

**Description:**

The purpose of the section is to highlight the current applicable UMD Design Standards for the design, selection and, installation of lighting fixtures within buildings.

**Related Sections:**

- 26 56 00 Lighting – Exterior

**Effective Date:**

January 1, 2023

**Applicable Standards:**

- ASHRAE 90.1
- Illuminating Engineering Society of North America (IESNA) Standards

**General Requirements:**

The application of this section applies to all interior and exterior lighting in “new building” designs. This section also applies to “renovation work” within existing buildings--if the installation of new light fixtures, or the relocation of existing light fixtures is a part of the renovation, and the lighting work involves at least 50% of the lighting within the renovated space. Any deviation or exception to the requirements of this section requires the prior written approval of the Director of the Operations and Maintenance (O&M) Department in Facilities Management Electrical Systems Section, as well as notification to the Electrical Systems Section within O&M.

**Light Fixture Components (Prohibited from use)**

- **Lamps**
  - Fluorescent Lamps
  - Linear fluorescent “U-Tubes”
  - Incandescent lamps
  - Mercury vapor lamps
  - High or low pressure sodium lamps
  - Interior horizontal mounted lamps in any fixture mounted higher than 10’ above the floor level

**Recommended Manufacturers :**

- Metalux
- Halo
- Corelite
- Wavelinx
- Eaton
- OSRAM
- Philips Advance
- Lutron

**LED Lighting:**

- UL listed products to be provided
- LED Lamp Color
  - Color temperature range - minimum 3500K.
  - Color Rendering Index (CRI) of 80 or higher
- LED Lamp Life
  - Lamps (non-fluorescent) shall have an “average” lamp life of 50,000 hours or more
  - Lamps installed in fixtures over 12’ high, shall have a lamp life of 50,000 hours or more
- Lamps installed within “BSL Labs”, “Clean Rooms” or hazardous areas, shall have a lamp life of 50,000 hours or more.
- Drivers to be compatible with lamp and fixture.

## Light Fixture Recommendations/Guidelines

- Hallways
  - Overhead fixtures – 2x2 Recessed Troffer, Flat LED; Grid TBar (Recessed), Linear LED
- Restrooms
  - Overhead fixtures – 2x2 Flat LED
  - 4” or 6” downlight; Linear LED (Surface or Recessed)
  - As coordinated with Architect and end user.
  - Moisture resistant fixture listed for Damp Locations
- Classroom, Laboratory with Ceiling
  - Overhead fixtures – 2x2 or 2x4 Recessed Troffer, Flat LED; Grid TBar (Recessed), Linear LED
  - As coordinated with Architect, Design Engineer and end user.
- Laboratory without Ceiling
  - Pendant type or Surface mounted LED Fixture
  - Vapor Proof Fixture
- Special Rooms
  - Fixtures installed in “Clean Rooms”, “BSL Labs” or hazardous areas shall have the drivers and light switches mounted remotely--outside of the clean area.
- Exit Signs
  - Shall be 2 watts or less LED fixtures. Exit fixtures with special features, such as “vandal resistant” fixtures, shall be 5 watts or less.
  - Shall be green for new construction and major renovation or red exit signs as applicable, sign color should match the color in the remainder of the building.
- Outdoor
  - Outside fixtures include but are not limited to streets, parking lots, parking garages, pathways, building entrances, canopies, and exterior stairway.
  - Lighting fixtures utilize 4000K LED lamps with a black finish (coordinate with Architect and University PM). Wattage to be determined by light level requirements as defined by IESNA for the application. Verify current BOD fixtures with FM Electric shop.
  - Pole mounted fixtures shall be mounted on Black, Round Straight poles.
  - See Section 26 56 00 for more information.

## Lighting Installation/Performance Guidelines

- **Energy Consumption**
  - The power consumption level of lighting fixtures shall be determined on a “Space-by-Space” method.
  - The power consumed by lighting fixtures within a “space type”, shall not exceed a value determined by multiplying 65% times the value listed in ASHRAE 90.1 “Lighting Power Densities (LPD) Using the Space-by-Space Method”.
  - All light fixtures within a space type shall be included in this calculation, including wall washer, decorative, bulletin board, cove, task, special lighting and overhead light fixtures.
  - The “input Power” rating of the light fixture shall be used in this calculation.
- **Lighting Levels**
  - General
    - Light levels shall be meet or exceed levels as specified by the Illuminating Engineering Society of North America (IESNA) handbook (latest edition), campus standard exceptions noted below .
    - Light levels shall be measured by “full spectrum” light meters, or at a level of 90% of IESNA Standards using “photopic” light meters.

- Classrooms, Offices and Labs
  - Light levels in classrooms shall be as indicated in IESNA on at least 90% of the desks in the classrooms.
  - Light levels in offices shall be as indicated in IESNA, with the recommended level measured on the portion of the desk used for detailed reading or paper work. The IESNA recommendation is not an average for the entire room, but is the level on the work surface.
  - “Average Light Level” range: Offices 30 – 50 foot-candles, calculated on the desk and table tops.
  - “Average Light Level” range: Classrooms & Laboratories 50-60 foot-candles, calculated on the desk and table tops.
- Hallways
  - “Average Light Level” range: minimum 8 foot-candles, calculated at floor level.
  - “Max to Min” Ratio Maximum: 5
- Restrooms
  - Shall be designed for 10 to 15 foot-candles.
- Stairwells
  - Shall be designed for 10 fc on the walking surfaces.
- Electrical and Mechanical Rooms
  - Electrical switchgear, distribution panels, motor control centers and branch panels shall have 50 fc measured at a height of 5’-0” above the finished floor along the front of the equipment and the rear of the equipment (if there is maintenance access).
  - Provide an average level of 30 fc throughout the remainder of the room (measured at 5’-0” level).
- **Power Source**
  - The hallway, lobby, stairwell, exit and emergency egress lighting fixtures required for emergency egress shall be powered from a 277 volt (if available) “emergency power” source originating from either an emergency generator or a central battery system such as a “Central Inverter System” (UPS System).
  - The “Central Inverter System”, if utilized, shall have an automatic “self-test” and “record” function, a bypass switch, the ability to communicate status via phone dialer, or similar feature. The inverter shall also include local status alarms.
  - In main Electrical and Mechanical rooms, 50% of the light fixtures throughout the room shall be on an emergency power source.
  - All overhead lighting within the building shall operate at 277 volts, if available within the building.
  - For reference in existing buildings; some Hallway and lobby lighting that is not needed for “emergency egress lighting” shall be connected to the “un-switched” leg of the existing emergency power source (see detailed description of existing hallway wiring below), or connected to a “non-emergency” power source utilizing occupancy sensors.
- **Lighting Controls Hardware**
  - Where existing lighting control system is installed in a building tie into that system as applicable.
  - Installations for New buildings or Major renovations where no existing lighting control system is present in the building shall conform to the following:
    - Stand-alone local lighting control devices are preferred by UMD. Three “basis of design” manufactures include Eaton, Wavelinx Lutron Vive, Acuity N-Lite or WattStopper.
    - Provide central time clock as applicable for spaces that require off hours dimming to meet energy code; otherwise the controls for spaces should be locally controlled only.
    - All occupancy sensors shall be dual-technology, incorporating both passive infrared and ultrasonic technologies for detection of occupancy.
    - Regardless of factory default settings, sensors will be set to the following:
      - Lights triggered on by detection of occupancy by both technologies.
      - Lights sustained on by detection of occupancy by either technology
      - Time delay shall be set to 30 minutes for all offices, classrooms and conference rooms (15 minutes in break rooms, copy rooms, etc.).

- Spaces where lighting is controlled by occupancy sensors will include at least one control device to provide manual override to OFF.
- The type of occupancy sensor shall be selected according to the following:
  - Smaller spaces including typical offices will get wall switch sensors.
  - Larger spaces, including larger offices (over 250 SF), L-shaped rooms, and classrooms will get ceiling-mounted sensors or ceiling and wall sensors.
- Occupancy Sensor Installation guidelines:
  - The selection, location and number of occupancy sensors will be such that the coverage range for minor motion detection by the least effective of the two technologies will not be exceeded, where minor motion coverage is typical for sedentary occupants.
  - Where more than one sensor is required to provide full coverage of the space area, then the number of sensors will be such that the minor motion coverage range of individual sensors will overlap in the areas between sensors.
  - Occupancy sensors shall be installed according to manufacturer's recommendations for location, obstructions, spacing and the directional sensing, but in general shall be installed:
    - Ceiling mounted: Directly over the desk or relevant work area, or if in a common work area, then in the center of the rooms.
    - Wall mounted: in a straight-on, unobstructed direct view of the person at the desk or relevant work area.
  - If necessary to prevent false-ons from corridor traffic, blinders or masking shall be installed over the applicable portions of the lens to prevent detection of movement in the adjacent space. Ultrasonic sensor transducers, if directional shall be directed away from corridors and adjacent spaces.
  - Sensitivity shall be adjusted so that lights come on within one or two steps of a person entering the room.
- **Lighting Controls Sequences**
  - Generally, sequences for these local lighting controls is as follows:
    - Where Auto OFF is specified the default shall be a 30 minute timeout unless utilized in a space that is not typically occupied (i.e. storage rooms),
    - Classrooms, offices, and non-public spaces will generally be programmed as Manual ON to 50% / Auto OFF.
    - Conference rooms, Manual ON to 50% / Auto OFF with dimming and Manual OFF Capability (Scene control if program request).
    - Copy rooms, break rooms, locker rooms, restrooms & storage rooms, Auto ON 100% / Auto OFF. No dimming required.
    - Laboratory areas shall not be provided with occupancy sensors. Provide dimmers with Manual ON / Manual OFF in these areas.
    - Lobbies and public gathering spaces, provide dimming and (and scene control as defined by building program).
  - Hallway, stairwell, lobby, exit, or emergency egress lighting needed to support emergency egress requirements, shall remain lit continuously and not be connected to local wall switches. Provide time clocks (or central controller) to implement day / night lighting levels for these types of spaces.
  - In main mechanical and electrical rooms provide manual switches for these room. Where code requires occupancy sensors rooms shall be circuited so that the occupancy sensor-controlled fixtures account for no more than 50% of fixtures and the room must be circuited so that every other light will stay "ON" based on manual switch position.
  - Requirements for room utilizing the campus AV fall under a different specification. Contact the DIT-ATI group for that specifications in classrooms or conference rooms that have this program requirement.
  - The outdoor lighting for sidewalks, parking lots and street shall be controlled via central photocell to turn the lights on; do not place photo cell in an area that is shaded during occupied hours. Provide a "Hand-Off-

Auto" (HOA) switch to operate the lights manually. The HOA switch shall be mounted in an area not accessible to the general public.

- **Fixture Mounting**
  - Fixtures mounted in stairwells shall be mounted at no more than 12'-0" above the flat landing surface in the stairwell, or utilize an integral "fixture lift" system.
  - Fixtures mounted over 15'-0" above the finished floor level shall utilize one of the following;
    - Be accessible from a standard stepladder (12'-0" max ladder height)
    - Utilize an integral "fixture lift" system
    - Be accessible from a "man lift" system, owned and stored in the building
    - Utilize remote accessible electrical drivers
    - Have an FM approved maintenance plan.
  - Locate fixtures at telecommunications closets to the front and rear of data racks. Coordinate locations with UM OIT.
  - Recessed/Above Ceiling Lighting Components
    - Lighting system components that are mounted above a suspended ceiling, such as power supplies, controls, relays, etc., shall be located within 6'-0" of the main entrance door to the space, but to the side, out of the path of travel.
  - Supports
    - Lighting fixtures shall be supported in accordance with code.
    - Sprinkler piping or hangers shall not be used to support non-sprinkler system components, per NFPA 13.
  - Labels
    - Junction boxes utilized for power distribution, shall be labeled on the cover plate with the following information.
      - Circuit Number (feeding the light fixture).
      - Power Panel Number.
      - Room Number for Panel location.