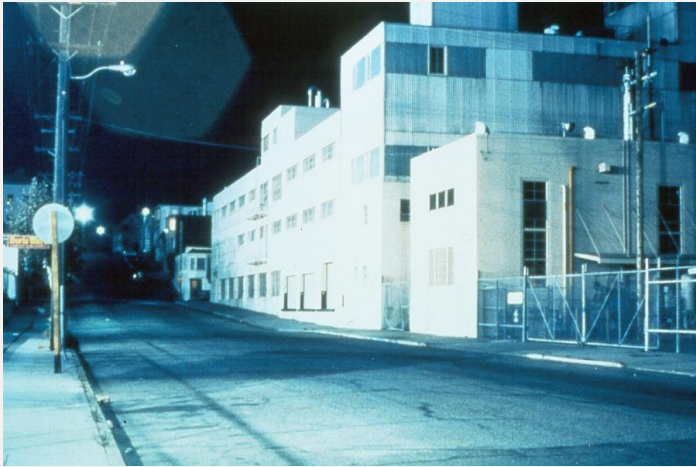


# Cambridge Outdoor Lighting Ordinance Task Force



Task Force Presentation  
Proposed Ordinance  
June 10, 2015

Why is there a task force?



To combat light trespass.....



....and light pollution.....



..and energy waste.

The City Manager appointed the to evaluate existing standards, offer guidance for the creation of a new outdoor ordinance, propose new regulatory approaches if needed, and develop enforcement mechanisms.

All 3 concerns are address by the proposed ordinance.

## General Requirements:



- Creates a simple standard for all property owners.
- Provides option for complex and creative design.
- Provides reasonable limits without impacting safety.
- Addresses concerns raised by Teague Petition.
- Collaborated with Cambridge Law Department.
- Introduces a clear standard for ISD to apply.
- Provides a reasonable approach to compliance.

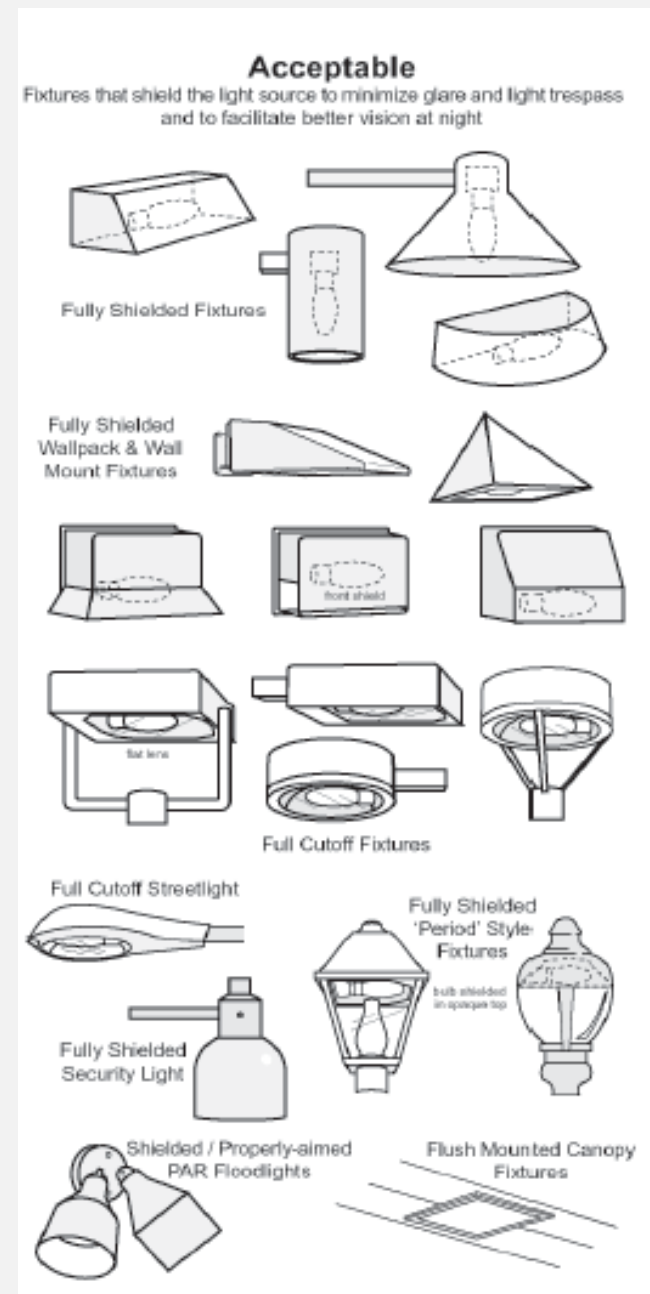
## What is exempt:



- Lighting within public ways.
- Lighting for public parks and public art.  
**(Not City Buildings)**
- Lighting for public monuments, statuary, and national flag.
- **Architectural lighting approved by Cambridge Historical Commission or on National Register.**
- Lighting solely for signage under the Cambridge Zoning Ordinance.
- Temporary lighting with proper permits.
- Underwater lighting for pools and water features.
- **Seasonal lighting for holidays or traditions.**
- Hospital emergency departments & helipads.
- Lighting that for emergency conditions.
- Lighting required by federal, state or local laws.

## Administration and Enforcement:

- Municipal ordinance is applied by ISD.
- Enforcement is complaint-driven.
- All light fixtures require an electrical permit.
- New and replacement fixtures must comply.
- Replacement light bulbs must comply.
- Existing fixtures must comply after 5 years.
- Administrative Exemption for unreasonable circumstances.
- Good Neighbor Brochure and educational campaign.





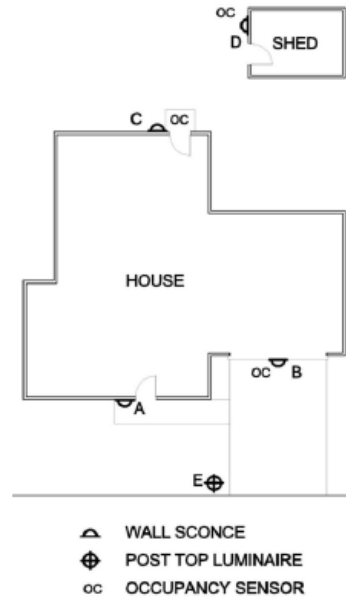
# Proposed Prescriptive Standard is based on International Dark Sky Association and Illuminating Engineering Society Model Lighting Ordinance

**JOINT IDA - IES**

**MODEL LIGHTING ORDINANCE (MLO)**

**with USER'S GUIDE**

June 15, 2011



## A. General Requirements

For residential properties including multiple residential properties not having common areas, all outdoor luminaires shall be fully shielded and shall not exceed the allowed lumen output in Table G, row 2.

## Exceptions

1. One partly shielded or unshielded luminaire at the main entry, not exceeding the allowed lumen output in Table G row 1.
2. Any other partly shielded or unshielded luminaires not exceeding the allowed lumen output in Table G row 3.
3. Low voltage landscape lighting aimed away from adjacent properties and not exceeding the allowed lumen output in Table G row 4.
4. Shielded directional flood lighting aimed so that direct glare is not visible from adjacent properties and not exceeding the allowed lumen output in Table G row 5.
5. Open flame gas lamps.
6. Lighting installed with a vacancy sensor, where the sensor extinguishes the lights no more than 15 minutes after the area is vacated.
7. Lighting exempt per Section III (B).

## B. Requirements for Residential Landscape Lighting

1. Shall comply with Table G.
2. Shall not be aimed onto adjacent properties.



Luminaire Type	Location	Luminaire Description	Property Type: Residential Lighting Zone 1					Controls	Compliant
			Fully Shielded	Lamp Type	Initial Luminaire Lumens*	Maximum Allowed Initial Luminaire Lumens (Table G)			
A	Front Entry	Decorative wall sconce	No	9W CFL	420	420	None	Yes	
B	Garage Door	Fully shielded wall pack	Yes	23W CFL	1050	1260	Occupancy Sensor	Yes	
C	Back Entry	Decorative wall sconce	No	7W CFL	280	315	Occupancy Sensor	Yes	
D	Shed Entry	Fully shielded wall pack	Yes	40W INC	343	1260	Occupancy Sensor	Yes	
E	Driveway	Fully shielded post top	Yes	13W CFL	1260	1260	None	Yes	

\*Initial Luminaire Lumens are calculated by multiplying the total initial lamp lumens by the luminaire efficiency. If the luminaire efficiency is not known, assume an efficiency of 70% and multiply the lamp lumen value by 0.7.

## PRESCRIPTIVE STANDARDS

- Simple standard to follow and monitor.
- Common fixtures and light bulbs.
- Addresses a variety of site conditions and property types.



Front Porch Lantern  
630 Lumens



Side Entrance Lantern  
390 Lumens

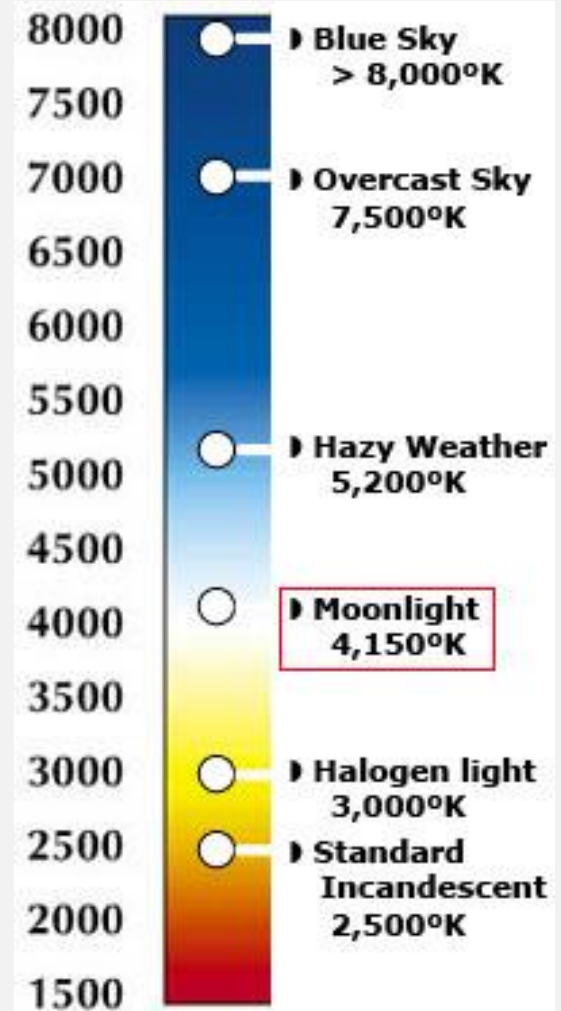
Outdoor Lighting Category	Unshielded or partially shielded light fixture (general)			Unshielded or partially shielded light fixture located in a front yard between the building and street			Shielded light fixture for entries, walkways, open spaces or buildings			Shielded light fixture for automobile surface parking areas, driveways or outdoor loading bays		
Maximum Initial Lumens Per Light Fixture	390			630			1,050			1,260		
Maximum Height	12 feet above the surface of the area to be illuminated			12 feet			12 feet above the surface of the area to be illuminated			14 feet above the surface of the parking area, driveway or loading bay		
Shielding and Direction	N/A			N/A			Must be fully shielded and directed away from all abutting residential properties			Must be fully shielded and directed fully downward and away from all abutting residential properties		
Examples of Lamp or Bulb Power in Watts: Incan CFL LED	Power (Watt)			Power (Watt)			Power (Watt)			Power (Watt)		
	Incan	CFL	LED	Incan	CFL	LED	Incan	CFL	LED	Incan	CFL	LED
	25	7	4	40	10	5	60	13	10	75	18	15

## Light Color

Color Temperature of any outdoor light source shall not exceed 4000 kelvin (less than moonlight).

- Reasonable limit with current technology.
- Provides property owners with more energy saving options for light bulbs and fixtures.

Color Rendering Index of any outdoor light source shall not be less than 65.





## PERFORMANCE STANDARDS

Allows creative design by lighting designers following recognized standards.

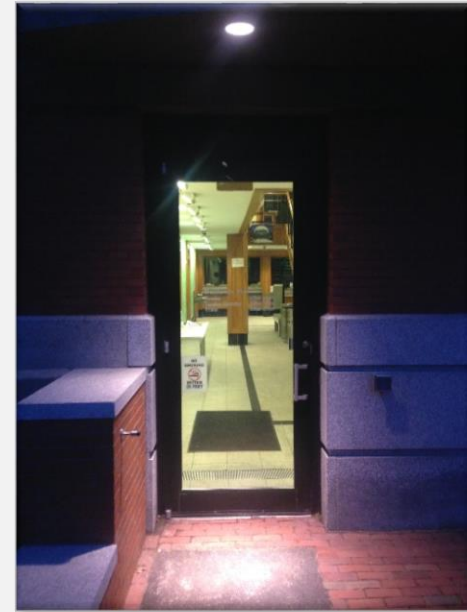
Choose from 2 options:

8 Lux at Property Line

OR

## LEED Light Pollution Reduction Credit

Presentation by  
Jeffrey Berg, AIA, LC, LEED AP BD+C  
Lighting Designer/Supervising Architect  
Parsons Brinckerhoff



 **SS Credit Light Pollution Reduction**

**Rating Systems**

**Building Design and Construction**

- New Construction
- Core and Shell
- Schools - New Construction
- Retail - New Construction
- Data Centers - New Construction
- Warehouses and Distribution Centers - New Construction
- Hospitality - New Construction
- Healthcare

The project is using IP units.

The project is using SI units.

**All Projects**

Classify the project under one of the following lighting zones:

- LZ0: No ambient lighting
- LZ1: Low ambient lighting
- LZ2: Moderate ambient lighting
- LZ3: Moderately high ambient lighting
- LZ4: High ambient lighting

**Optional: Site lighting plan.**  
Provide a site lighting plan depicting the project boundary, the property line (if different from the project boundary), the lighting boundary, any additional properties included in the lighting boundary (if applicable), the location and level of all exterior luminaires within the project boundary (both exempt and nonexempt), and any relevant project site conditions.

**Uplight**

Select one of the following options for uplight compliance:

- Option 1. BUG rating method
- Option 2. Calculation method

**Light Trespass**

Select one of the following options for light trespass compliance:

- Option 1. BUG rating method
- Option 2. Calculation method

Projects that are part of construction activities may choose the lighting system that best fits the end use and surrounding context.

Projects should also aim to meet the BUG rating criteria (1) or (2) or (3) or (4) or (5) or (6) or (7) or (8) or (9) or (10) or (11) or (12) or (13) or (14) or (15) or (16) or (17) or (18) or (19) or (20) or (21) or (22) or (23) or (24) or (25) or (26) or (27) or (28) or (29) or (30) or (31) or (32) or (33) or (34) or (35) or (36) or (37) or (38) or (39) or (40) or (41) or (42) or (43) or (44) or (45) or (46) or (47) or (48) or (49) or (50) or (51) or (52) or (53) or (54) or (55) or (56) or (57) or (58) or (59) or (60) or (61) or (62) or (63) or (64) or (65) or (66) or (67) or (68) or (69) or (70) or (71) or (72) or (73) or (74) or (75) or (76) or (77) or (78) or (79) or (80) or (81) or (82) or (83) or (84) or (85) or (86) or (87) or (88) or (89) or (90) or (91) or (92) or (93) or (94) or (95) or (96) or (97) or (98) or (99) or (100) or (101) or (102) or (103) or (104) or (105) or (106) or (107) or (108) or (109) or (110) or (111) or (112) or (113) or (114) or (115) or (116) or (117) 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# LEED v.4

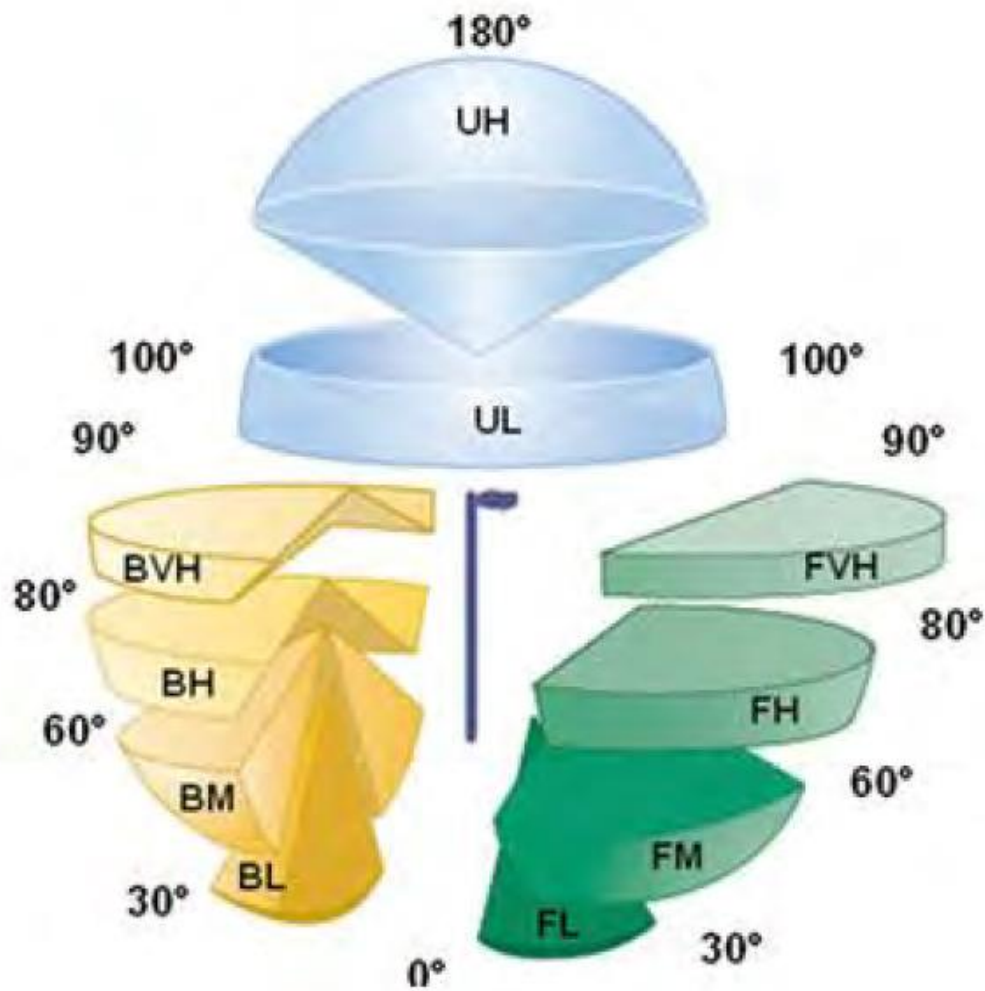
Sustainable Sites (SS) Credit: Light  
Pollution Reduction

Meet upright and light trespass requirements, using either the backlight-uplight-glare (BUG) method (Option 1) or the calculation method (Option 2). Projects may use different options for upright and light trespass.

Meet these requirements for all exterior luminaires located inside the project boundary (except those listed under "Exemptions"), based on the following:

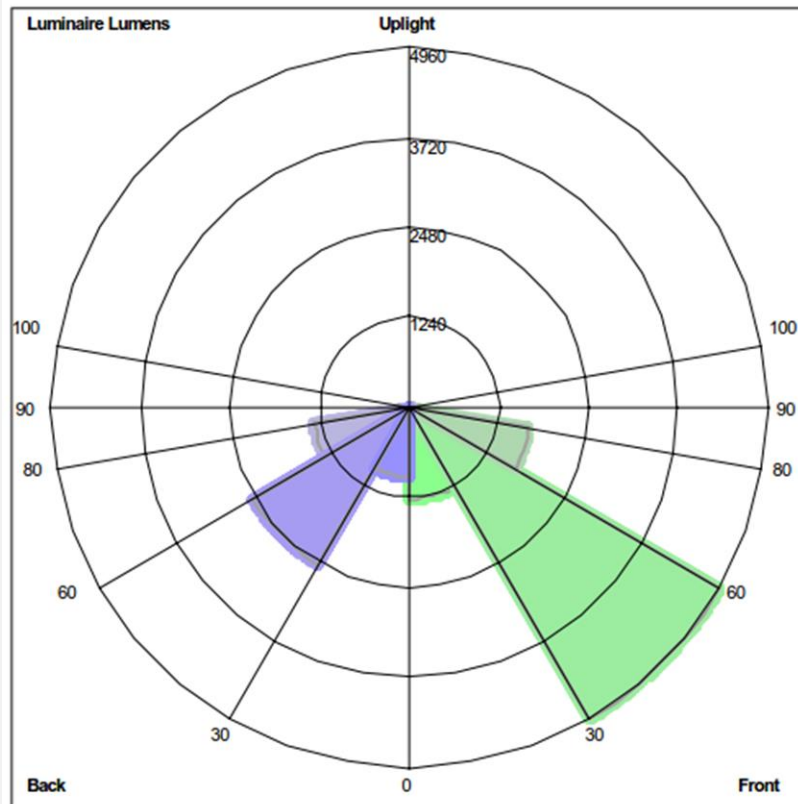
- the photometric characteristics of each luminaire when mounted in the same orientation and tilt as specified in the project design; and
- the lighting zone of the project property (at the time construction begins). Classify the project under one lighting zone using the lighting zones definitions provided in the Illuminating Engineering Society and International Dark Sky Association (IES/IDA) Model Lighting Ordinance (MLO) User Guide.

Additionally, meet the internally illuminated signage requirement.



IES ROAD REPORT  
PHOTOMETRIC FILENAME : STR-LWY-2S\_-\_08-E-UL-525-40K-CONFIGURED.IES

LUMINAIRE CLASSIFICATION SYSTEM (LCS) GRAPH



Luminaire Lumens:  
Front: Low=1264.9, Medium=4959.7, High=1670.8, Very High=37.4  
Back: Low=960.3, Medium=2508.7, High= 1349.0, Very High=9.7  
Uplight: Low=0.0, High=0.0

BUG Rating : B3-U0-G3

Zone	Recommended Uses or Areas	Zoning Considerations
LZ-0	Lighting Zone 0 should be applied to areas in which permanent lighting is not expected and when used, is limited in the amount of lighting and the period of operation. LZ-0 typically includes undeveloped areas of open space, wilderness parks and preserves, areas near astronomical observatories, or any other area where the protection of a dark environment is critical. Special review should be required for any permanent lighting in this zone. Some rural communities may choose to adopt LZ-0 for residential areas.	Recommended default zone for wilderness areas, parks and preserves, and undeveloped rural areas.  Includes protected wildlife areas and corridors.
LZ-1	Lighting Zone 1 pertains to areas that desire low ambient lighting levels. These typically include single and two family residential communities, rural town centers, business parks, and other commercial or industrial/storage areas typically with limited nighttime activity. May also include the developed areas in parks and other natural settings.	Recommended default zone for rural and low density residential areas. Includes residential single or two family; agricultural zone districts; rural residential zone districts; business parks; open space include preserves in developed areas.

Zone	Recommended Uses or Areas	Zoning Considerations
LZ-2	Lighting Zone 2 pertains to areas with moderate ambient lighting levels. These typically include multifamily residential uses, institutional residential uses, schools, churches, hospitals, hotels/motels, commercial and/or businesses areas with evening activities embedded in predominately residential areas, neighborhood serving recreational and playing fields and/or mixed use development with a predominance of residential uses. Can be used to accommodate a district of outdoor sales or industry in an area otherwise zoned LZ-1.	Recommended default zone for light commercial business districts and high density or mixed use residential districts. Includes neighborhood business districts; churches, schools and neighborhood recreation facilities; and light industrial zoning with modest nighttime uses or lighting requirements.
LZ-3	Lighting Zone 3 pertains to areas with moderately high lighting levels. These typically include commercial corridors, high intensity suburban commercial areas, town centers, mixed use areas, industrial uses and shipping and rail yards with high night time activity, high use recreational and playing fields, regional shopping malls, car dealerships, gas stations, and other nighttime active exterior retail areas.	Recommended default zone for large cities' business district.  Includes business zone districts; commercial mixed use; and heavy industrial and/or manufacturing zone districts.
LZ-4	Lighting zone 4 pertains to areas of very high ambient lighting levels. LZ-4 should only be used for special cases and is not appropriate for most cities. LZ-4 may be used for extremely unusual installations such as high density entertainment districts, and heavy industrial uses.	Not a default zone.  Includes high intensity business or industrial zone districts.



## Uplight

### Option 1. BUG Rating Method

Do not exceed the following luminaire uplight ratings, based on the specific light source installed in the luminaire, as defined in IES TM-15-11, Addendum A.

**Table 1. Maximum uplight ratings for luminaires**

MLO lighting zone	Luminaire uplight rating
LZ0	U0
LZ1	U1
LZ2	U2
LZ3	U3
LZ4	U4

OR

### **Option 2. Calculation Method**

Do not exceed the following percentages of total lumens emitted above horizontal.

**Table 2. Maximum percentage of total lumens emitted above horizontal, by lighting zone**

MLO lighting zone	Maximum allowed percentage of total luminaire lumens emitted above horizontal
LZ0	0%
LZ1	0%
LZ2	1.5%
LZ3	3%
LZ4	6%

## Light Trespass

### Option 1. BUG Rating Method

Do not exceed the following luminaire backlight and glare ratings (based on the specific light source installed in the luminaire), as defined in IES TM-15-11, Addendum A, based on the mounting location and distance from the lighting boundary.

**Table 3. Maximum backlight and glare ratings**

Luminaire mounting	MLO lighting zone				
	LZ0	LZ1	LZ2	LZ3	LZ4
	Allowed backlight ratings				
> 2 mounting heights from lighting boundary	B1	B3	B4	B5	B5
1 to 2 mounting heights from lighting boundary and properly oriented	B1	B2	B3	B4	B4
0.5 to 1 mounting height to lighting boundary and properly oriented	B0	B1	B2	B3	B3
< 0.5 mounting height to lighting boundary and properly oriented	B0	B0	B0	B1	B2
	Allowed glare ratings				
Building-mounted > 2 mounting heights from any lighting boundary	G0	G1	G2	G3	G4
Building-mounted 1–2 mounting heights from any lighting boundary	G0	G0	G1	G1	G2
Building-mounted 0.5 to 1 mounting heights from any lighting boundary	G0	G0	G0	G1	G1
Building-mounted < 0.5 mounting heights from any lighting boundary	G0	G0	G0	G0	G1
All other luminaires	G0	G1	G2	G3	G4

The lighting boundary is located at the property lines of the property, or properties, that the LEED project occupies. The lighting boundary can be modified under the following conditions:

- When the property line is adjacent to a public area that is a walkway, bikeway, plaza, or parking lot, the lighting boundary may be moved to 5 feet (1.5 meters) beyond the property line.
- When the property line is adjacent to a public street, alley, or transit corridor, the lighting boundary may be moved to the center line of that street, alley, or corridor.
- When there are additional properties owned by the same entity that are contiguous to the property, or properties, that the LEED project is within and have the same or higher MLO lighting zone designation as the LEED project, the lighting boundary may be expanded to include those properties.

Orient all luminaires less than two mounting heights from the lighting boundary such that the backlight points toward the nearest lighting boundary line. Building-mounted luminaires with the backlight oriented toward the building are exempt from the backlight rating requirement.

## Option 2. Calculation Method

Do not exceed the following vertical illuminances at the lighting boundary (use the definition of lighting boundary in Option 1). Calculation points may be no more than 5 feet (1.5 meters) apart. Vertical illuminances must be calculated on vertical planes running parallel to the lighting boundary, with the normal to each plane oriented toward the property and perpendicular to the lighting boundary, extending from grade level to 33 feet (10 meters) above the height of the highest luminaire.

**Table 4. Maximum vertical illuminance at lighting boundary, by lighting zone**

MLO lighting zone	Vertical illuminance
LZ0	0.05 fc (0.5 lux)
LZ1	0.05 fc (0.5 lux)
LZ2	0.10 fc (1 lux)
LZ3	0.20 fc (2 lux)
LZ4	0.60 fc (6 lux)

FC = footcandle.

AND

### **Internally Illuminated Exterior Signage**

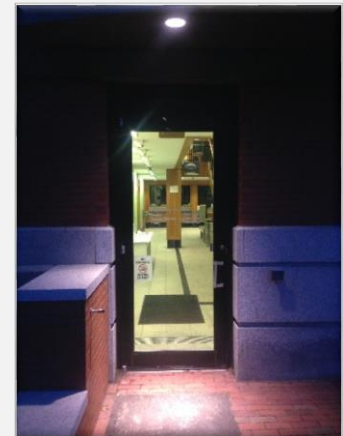
Do not exceed a luminance of 200 cd/m<sup>2</sup> (nits) during nighttime hours and 2000 cd/m<sup>2</sup> (nits) during daytime hours.





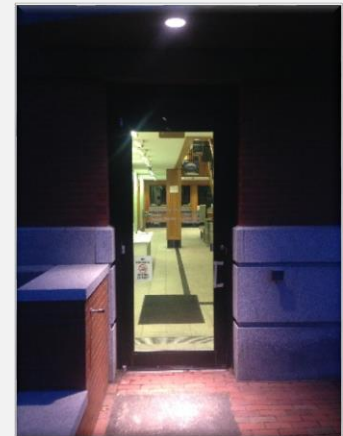


# Questions and Discussion By Task Force Members





## Public Comment







**Next Steps**  
**Thank you!**

