PW-2013-046

To: Mayor and Members of Council

From: Public Works Department

Meeting: 2013-11-26

Subject: new LED Outdoor Lighting Standard

RECOMMENDATIONS

That Report PW-2013-046 regarding new LED Outdoor Lighting Standard, be received; and,

That the Outdoor Lighting Standard for new residential subdivisions and commercial and industrial sites attached to Staff Report as Schedule "A" PW-2013-046 be adopted.

EXECUTIVE SUMMARY

With continuous improvements to light emitting diode (LED) technology, more and more municipalities are requiring LED lights within new subdivisions, parks, and commercial and industrial settings. This Report presents a new Outdoor Lighting Standard that reflects these technological advancements while delivering financial savings to the Town and maintaining our environmental leadership record.

DISCUSSION

Purpose (background)

In July 2013, Council Resolution 2013-049 was passed that "directed staff to jointly undertake and report back on implementing LED street lighting for, but not limited to, all new subdivisions, annual street lighting retrofit programs and road reconstruction projects requiring new street lighting units that currently fall under the Town's ownership".

This Resolution builds on various ongoing Town LED lighting initiatives. In 2009, the Town participated in the GTA LightSavers LED and Adaptive Lighting pilot which tested three LED lighting technologies within the Town Hall parking lot. This led to the installation of LED lights at the Town Hall and Caledon Community Complex parking lots. Civic Properties are currently installing LED lights at the 6211 Old Church Road site's parking lot.

Within Engineering Services, staff has relied on LED lighting for pedestrian lighting on Columbia Way. Staff is also incorporating LED within the Caledon East road reconstruction projects at Mountcrest Road, Valleygreen Cresent and Valewood Drive.

Beyond the LED parking lot installation, Civic Properties has also initiated additional LED projects. Almost all Fire Halls have been equipped with new LED wall packs and staff is initiating a new LED lighting pilot within the Caledon East Fire Hall. As part of the Mayfield Recreation Complex and Albion Community Centre arena lighting upgrade project, staff will be installing LED wall packs. All compact fluorescent lights and incandescent bulbs are being replaced with LED in Civic Properties. Parks and Landscape Architect staff rely on a fairly recent LED lighting standard for new parks and pathway lighting. Lastly, while this new LED Outdoor Standard was in development, Development Approval and Planning Policy staff have required LED lighting in the Mayfield West development on the west side of Kennedy Rd.

Staff Working Group

During late summer, a staff working group was created to address the July 9, 2013 Council Resolution. This group has representation from Development and Approval Planning Policy (Energy and Environment and Development Sections); Public Works; and Parks and Recreation's Parks Manager. Due to the Town's immediate subdivision developments in the Mayfield West area, the Working Group's primary emphasis was a new Development Standard which is attached as Schedule A of this Report. Town staff retained Runge and Associates to assist with this work.

Outdoor Lighting Standard

Objectives and Guiding Principles

The attached Outdoor Lighting Standard (Schedule A) has four main objectives: 1) enhance public safety and welfare by providing for adequate and appropriate outdoor lighting; 2) providing for lighting that will complement the character of the Town; 3) minimize light trespass and 4) reduce the cost and waste of unnecessary energy consumption by using LED technologies. The Town has chosen to require LED lights since they have proven energy and maintenance cost savings. They can also reduce capital costs associated with maintaining a large inventory of replacement parts.

This Standard only applies to street light design and installation for new residential subdivisions and commercial and industrial applications. It does not address traffic control lights; residential dwellings on lots on which they are the principal use; or Town owned park or trail lighting.

The Standard is in accordance with the Illumination Engineering Society of North America's (IESNA) latest edition of RP-8 (American National Standard Practice for Roadway Lighting). IESNA is the recognized technical authority on illumination standards for lighting and as such, they develop lighting level standards and evaluation methods for lighting to be implemented by municipalities. The lighting standards developed by IESNA are determined through consensus with representatives throughout the lighting industry using scientific methodology that looks at safe lighting levels for

driving and vision. Most municipalities in North America use the IESNA recommended lighting standards.

Consideration of light pollution and the importance of night sky have been taken into account when developing the Standard. The International Dark Sky Association and IESNA have partnered to ensure night sky issues are accounted for within IESNA guidelines. Safety and security issues underscore the Standard since IESNA guidelines are referenced in the International Crime Prevention through Environmental Design Association (CPTED).

Environmentally and in addition to the projected energy savings, the Standard requires LED's and applicable parts to be environmentally friendly, 100% recyclable and RoHS (Restriction of Hazardous Substance Directive) compliant.

Residential Subdivisions

The Standard requires a streetlighting plan submission that is designed and stamped by a qualified Engineer in accordance with the Town's Standard and approved by the Town reviewer. The Standard also specifies three pre-approved LED manufacturers and luminaries based on the City of Hamilton's prequalification process. Submission specifications related to the LED light and photocell are described in detail in Schedule A. Warranty includes 10 years for the luminaire and 20 years for the photocells. The Town will require a certified letter from the manufacturer unconditionally warrantying the luminaires and photocells for these respective time periods.

Commercial and Industrial Applications

Outdoor lighting plans for commercial and industrial buildings or subdivisions are also addressed in this Standard. The illumination levels and uniformity will be based on the exterior application and must conform to the IESNA guidelines as per IESNA G-1-03 "Guideline for Security Lighting for People, Property, and Public Spaces."

Street lighting Retrofit Programs

The Town spends approximately $500k in electricity costs for streetlights annually and approximately $75,000 on annual maintenance. This represents 33.26% of the Town's annual energy costs. With rising energy costs, these prices may only increase. Fortunately, the Town has an opportunity to explore LED streetlighting retrofit programs which many municipalities have completed. These include the City of Welland, City of Mississauga, City of North Bay, Town of Ingersoll and many others.

According to Local Authority Services (a subsidiary company that is wholly owned by the Association of Ontario Municipalities) LED streetlights have numerous advantages over high pressure sodium lights that include the following:

- much lower power consumption ranging from 40-70% energy savings;
- long, predictable lifetime, LED lights do not burn out and generally last much longer than traditional lights, up to 100,000 hours;
- ability to be dimmed when less street lighting is needed;
- more accurate colour rendering;
- quick turn on and off;
- environmentally positive since they do not contain mercury or lead;
- higher light output;
- less wasted light since light from LED's is very directional; and,
- enhanced safety via longer life and fact they will never leave an area in complete darkness as well as enhanced colour rendering which makes areas appear better lit.

Town staff will be exploring various LED streetlight conversion implementation options in the coming months. One option is the LED Streetlight Upgrade Turn-Key Service offered by Local Authority Services. Initially however, staff need to finish the street lighting inventory which is partially complete. Depending on the approach, next steps may also include a process to prequalify LED streetlight manufacturers for consistency and simplicity. This would then entail a RFP for supply and installation of luminaires.

Road Reconstruction Projects

As mentioned, Public Works has already incorporated LED technology into road reconstruction projects such as Caledon East. Town staff will review existing standards/protocols for road reconstruction projects to further incorporate LED.

Financial Implications

There are no immediate financial implications for the Town as the new standard applies to new residential subdivisions and commercial and industrial sites which is generally the responsibility of the developer.

Once the Town of Caledon assumes the infrastructure, the Town will benefit from lower overall operating costs for energy and maintenance over the remaining life of the LED lights and will have to plan to fund for the future replacements.

Applicable Legislation and Requirements

Not applicable.

COMMUNITY BASED STRATEGIC PLAN

Strategic Objective Goal 1: Partner with land owners and community to preserve, protect and enhance our environment and agricultural resources and natural capital.

NEXT STEPS

- Finish streetlighting inventory
- Explore LED streetlighting conversion options and implementation approach
- Review and upgrade existing standards/protocols for road reconstruction projects

ATTACHMENTS

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Approver (L1): Sara Peckford

Approver (L2): Ian Neville

Approver (L3): Carey deGorter

Approver (L4): Douglas Barnes

Approver (L5):

Outdoor Lighting Standard

Town of Caledon

Prepared for:

TOWN OF CALEDON

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1.0 GENERAL

1.1 Objectives

The regulation of outdoor lighting through this standard is intended to do the following:

- Enhance public safety and welfare by providing for adequate and appropriate outdoor lighting.
- Provide for lighting that will complement the character of the town and reduce glare.
- Minimize light trespass.
- Reduce the cost and waste of unnecessary energy consumption by using LED technology. The following are advantages to using LED technology:
    1. LED lighting technology reduces the power consumption by at least 50%.
    2. Due to the greatly improved optics associated with each LED in the luminaire, average illuminance and average to minimum uniformity ratios can be maintained with the use of fewer poles spaced farther apart, thus further reducing the energy consumed.
    3. Maintenance is reduced significantly as well when comparing the life of a LED luminaire driver and lamp and a Metal Halide luminaire and ballast. Metal Halide requires replacement of lamps and ballast on the average of five years, while LED luminaires have a minimum expected life of at least twenty years (based on be energized twelve hours per day).
    4. There is no longer a requirement to stock matching ballasts and lamps for replacement, thus reducing the capital cost of maintaining a large inventory of replacement parts.

1.2 Applicability, Terminology

The requirements of this document shall apply to street lighting and outdoor lighting on lots and parcels in the municipality, but shall not apply to the following:

- Residential dwellings on private property lots on which they are the principal use.
- Traffic control lights.

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 this standard.

1.3 Terminology

The following words, which are technical terms applying to lighting and 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.
- COLOR RENDERING INDEX (CRI): A measurement of the amount of color shift that objects undergo when lighted by a light source as compared with the color of those same objects when seen under a reference light source of comparable color 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 (NIGHT SKY FRIENDLY): A lamp and fixture assembly designed with a cutoff angle of 90º 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.
- 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 footcandle is one lumen per square foot. For purposes of this by-law, the lumen output shall be the initial lumen output of a lamp, as rated by the manufacturer.

1.4 Control of Glare and Light Trespass

All luminaires 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.

All luminaires, regardless of lumen rating, shall be equipped with whatever additional shielding, lenses, or cutoff devices are required to minimize 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.

2.0 STREET LIGHTING DESIGN

The street lighting system shall be designed and stamped by a qualified engineer in accordance with the Illumination Engineering Society of North America (IESNA) latest edition of RP-8 (American National Standard Practice for Roadway Lighting) and approved by the Town reviewer.

The objective in designing street lighting is to provide a uniform distribution of lighting at a level that is adequate for the intended use of the roadway. The illuminance method of calculation is acceptable.

2.1 Street Lighting Plan

All submissions of lighting plans shall show the following:

- The location and type of street lighting luminaires, including the height of the luminaire.
- The luminaire manufacturer's specification data, including lumen output and photometric data showing cutoff angles.
- A photometric plan showing the intensity of illumination at ground level, expressed in lux and footcandles.
- Illumination levels shall not exceed the recommended lighting levels and uniformity as recommended by the IESNA.
- Provide a clear summary of the following in LUX and footcandles:
  1. Average
  2. Maximum
  3. Minimum
  4. Average / Minimum Uniformity Ratio

2.2 Cobrahead-style Luminaires

The following manufacturers and luminaires have been pre-approved:

1. Philips Lumec - Roadview Series
2. General Electric - ERS Series
3. Cooper Lighting - Navion Series

Provide an unconditional manufacturer's certified letter unconditionally warrantying luminaire for a minimum of ten (10) years.

All luminaire drivers to have 0-10v dimming.

Submission of alternate luminaires is to include the following additional information:

1. Specifications clearly indicating all requirements of the LED Luminaire Assembly Specifications section in this document have been met or exceeded.
2. Alternate luminaires must be on the "Qualified Products List with the DesignLights Consortium" (www.designlights.org).

2.3 Decorative-style Luminaires

Decorative-style luminaires will be a lantern style similar to the style in Pic-1 below.

Pic-1

Luminaire assembly must meet the minimum LED Luminaire Assembly Specification requirements.

Luminaires must be on the “Qualified Products List with the DesignLights Consortium” (www.designlights.org).

2.4 Photocells

Photocells shall be TRS Series model TRS-1 manufactured by Sunrise Technologies Inc.

Provide an unconditional manufacturer’s certified letter unconditionally warrantying photocell for a minimum of twenty (20) years.

Alternate manufacturers for photocells will be considered if they meet the minimum photocell specifications.

2.5 Poles

The following spun concrete pole manufacturers have been pre-approved:

1. Stresscrete
2. USI (Utility Structures Inc.)
3. Dynapole
4. Skycast

Concrete poles to meet the following minimum specifications:

1. Spun concrete
2. Octagonal
3. Polished midnight lace
4. Direct burial
5. Post top luminaires (light duty)
6. Arm bracket with luminaire (medium duty)

Alternate spun concrete pole manufacturers will be considered if they meet the minimum specifications above.

2.6 LED Luminaire Assembly Specifications

- Driver:
    1. The LED driver shall be securely mounted inside the fitter, for optimized performance and longevity.
    2. The LED driver shall be supplied with a quick-disconnect electrical connector on the power supply, providing easy power connections and fixture installation.
    3. The driver shall be UL Listed or recognized, have a power factor not less than 90%, and a THD no greater than 20% at full load.
    4. The driver shall have overload as well as short circuit protection.
    5. The driver current shall be constant current design.
    6. The driver shall be a DC voltage output.
    7. The driver shall have 0-10v dimming.
    8. The driver shall have a minimum efficiency of 90%.

- Light Sources:
  1. The luminaire shall use high output, high brightness LEDs.
  2. The LEDs shall be attached to the printed circuit board with not less than 90% pure silver to insure optimal electrical and thermal conductivity.
  3. The LEDs and printed circuit boards shall be protected from moisture and corrosion by a conformal coating of 1 to 3 mm.
  4. The LEDs and printed circuit board construction shall be environmentally friendly and 100% recyclable. They shall not contain lead, mercury or any other hazardous substances and shall be RoHS (Restriction of Hazardous Substance Directive) compliant.
  5. The LED life rating data shall be determined in accordance with IESNA LM-80-08. Testing must be done with a complete assembled luminaire.
- Optics:
  1. The luminaire shall be provided with individual acrylic, refractor type optics applied to each LED.
  2. The luminaire shall provide light distribution per IESNA classifications. Testing shall be done in accordance with IESNA LM-79-08.
- Performance:
  1. The LED arrays are built in series-parallel circuits, which maintain overall light output in the event of single LED failures.
  2. The LED and LED driver shall operate over -40°C to +50°C ambient air temperature range.
  3. Outdoor pole and wall pack lighting must have high performance white LEDs and have a minimum 100,000 hour L70 value rated at 25°C.
  4. The high brightness, high output LEDs shall be a maximum 4000K (+/- 300K) colour temperature.
  5. Colour Rendering Index minimum 70 CRI (+/- 5%).
  6. The luminaire fixture output distribution shall be as per photometric layout.
- Warranty:
  1. Luminaires and drivers shall be free from all defects in materials and workmanship for a minimum period of ten (10) years from the date of manufacture.
  2. Provide an unconditional manufacturer’s certified letter warrantying luminaire for a minimum of ten (10) years.
  3. The luminaire manufacturer shall warrant the LED boards/system, during the stated warranty period, against failure defined as more than three (3) simultaneous non-operating LEDs.
- Shop Drawings:

  All shop drawings must be submitted with the following tests:
  1. IESNA LM-79-08 Photometric measurements
  2. IESNA LM-80-08.
  3. Test must be done for the complete assembled luminaire.
- Alternates / Equals:
  1. Luminaire assembly (driver and LED) must meet or exceed all these specifications.
  2. Provide a manufacturer’s letter of unconditional ten (10)-year warranty on the luminaire assembly and driver.

2.7 Photocell Specifications

Twist lock, plug-in type to provide automatic on/off switching of outdoor lighting.

Photo-electric control switch shall be weather tight, completely self-contained, not affected by moisture, vibration or temperature changes and with die cast housing.

On-off adjustment shall be made by moving a light level selector to any desired light level in a range from 2 fc to 50 fc, and the control cannot fail to operate with the selector in either of its extreme positions.

Minimum twenty (20)-year unconditional manufacturer's warranty.

2.8 Spare Conduits for Future Lighting Control

Provide a minimum of one (1) spare 53mm rigid PVC conduit in addition to lighting power distribution conduits for future lighting controls.

3.0 COMMERCIAL / INDUSTRIAL OUTDOOR LIGHTING INSTALLATIONS

All submissions of outdoor lighting plans shall show the following:

- 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.
- A photometric plan showing the intensity of illumination at ground level, expressed in footcandles and Lux.
- Lighting trespass on adjacent residential properties shall be zero footcandles. Light trespass onto any street will not occur.
- Illumination levels shall not exceed the recommended lighting levels and uniformity as recommended by the IESNA.
- Clearly indicate on site plan approval submission reference to IESNA standard that applies to the type of outdoor lighting installation.
- Provide a clear summary of the following in LUX and footcandles:
  a. Average
  b. Maximum
  c. Minimum
  d. Average / Minimum Uniformity Ratio

3.1 Hours of Operation

Outdoor lighting shall not be illuminated between 11:00 p.m. and 6:00 a.m., with the following exceptions:

- If the site is being used during these hours, such as at a business open to customers, or where employees are working, or where an institution or place of public assembly is conducting an activity, normal illumination shall be allowed during the activity, but for not more than one-half hour after the activity ceases.

- Low-level security lighting sufficient for the security of persons or property on the lot may be in operation between 11:00 p.m. and 6:00 am. The illumination levels and uniformity will be based on the exterior application and conform to the IESNA guidelines as per IESNA G-1-03 “Guideline for Security Lighting for People, Property, and Public Spaces.”

3.2 Special Permits

Council may grant a special permit modifying the requirements of this standard, provided it determines that such modification is consistent with the objectives set forth in the standard and in the following cases:

- Where an applicant can demonstrate that, by means of a history of vandalism or other objective means, an extraordinary need for security exists.
- Where an applicant can show that conditions hazardous to the public, such as steep embankments or stairs, may exist in traveled ways or areas.
- Where a minor change is proposed to an existing non-conforming lighting installation, such that it would be unreasonable to require replacement of the entire installation.
- Where it can be demonstrated that for reasons of the geometry of a lot, building or structure, that complete shielding of direct light is technically infeasible.

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