Improving lighting and saving energy in Northampton's Gare Parking Garage

NorthamptonCityLights.org
July 2021

Northampton lighting code 350-12.2

Because garage windows are large and always open, lights inside garage should be considered as outdoor lights.

C. Standards. Any use permitted by zoning either by right or through any type of zoning relief in any district shall conform to the following lighting standards. All outdoor light fixtures and illuminated signs for all uses and structures within the City of Northampton shall be designed, located, installed and directed in such a manner as to prevent measurable light at the property lines and glare at any location on or off the property. If necessary, an applicant may need to provide photometric plans and/or manufacturing specification sheets to show conformance with these standards. This standard shall be met through the following:

(1) All outdoor lighting shall have full cutoff-type fixtures (See below.) Cutoffs shall shield bulbs from visibility and may consist of internal baffles or reflectors or external panels or other mechanisms.

(a) General site lighting shall not exceed 90°, the horizontal plane of bottom of lamp fixture. No uplighting is allowed; parking, security and aesthetic lighting must shine downward.

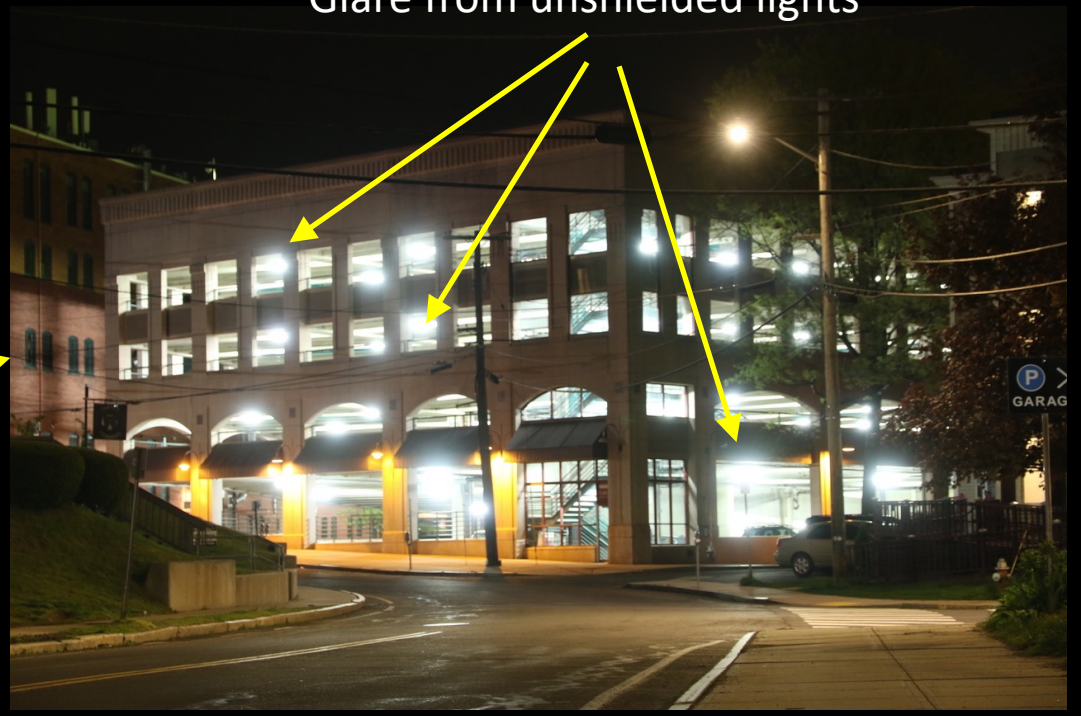
(b) Spotlights used to illuminate buildings, signs or specific site amenities/features shall be targeted on such objects so as to prevent direct uplighting. Cutoffs shall limit lighting to a forty-five-degree angle above the horizontal plane.

(c) Upward search or spotlighting of the sky for entertainment or advertising purposes is prohibited.

Current lights are unshielded, causing significant glare and light trespass onto neighboring property – bad for health, quality of life

Light trespass from unshielded lights

Glare from unshielded lights



Not consistent with city's lighting code

The Five Principles of Responsible Outdoor Lighting

Co-authored by the International Dark-Sky Association (IDA) and the Illuminating Engineering Society (IES)

Northampton's Energy and Sustainability Commission unanimously endorsed the Five Principles in January, 2021

Joining Forces to Protect the Night from Light Pollution

on APRIL 17, 2020

LIGHT TO PROTECT THE NIGHT
Five Principles for Responsible Outdoor Lighting

IES Illuminating Engineering Society — IDA

USEFUL	**ALL LIGHT SHOULD HAVE A CLEAR PURPOSE** Before installing or replacing a light, determine if light is needed. Consider how the use of light will impact the area, including wildlife and the environment. Consider using reflective paints or self-luminous markers for signs, curbs, and steps to reduce the need for permanently installed outdoor lighting.
TARGETED	**LIGHT SHOULD BE DIRECTED ONLY TO WHERE NEEDED** Use shielding and careful aiming to target the direction of the light beam so that it points downward and does not spill beyond where it is needed.
LOW LIGHT LEVELS	**LIGHT SHOULD BE NO BRIGHTER THAN NECESSARY** Use the lowest light level required. Be mindful of surface conditions as some surfaces may reflect more light into the night sky than intended.
CONTROLLED	**LIGHT SHOULD BE USED ONLY WHEN IT IS USEFUL** Use controls such as timers or motion detectors to ensure that light is available when it is needed, dimmed when possible, and turned off when not needed.
COLOR	**USE WARMER COLOR LIGHTS WHERE POSSIBLE** Limit the amount of shorter wavelength (blue-violet) light to the least amount needed.

IDA default: 2200K

The Five Principles of Responsible Outdoor Lighting applied to Gare Garage

IDA default: 2200K

1. Clear purpose? Safety of pedestrians to, in, and from garage ✓
2. Targeted? Significant glare and light trespass far beyond garage ✗
3. Low light levels? 10x brighter than IES/DOE recommendations ✗
4. Controlled? No controls now, some controls planned ✗ / ✓
5. Color? 2000K outside / 4000K inside now, 3000K planned ✓ / ✗

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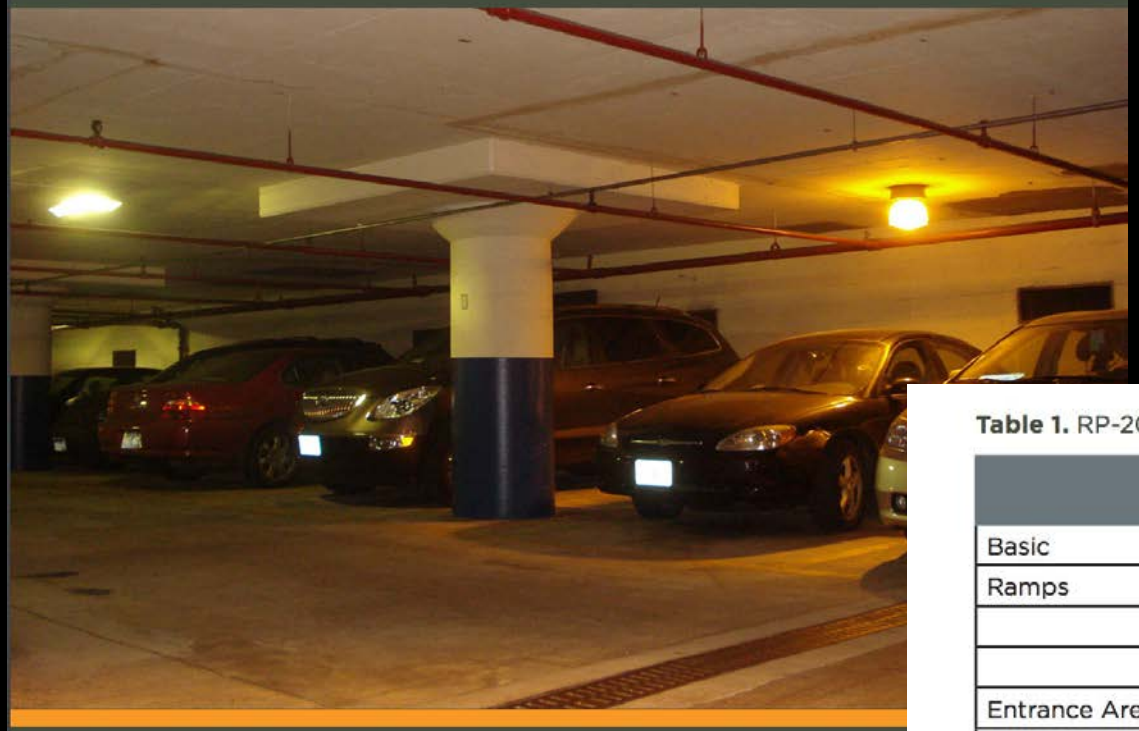


GUIDE TO FEMP-DESIGNATED PARKING STRUCTURE LIGHTING

FOR FEDERAL AGENCIES

FEMP Federal Energy Management Program

US Dept. of Energy / IES recommendations for garage lighting

Table 1. RP-20-98 Parking Structure Illuminance Recommendations.

		Minimum Horizontal Illuminance	Maximum/Minimum Horizontal Uniformity Ratio	Minimum Vertical Illuminance
Basic		1 fc	10:1	0.5 fc
Ramps				
	Day[1]	2 fc	10:1	1.0 fc
	Night	1 fc	10:1	0.5 fc
Entrance Areas[2]				
	Day[1]	50 fc		25 fc
	Night	1 fc	10:1	0.5 fc
Stairways		2 fc		1.0 fc

[1]Daylight may be considered in the design calculation.

[2]A high illuminance level for about the first 65 feet inside the structure is needed to help with the transition from bright daylight to a lower internal level.

Comparison: DOE/IES recommendations vs. current Northampton garage illumination levels

Table 1. RP-20-98 Parking Structure Illuminance Recommendations.

		Minimum Horizontal Illuminance	Maximum/Minimum Horizontal Uniformity Ratio	Minimum Vertical Illuminance
Basic		1 fc	1[illegible]:1	0.5 fc
Ramps				
	Day[1]	2 fc	1[illegible]:1	1.0 fc
	Night	1 fc	1[illegible]:1	0.5 fc
Entrance Areas[2]				
	Day[1]	50 fc		25 fc
	Night	1 fc	1[illegible]:1	0.5 fc
Stairways		2 fc		1.0 fc

[1]Daylight may be considered in the design calculation.

[2]A high illuminance level for about the first 65 feet inside the structure is needed to help with the transition from bright daylight to a lower internal level.

Actual measured values in garage:

Ramps: 3-15 fc, typically 10 fc
Stairways: 10-20 fc, typically 15 fc
Entrance areas: 3-10 fc

Measured values are 10x brighter than DOE/IES recommendations

Planned replacement lights

LED fixtures for interior

LED ” corn cob” for exterior

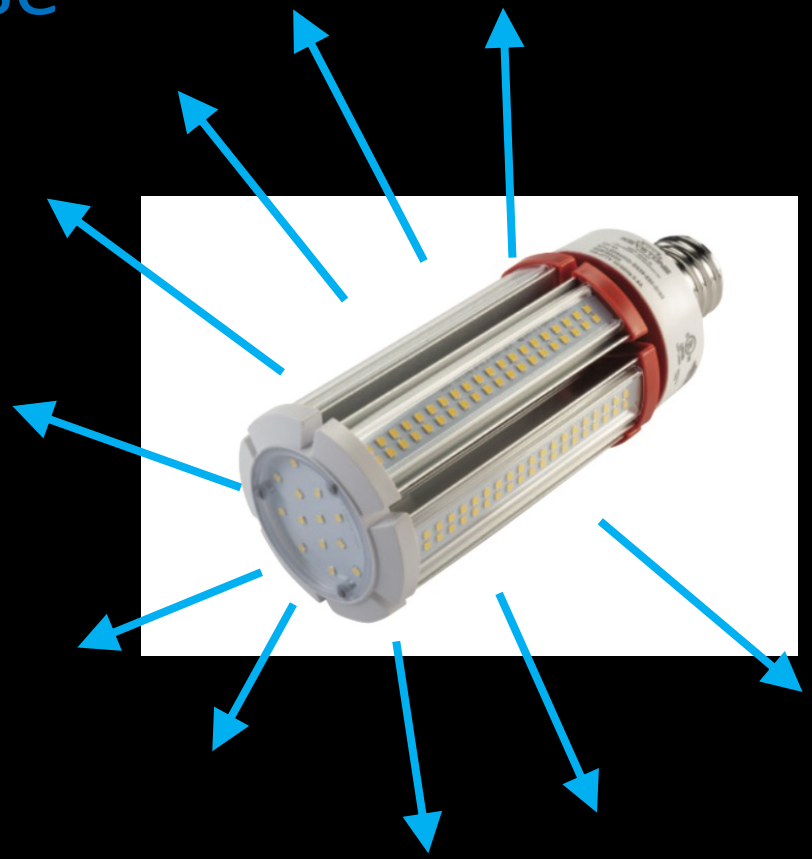
Planned LED fixtures are still 10x too bright, completely unshielded against glare and light trespass

- Color: 3000K (better than now)
- Brightness: comparable to now (10x brighter than DOE/IES rec)
- Glare: just as bad as now

Ugly, obtrusive glare and wasted light and energy, outside Patria restaurant.

Exterior lights would get much worse

Now: warm color (~2000K), minimum glare (esp. when drop lens missing)



54W/7884 lum LED “corn cob” is a ”glare bomb”, casting 3000K light in all directions. Visibility, safety, and light pollution will all get worse. Most city streetlights are 19W/1900 lum -- less than 1/4 as bright.

Roof deck: why no plan to replace with sensors, timers, fully-shielded fixtures?

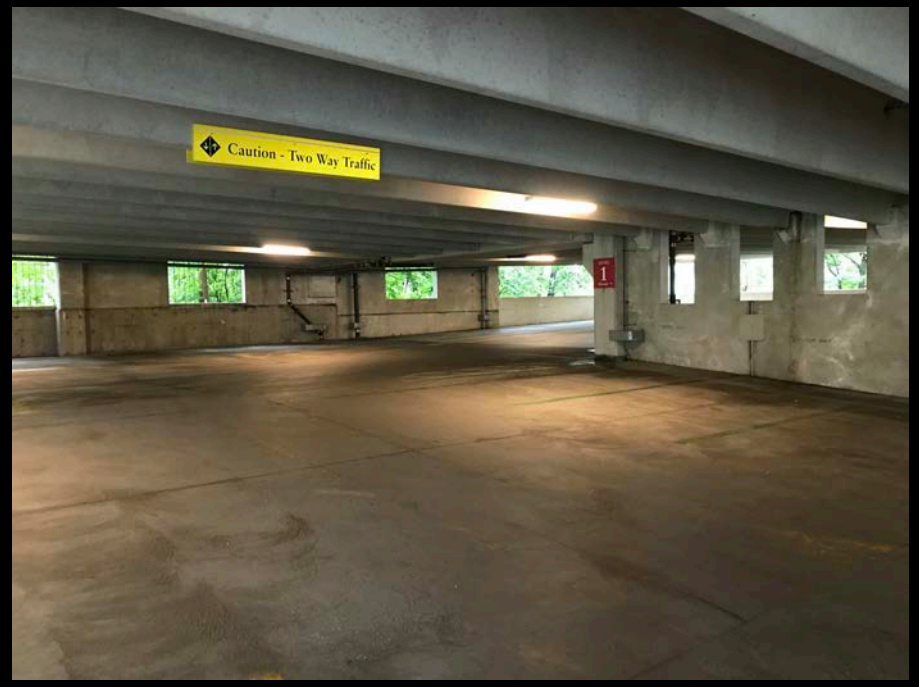
Roof lights on all night long even when empty = pure waste

Roof light glare visible from blocks away = pure waste

Examples of good parking garage lighting

Smith College parking garage, West St., Northampton

- No history of significant crime or hazard



Well shielded against glare and light trespass
Illumination levels: 1-2 fc, consistent with DOE/IES recommendations
Northampton's Gare Garage lighting is 10x brighter, with much worse glare and light trespass

Examples of good parking garage lighting

Figure 9(a). Photo of site

Well shielded against glare and light trespass

Figure 10(a). Photo of site

Figure 14. Electric lights off during the day.

Northampton's Gare Garage lighting is 10x brighter, with much worse glare and light trespass

Source: DOE/FEMP Parking Structure Lighting Guide 2013

Save energy with improved lighting plan

Current replacement plan

- 250 fixtures (1:1 replacement)
- 1,140,380 lumens (vs. 1,355,820 now) – almost 1:1
- 8714 Watts total (vs. 21,000 now)
- Motion sensors + Dimmers (to 30%) on 209 fixtures
- 47,000 KWH/year (vs. 163,000 now)

Proposed improvements and savings

- Reduce number of fixtures
- Fully shield against glare, send light down only
- Reduce wattage and illumination by 10x to match IES/DOE rec's.
- Include well-shielded, warm color, controlled roof lights in plan
- Turn most lights off when no one present or in daylight

Estimated energy use: 4,000 KWH/year -- less than 10% of current plan
Estimated savings: at least $4,000/year compared to current plan

Benefits of improved lighting plan

- Save energy
- Save money on electricity
- Reduce light pollution
- Protect health of neighbors
- Improve ambiance and aesthetics
- Reduce light pollution
- Consistent with City lighting code
- Consistent with IDA/IES 5 Principles
- Consistent with DOE/IES recommendations

Ugly, obtrusive glare and wasted light and energy, outside Patria restaurant.