

Lighting Guidelines



Clarington
Leading the Way



Planning Services Department
Corporation of the Municipality of Clarington

APPROVED BY COUNCIL ON
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PREFACE

In 2005, the area municipalities of Durham Region began the process of formalizing the review criteria of lighting systems for new development and redevelopment proposals subject to site plan approval. The municipalities, comprising representation from the Durham Regional Planning Department, Town of Ajax, Township of Brock, Municipality of Clarington, City of Oshawa, City of Pickering, Township of Scugog, Township of Uxbridge, and Town of Whitby, formed a committee, known as the Inter-municipal Lighting Committee, in order to develop a set of Lighting Guidelines. Lumetech Engineers Inc. was retained to provide expert advice and assist in the development of the technical data. The Durham Region Astronomical Association (DRAA) also provided input and advice for the Guidelines.

The purpose of the Lighting Guidelines is to provide a set of effective standards, consistent across the Durham Region, that are designed to mitigate the impacts of excess and unnecessary external lighting. These Guidelines are intended to be used as part of the site plan approval process for new development applications. Proponents installing new lighting systems or retrofitting existing systems as part of the site plan process should refer to these Guidelines and ensure that they are in compliance with all requirements herein.

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1. PURPOSE

The purpose of these guidelines is to provide a set of effective standards designed to limit the impacts of excess and unnecessary external lighting. Specifically, these guidelines are intended to be used as part of the site plan approval process for new development applications.

These guidelines are not intended to regulate lighting for single family dwellings (including single detached dwellings, semi-detached dwellings, linked dwellings, and street townhouse dwellings) or municipal street lighting.



Figure 1: Urban Sky Glow Effect

2. BACKGROUND

Excessive and unnecessary site lighting can have a number of detrimental environmental and safety impacts. Specifically, excessive lighting can be inefficient in terms of energy consumption, as well as create glare levels that can be a detriment to drivers, pedestrians and neighbouring properties. From an environmental perspective, the over lighting of towns and cities creates a phenomenon known as Urban Sky Glow (refer to Figure 1), that renders the night sky effectively unviewable to town and city dwellers. Furthermore, poor outdoor lighting design can create light trespass which is a nuisance that can negatively affect the enjoyment of a person's property.

The uneven application of lighting standards can create issues around transition; moving from an under lit area to an over lit one. This can have a significant effect on the night vision of drivers, cyclists and pedestrians.

These guidelines are designed to mitigate these issues through introducing standards that will address concerns about direct glare and light trespass. In addition, these standards factor in safety issues, such as those addressed by Crime Prevention Through Environmental Design (CPTED) principles and, in particular, safety issues that pertain to shadowing, peripheral visual detection and clarity of vision, with respect to seeing other people and objects.

3. SCOPE

The scope of the lighting guidelines is to create a set of standards that are applicable for land uses across Clarington. These guidelines are intended to address, but are not limited to:

- Lighting for buildings and structures, including building entrances, canopies or overhangs;
- Parking lot lighting;
- Pedestrian and landscape lighting;
- Recreational area lighting;
- Display, service and advertising lighting;
- Wall mounted lighting;
- Security lighting;
- Ornamental/decorative lighting;
- Lighting in heritage areas.

4. AUTHORITY

The Planning Act, through Bill 51, allows for lighting studies to be requested as part of the municipal site plan process. As such, applicants will be required to submit information from a qualified lighting design professional with respect to any proposed external lighting as part of the site plan process. The required information will include:

- Light fixture (luminaire) design sheets, containing:
 - Lamp (bulb) types;
 - Fixture specifications (full cut-off required);
- Lighting Plan in foot candle values showing photometric data (refer to Figure 2), containing:

- Pole specifications such as height, spacing and placement; and
- Photometric information, showing areas of illuminance illustrated with isometric lines.

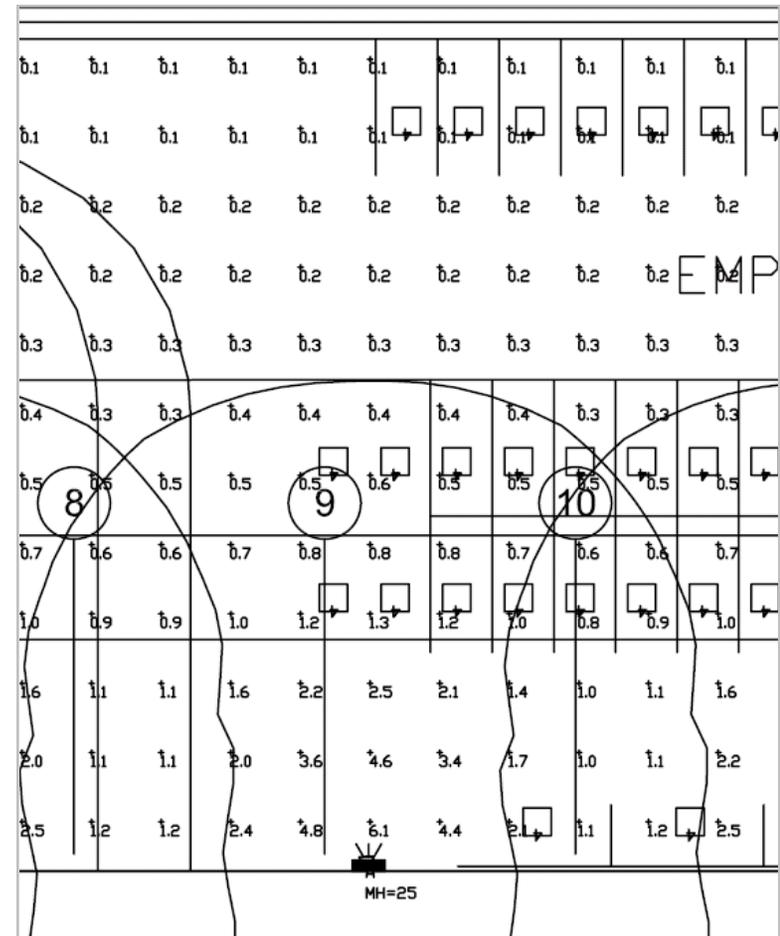


Figure 2: Lighting Plan Section

5. LIGHTING FIXTURE REQUIREMENTS

A wide number of lighting fixture designs and lamp types exist today. Light sources, or lamps, are available in a variety of styles. Each lamp type has different attributes and can be installed where most suitable. For example, metal halide lamps and LED lamps produce a white light which is ideal when colour rendering is required for purposes such as security. High pressure sodium, on the other hand, produces a yellowish light that is ideal when colour rendering is not required. This is an appropriate, energy efficient lamp for purposes such as ornamental or accent lighting.

The issue of light fixture design refers to the nature of the fixture itself. The standard requirement is for full cut-off lights. These are lights that are designed and/or shielded in such a way that all of the light rays emitted by the fixture are projected below the horizontal plane. In technical terms, there should be no light emission at the vertical angle of 90 degrees or greater above the nadir (the point at ground level directly below the source of light), and no more than 10% at the angle of 80 degrees above the nadir (refer to Figure 3).

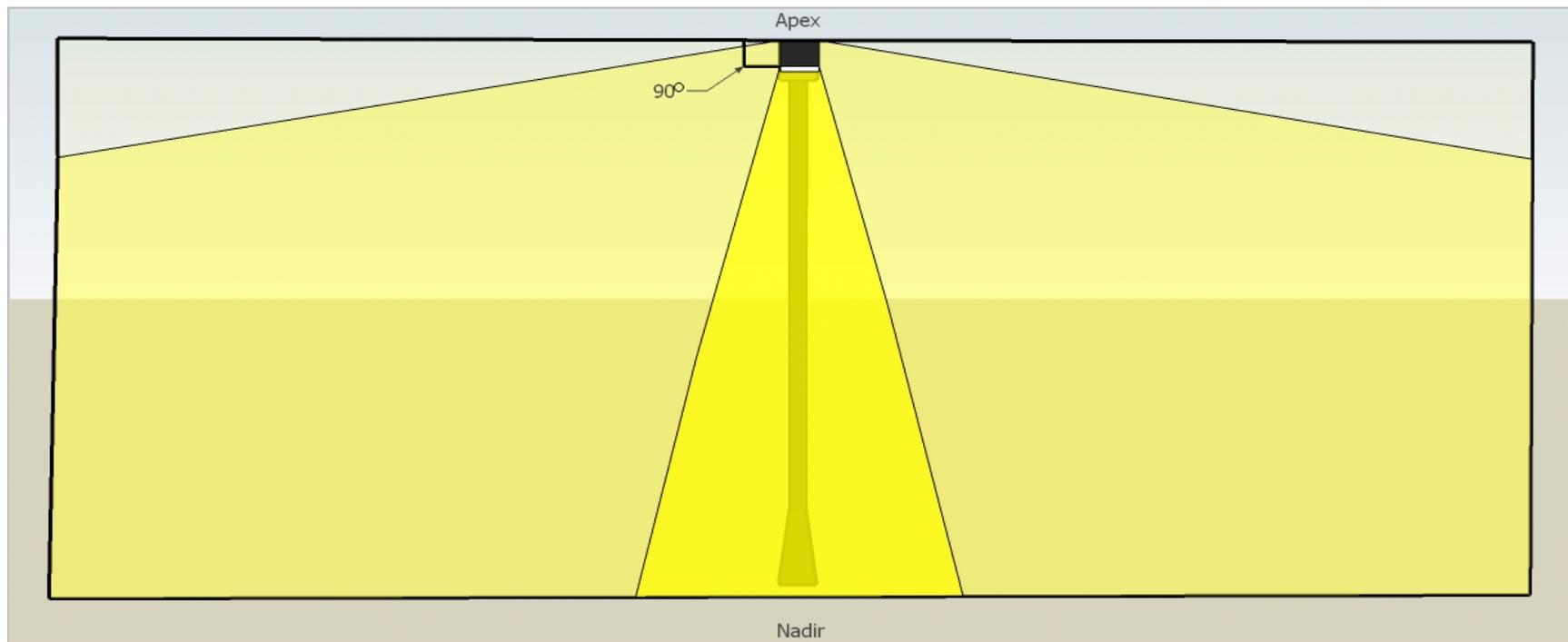


Figure 3: Full Cut-off Fixture

Light fixture designs which cannot meet these standards, such as those with sag lenses or wall mount lights that shine horizontally, are prohibited.

5.1 ACCEPTABLE FIXTURES



Figure 4: Full Cut-off Wall Mount

Examples of full cut-off fixtures and prohibited fixtures are provided below.

5.2 PROHIBITED FIXTURES



Figure 6: Prohibited Wall Mount



Figure 5: Full Cut-off Light Standard



Figure 7: Prohibited Sag Lens Light

6. ILLUMINATION REQUIREMENTS

In addition to setting standards for acceptable lamps and fixture types, these guidelines have established a set of maximum illumination values for different Lighting Zones. The illumination requirements are expressed in the form of tables pertaining to each Lighting Zone's maximum illumination at the property line (refer to Appendix 1).

The lighting zones are intended to recognize that not all areas can achieve the same lighting levels. At the pre-consultation stage, the applicant will work with the Planning Services Department to determine which Lighting Zone the proposal falls under. Four Lighting Zones have been established. Lighting Zone 1 is the most stringent and includes environmentally sensitive and open space areas. The majority of development proposals will be designated as part of Lighting Zone 2. Locations with unique constraints and dense development may be classified as Lighting Zone 3. The Lighting Zone 4 designation is reserved for those sites with extreme constraints, requiring special consideration. Lighting Zone 4 will typically constitute development within downtown areas.

Non-essential external lighting is encouraged to be switched off during non-operating hours, or placed on sensor-activated timers (where lighting does not serve security purposes).

The land uses that these guidelines will apply to are:

- Commercial uses such as plazas, retail outlets, car dealerships, offices, personal service uses, and others;
- Industrial uses such as warehousing, manufacturing, fabrication, aggregate extraction and processing uses;
- Institutional uses such as, places of worship, schools (public and private), hospitals, and government facilities;
- Recreational uses such as golf courses, driving ranges, soccer pitches, domes and baseball diamonds and ski hills;
- Residential uses with three or more units (save and except for street townhouses) and retirement homes.



Figure 8: Shoppers Drug Mart Full Cut-off Lights

7. SUBMISSION REQUIREMENTS & STANDARDS

When requested, site plan applications should be accompanied by a lighting plan and lighting fixture details that demonstrate that the proposal meets the guidelines. The following submission requirements and standards will apply:

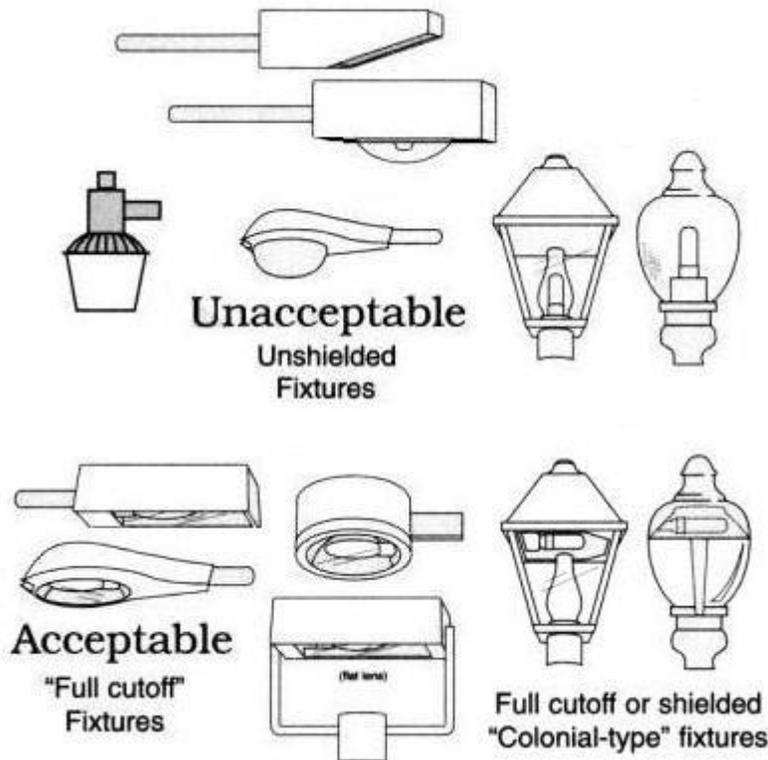


Figure 9: Lighting Fixture Examples

7.1 GUIDING STANDARDS

- Light fixtures should be positioned across a site so as to give a uniform distribution of light over the relevant area. This assists in the avoidance of the creation of "hot spots" (areas of over-illumination that make adjacent areas seem darker);
- The conservation of energy should be encouraged;
- Lamps shall be located in such a way as to direct light away from neighbouring properties;
- Except where lighting is strictly ornamental, photometric performance (the glare, intensity and uniformity of the light produced) will be a more important factor in assessing the suitability of proposed lighting than aesthetics;
- Only down-lighting or back lighting will be permitted for on-site signage;
- Areas as identified as unsafe or provide security concerns may require additional lighting based on CPTED principles.

7.2 LIGHTING FIXTURE SUBMISSION REQUIREMENTS

- Detail specifications, including lamp type, fixture type, lumens rating of lamp, wattage, colour, etc. shall be submitted;
- Only full-cut off fixtures shall be accepted;
- Fixtures shall be positioned such that they focus light down, preventing light from emitting above the horizontal plane (90 degree position relative to the ground) and preventing light trespass.

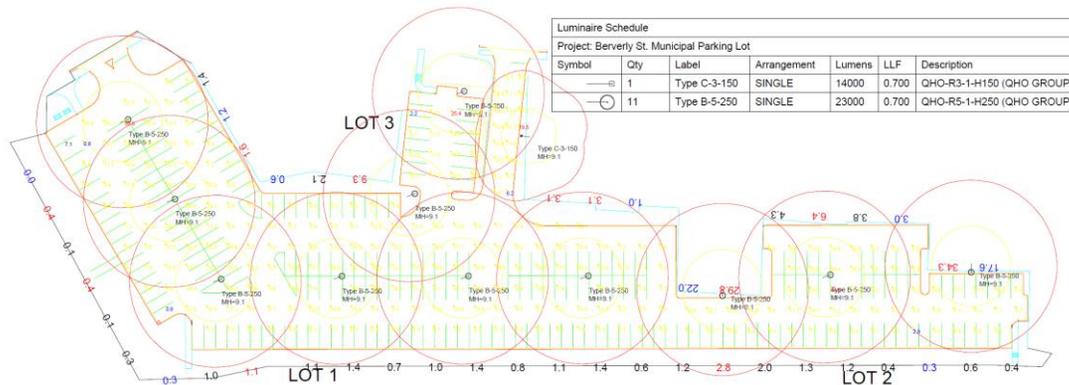
7.3 LIGHTING PLAN SUBMISSION REQUIREMENTS

- The illumination levels shall be expressed in foot candles and in the form of isolux curves showing the predicted lighting levels at the property line and throughout the development site;
- Pole specification such as height, spacing, foundation details, and placement shall be provided. Pole heights will generally be between 6.0 metres (for smaller, pedestrian scaled development) and 7.5 metres for larger scale development. Municipal recreation uses, such as baseball diamonds, are not regulated by these guidelines;
- Lot boundaries must be shown;
- Location of all structures must be shown;
- Location and height of all proposed luminaires, including wattage, and lamp type must be shown;
- The illumination levels at all property lines should strive to achieve '0' foot candles;
- A photometric diagram showing the predicted lighting levels from each of the proposed light sources shall be provided;

- The lighting plan is to be signed by the qualified lighting design professional responsible for the plan;
- Five (5) copies of the lighting plan and fixture details are to be included in the final submission.

7.4 UNIFORMITY RATIOS

In lighting design the average maintained illuminance and uniformities are calculated. The uniformity ratio is computed to make sure that certain minimum levels are achieved in the design, creating uniform lighting across a site. For outdoor lighting applications, Average to Minimum ratio is considered essential in order to control the creation of “hot spots”, which are areas with very high illumination that are surrounded by darker areas. As part of a lighting plan submission, designers are required to submit the Average to Minimum ratio, which is to be designed in accordance with the Illuminating Engineering Society (IES).



Numeric Summary							
Project: Bervery St. Municipal Parking Lot							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	Max/Min
Lot 1	Illuminance	Lux	11.89	50.8	0.8	14.86	63.50
Lot 2	Illuminance	Lux	10.88	44.9	2.9	3.75	15.48
Lot 3	Illuminance	Lux	13.54	25.4	2.2	6.15	11.55
Road	Illuminance	Lux	11.92	19.5	6.2	1.92	3.15
CalcPts	Illuminance	Lux	0.22	0.4	0.0	N.A.	N.A.
CalcPts_1	Illuminance	Lux	0.80	1.1	0.3	N.A.	N.A.
CalcPts_2	Illuminance	Lux	1.09	2.8	0.3	N.A.	N.A.
CalcPts_3	Illuminance	Lux	25.95	34.3	17.6	N.A.	N.A.
CalcPts_4	Illuminance	Lux	4.38	6.4	3.0	N.A.	N.A.
CalcPts_5	Illuminance	Lux	25.90	29.8	22.0	N.A.	N.A.
CalcPts_6	Illuminance	Lux	2.40	3.1	1.0	N.A.	N.A.
CalcPts_7	Illuminance	Lux	4.00	9.3	0.6	N.A.	N.A.
CalcPts_8	Illuminance	Lux	1.40	1.6	1.2	N.A.	N.A.

Figure 10: Parking Lot Lighting Plan

8. QUALIFIED DESIGNER SIGNOFF

The following statement is to be included on the Lighting Plan and signed by the qualified designer:

This drawing indicates all proposed outdoor lighting fixtures for this proposed development. The lighting design is in accordance with the applicable lighting zone as established by the Planning Department, and designed with an Average to Minimum ratio in accordance with the Illuminating Engineering Society guidelines. This lighting design will not create any objectionable glare for adjacent properties.

Signature of Qualified Designer

9. POST INSTALLATION INVESTIGATION

After the installation of any new lighting subject to municipal review and approval, the applicant's lighting consultant shall provide a written signoff confirming that the lighting has been installed as per the approved plan.

APPENDIX 1: LIGHTING ZONES

Lighting Zone¹	Ambient Brightness	Locations	Land Use	Maximum Vertical Illuminance Level at Property Lines² (foot candles)
LZ1	Dark	Rural Areas / Environmentally Sensitive Areas	Agricultural, Natural areas identified in the Official Plan including parks and designated environmental sensitive areas	0.1(1 lux)
LZ2	Low	Rural/Suburban Applications	Open Spaces, Low – Medium Density Residential, Small Scale Commercial, Institutional, Recreational and Industrial Uses	0.3 (3 lux)
LZ3	Medium	Urban	Large Scale Commercial, Industrial, Recreational, Institutional and Medium – High Density Residential	0.8 (8 lux)
LZ4	High	Dense Urban Development / Downtown	Land uses that warrant special consideration. Generally this zone is reserved for properties in the Downtowns	1.5 (15 lux)

¹ Where multiple lighting zones are present on a single lot or development, or if an Environmental Impact Study makes specific recommendations regarding lighting levels, the more restrictive shall apply.

² The Maximum Illuminance Level at Property Line represents worst case scenarios. Lighting designers will be expected to attempt to achieve minimal or no lighting on or beyond property lines in all lighting zones.

APPENDIX 2: DEFINITIONS

Foot Candles: Lumens per square foot.

Illuminance: The amount of light that actually falls on an object. It is the density of light on a particular surface – measured in lux or lumens per square foot (foot candles – fc).

Lamp: A bulb or other light producing source.

Light: Visible wavelength energy that enables you to see.

Light Pollution: The overall impact that the lighting of cities and towns has on the night sky.

Light Trespass: The projection of light from one site onto another.

Lumens: Measurement of the total amount of light emitted by a bulb, known as luminous flux. A 100 watt incandescent bulb will put out roughly 1,800 lumens, while a high pressure sodium street lamp of the same wattage will emit about 8,550 lumens.

Luminaire: The lighting fixture itself. It is a combination of the bulb, socket, reflectors or lenses, ballast, and housing.

Luminance The light that the eye sees – i.e., light that has been reflected by a surface. It is measured in Candelas per square foot or metre.

Lux: The measure of illuminance, expressed in units of Lumens per square metre.

Metal Halide: Produces white light, which the eye sees well for scotopic vision. The yellow light produced by low and high pressure sodium is not seen well by the eye in low light situations.

Pole Height: Height of a light standard, measured from the grade (ground level) to the highest point on the luminaire.

Qualified Lighting Design Professional: A person with the appropriate qualifications to design lighting systems. This may include those with the L.C. (lighting certification) or Professional Engineers registered in Ontario in Electrical Engineering. Others with similar credentials may be considered Qualified Lighting Design Professionals on a case by case review.

Vertical Illuminance: Lighting levels measured on the vertical plane at a height of 1.5m (5ft) above ground level. This is a normalized observer eye height, and represents effects on humans at eye level.