate the engineer or lighting designer shall consider the use of light sensing and switching or dimming controls to take advantage of available ambient light within the building.

- 1.7 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:
 - A. The fixture shall utilize standard lamps available from all manufacturers.
 - B. The fixture shall be readily serviceable for lamp and ballast replacement without major disassembly or removal of fixture.
 - C. Lenses shall be well secured and readily replaceable.
 - D. Ballasts shall be approved for the application. Approval shall be in writing from the manufacturer of the ballast. The manufacturer shall perform an 8 hour documented test before installation verifying that ballast compartment and lamp temperature will not exceed manufacturer's published limits.
 - E. All custom fixtures shall be UL listed assemblies approved for use in the application to which they are specified.
 - F. Lamp sockets shall be secured with hardware, not clips.
 - G. Detailed shop drawings shall be submitted to the Owner for review prior to construction. Where multiple fixtures are used, a prototype shall be assembled and submitted to the Dartmouth for approval.
- 1.8 Fixtures shall include a means for secure mounting to a standard UL approved steel outlet box and shall be readily removable.
- 1.9 Fluorescent lighting fixtures shall utilize T-5, T-8 or compact fluorescent lamps.
- 1.10 When selecting fixtures that utilize compact fluorescent lamps the engineer or lighting designer shall only use four pin lamps and an electronic ballast with end of lamp life detection circuitry.
- 1.11 The contractor shall provide a complete list of lamps and ballast organized by fixture number for use in procuring spare parts inventories. The tabulation shall be in a spreadsheet format on 8 ½" by 11" paper and must be submitted prior to substantial completion.
- 1.12 The contractor shall provide to the project spare lamps and ballast 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.
- 1.13 The lighting designer shall provide point by point lighting calculations/tabulations for each space that include all the design criteria and assumptions that were used in the design. A copy of the design documentation shall be included in the O&M manuals.
- 1.14 Emergency lighting systems where required in large classrooms and places of assembly shall consist of a set of dedicated light fixtures adequately spaced to provide the code required level of emergency egress illumination and connected to the emergency transfer switch.
- 1.15 Public bathrooms shall have an adequate number of dedicated fixtures to provide egress illumination that are supplied from the emergency transfer switch.
- 1.16 Hallways and stairways shall have the appropriate number of fixtures connected to operate from circuits supplied by the emergency transfer switch.
- 1.17 All lighting and power circuits that require generator backup and are not classified as emergency loads shall receive their power from an optional standby equipment transfer switch.

- 1.18 Exterior walkway, roadway and parking lot lighting fixture foundations are specified in the Campus Landscape Constructions standards.
- 1.19 Exterior walkway lighting assemblies shall be as follows, no substitutions:
- A. Luminaire: LOUIS POULSON - SLP- MIN – OPAL – RAL – 9017, Dwg. Rev. F, dated 2/11/06 with 70W ED-17 HPS lamp and wiring for remote F-Can ballast.
 - B. Pole: HADCO – SP6979B-10A, Dwg. SP6079B Rev. B, dated 08/05/05 with 70W HPS multi-tap ballast (120V, 277V).
- 1.20 Exit light letter color shall be determined as follows:
- A. Additions to existing buildings shall be the same as the existing fixtures.
 - B. New buildings shall be determined by the architect. DC prefers the color be red.

PART 2 -Products

- 2.1 All ballasts shall be instant or rapid start and specified as high power factor type (>0.9 pf)
- 2.2 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. The Engineer or Lighting Designer shall coordinate ballast selection and lamp holder types with the requirements of dimming controls.
- 2.3 In buildings where emergency power is not available; battery operated exit and emergency lighting shall be as follows:
- A. Exit signs: Sure-Lite (manufactured by Cooper Lighting) model CX7-[1/2]-70-[R/G]-WSD, with self diagnostics.
 - B. Egress Lighting: Lite-Guard Vectra series, Model VP625W-J962, no self-diagnostics.
- 2.4 In buildings where emergency power is available; exit lighting shall be as follows:
- A. Sure-Lite (manufactured by Cooper Lighting) model CX6-[1/2]-[R/G]-W.
- 2.5 Fluorescent lighting utilizing individual power supplies for emergency lighting shall not be used.

PART 3 -Execution

- 3.1 Fixtures shall be secured to the steel outlet box where used. Where additional support is needed for fixtures on suspended ceilings, a steel support framework shall be used. Fixtures and appliances shall not be supported by or attached to ceiling tiles, sheet rock, or plaster.

- 3.2 All light fixtures shall be connected to the branch circuit wiring system by means of a flexible connection. Each fixture shall be served by a single flexible connection from a junction box in the branch circuit raceway system. "Daisy Chain" connections from fixture to fixture shall only be allowed in spaces above hard ceiling and under no circumstances shall more than two cables be installed into a single fixture connection box.
- 3.3 Refer to the Campus Landscape Construction Standards for exterior lighting installation details

END OF SECTION 16515