

Beth Israel Deaconess Medical Center Lighting Standards

Lighting plays a vitally important role in hospitals by providing for the visual comfort of patients, staff and visitors and fostering a healing environment. Quality lighting can reduce energy consumption, improve staff performance and enhance the patient experience. This document will define how to efficiently and effectively illuminate Beth Israel Deaconess Medical Center (BIDMC) utilizing sustainable practices. Concepts from IESNA RP-29-06 “Lighting for Hospitals and Health Care Facilities” are included.

Long term energy costs far outweigh installation, periodic re-lamping, and maintenance costs in most lighting. Control of long term energy costs includes:

- Providing the proper quality and quantity of light to meet user needs as documented by recognized national standards¹, and the appropriate building codes² or, in some instances, as determined by empirical information.
- Selection of efficient lighting fixtures.
- Controlling lighting so that it is on when needed and minimized or off when a space is unused, unoccupied or, where practical, lends itself to photocell control due to the presence of adequate natural light.

For all projects that include a lighting or space usage change, lighting analysis shall be prepared by the responsible architect, engineer or lighting design professional and delivered to BIDMC Engineering at the earliest possible time or immediately upon any change for review and acceptance. Lighting power analysis shall be completed using VisualTM or an approved equal. The lighting analysis shall include the point by point, reflected ceiling plans, power density, cut-sheets, etc. for all light fixtures and lighting controls (sensors, photocells, timers, etc.) to be considered. The cut-sheets shall show the efficiency and spacing criteria of each fixture to be considered.

Automatic controls (sensors, timers, photocells, etc.) will be incorporated into lighting work covered by this policy. As a minimum in all appropriate areas, controls will turn off or reduce the lighting to lowest allowable level when a space is unoccupied or inactive. For all projects where lighting is affected, controls are a required element.

BIDMC Engineering is available to advise and assist in lighting projects.

¹ Examples include ANSI/IESNA RP-29-06 “Lighting for Hospitals and Health Care Facilities”, and other publications by the Illuminating Engineering Society of North America (IESNA).

² Including ASHRAE 90.1, the National Electric Code and the Massachusetts State Building Code.

1. General Lighting Standards

The following standards are to be followed by architects, engineers and lighting professionals, as well as BIDMC staff, who are designing new and upgraded lighting for spaces at BIDMC and associated off-site facilities. The purpose of these standards is to provide consistent, high quality lighting for each space while minimizing the costs for operation, types of fixtures, and maintenance.

1.1. Lighting Fixtures

1.1.1. LED fixtures are preferred for most lighting systems. Light fixture(s) not listed on Appendix 1 shall be submitted for approval. See the approved standard light fixtures in Appendix 1.

1.1.1.1. LED fixture efficiencies should be at least 100 lumens per Watt. Fixture efficiencies shall be verified by photometric testing provided by the manufacturer

1.1.1.2. The LED's shall be 3500K and at least 80 CRI.

1.1.1.3. All exterior and maintenance area LEDs shall be 5000K and at least 80 CRI.

1.1.1.4. The general lighting fixtures in operating rooms shall be 3500K. Other fixtures in operating rooms shall be 4000K and at least 90 CRI to match halogen lamps in surgical lighting fixtures.

1.1.1.5. Lighting fixtures within food prep locations (ie. kitchen) shall be a minimum of 4000K and at least 90 CRI.

1.1.2. Lighting fixtures may be surface mounted, recessed, or pendant-mounted. The fixture style will be selected to deliver most efficiently the needed light, given physical space constraints (ceiling heights, and types, etc). Fixtures shall be selected based on the following considerations. See Appendix 1 for approved standard light fixtures.

1.1.2.1. Light distribution and efficiency

1.1.2.2. Ease and accessibility of lamp, fixture, driver exchange and LED modules

1.1.2.3. Appearance

1.1.2.4. Durability of lenses, grills, covers, etc when subjected to cleaning and lamp replacement

1.1.2.5. Speed of delivery by distributor

- 1.1.2.6. Designs that inhibit the collection of dust, dirt, insects and cobwebs are preferred
- 1.1.2.7. Long term availability of repair parts such as lenses, latches, etc.
- 1.1.3. The use of architectural and special lighting fixtures shall be avoided. In the event that a special need arises, these fixtures will be evaluated against the criteria found at 1.1.1.1-1.1.1.4 by BIDMC Engineering. Every effort shall be made to minimize the number of fixture and lamp types used throughout the facility.
- 1.1.4. Indirect fixtures should be avoided.
- 1.1.5. Recessed can lights should be avoided because they are inefficient. Retrofitting existing can lights to LED is acceptable.
- 1.1.6. Wall-wash fixtures will only be considered for highlighting art work or plaques.
- 1.1.7. Exit signs shall be LED with red lettering. Lithonia LED exit sign 120/277 volt Model # LQM S W 3 R 120/277 M6.

1.2. Lamps – For Retrofit Applications Only

- 1.2.1. Retrofits of existing light fixtures with LED lamp equivalents shall be avoided where feasible/practical.
- 1.2.2. BIDMC accepts RemPhos LED lamp or equivalent manufacturer in retrofit applications.
- 1.2.3. All lamps shall be LED 3500K and at least 80 CRI. Additionally, all exterior lamps shall be 4000K. Lamps should have over 100 lumens per watt efficiency. Lamp retrofits in surgical suites shall be avoided.
- 1.2.4. Metal Halide lamps are not acceptable.

1.3. Lighting Circuits

- 1.3.1. New lighting circuits shall be designed to maximize every opportunity to save energy through the use of lighting controls.
- 1.3.2. Daylight responsive controls shall be provided within daylight zones as defined per the Energy Code, where patient care is not being directly provided. Controls shall readily accessible and must be capable of the following:

- 1.3.2.1. Shall dim lights continuously from full light output to 15 percent of full light output or lower.
- 1.3.2.2. Shall completely shut off all controlled lights.
- 1.3.3. Patient rooms located on an inpatient floor shall be designed so that there are a minimum of two (2) branch circuits originating from two (2) separate sources serving the lighting. This is to ensure that a shutdown of one (1) circuit shall not leave patient room in darkness.
- 1.3.4. All light fixtures shall utilize 277V power. Where 277V power is not available, BIDMC Engineering shall be consulted for further review.
- 1.3.5. Emergency egress lighting shall be connected to a 277V Life Safety branch circuit and shall be un-switched.

1.3.6. Emergency transfer switches/shunt relays shall not be utilized.

1.4. Light Levels

Light levels shall generally adhere to IESNA recommendations. Light levels within specialty areas shall be reviewed by BIDMC Engineering.

2. Lighting Controls

BIDMC uses only Sensor-Switch/ nLight® lighting control products for interior occupancy and photocell applications. The Energy Management office is available to advise and assist in lighting projects requiring controls.

The objective of automated lighting control is to minimize energy use during periods when spaces have low use or are not in use. This may be achieved through a combination of occupancy and daylight sensors and controls and/or programmable scheduling through local or building control systems.

Lighting controls must be carefully matched to the space and occupancy patterns to be successful. Large and or odd shaped areas may require multiple sensors to ensure acceptable operation. Individually controlled fixtures with occupancy and daylight controls are not acceptable in most spaces. Switch box mounted sensors must cover the entire space and function reliably during periods of “quiet” occupancy (extended phone calls, reading, etc.). Dual technology sensors provide greater reliability. If this can not be assured even with a dual-tech sensor, then a ceiling or wall mounted sensor should be used. Large areas such as labs will use ceiling mounted and multiple sensors as needed. All areas should take advantage of day lighting wherever possible: labs, rest rooms, corridors, stairwells, and lobbies. Rest rooms controls in particular must insure there no “false offs” while the facility is occupied.

2.1 Occupancy sensors shall be used in accordance with code requirements. The following locations must be considered for occupancy sensor control for new or renovated spaces:

2.1.1 Occupancy sensors shall be used in offices, conference rooms, storage areas, work rooms, closets, etc. where applicable.

2.1.2 Occupancy sensors shall not be used in maintenance closets or other areas where safety or security may be seriously jeopardized if the lighting is unexpectedly turned off.

2.1.3 As required by code, photocell controls shall be used in areas which have sufficient daylight during certain periods of the day. The controls shall be placed so that some or all of the lights are dimmed or turned off during such periods. Patient space and exam rooms may be dimmed, but not full off.

2.1.4 Switch body colors shall be white.

- 2.2** Desired characteristics of the lighting control system include:
 - 2.2.1 Manual-on (automatic when required) when a room, space or facility is occupied or in use.
 - 2.2.2 Automatic-off, if the occupant fails to turn off lights when the occupancy or use ends.
 - 2.2.3 Use the appropriate sensors to prevent false offs.
 - 2.2.4 Automatic daylight adjustment where required by code and where possible/practical.
 - 2.2.5 Local override in special purpose spaces, where needed.
 - 2.2.6 Return to automatic operation without user action when occupancy in overridden areas ends.
- 2.3** Low voltage switching is permissible.
- 2.4** Where utilized, individual low voltage relay/power packs to be mounted above the ceiling shall be installed at a common location above the entry doorway into the respective space. Mounting location shall be accessible and clear from conflicts with all foreign systems. See Appendix 2 for installation details.
- 2.5** Inpatient rooms shall utilize a relay control cabinet. Relay cabinet shall be flushed mounted in wall and located below the ceiling closest to the entry doorway.
- 2.6** All efforts shall be made to simplify switching and avoid excessive lighting zones.
- 2.7** Commissioning
 - 2.7.1 The Electrical Contractor and the controls manufacturer's representative shall coordinate with the Maintenance and/or end users to determine the sequence of operation guidelines required for programming by the Electrical Contractor.
 - 2.7.2 On-site training for Owner and/or end users shall be provided.
 - 2.7.3 On-site initial system start-up and programming shall be provided by the controls manufacturer's representative as follows:

1. Verify operational communication to all system devices.
 2. Program and verify all sequence and operations determined during initial coordination meeting.
- 2.7.4 System programming support and diagnostic of installed controls shall be provided to the Owner for a period of one (1) year from the time the system is turned over after the completions of initial start-up and integration.

3. Incentive Opportunities

Electric Utility companies, including Eversource and National Grid pay incentives to customers who use qualifying lighting products. This can amount to a considerable amount of money to offset the cost of any qualifying lighting project whether it is new construction, renovation or retrofit.

- 3.1.** Attention must be paid to the opportunity for collecting incentives for superior lighting designs.
- 3.2.** Familiarity with the utility company incentive/rebate programs is required.
- 3.3.** The architect, electrical engineer or lighting professional shall prepare the incentive submittal. The Energy Manager shall review, approve and submit the required utility company paperwork.

APPENDIX 1

GENERAL LIGHTING FIXTURES			
DESCRIPTION	MANUFACTURER	CATALOG NUMBER	NOTES
LED Exit Signs	Lithonia	LQM S W 3 R 120/277 M6	
LED Emergency Wall Light (approved locations only)	Lithonia	ELM2L UVOLT LTP SDRT	Remote test switch shall be provided for operating rooms
2'x2', 2x4', 1'x4' LED Troffer Ceiling Grid	Remphos	RPT-LEDPANEL-size-33L-840-G2	either fixture is permissible
	MARK Lighting	WHSPR-size-2000LM-35K-90CRI-DARK-MVOLT-SWC-CL80	
Exterior Lights Ceiling Mount	Remphos	RPT-TOUGHDRUM-13IN-2200LM-4000K-options	either fixture is permissible
		RPT-LEDCF-3100LM-4000K-options	
Exterior Light Wall Mount	ThinkLite	TL LED Wall Pack	60W LED Wallpack with photo sensor
Exterior Pole Mount	RAB Lighting	FXLED Series	
4' Utility LED strip	Lithonia	ZL1N-L48-3000LM-FST-MVOLT-35K-90CRI-WH	Mechanical and Electrical Rooms
6" or 8" Recessed LED Downlight	Gotham	EVO Series	
Under-cabinet with integral occupancy sensor	Healthcare Lighting	Spectra SF LED	either fixture is permissible
	Kenall	MAUC Series LED	
4' Utility strip LED (not in mechanical and electrical rooms)	Philips	FSS440L835-UNV-DIM-SWZDT	With SpaceWise Controls

LIGHTING RETROFITS			
DESCRIPTION	MANUFACTURER	CATALOG NUMBER	NOTES
LAMPS	Remphos, Sylvania, or GE	As Applicable	Lamp replacement dependent on the fixture
CAN Lights or Downlights	GE	Lumination LRX	
2x2 & 2x4 LED Retrofit with integral sensor, daylighting and occupancy controls	Philips	EvoKit LED Retrofit	Coordination with Energy Manager required
PATIENT ROOMS			
DESCRIPTION	MANUFACTURER	CATALOG NUMBER	NOTES
Recessed Linear LED Patient Fixture ambient/exam light levels	Fail-Safe	MNAE G 48 LD4 STD/STD 35 89DA ALW 277 ED1D2	either fixture is permissible
	HE Williams	MD 4+4AE G 4 L44/L104/835 A DIM UNV	
Step light	Winona	Step 12	either fixture is permissible
	Lucifer Lighting	ISL1-LED 1 Finish 80L 02B 3 PSA-24V-66-U-ED3	
6"x4' Recessed Linear LED Fixture	MARK Lighting	SL6L-QS-LOP-4FT-RLP- ceiling trim-90CRI-35K- 600LMF-MIN1-ZT-voltage	review options on spec sheet for correct configuration
2'x2' Recessed Linear LED Fixture	MARK Lighting	WHSPR-size-2000LM- 35K-90CRI-DARK- MVOLT-SWC-AMF-CL80	
2'X2' Recessed Linear Wet Location LED	Lithonia	2WRTL-F-L24-3000LM- OAW-AFL-MVOLT-EZ1- 35K-90CRI-WH	Shower location
6" Recessed LED Downlight	Gotham	EVO Series	Shower fixtures shall be wet listed

SPECIALTY FIXTURES			
DESCRIPTION	MANUFACTURER	CATALOG NUMBER	NOTES
Surgical Troffers	Fail-Safe	ORL Series	
Cleanroom Troffers	Lithonia	2SRTL G L24 3000LM IAW AFL MVOLT EZ1 40K 90CRI DWAM	
	Kenall	CSEDO 22 45L35K DCC DV 2F 2H AMF	
Food Prep Troffer	Columbia Lighting	LJT24 40MLG FAA12 EDU WL G3	

APPENDIX 2

