

Illumination Levels: Illumination levels and quality for areas and tasks in campus buildings shall be within 10 percent of that recommended by the IESNA Handbook for each type of space. It is not the intention of the standard to sacrifice safety, comfort or performance for the sake of energy conservation. Sample foot-candle calculations (for each typical space in the project) shall be provided to the Owner as part of the design review submittals. Calculations shall also be submitted for review indicating illumination levels and energy consumption are in compliance with program requirements, IESNA recommendations and ASHRAE 90.1.

Fixture Selection: Provide high quality equipment to meet the requirements of the design, while providing low cost illumination with a minimum of installation and maintenance expense. For this reason, fixture selection will include, but is not limited to, the evaluation of the following:

1. Minimum life cycle cost.
2. Ease of obtaining and replacing lamps, lenses, lamp sockets, and ballasts.
3. Structural integrity and fixture finish durability, including ease of cleaning.
4. Installation labor including aligning fixtures when mounted on stems.

Energy Performance: Installed lighting power density shall conform to ASHRAE 90.1, and the AE shall endeavor to exceed this standard by the widest margin possible. Calculation sheets shall be provided to the Owner as part of the design review submittals.

General Illumination: General illumination for typical interior spaces such as offices, classrooms, laboratories, lecture halls, stairwells, corridors and other public areas, restrooms, equipment rooms, service areas, storage rooms, etc. shall be provided by four ft. fixtures fitted with T8 fluorescent lamps and the most efficient electronic ballasts available. Four-lamp instant start, electronic ballasts shall be used wherever possible. This may require tandem wiring of fixtures.

Indirect lighting shall be kept to a minimum due to its high installed, operating and maintenance costs. 2 x 2 ft. fluorescent

fixtures shall not be installed. Standard-output T5 (28W) fixtures are not permissible. High-output T5HO (54W) shall be permissible only in select applications where the lamp is concealed from direct view and no suitable T8 fixture is available.

Incandescent fixtures shall not be installed unless no other lamp source is suitable. Compact fluorescent fixtures shall be kept to a minimum and shall not be used for general illumination purposes. LED fixtures shall be used only where justified by total life-cycle cost analysis.

Larger Areas: Illumination for larger interior areas such as atriums, auditoriums, gymnasiums, warehouses, etc. shall be provided by fixtures and lamps that represent the lowest life-cycle-cost installation. The quality and quantity of illumination shall be in compliance with the requirements of *Section 26 51 00 – Interior Lighting* and the *IESNA Handbook*. Fixtures shall provide direct illumination. As mentioned above, indirect illumination shall be avoided due to its high operation and maintenance costs.

Specialty Lighting: If used, display case, decorative, accent and other specialty lighting shall be kept to a minimum and used only in the highest profile areas, such as main entry lobbies, theaters, etc. or where appropriate for historical preservation. The most efficient appropriate light source shall be used. In rooms where reduced lighting levels are necessary to allow note-taking during video presentations (e.g. conference rooms, lecture halls as well as some classrooms and instructional labs) incremental switching of standard fluorescent lighting shall be considered first. If the desired level/distribution of lighting cannot be achieved in this manner, dimmable fluorescent lighting shall be provided.

Maintenance Responsibility: Maintenance of specialty lighting, including all incandescent and dimmable fluorescent lighting systems, will not be provided by the F&S Division, but will be the responsibility of the using department/agency.

Circuiting: Lighting and outlets shall be served by separate dedicated branch circuits.

LIGHTING, INTERIOR AND EMERGENCY

Lighting Controls: The interior lighting that serves an area shall be controlled by local switches that are installed as close as possible to the entrance that serves the area. For example, locate light switches at the ends of hallways rather than the middle. Master switching of the lighting that serves a larger area shall not be used. Where multiple circuit switching is necessary, multi-pole contactors shall be used. Occupancy sensors shall be used wherever practical. If a building-wide lighting control system is used, it must be integrated with the building automation system (BAS) for mechanical systems controls.

Lenses: Fixture housings shall be appropriate to the application. The use of glare-reducing baffles or parabolic style lenses shall be minimized. Direct/indirect "basket" style fixtures shall be avoided in favor of lensed "wrap" style due to insect contamination issues.

Conference Rooms, Classrooms & Lecture Halls: Reduced general lighting levels are typically necessary to allow note-taking during video projection presentations, so incremental switching of standard fluorescent lighting shall be provided. If the desired level/distribution of lighting cannot be achieved in this manner, dimmable fluorescent lighting shall be provided. Specialty lighting (e.g. to illuminate blackboards, presentation areas, etc.) and associated controls shall be provided as directed by the Program Statement.

Emergency Lighting: Provide emergency egress lighting and exit signage in accordance with all applicable codes and standards, including *NFPA 101* and *NEC 700*. Egress lighting systems shall be designed with the minimum possible maintenance requirements. The power source for egress and exit lighting shall be, in order of preference:

1. Standby generator, if available. Consider extending circuit from a neighboring building's generator if practical.
2. Existing central building inverter system, if available and operational. (No new inverter systems shall be installed.)

3. Individual battery units, with multiple external heads sharing a single battery when possible. Batteries shall be installed only when no other power source is available.

It is preferred to connect standard fluorescent fixtures to emergency power sources whenever possible. When unswitched "night light" fixtures are installed in corridors, they shall be kept to the minimum necessary for egress lighting, and designed so as to use the least amount of energy possible. Incandescent adjustable-head type emergency lights, if used, shall have self-diagnostics and laser pointer testing capability.

All exit signs shall use red LEDs and shall be *UL 924* listed. "Self-powered" LED signs are not permissible.

Refer to *Section 26 52 00 – Exit and Emergency Lighting* for additional requirements.