



**TOWNSHIP OF GUELPH/ERAMOSIA**  
**“Outdoor Lighting Policy”**

# Outdoor Lighting Policy

## **PURPOSE AND OBJECTIVES OF OUTDOOR LIGHTING POLICY:**

The Township of Guelph/Eramosa (Township) values its rural countryside character and its natural environment. Both of these are potentially threatened by poorly considered or even inadvertent over-lighting. Objectives of the Outdoor Lighting Policy are as follows:

- Encourage good lighting at the design or development stage to help prevent over-lighting and excessive glare that actually inhibit good vision.
- Reduce glare, excessive lighting and light spill. These nuisances can generate complaints.
- Reduce glare to improve visibility for motorists and neighbours.
- Reduce unwanted light spill on adjacent properties and streets
- Reduce the cost and waste of unnecessary energy consumption.
- Promote voluntary actions by property owners to improve their own lighting installations by encouraging good lighting in the policy.
- Eliminate light trespass from site, improve night sky access and reduce development impact on nocturnal environment.
- Complement the character of the Township by promoting good outdoor lighting

## **WHY NOW?**

For the past 10 years, the Township has been formally reviewing light standards on commercial and industrial developments to reduce light trespass on to neighboring properties and into the night sky. This approach has been completed at a Staff level without a formal policy approved by Council. The Environmental Stewardship Committee believes it is appropriate to formalize the current approach in a policy, and be more pro-active to the general public on the outdoor lighting issue.

The current movement toward formal policy of lighting has two (2) essential roots:

1. The quality of life - an aesthetic concern about the character of the community and the night sky; and,
2. Energy conservation and "sustainability" - the efficient use of resources.

In preparing this discussion paper, we have relied on standards proposed by the IESNA, Illuminating Engineering Society of North America. The IESNA is a recognized technical authority on illumination. Also, the LEED (Leadership in Energy and Environmental Design) recommendations for efficient and environmentally friendly designs were taken into consideration.

## **CHARACTERISTICS OF LIGHTING**

The general problems of poor lighting are glare, over illumination, light escalation, sky glow, and energy waste.

### **Lighting Levels**

Lighting problems arise when neighboring areas are illuminated at different levels. The human eye can adapt to only one light level at a time. An area can be adequately lit at a lower level of light. However, if a bright light is introduced on an adjoining area, the eye adjusts to the brightest light level. The formerly adequately lit area can now look dark and shadowy. That starts an escalation process in which light levels are ratcheted up to ever-higher levels.

It may be contrary to conventional wisdom but brighter is not always better. Scientific evidence is that even light levels result in the greatest visibility. Besides, not all the light emitted from the luminaire is perceived by the human eye, there are scotopic and photopic light levels. Scotopic light levels are the levels perceived by the human eye. Photopic light levels are the levels measured by a light meter. In many applications it can be seen that calculated light levels (Photopic) are high but they still look darker than other sites where calculated light levels (Photopic) are lower but perceived levels (Scotopic) are higher.

Acceptable lighting levels could be assessed on an individual review by the Township Staff. The reviewer could base their acceptance on the recommended levels outlined in the latest edition of the IESNA Lighting Handbook (Reference and Application Manual). All submissions would be required to adhere to the IESNA recommendations and all additional criteria in the municipal policy.

### **Glare**

Glare is excessive brightness that makes it difficult to see or causes discomfort. Glare is caused by light fixtures that do not control the light they emit. Instead of simply lighting the surface that needs to be lit, light spills out and shines into the viewer's eyes. The viewer may not be able to see other objects that are necessary to see. Glare is a factor in nighttime accidents in which a driver cannot adequately see other vehicles, pedestrians, cyclists or even poles or trees.

Glare is a particular problem for older persons due to changes in the eye brought about by aging. Older people are reluctant to drive or walk at night because of reduced visibility. With an aging population, in general, and a high percentage of its residents 50 and over, the Township needs to pay particular attention to glare and poor lighting.

One solution to glare is to use "Full Cut-off" light fixtures that direct light down onto only the surface that needs to be lit. "Full Cut-off" light fixtures avoid "light spill" onto adjoining properties or streets.

## **Colour**

Objects illuminated under different types of lighting appear to be coloured differently. Most people are familiar with the yellow-orange hue of objects lit by sodium vapor lights. Trees, shrubs, lawns, people and nearly all other objects appear differently under certain types of lighting.

Lighting standards are expressed in terms of white light. An incandescent bulb most closely corresponds to daylight. The ability of a lamp to show colour accurately is known as its colour-rendering ability. The industry has a "colour rendering index (CRI)".

The colour of lighting is more than an aesthetic issue, although many are simply dissatisfied with the colour of objects lit at night. Public safety may also be at risk. In a surveillance or criminal situation it may be important to identify vehicles, people's clothing or other objects accurately by their colour. Imagine a report of criminal activity under sodium vapor lighting – *"The suspect was a yellow-orange male of medium height and build with a yellow-orange complexion. He was wearing a yellow-orange jacket and a yellow-orange hat. He fled the scene driving a yellow-orange vehicle."*

## **Security, Crime and Exterior Lighting**

Specialists in the field of security lighting point out that lighting does not, by itself, prevent crime. This is not to say that lighting is not important because it does play a role in both personal security and protecting property. In terms of visibility, that role is facilitating surveillance - allowing potential criminal acts or perpetrators to be seen. Security lighting should be designed to produce good visibility - through even light at an adequate light level. Lighting that is too bright or glaring can create shadows and prevent good visibility by witnesses. As indicated above, the quality of the light, i.e. its "colour rendering index (CRI)" is important.

Regardless of its actual effects on visibility and what the eye can see, an adequate light level is important for a person's sense of security - their psychological well being. It is still possible to have an adequate, and even, level of light that reduces shadows without over lighting.

Security studies show that high lighting levels late at night, when there are no persons to be protected or no potential witnesses to a crime, are not effective. Those studies suggest the property owner would be better advised to invest in other security systems such as motion detectors.

For security reasons, contrary to some popular opinion, the objective should be adequate and even light levels rather than overly bright and inconsistent light levels. It is to this end that a municipal policy would aim to promote.

**Sky glow**

"Sky glow" occurs when exterior light, shining into the sky bounces off clouds or dust particles. The light source may be unshielded fixtures or light that reflects off surface materials such as paving, painted walls or snow. "Skyglow" is also referred to as ambient glow or light pollution.

Some Township residents may be familiar with the skyglow phenomenon above concentrations of development within the Township limits and from the City of Guelph. The effect of "skyglow" is to change the character of a nighttime space from rural or suburban to urban.

While skyglow cannot be eliminated, it can be reduced by the use of "Full Cut-off" fixtures and reducing lighting levels to only the amount of illumination necessary as recommended by the IESNA. Energy is wasted when light is directed where it isn't wanted or when it shines uselessly into the night sky.

**REGULATION AND/OR EDUCATION**

As indicated previously, Township Staff have utilized various approaches to minimize light pollution, where it is possible through Site Plan Approval. Staff believe that any policy adopted by Council should be balanced and not be restrictive or prohibitive to most homeowners. Outdoor lighting is a new field in the Township and needs to be approached in manageable increments. Outdoor lighting is a technical field requiring specialized skills, experience and in some circumstances, equipment.

Staff would suggest that a proposed policy should not apply to individual dwellings on lots on which they are the principal use. This will create an onerous time consuming review and enforcement process and would require a formal lighting plan to be submitted and reviewed with each application for a building or special permit. Homeowners should be spared the cost of retaining a lighting professional to prepare a lighting plan to accompany a building permit application. Staff do however suggest an education program through brochures, website information to allow homeowners to understand the impact of choices they make in lighting design and provide advice to alternatives and where dark sky compliant or friendly products may be purchased.

Township Staff would suggest that a policy confirm the current approaches utilized by Staff, include current engineering standards for development design (eg. Street lighting) and apply to large (multiple) outdoor lighting designs on individual estate and farm properties. It would be proposed to apply policies to new construction or installations, with existing lighting installations to be "grandfathered". However, when an existing outdoor lighting installation is being modified, extended, expanded, or added to, the entire outdoor lighting installation on the lot would be subject to the new policy. This same approach has been used on the commercial and industrial site plan approvals.

It would also be suggested that Council retain an exception provision in the policy since no policy can be written to cover absolutely everything or provide for a special permit where special situations can be shown to exist.

## **SUGGESTED POLICY DEVELOPMENT**

The basic principles of any policy development should be to:

- Enhance public safety and welfare by providing for adequate and appropriate outdoor lighting,
- Provide for lighting that will complement the character of the Township, reduce glare,
- Minimize light trespass, minimize dark sky impact and
- Reduce the cost and waste of unnecessary energy consumption.

As a minimum, Staff would recommend that the proposed policy incorporate the following matters:

- The proposed policy will require a lighting plan as part of every site plan application whenever outdoor lighting is proposed. That will provide the opportunity to review designs while they are still on paper.
- Shielding of luminaires to control glare and light trespass. That control will occur in three ways:
  - Require that any luminaire above a certain threshold of brightness be shielded so that none of its light shines above a horizontal plane.
  - Require that all luminaires, regardless of brightness, be shielded to prevent glare and light spill on adjacent properties.
  - Prohibit upward-shining floodlighting, only permitted for special applications and will require shielding to limit the light to the object being lit.
- The quality and colour of lighting will be improved by provisions that:
  - Eliminate the worst light sources. Examples are: Low-pressure sodium and non colour-corrected mercury vapor lamps. These give the poorest outdoor visibility.
  - Introduce the concept of CRI (colour rendering index) as an objective standard. Lamp technology is changing fast, and acceptable choices with efficiencies, comparable to these older types of poor light, are increasingly available.

	<b>TOWNSHIP OF GUELPH/ERAMOSIA</b>	<b>CORPORATE POLICY MANUAL</b>  <b>Policy No: COR- 108</b> <b>Effective Date: 05/07/2010</b>
<b>SUBJECT</b>	<b>Outdoor Lighting Policy</b>	
<i>Department/Category</i>		
<i>Related Documents</i>	Outdoor Lighting Policy Rationale Document	

## OBJECTIVES

The regulation of outdoor lighting through policy is intended to:

- enhance public safety and welfare by providing for adequate and appropriate outdoor lighting,
- minimize conflict between neighbouring properties caused by excessive lighting,
- provide lighting that will complement the character of the Township, reduce glare,
- minimize light trespass, and
- reduce the cost and waste of unnecessary energy consumption.

## APPLICABILITY, TERMINOLOGY

The requirements of this section shall:

- Apply to outdoor lighting on all roads, lots, blocks and agricultural properties in the municipality
- Apply to residential dwellings on lots on which they are the principal use only in the event of a neighbour's complaint
- Apply when an existing non-residential outdoor lighting installation is being modified, extended, expanded, or added to, the entire outdoor lighting installation on the lot shall be subject to the policy.

The Township has the authority to enforce the policy in the event of complaints. Policing is not recommended for residential applications.

## TERMINOLOGY

The following words, which are technical terms applying to lighting, which are set forth below, shall have the meaning indicated below.

IESNA: Illuminating Engineering Society of North America. The IESNA is the recognized authority on Illumination.

COLOUR RENDERING INDEX (CRI): A measurement of the amount of colour shift that objects undergo when lighted by a light source as compared with the colour of those same objects when seen under a reference light source of comparable colour temperature. CRI values generally range from 0 to 100, where 100 represents incandescent light.

CUTOFF ANGLE: The angle formed by a line drawn from the direction of the direct light rays at the light source with respect to the vertical, beyond which no direct light is emitted.

DIRECT LIGHT: Light emitted from the lamp, off the reflector or reflector diffuser, or through the refractor or diffuser lens, of a luminaire.

LUMINAIRE: The assembly that houses a lamp or lamps, and which may include a housing, a mounting bracket or pole socket, a lamp holder, a ballast, a reflector or mirror, and/or a refractor, lens, or diffuser lens.

FULLY SHIELDED LUMINAIRE: A lamp and fixture assembly designed with a cutoff angle of 90°, so that no direct light is emitted above a horizontal plane.

GLARE: Light emitted from a luminaire with an intensity great enough to produce annoyance, discomfort, or a reduction in a viewer's ability to see.

HEIGHT OF LUMINAIRE: The vertical distance from the finished grade of the ground directly below to the lowest direct light emitting part of the luminaire.

INDIRECT LIGHT: Direct light that has been reflected off other surfaces not part of the luminaire.

LAMP: The component of a luminaire that produces the actual light.

LIGHT TRESPASS: The shining of direct light produced by a luminaire beyond the boundaries of the lot or parcel on which it is located.

LUMEN: A measure of light energy generated by a light source. One foot candle is one lumen per square foot. For purposes of this policy, the lumen output shall be the initial lumen output of a lamp, as rated by the manufacturer.

## **LIGHTING PLAN**

Wherever outside lighting is proposed on site plan applications and plans of subdivision or, where more than five (5) yard/security lights are proposed for driveway or security purposes on any poles/structures greater than ten (10)

metre high on residential or rural properties, shall be accompanied by a lighting plan, and applicable review fee, which shall show:

- the location and type of any outdoor lighting luminaires, including the height of the luminaire;
- the luminaire manufacturer's specification data, including lumen output and photometric data showing cutoff angles;
- the type of lamp such as: LED, metal halide, compact fluorescent, high pressure sodium;
- a photometric plan showing the intensity of illumination at ground level, expressed in foot candles; and
- that light trespass onto any street or abutting lot will not occur. This may be demonstrated by manufacturer's data, cross section drawings, or other means.

### **CONTROL OF GLARE AND LIGHT TRESPASS**

Any luminaire with a lamp or lamps rated at a total of more than 1,000 lumens shall be of fully shielded design and shall not emit any direct light above a horizontal plane passing through the lowest part of the light emitting luminaire.

Any luminaire with a lamp or lamps rated at a total of more than 3,500 lumens shall be 'Full Cutoff' as per IESNA classifications and shall not emit any light towards the sky to eliminate night sky and energy waste.

All luminaires, regardless of lumen rating, shall be equipped with whatever additional shielding, lenses, or cutoff devices are required to eliminate light trespass onto any street or abutting lot or parcel and to eliminate glare perceptible to persons on any street or abutting lot or parcel.

Paragraph 1, above, shall not apply to any luminaire intended solely to illuminate any freestanding sign or the walls of any building but such luminaire shall be shielded so that its direct light is confined to the surface of such sign or building.

### **LAMPS**

Lamp types shall be selected for optimum colour rendering as measured by its colour rendering index (CRI), as listed by the lamp manufacturer. Lamps with a low colour rendering index are not permitted. This paragraph shall not apply to temporary decorative lighting which may include coloured lamps, such as holiday lighting, used only during the specific holiday time and not to be used as permanent lighting.

**LED application:**

## Advantages:

- Produce more light per watt than an incandescent light (useful in battery equipments and energy efficiency applications)
- Emits light of an intended colour without colour filters
- Comes in solid packages that are hard to be damaged and light can be focused without external shields (minimizes light pollution)
- Have long expected life, estimated at 60,000 hours
- Do not contain mercury

## Disadvantages:

- Expensive when measuring initial price per lumen
- Performance depends on ambient temperature of the environment. High temperature result in overheating the LED package and lead to a whole system burnout.
- Not suitable for application higher than 6.1 meters (20')

LED lighting could achieve significant reduction in energy usage, cost of maintenance and lighting pollution but it is presently not applicable to high mounting heights (i.e. street lighting, parking lot lighting, etc.).

**BALLAST**

Ballast types shall be selected for minimum current requirements while stabilizing the lamp's wattage. High power factor (HPF) ballasts draw half the current drawn by other ballast with low or normal power factor and they require smaller conductors, switches and breakers because of the lower power requirement.

**GRANDFATHERING PROGRAM**

All residential and agricultural projects that are under the construction or design phase, as of the date of the approval of this policy, do not have to comply with the new policy/standards unless there is a complaint registered (all complaints will be handled on an individual basis with the lighting designs as set out by this policy to be used as the standard if the conflict is not resolved by other means). After the mentioned time period all designers, contractors and developers have to abide by the standards in all projects.

Approved by Council: July 5, 2010