Right-of-Way Lighting Policy

Updated September 9, 2016

List of Tables

List of Figures

CHAPTER 1 INTRODUCTION

1.1 GENERAL

The Right-of-Way Lighting Policy hence forth referred to as the ROW Lighting Policy is an effort to standardize the design and application of roadway and sidewalk lighting within the City of Ottawa boundaries. The ROW Lighting Policy identifies lighting related issues to be addressed in construction and reconstruction projects and future planning discussions with the public, developers, stakeholders, and City officials.

The ROW Lighting Policy was developed using recognized national and international practices for roadway and sidewalk lighting, including the American National Standard Institute / Illuminating Engineering Society of North America (ANSI / IESNA) *RP-8-14 Roadway Lighting*[1] and Transportation Association of Canada (TAC) *Guide for the Design of Roadway Lighting*[2] as benchmarks. Building upon these benchmarks, the Policy adopted specific standards and modified others in order to develop a more cost-effective and environmentally conscious strategy for lighting rights-of-way. The Policy was also developed in context of the *City of Ottawa Official Plan*[3] in terms of roadway and land use area classifications. This document incorporates selected components of the *City of Ottawa Right of -Way Lighting Policy*, approved on February 14, 2008. The 2008 policy is now superseded by this updated lighting policy.

This Policy adopts an approach for ROW lighting where all areas of the city are placed into one of two categories; “Special Areas” and “All Other Areas”. “Special Areas” of the city includes land use areas as identified in the *City of Ottawa Official Plan*3 *Schedules A and B* (e.g. Mixed-Use Centres, Traditional Main streets and Central Areas) and also as identified in this Policy (e.g. Community Design Plan (CDP) Core Areas and Rural Area Village *main streets*). “All Other Areas” applies to parts of the city outside of the designated “Special Areas”. The “Special Areas” will receive decorative style lighting equipment to highlight the distinctiveness of the area. “All Other Areas” will receive standard lighting equipment.

The ROW Lighting Policy includes information on the purpose and impacts of street lighting, minimum recommended lighting levels, acceptable styles of lighting poles and luminaires, priority and associated aspects of street lighting such as designing with reducing light pollution in mind, and the use of banners and flower baskets on street light poles.

This Policy will be reviewed as needed and updated appropriately to incorporate changes in lighting technologies, lighting hardware, and economics.

1.2 INTENT

The ROW Lighting Policy is to be used by the public, lighting designers, developers, and City officials in recognizing lighting-related issues to be addressed in undertaking right-of-way lighting projects. The fundamental goal of the Policy is to provide a uniform structure for the ongoing provision of right-of-way lighting across the city carried out by the City, developers, and other stakeholders. The Policy strives to achieve the following over time:

i. Reduce overall lighting equipment inventory to achieve savings on maintenance and lifecycle replacement;

ii. Provide a more uniform lighting approach throughout the City of Ottawa;

iii. Provide pole and luminaire options that are high quality, cost efficient, and maintainable;

iv. Reduce operational and maintenance budgets for right-of-way lighting;

v. Improve maintenance response time for right-of-way lighting;

vi. Improve urban design with uniform right-of-way lighting installation;

vii. Reduce light pollution by lowering lighting levels, requiring use of full cut-off luminaires in specified urban areas, and by reducing marker lighting levels in the rural area;

viii. Reduce energy consumption by using energy efficient luminaires; and

ix. Establish guidelines for assessing the need and prioritization of new right-of-way lighting.

The ROW Lighting Policy applies to roadways and sidewalks within public rights-of-way under the jurisdiction of the City. It does not apply to private properties, parks, open spaces, and pathways. It also does not apply to federal and provincial roadways. Right-of-way lighting on these roadways will be undertaken by the respective roadway authority on a project-by-project basis in cooperation with the City of Ottawa, as may be required. Transitway lighting is undertaken by the City in accordance with the *Transitway Design Manual (October 1993)*, as amended from time to time.

Although the Policy addresses several lighting design situations, there may be instances where a lighting design issue is not covered. Where special circumstances in lighting design arise that are not addressed in this policy, the Manager of the Public Works Department's Traffic Services Branch, in consultation with the Planning and Growth Management Department's Policy Development and Urban Design Branch, has authority to vary from the requirements of this policy as may be required.

1.3 PURPOSE OF LIGHTING

The main purpose of right-of-way lighting is to achieve a level of visibility that assists the motorists, cyclists and pedestrians to perceive distinctly, and with certainty, roadway details such as raised curbs, horizontal bends and obstacles in the roadway.

Right-of-way lighting is an operative tool that provides both economic and social benefits to the public including:

i. Reducing night-time accidents;

ii. Facilitating traffic flow;

iii. Promoting commercial activity downtown, in Community Design Plan (CDP) Core Areas, Mixed Use Centres, and Village main streets by the general public;

iv. Encouraging night time use of public & private facilities, such as libraries, community centres, entertainment facilities, and commercial areas; and

v. Assisting in crime prevention and police enforcement.

The quality and safety of public rights-of-way is greatly influenced by the application of proper street lighting, and while very beneficial when used appropriately, right-of-way lighting may have negative impacts when not implemented correctly such as:

i. Increased night-time sky glow;

ii. Light trespass onto adjacent properties;

iii. Glare; and

iv. Increased energy consumption resulting in increased energy costs and greenhouse gas emissions.

With careful planning and proper use of lighting poles and luminaires, the design of the right-of-way lighting can provide a comfortable night-time environment for motorists, cyclists, and pedestrians alike using the City's rights-of-way.

CHAPTER 2 LIGHTING LEVELS AND DESIGN REQUIREMENTS

2.1 LIGHTING DESIGN CALCULATIONS

Lighting design calculations shall be carried out as described in *Annex A Calculation and Measurement Parameters* and *Annex B Design Guides and Example* of the ANSI / IESNA RP-8-14 *Roadway Lighting*. When performing lighting calculations, the travelled pavement width on which the calculation is being undertaken, shall include from face of curb to face of curb (or from the painted line / edge of asphalt to the painted line / edge of asphalt where no curb is present). Similarly for sidewalks, the lighting calculations shall be carried out to include the sidewalk from the edge of concrete to edge of the concrete of the sidewalk.

Based on the performance of LEDs at the time this policy was updated, a luminaire lifecycle of a minimum of 70,000 hours was selected for the basis of light calculations. As LED technology and light output evolves rapidly, the light loss factor for all LED roadway and sidewalk lighting calculations shall be based on the manufacturer's recommended light loss factor at 70,000 hours less an additional 10% for environmental effects. Please contact the Public Works Department's Street Lighting Asset Management Section for the latest documents on approved street lighting equipment and design specifications for complete details. Colour options for special streets include: Natural/ Light Grey (pantone 441), Black (pantone 419), Medium Grey (Pantone 430), Bronze/ Dark Brown (Pantone 412) and Dark Green (Pantone 553). Colours options for special areas are to be coordinated at the time of relighting and be matched by manufacturers.

Starting in 2014, the City of Ottawa will be deploying a street lighting monitoring and dimming system to monitor energy consumption, light operation, and control light output of all LED luminaires. For this purpose, all new LED luminaires must be equipped with a new ANSI C136.41 compliant 7–pin dimming receptacle and driver combination compatible with the City's approved wireless monitoring and dimming system node.

In performing lighting computations, the designer should always attempt to minimize the amount of 'over lighting', inherent in some lighting designs by manipulating one or more lighting parameters including luminaire mounting height, pole spacing, or luminaire lumen output.

The minimum lighting average must be achieved while satisfying the lighting uniformity and glare requirements outlined in Table 2.1 *Recommended Average Roadway Lighting Levels.* The lighting designer must, through the use of dimming, optimize light output to maximize energy savings while meeting all requirements of this policy. All dimming values and associated details must be supplied by the designer to the Public Works Department's Street Lighting Asset Management Section for commissioning and programming into the street lighting monitoring and dimming system.

2.2 RECOMMENDED AVERAGE ROADWAY LIGHTING LEVELS

There are two distinct areas for rights-of-way lighting within the City of Ottawa; "Special Areas" and "All Other Areas". For both areas the recommended average roadway lighting levels are the same (for similar road classifications) as shown in Table 2.1 *Recommended Average Roadway Lighting Levels.* The Table also shows the minimum average Luminance levels, minimum average maintained illuminance levels, the maximum uniformity ratios and the maximum glare ratio by roadway and area classification.

2.2.1 Illuminance Criteria

The illuminance method will complement the luminance lighting criteria for designing roadway lighting of all tangent sections of roadway. Illuminance will be used as a secondary lighting design tool for field measurements and verification of the lighting design. It will only be used on its own to design roadway lighting for curvilinear road sections, sidewalks / walkways, and intersections.

2.2.2 Luminance Criteria

The luminance method will now be utilized to design roadway lighting for all tangent sections of roadway throughout the city of Ottawa. Right-of-way lighting designs will not be required to satisfy both luminance and illuminance criteria. Luminance will only be complemented by the illuminance for field verification of lighting designs with the luminance criteria taking precedence except as mentioned in **Section 2.2.1 *Illuminance Criteria***. Refer to Appendix F *Luminance Versus Illuminance* for a sample calculation illustrating the impacts of attempting to utilize both criteria for roadway lighting designs.

2.2.3 Small Target Visibility (STV) Criteria

At the time of updating the Policy, the Roadway Lighting Committee of IESNA had yet to decide on the reliability of the STV method for lighting design. Although all of the Committee members concur that a contrast metric was desirable for lighting design, this method is still undergoing evaluation. STV might be a valuable tool when comparing the results of designs of approximately the same luminance and illuminance performance. The STV criteria and any new lighting criteria should be investigated further at the time of any future update to the ROW Lighting Policy.

Table 2.1 Recommended Average Roadway Lighting Levels

ROADWAY CLASSIFICATION		AREA CLASSIFICATION †	LUMINANCE		GLARE	ILLUMINANCE	
			Average Luminance L_{avg} (Cd/m^2)	Uniformity Ratio L_{avg} / L_{min}	Veiling Luminance Ratio L_{Vmax} / L_{avg}	Minimum Maintained Average E_{avg} (Lux)	Uniformity Ratio E_{avg} / E_{min}
URBAN AREA	ARTERIAL	Mixed Use Centre / Central Area	1.20	3.0	0.3	17.0	3.0
		Employment / Enterprise Area	0.90	3.0	0.3	13.0	3.0
		General Urban Area / Other	0.60	3.5	0.4	9.0	4.0
	MAJOR COLLECTOR & COLLECTOR	Mixed Use Centre	0.80	3.0	0.3	12.0	3.0
		Employment / Enterprise Area	0.60	4.0	0.4	9.0	4.0
		General Urban Area / Other	0.40	4.0	0.4	6.0	4.0
	LOCAL	Mixed Use Centre / Central Area	0.60	6.0	0.4	9.0	6.0
		Employment / Enterprise Area	0.50	6.0	0.4	7.0	6.0
		General Urban Area / Other	0.30	6.0	0.4	4.0	6.0
RURAL AREA	ARTERIAL	Village *Main street*	0.80	3.0	0.3	12.0	3.0
		All Other Roadways	Marker Lighting Only				
	COLLECTOR	Village *Main street*	0.60	4.0	0.4	9.0	4.0
		All Other Roadways	Marker Lighting Only				
	LOCAL *	Village *Main street*	0.40	6.0	0.4	6.0	4.0
		All Other Roadways	Marker Lighting Only				

† Area Classification as defined by the City of Ottawa Official Plan Schedules A & B and the ROW Lighting Policy.

* Includes Estate and Village Residential roadways.

2.3 INTERSECTIONS

2.3.1 Intersections of Public Rights-of-Way

Urban area intersections will be fully lit if one of the intersecting roadways has full continuous lighting. Urban and rural area intersections will be fully lit in accordance with Table 2.2 *Recommended Average Lighting Levels for Intersections* if they have traffic signals. This is to promote visibility and safety at night for the intersection as it is a location where pedestrians, cyclists, and motorists all meet and negotiate for right-of-passage with each other at the controlled intersection. For urban intersections, the intersection lighting shall be the sum of the intersecting roadway lighting levels as per Table 2.2. For rural intersections with traffic signals only, the intersection lighting shall also be as per Table 2.2 regardless of whether or not the approaches are illuminated. If the approaches to the rural intersection are not illuminated, the intersection lighting shall be transitioned as described in **Section 2.10 Transition Illumination**.

Based on Table 2.1 *Recommended Average Roadway Lighting Levels,* the Road and Area Classes intersect to form fifteen types of intersections. The recommended lighting levels for each of these intersections are shown in Table 2.2 *Recommended Average Lighting Levels for Intersections* that sets out the sum of the lighting values of the two intersecting roadways. To determine the class of the roadway, refer to Schedules "E" to "H" of the City of Ottawa Official Plan3. In cases where the sum cannot be achieved (i.e. lower than the recommended levels in Table 2.2) due to the geometric design or other physical limitations of the intersection, such as the location of Hydro utilities, then the intersection levels, as a minimum, shall be 50% greater than the highest lighting level of the intersecting roads. Table 2.2 will always take precedence for intersection lighting and not until all other alternatives have been exhausted will the 50% exception to Table 2.2 apply. For intersections with only one of the intersecting roads having full continuous lighting, the intersection light levels shall be 50% greater than the levels of the fully lit approaching roadway. The non-illuminated intersecting roadway shall have transition lighting as described in **Section 2.10 Transition Illumination**.

Where the design lighting levels of the intersecting roads exceed the criteria in Table 2.1 *Recommended Average Roadway Lighting Levels,* the design levels shall then be used to determine the intersection requirements. This is to maintain visibility and safety of everyone using the intersection by 'highlighting' the area with increased lighting levels compared to the levels on the approaching roadway of the intersection.

2.3.2 Intersections of Public Rights-of-Way with Transitways

Lighting of intersections of Transitways with public road rights-of-way will be the sum of the Transitway lighting level as recommended by the *Transitway Design Manual (October 1993)* and the public roadway lighting level as set out in Table 2.1 *Recommended Average Roadway Lighting Levels.* In cases where the sum cannot be achieved due to the geometric design or other physical limitations of the intersection, such as the location of Hydro utilities, then the intersection levels, as a minimum, shall be 50% greater than the highest lighting level of the intersecting public roadway or Transitway.

Table 2.2 Recommended Average Lighting Levels for Intersections

INTERSECTING ROADWAY CLASSIFICATION 3	MINIMUM MAINTAINED AVERAGE (Lux) BY AREA CLASSIFICATION / UNIFORMITY RATIO E_{avg} / E_{min}		
	Mixed Use Centre / Central Area	Employment / Enterprise Area	General Urban Area / Other & Rural Signalized Intersections
ARTERIAL & ARTERIAL	34.0 / (3.0)	26.0 / (3.0)	18.0 / (4.0)
ARTERIAL & MAJOR COLLECTOR/ COLLECTOR	29.0 / (3.0)	22.0 / (4.0)	15.0 / (4.0)
ARTERIAL & LOCAL	26.0 / (6.0)	20.0 / (6.0)	13.0 / (6.0)
ARTERIAL & TRANSITWAY	37.0 / (3.0)	33.0 / (3.0)	29.0 / (4.0)
MAJOR COLLECTOR/COLLECTOR & MAJOR COLLECTOR/COLLECTOR	24.0 / (3.0)	18.0 / (4.0)	12.0 / (4.0)
MAJOR COLLECTOR/COLLECTOR & LOCAL	21.0 / (6.0)	16.0 / (6.0)	10.0 / (6.0)
MAJOR COLLECTOR/COLLECTOR & TRANSITWAY	32.0 / (3.0)	29.0 / (4.0)	26.0 / (4.0)
LOCAL & LOCAL	18.0 / (6.0)	14.0 / (6.0)	8.0 / (6.0)
LOCAL & TRANSITWAY	29.0 / (6.0)	27.0 / (6.0)	24.0 / (6.0)

2.4 SIDEWALKS

A sidewalk is a dedicated pedestrian facility located within a public road right-of-way. The minimum illumination levels for sidewalks shall be as indicated in Table 2.3 *Recommended Average Lighting Levels for Sidewalks* and is applicable to both "Special Areas" and "All Other Areas". For the purpose of achieving the recommended average lighting levels shown in Table 2.3 *Recommended Average Lighting Levels for Sidewalks*, sidewalks are assumed to be located adjacent to or within 2.5 m from the light pole. The roadway lighting levels will take precedence over sidewalk lighting levels for sidewalks located more than 2.5 m away from the light pole; therefore, roadways will not be over lit in order to achieve average lighting levels in Table 2.3 for sidewalks in distant locations or on the side of the road opposite a single sided lighting installation.

Sidewalks will be illuminated at the same time as the adjacent roadway is illuminated based on available capital funding and in accordance with the priority ranking of the abutting roadway. Sidewalk lighting will be provided through 'back lighting' of the roadway lighting system and only on streets where there is a full continuous roadway lighting system. Separate dedicated sidewalk lighting systems will not routinely be installed in the City.

Sidewalks throughout the city will be lit to the lighting levels and uniformity ratios as shown in Table 2.3. In "Special Areas", there is also the option of either utilizing pedestrian-scale poles in conjunction with 'tall-height' light poles and/or pedestrian-scale luminaires mounted onto the 'tall-height' light poles as determined through future public processes (refer to **Section 3.1 *Lighting Strategy for "Special Areas"***). Without a dedicated pedestrian lighting system, the Vertical Illuminance component of the sidewalk lighting criteria identified in ANSI / IESNA *RP-8-14 Roadway Lighting*, will not be practical to implement in some circumstances such as median lighting installations and therefore is not utilized by this Policy. As part of the City's street lighting design process, and within the terms of this lighting policy, efforts will be made by lighting designers to adjust street light locations and spacing to light sidewalks to the average recommended lighting levels outlined in table 2.3 where practicable.

Sidewalks that are lit with existing lighting from a pedestrian scale lighting system ("Special Areas") or from 'back lighting', resulting from an existing street lighting system ("All Other Areas"), shall remain as-is until such time when major reconstruction occurs. At that time the sidewalk lighting levels will conform to Table 2.3 *Recommended Average Lighting Levels for Sidewalks* subject to capital and operating funding.

Table 2.3 Recommended Average Lighting Levels for Sidewalks

ROADWAY CLASSIFICATION ADJACENT TO SIDEWALK 7	Maintained Illuminance Levels	
	Average Horizontal E_{avg} (Lux)	Uniformity Ratio E_{avg} / E_{min}
ARTERIAL	10.0	4.0
MAJOR COLLECTOR	5.0	4.0
COLLECTOR	3.0	4.0
LOCAL	2.0	6.0

2.5 LIGHTING POLE LOCATION AND OFFSET REQUIREMENT

Poles can be located in protected areas, unprotected areas, or be mounted on structures. Poles in protected areas include poles that are located behind a physical barricade such as a guide rail or concrete barrier wall. Poles in unprotected areas include poles that are not located behind any physical barricade and are typically located behind barrier type curb or the shoulder 'rounding.' These poles are susceptible to impact by a vehicle accidentally leaving the roadway.

2.5.1 Pole Offsets

2.5.1.1 Poles in Protected Areas

Poles in protected areas shall be located on a project-by-project basis in accordance with the barrier deflection characteristics and the proposed field conditions such as finished grades and right-of-way width.

2.5.1.2 Poles in Unprotected Areas

The offset for poles in unprotected areas is defined as the distance from the front face of the barrier type curb (or edge of traveled asphalt (solid white painted line) if no barrier type curb is present) to the nearest face of the pole. Poles in unprotected areas shall have a minimum offset from the barrier type curb or edge of traveled asphalt as indicated in Table 2.4 *Pole Offsets for Poles Located in Unprotected Areas.* When using Table 2.4 the following shall be noted:

i. Deviations from the minimum pole offsets may only be approved at the discretion of the Manager of the Public Works Department's Traffic Services Branch.

ii. The use of frangible bases on decorative and standard lighting poles shall not be permitted where the posted speed of the roadway is equal to or less then 60km/h.

iii. The pole offsets are for tangent road sections only.

iv. For curvilinear road sections, the pole offset shall be dealt with on a project-by-project basis. Refer to the *Roadside Safety Manual* [4] for guidelines and recommendations for pole locations and offsets on curvilinear roadway sections

v. Poles in areas of posted speed greater than 60 km/hr are required to be installed with frangible bases.

Table 2.4 Pole Offsets for Poles Located in Unprotected Areas

Road Class 7	Curbs	Minimum Permissible Pole Offset (Metres (m)) (Note 1)	
		Concrete Pole Direct Buried	Aluminum Pole Base Mounted
Arterial (Roadside)	Y	2.4 (Note 4 & 5)	0.6
	N	4.0	4.0
Arterial (Median) (Note 3)	Y	Note 2	0.6
	N	Note 2	4.0
Major Collector	Y	2.4 (Note 5)	0.6
	N	4.0	2.4
Collector	Y	1.5 (Note 5)	0.6
	N	3.0	1.5
Local	Y	1.5 (Note 5)	0.6
	N	1.5	1.5

Note:

1. Minimum permissible pole offsets can be increased as per the City's approved Urban and Rural Road Cross Sections. The minimum permissible pole offsets may be reduced if all other design options have been exhausted and the reduced offset must be approved by the Manager of the Public Works Department's Traffic Services Branch.

   These minimum permissible pole offsets in Table 2.4 may be revised by approved City Cross Section Designs without amendment to this Policy.

2. Concrete poles direct buried are not allowed to be installed within a median.

3. Median width shall be a minimum of 1.5 m for pole installation.

4. Base-mounted aluminum poles should be given first consideration

5. For locations where there is a permanent dedicated 'on-street' parking bay abutting the traveled portion of the roadway, the minimum permissible pole offset may be reduced to 600 mm.

2.6 LIGHTING DESIGNS IN PROXIMITY TO AIRPORTS

Lighting designs in proximity to airports must adhere to Transport Canada's aerodrome standards and recommended practices. These requirements will typically restrict the height of the luminaires.

2.7 UNDERPASS, TUNNEL, BRIDGE & AT-GRADE RAILWAY CROSSING LIGHTING APPLICATIONS

Underpasses under the jurisdiction of the City will be illuminated using wall or overhead mounted luminaires as listed in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***. The roadway lighting levels for the underpass shall be similar to the adjoining roadway and conform to Table 2.1 *Recommended Average Roadway Lighting Levels*. Underpasses must be illuminated if the approaches are fully illuminated. Lighting of bridges and at-grade railway crossings will be at the same level as the adjoining roadway and be dealt with on a project by project basis based on available capital funding and priority ranking of the associated roadway. The illumination of tunnels shall be dealt with on a project-by-project basis based on available capital funding.

2.8 BICYCLE LANES

Bicycle lanes are dedicated travel lanes for bicycles located on the roadway adjacent to the curb or edge of pavement. The lanes are delineated with pavement markings and are considered part of the roadway. As such, they will be illuminated based on the recommended roadway lighting levels stipulated in Table 2.1 *Recommended Average Roadway Lighting Levels,* and any illumination requirements will be governed by the strategy for roadway lighting as set out in this Policy.

2.9 URBAN NATURAL FEATURES

Lighting design undertaken within 50 metres of a Category 1 or Category 2 Urban Natural Feature (UNF) as identified in the City's Urban Natural Features Strategy shall consider ways to mitigate potential adverse impacts that right-of-way lighting may have on the natural habitat within the UNF. Lighting design considerations in these circumstances include:

i. Placing luminaires in the right-of-way in a location that minimizes the amount of light entering the UNF.

ii. Selecting a luminaire type with lighting optics that directs light along the length of the right-of-way minimizing light spillage into the UNF.

iii. Designing to provide for reduced average light levels that meet or exceed the minimum recommended average light level for the roadway class, but that result in minimizing the amount of light entering the UNF.

2.10 TRANSITION ILLUMINATION

Where sections of roadways that are fully illuminated are located adjacent to sections that are not, the street lighting shall be transitioned as recommended by the *Guide for the Design of Roadway Lighting*2 Transitioning of the roadway illumination will allow for easier adaptation of the driver's eye from a lit to a dark section of roadway. A consistent style of lighting equipment will be used in the transition area selected from in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***.

2.10.1 Full Continuous Lighting up to a Boundary Road

For unique situations where an urban road designation is being fully illuminated up to the boundary of an urban / rural area, the full illumination shall be transitioned as recommended by the *Guide for the Design of Roadway Lighting*2. The transition illumination will be extended into the rural area up to and including the point where the roadway tapers from an urban cross section (four lanes with curb) to a rural cross section (two lanes without curb).

2.10.2 Transition Illumination at Intersections

For intersections where only one of the intersecting roads has full continuous lighting and the light levels at the intersection are 50% greater than the light levels of the approaching illuminated roadway (as recommended by **Section 2.3 *Intersections***), the non-illuminated intersecting road shall have transition lighting designed to extend the lighting beyond the intersection with a maximum of two pole cycles for each approach.

2.11 MARKER TYPE LIGHTING

Marker type lighting shall consist of one of the following:

a) A single pole and luminaire located on the far right hand side of a 'T' intersection;
b) A single pole and luminaire located at 'super mailbox' locations;
c) Two poles and luminaires located diagonally opposite to each other at 'four-way' intersections in urban areas;
d) A single pole and luminaire located on the crest of the cul de sac (i.e. the light standard will be placed at the intersection of the circumference of the cul de sac and the centerline of the road with the appropriate offset from the curb); or
e) A single pole and luminaire located at a 90 degree bend of a roadway.

The luminaire shall be from the marker light classification of this policy complete with a maximum lumen output of 5,000 lumens except at 'super mailbox' locations where the luminaire shall be a standard classification. Marker type lighting will only be installed for the intersection of two public rights-of-way, at the crest of cul-de-sacs and at a 90 degree bend of a roadway where the rights-of-way are travelled and maintained all year round. Right-of-Way lighting for roadways with bends other than 90 degrees will be dealt with on a case-by-case basis at the discretion of the Manager of the Public Works Department's Traffic Services Branch. For an intersection of a public right-of-way and a private roadway refer to **Section 4.11 *Lighting of Privately Owned Roads and Lanes*** for lighting recommendations. Refer to **Section 4.2 *Rural Local Roads*** and **Section 4.3 *Existing Unlit Urban Local Roads*** for context based marker type lighting installations. The installation of the marker type lighting shall be subject to the availability of both existing electric power and capital funding.

2.12 HYDRO UTILITY WITHIN THE RIGHTS-OF-WAY

2.12.1 Conditions of Service

Roadway lighting systems shall meet the *Conditions of Service* set out by the local Electrical Supply Authorities and the Electrical Safety Authority (ESA).

2.12.2 Joint Use Hydro Light Pole

Where Hydro utility poles are located within public rights-of-way, it is desirable to utilize these poles where possible for the installation of luminaires in order to minimize the number of poles within rights-of-way. These joint use Hydro / street light poles must be coordinated with the local Electrical Supply Authority and shall satisfy the requirements of *Ontario Regulation 22/04 Electrical Distribution Safety*[5] for third party equipment mounted on Hydro utility poles. In situations where hydro utility poles could be utilized to install decorative or pedestrian scale lighting the detailing of such a lighting plan should be made in consultation with the City's urban design unit.

2.13 CITY APPROVAL OF LIGHTING DESIGNS BY THIRD PARTIES

Lighting design for rights-of-way in the City of Ottawa shall be performed or supervised by a Professional Electrical Engineer, registered in the Province of Ontario. The lighting design together with the lighting calculation summary shall be submitted to the Public Works Department's Street Lighting Asset Management Section of the City of Ottawa for review and final approval.

2.14 ROUNDABOUTS

Roundabouts shall be treated as an intersection and illuminated according to IES publication RP-19-08. Refer to **Section 2.3 *Intersections*** for more information.

2.15 OTHER JURISDICTIONS

Within the city of Ottawa, there are rights-of-way that are owned by, under the control of, and/or that are subject to design input by other public authorities such as the National Capital Commission (NCC), the Ministry of Transportation of Ontario (MTO), and Parks Canada. The NCC and MTO have their own lighting policies which take precedence over the City's ROW Lighting Policy. Parks Canada has authority for providing design input on the lighting of bridges over the Rideau Canal.

The following is a partial listing of roadways/bridges that are under the control of or subject to lighting design input by other authorities:

ROADWAYS	HIGHWAYS	BRIDGES
Aviation Parkway	Highway 17	Chaudière
Colonel By Drive	Highway 417	Portage
Confederation Boulevard	Highway 416	Alexandria
Island Park Drive		MacDonald-Cartier
Sir John A. Macdonald Parkway		Billings
Queen Elizabeth Drive		Cummings
Rockcliffe Parkway		Pretoria
Experimental Farm Drive		Bank Street
Lady Grey Drive		MacKenzie King
Roads through the Greenbelt		Laurier Avenue
		Union Street
		Dunbar

As roadways/bridges are approved through future federal/municipal processes, these roadways/bridges will be subject to the respective authority's lighting policies without amendment to the above list or this Policy.

2.16 THIRD PARTY ELECTRICAL ATTACHMENTS ON LIGHT POLES

Duplex receptacles and any external electrical equipment not pertaining to street lighting such as Christmas lights and wreaths are not permitted on City-owned light poles located within any City right-of-way.

New business alignments under consideration may impact Third Party Electrical Attachments on Light Poles. When the Policy is scheduled for updating in the future, this section should be reviewed and revised accordingly if required.

2.17 EXTERNAL LUMINAIRE SHIELDS

Installation of an external shield onto a luminaire is not permitted for any street lighting luminaires. The Public Works Department's Street Lighting Asset Management Section will leverage LED technology to enhance lighting patterns and minimize trespass light on existing LED or new LED installations only.

2.18 CYCLING TRACKS

Cycling tracks are segregated travel lanes for bicycles located within the road right-of-way; although not necessarily on the roadway, cycle tracks are considered a part of the roadway. As such, cycle tracks will be illuminated based on the recommended roadway lighting levels in Table 2.1 *Recommended Average Roadway Lighting Levels,* and any illumination requirements will be governed by the strategy for roadway lighting as set out in this Policy. Cycle tracks will be illuminated at the same time as the adjacent roadway and only on streets where there is a full continuous roadway lighting system. As part of the City's street lighting design process, and within the terms of this lighting policy, all feasible efforts will be made by lighting designers to adjust street light locations and spacing to light cycle tracks. Roadway lighting levels will take precedence over cycle track lighting, and therefore roadways will not be over lit in order to achieve lighting of cycle tracks in distant locations or on the side of the road opposite a single sided lighting installation. Supplemental cycle track lighting systems will only be considered subject to capital and operating funding.

2.19 MULTI USE PATHWAYS WITH THE ROAD RIGHT OF WAY

Multi Use Pathways (MUPs), shared by both pedestrians and cyclists, are segregated facilities located within the road right-of-way. MUPS are not necessarily on the roadway and are not considered part of the roadway. As such, they will be illuminated based on the IES recommended lighting levels for Pathways, and any illumination requirements will be governed by the strategy for pathway lighting as set out in the Park Pathway Lighting Policy. MUPs within the ROW will be illuminated at the same time as the adjacent roadway and only on streets where there is a full continuous roadway lighting system. As part of the City's street lighting design process, and within the terms of this lighting policy, all feasible efforts will be made by lighting designers to adjust street light locations and spacing to light MUPs. Roadway lighting levels will take precedence over MUP lighting, and therefore roadways will not be over lit in order to achieve lighting of MUPs in distant locations or on the side of the road opposite a single sided lighting installation. Supplemental MUP lighting systems will only be considered subject to capital and operating funding.

CHAPTER 3 "SPECIAL AREAS"

"Special Areas" are to receive decorative style lighting equipment in accordance with this subsection. The following locations are subject to the Special Area lighting strategy:

a. Central Area,
b. Mixed-Use Centres,
c. Town Centres,
d. Arterial Main streets
e. Traditional Main streets,
f. Heritage Conservation Districts,
g. Business Improvement Area *main streets*,
h. Rural Village *main streets* and
i. Community Design Plan (CDP)/ Transit Oriented Development (TOD) Plan - *active mixed-use frontage streets*

Areas (a) through (e) are designated and identified in the *City of Ottawa Official Plan – Schedule B Urban Policy Plan*3. Area (f) is identified in Annex 4 to the *City of Ottawa Official Plan*3. Areas (g) and (h) are identified in the ROW Lighting Policy and discussed in **Section 3.4 *Rural Area Village Main streets*** and **Section 3.5 *Business Improvement Areas***. CDP active frontage streets (i) consist of existing or future high density, mixed-use residential and commercial locations that have been identified through a Council approved Community Design Plan (CDP) or TOD Plan process but are not identified in the map schedules to the *City of Ottawa Official Plan*. CDP active mixed-use frontage streets are subject to the Special Area lighting strategy as part of this ROW Lighting Policy (e.g. Riverside South CDP active frontage street). CDP active frontage streets may be located both in urban and in rural (village) locations. Further information, on CDP Active mixed-use frontage streets can be obtained through the Planning and Growth Management's Policy Development & Urban Design Branch. Village main streets and BIA main streets identified through a future public process approved by Council are subject to Special Area lighting without amendment to this Policy.

The decorative lighting equipment selection process for any "Special Area" may be initiated when one or more of the following public consultation processes occurs:

i. Commencement of an Environmental Assessment and / or design for major roadway reconstruction,
ii. Part of major lifecycle re-lighting project without roadway reconstruction,
iii. Part of preparation of a Community Design Plan or planning study for all or applicable parts of the Special Area and,
iv. Part of private improvements to the public right-of-way associated major redevelopment.

v. Other process as approved by the Manager of the Public Works Department's Traffic Services Branch in consultation with the Planning and Growth Management Department's Policy Development and Urban Design Branch.

Rights-of-way within any Special Area that are the subject of an Environmental Assessment (EA) or detailed road design to provide for upgrading or new construction, including sections of connecting streets, may be identified for installation of decorative lighting. When these rights-of-way have been approved through a future public process approved by Council they are subject to Special Area lighting without amendment to this Policy.

3.1 LIGHTING STRATEGY FOR "SPECIAL AREAS"

Decorative lighting shall be used on all rights-of-way in "Special Areas" except as otherwise provided for in this Policy (i.e. in BIAs and in Rural Area Villages only identified main streets are to be lit with decorative lighting equipment - other streets in these areas are to be lit with standard lighting equipment).

With the Central, Area Mixed Use Centres, Town Centres, Arterial Main streets, and Community Design Plan Areas, decorative lighting should be applied consistently to with a goal to unify distinct character areas within the broader designation or area, however the addition of pedestrian lighting in combination with tall mount lighting should generally be limited to areas of continuous active mixed-use frontage, designated main streets, or the highest profile mixed use commercial streets that have been identified in council approved CDPs, TODs, or secondary plans.

There are three options for lighting "Special Areas", as follows:

i. 'Mid-height' pole complete with a decorative luminaire attached to the pole by either a bracket arm or post top mounted. This lighting option is applicable to all roadway classifications except arterial main streets.

ii. 'Tall-height' pole complete with a decorative luminaire complete with bracket arm. This lighting option is available to all Special Areas.

iii. 'Tall-height' and 'Short-height' pole combination; the combination consists of a 'tall-height' pole with a single 'short-height' pole where feasible mid-span between the 'tall-height' poles. The 'tall-height' pole is complete with a decorative luminaire with a bracket arm. The 'short-height' pole is complete with a decorative post top luminaire. There is also the option to have an additional 'short height' style luminaire attached to the 'tall-height' pole. This lighting option is only available to designated mainstreets, village *mainstreets* and continuous mixed use active frontage streets identified in a council approved plan.

All poles and luminaires for "Special Area" lighting shall be selected using ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***. All new and existing full height decorative lighting poles used in "Special Areas" may accommodate banners of standard dimension (maximum width 1.0 m, maximum height 1.5 m) at the request of the proponent. All requests for non standard banners, planters and attachments must be accompanied by an engineering report certified by a licensed Professional Engineer in the province of Ontario. The engineering report must confirm that the integrity of the light pole will not be compromised and that it can safely accommodate the additional load of the banner and/or

planter arms and/or attachments. The report shall also illustrate mounting bracket detail, proposed mounting height on the pole, minimum vertical clearance from the ground and dimensions of the banner and/or planter and/or attachment.

All new lighting options selected, including the addition of banners and/or planters, are subject to approval through a public consultation process described in Chapter 3 *"Special Areas"*. For existing decorative lighting installations, the request to add banners and/or planters is subject to approval by the Manager of the Public Works Department's Traffic Services Branch in consultation with the Planning and Growth Management Department's Policy Development and Urban Design Branch.

In addition to providing a certified engineering report, any banners placed on decorative poles are subject to the City's Signs By-law. Both banners and any planters placed on decorative poles shall meet minimum vertical clearances as approved by the Manager of the Public Works Department's Traffic Services Branch in consultation with the Planning and Growth Management Department's Policy Development and Urban Design Branch.

Within the boundary of clearly defined Special Areas, all rights-of-way under the control of the City that are subject to special lighting will use the same style of decorative luminaire and pole to provide both for continuity in design and to simplify lighting maintenance.

3.2 HIERARCHY FOR "SPECIAL AREA" LIGHTING

In some Special Area designations an overlap exists with other Special Area designations. For example, a Traditional Main street may be located within a Business Improvement Area, and both may lie within a Heritage Conservation District. To deal with these complex situations, the following hierarchy approach has been developed to assist in determining the style of right-of-way lighting to be applied.

i. Heritage Conservation Districts (HCD)

ii. Business Improvement Areas (BIA)

iii. Traditional Main streets, Arterial Main streets and Village main streets

iv. Central Area

In the example given above, because the HCD has higher illumination priority than the BIA and the Traditional Main street, the right-of-way lighting style of the HCD will take precedence and apply within the overlap area only. The application of this hierarchy can become complicated in some contexts and should be informed through consultation with the Policy and Urban Design unit who will review and interpret approved planning documents and related polices to establish the appropriate hierarchy of public streets within overlapping designations.

3.3 HERITAGE CONSERVATION DISTRICTS

Heritage Conservation Districts (HCDs) are identified in the *City of Ottawa Official Plan Annex 4 Heritage Conservation Districts*3. HCDs including designated heritage areas and bridges will be subject to special (decorative style) lighting poles and luminaires.

The style of poles, luminaires, and light source colour will be selected as part of a future public consultation process conducted on a district-by-district basis with the public, affected residents, and stakeholders. For local roads in HCDs, the light level can also be selected as part of the future public consultation process provided that it is not less than a "marker" standard and not greater than the recommended light levels for local roads shown in Table 2.1. Once a style of lighting equipment is selected through the consultative process, the same style of equipment will be recommended in all future right-of-way lighting or re-lighting projects within the respective HCD. This is consistent with the intent of the lighting policy to reduce the range of lighting equipment across the city while providing opportunity for community input and tailoring the lighting design to the needs of each HCD.

3.3.1 Public Consultation Process

The lighting equipment selection process within any HCD may be initiated when one or more of the following public consultation processes occurs:

i. Commencement of an Environmental Assessment and / or design for major roadway reconstruction;
ii. Part of major lifecycle re-lighting project without roadway reconstruction;
iii. Part of preparation of a Community Design Plan or planning study for all or applicable parts of the HCD;
iv. Part of private improvements to the public right-of-way associated major redevelopment; and/or
v. Other process as approved by the Manager of the Public Works Department's Traffic Services Branch in consultation with the Planning and Growth Management Department's Policy Development and Urban Design Branch.

Lighting poles and luminaire styles for HCDs may be selected from one of the following:

i. Specific decorative lighting equipment used in an established HCD as shown in **Appendix E *Lighting Styles in Existing Heritage Conservation Districts***; or,
ii. The approved Special Area decorative style lighting equipment can be selected using in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***; or,
iii. One new or customized equipment type which will be added to the decorative options but be strictly reserved for use in HCD's.

New or customized lighting equipment must be approved by the Manager of the Public Works Department's Traffic Services Branch in consultation with the Manager of the Planning and Growth Department's Policy Development and Urban Design Branch. New or customized lighting equipment must also meet or exceed the lighting performance standards of this Policy.

3.3.2 Boundary Roads of Heritage Conservation Districts

Supplementary standard (non-decorative) lighting equipment will be used where necessary on arterial and collector roadways that pass through or form the boundary of a HCD in order to satisfy Table 2.1 *Recommended Average Roadway Lighting Levels*. The standard lighting equipment shall be selected from in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***. The lighting equipment of a local road that forms the boundary of a HCD will be selected from one of the following:

i. The existing special lighting equipment style from within the adjoining HCD;

ii. The special lighting equipment style selected through an approved study process; or

iii. If neither (i) nor (ii) apply, the equipment style that is to be used on the boundary road will be the same as that to be used on the same roadway beyond the HCD boundary.

3.4 RURAL AREA VILLAGE MAIN STREETS

Rural Area Village Main streets are identified in the *City of Ottawa Official Plan – Schedule G Rural Road Network*3.Village main streets shall have decorative lighting equipment while all other rights-of-way within the Village shall have standard street lighting equipment (refer to **Appendix C.2 *Rural Area Villages*** for suggested Rural Area Village Main streets).

3.4.1 Rural Village Main street Classification

The use of the term Village main street within this Policy refers to the primary (i.e. commercial/ mixed use and continuous active frontage street(s)) segments within a Village.

Within the boundaries of a rural Village, only arterial and collector main street roadways that provide direct, through access in to and out of the Village, as well as local main street roadways that provide access to commercial and or 'mixed-use' properties, are candidate roads to receive special (decorative) lighting equipment.

The number and extent of main street Roads in any Village may be refined as part of an existing or future planning study or public consultation process. Other collector and local roadways internal to the Village are to receive "marker" lighting with standard lighting equipment selected in adherence to in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***.

3.4.2 Public Consultation Process

The extent of Village main street roads that are to be lit, the light source colour, and the style of poles and luminaires will be selected as part of a public consultation process carried out on a village-by-village basis with affected Village residents, stakeholders, and the City's Policy and Urban Design Unit.

Once a style of lighting is selected through a consultative process, the same style of lighting equipment is recommended to be used in future lighting or re-lighting projects on other applicable main street roads in the respective Village. This is consistent both with the intent of the lighting policy to reduce the range of lighting equipment across the City, and with the desire to achieve design consistency in terms of a lighting theme for each Village.

The lighting equipment selection and main street identification process for any Village main street will be initiated when one or more of the following public consultation processes occurs:

i. Commencement of an EA and / or design for major main street reconstruction,

ii. Part of major lifecycle re-lighting project without main street reconstruction,

iii. Part of preparation of a Community Design Plan or planning study for all or applicable parts of a Village and,

iv. Other process as approved by the Manager of the Public Works Department's Traffic Services Branch in consultation with the Planning and Growth Management Department's Policy Development and Urban Design Branch.

The decorative style lighting equipment for the rural area Village main streets shall be selected from the approved Special Area decorative lighting equipment listed in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***.

3.5 BUSINESS IMPROVEMENT AREAS

Existing Business Improvement Areas (BIAs) are shown in Section D.1 *Business Improvement Areas* of **Appendix D *Map Schedules***. There are currently 18 designated BIAs in the city.

The number and location of Business Improvement Areas are subject to change without amendment to the ROW Lighting Policy. Only the main streets within a BIA District are candidates for special street lighting equipment (refer to **Appendix C.1 *Business Improvement Area*** for existing main street Roads). All other roadways within the BIA District shall be lit with standard street lighting equipment. The special and standard street lighting equipment shall be selected in adherence to in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***.

3.5.1 Public Consultation Process

The style of poles and luminaires (decorative and/or standard) and the main streets to which they will apply will be selected as part of a future public consultation process carried out on an area-by-area basis and undertaken in consultation with the public, affected residents and stakeholders.

Once a style of lighting is selected through the consultative process the same style of lighting equipment is recommended to be used in future lighting or re-lighting projects on other main streets within the respective BIA identified either in the ROW Lighting Policy (**Appendix C.1 *Business Improvement Area***) or through another process as described below, as may be applicable. This is consistent both with the intent of the lighting policy to reduce the range of lighting equipment across the City and with the desire to achieve visual consistency within each BIA.

The lighting equipment selection process for any BIA main street will be initiated when one or more of the following public consultation processes occurs:

i. Commencement of an EA and / or design for major main street reconstruction,

ii. Part of major lifecycle re-lighting project along the main street without roadway reconstruction,

iii. Part of preparation of a Community Design Plan or planning study for all or applicable parts of a BIA and,

iv. Other process as approved by Manager of the Public Works Department's Traffic Services Branch in consultation with the Planning and Growth Management Department's Policy Development and Urban Design Branch.

For the public consultation process, the lighting pole and luminaire style may be selected from one of the following:

i. Existing BIA's with decorative style lighting will continue to use, when decorative lighting is extended or the BIA boundary is enlarged, the same style of equipment along designated main streets within the respective BIA or,

ii. New BIA's and existing BIA's subject to major roadway reconstruction along identified main streets shall select the Special Area decorative lighting equipment in adherence to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***.

3.5.2 Boundary Roads of Business Improvement Areas

Lighting of any main street road that forms the boundary of a BIA will be undertaken using one of the following:

i. The existing special lighting equipment style from within the adjoining BIA or,

ii. The decorative lighting equipment style using ***Appendix B Street Lighting Selection Criteria and Equipment Inventory*** as selected through an approved study process, or

iii. If neither (i) nor (ii) apply, the equipment style that is to be used on the boundary road will be the same as that to be used on the same roadway beyond the BIA boundary.

CHAPTER 4 CONTEXT-BASED POLICY APPLICATION

4.1 AREAS UNDER DEVELOPMENT – LIGHTING LEVELS AND STYLE

The following requirements will ensure consistency in right-of-way lighting for areas under development at the time the Policy is approved.

4.1.1 "All Other Areas" under Development

To ensure right-of-way illumination consistency in the completion of neighbourhoods that are partially constructed or are approved for development (i.e. *Composite Utility Plan* has been approved) when this policy comes into effect, future development phases shall have right-of-way lighting designed and installed to match the existing street lighting levels and equipment style up to the nearest adjacent existing or planned arterial or collector roadway. However, where a substantive portion of vacant development land within the adjacent arterial or collector roadway boundaries has not been approved for development (i.e. prior to *Draft Plan of Subdivision* approval), the Manager of the Planning and Growth Management Department's Policy Development and Urban Design Branch has the authority to select an alternate road or land use boundary (i.e. change from residential to commercial) up to which the existing street light level of illumination and equipment style will apply.

For example, if a specific style of lighting equipment (e.g. a lantern style luminaire), was chosen for the abutting development then that same style luminaire is to be used in the new adjoining development up to the nearest existing or planned arterial or collector road designation, or other approved boundary, regardless of change in land ownership / developer.

4.1.2 Infill of Existing Developments

For infill developments, the existing roadway lighting levels of the abutting developed land shall apply. Compatible style of roadway lighting poles and luminaires shall be utilized for the street lighting design. The lighting equipment shall be selected in adherence to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***.

4.1.3 "Special Areas" Under Development

Where an area subject to Special Area lighting policies is partially constructed or is approved for development at the time this Policy comes into effect (e.g. Kanata Town Centre), future development phases shall have right-of-way lighting designed and installed to match the existing street lighting levels and style of equipment for the remaining development land up to the nearest adjacent existing or planned collector roadway, arterial roadway or land use boundary (i.e. change from residential to commercial). However, where a substantive portion of vacant development land within the adjacent collector road, arterial road or land use boundaries has not been approved for development (i.e. prior to *Draft Plan of Subdivision* approval), the Manager of the Planning and Growth Management Department's Policy Development and Urban Design Branch has the authority to select an alternate road or land use boundary up to which the existing street lighting 'style of equipment' will be installed.

4.2 RURAL LOCAL ROADS

New and existing rural local roads[6] shall receive marker type lighting installations as outlined in **Section 2.11 *Marker Type Lighting***. Rural Village main streets are the exception to this rule and shall be lit in accordance with **Section 3.4 *Rural Area Village Main streets***. Rural intersections with traffic signals will be fully illuminated in accordance with Table 2.2 *Recommended Average Lighting Levels for Intersections* regardless of whether or not the approaches are illuminated (refer to **Section 2.3 Intersections**). If it is not illuminated then transition lighting shall be provided as described in **Section 2.10 Transition Illumination**.

4.3 EXISTING UNLIT URBAN LOCAL ROADS

Unlit urban local roads6 shall receive an upgrade to marker type lighting installations as outlined in **Section 2.11 *Marker Type Lighting***. In addition to the availability of both electric power and capital funding (**Section 2.11 *Marker Type Lighting***), the installation of the marker lighting shall be based on the priority ranking of this Policy. The priority ranking of some of the local roads in some instances is the same and therefore any marker type lighting shall be completed based on the availability of both electric power and capital funding.

4.4 EXISTING URBAN LOCAL ROADS WITH MARKER LIGHTING

Existing urban local roads6 with marker lighting at the intersection shall remain as is. At the time of any major roadway reconstruction the existing marker lighting will be reinstated but the lighting equipment shall be selected to conform to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***.

4.5 EXISTING URBAN LOCAL ROADS WITH PARTIAL LIGHTING

Existing urban local roads6 with partial mid-block illumination shall remain as is. At the time of any major roadway reconstruction the partial mid-block illumination will be reinstated as per existing conditions except that the lighting equipment will conform to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***. Unlit intersections in the vicinity of the partial mid-block lighting shall be upgraded to marker type lighting as outlined in **Section 2.11 *Marker Type Lighting***.

4.6 LIGHTING FOR THE FORMER CITY OF OTTAWA AREA

The roadways within the former City of Ottawa have full continuous illumination. The existing lighting levels are slightly higher compared to ANSI / IESNA1 for arterial roadways and are lower for collector and local roadways. At the time of major roadway reconstruction in the former Ottawa area, the existing illumination levels for arterial roads[7] will be reduced while the collector and local road designation7 lighting levels will be increased to meet the requirements of this Policy as shown in Table 2.1 *Recommended Average Roadway Lighting Levels*.

4.7 URBAN / RURAL AREA BOUNDARY RIGHTS-OF-WAY

For rights-of-way that form the boundary between urban and rural areas, the urban classification shall always take precedence over the rural policy for lighting that specific right-of-way. However, if the rural area falls under a Special Area designation the Special Area lighting policy shall take precedence only within the limits of the Special Area.

4.8 URBAN LOCAL ROADS IN NEW RESIDENTIAL, EMPLOYMENT & MIXED-USE CENTRE AREAS

Urban local roads in new Residential, Employment, and Mixed Use Centre Areas constructed after approval of this Policy will be illuminated to ANSI/IESNA[1] recommended lighting levels where practicable as shown in Table 2.1 *Recommended Average Roadway Lighting Levels.* The lighting equipment shall conform to that as listed in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory*** and the luminaires will be of Full Cut-Off style with a maximum lumen output of 5000 lumens.

4.9 LANEWAYS

A laneway is typically a narrow roadway found in urban residential areas running between or behind houses in neighbourhood blocks. This Policy applies to laneways owned and maintained by the City. Laneways lit prior to the approval of this Policy shall remain as is with the same number of pole(s) and luminaire(s). For existing laneways without lighting, only marker lighting consisting of a single pole and luminaire shall be installed. The installation of the marker lighting will be considered if initiated by the abutting property owners and as approved by the Manager of the Public Works Department's Traffic Services Branch. The lighting shall be subject to a lighting warrant review and availability of both capital funding and electric power. The marker lighting shall only be located at the intersection of the laneway with the public road and not within the laneway. New laneways shall be lit to a marker lighting standard at the intersection of the laneway with the road and not within the laneway.

4.10 THROUGH-BLOCK PEDESTRIAN WALKWAYS

Through-block pedestrian walkways are short, mid-block connections between two public rights-of-way. The installation of lighting for existing unlit and new through-block pedestrian walkways shall only be installed on an as-requested basis and only if the through-block pedestrian walkway connects two lit public rights-of-way where both the rights-of-way and the through-block pedestrian walkway are open and maintained by the City throughout the year. The lighting of the existing through-block pedestrian walkways shall be subject to a lighting warrant review and the availability of both electric power, and operating and capital funding. For new through-block pedestrian walkways, lighting requirements shall be provided during the development of the through-block pedestrian walkway.

Typically through-block pedestrian walkways shall be lit to 2.0 Lux with a Uniformity of 6.0:1. If the through-block pedestrian walkway lighting is approved, only full cut off, 'shoe box' style luminaires

mounted at 4.6 metres above finished grade on approved lighting poles shall be used (refer to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory*** for equipment description).

4.11 LIGHTING OF PRIVATELY OWNED ROADS AND LANES

Lighting of privately-owned roadways and lanes shall be installed and maintained at the expense of the owner(s) of the private road or laneway. The lighting style and location is subject to the approval of the Manager of Planning and Growth Management Department's Policy Development and Urban Design Branch and cannot be located in the public right-of-way.

If the private road intersection with the public right-of-way warrants the installation of a traffic control signal system, then it will be lit to City standards at the expense of the owner(s). The equipment selected shall conform to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***.

4.12 BEAVERBROOK & CHIMO AREA LAWN LAMPS

Portions of the Beaverbrook neighbourhood and the Chimo area of the Katimavik neighbourhood in the former City of Kanata have "globe" style lawn lamps that were installed along residential streets at the time the neighbourhoods were originally developed. The two areas subject to this Policy subsection are illustrated in D.2 *Existing Lawn Lamps* in **Appendix D *Map Schedules***. The lawn lamps in Beaverbrook located on both public and private property are owned by the homeowner, but have been maintained by the City. In the Chimo portion of Katimavik the lawn lamps are located on the public street right-of-way and are owned and maintained by the City. In addition to the lawn lamps, there is existing "marker" streetlights located at some street intersections in both neighbourhoods.

4.12.1 Beaverbrook

The lighting approach in Beaverbrook is to keep in place existing intersection marker lighting and to upgrade all unlit streets to marker type lighting standard. Marker lights will be installed at unlit street intersections and sharp bends in roads. Such upgrades will occur incrementally as Council approves required budgets. The new marker lights are to be selected in adherence to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***. When unlit streets are upgraded to the marker type lighting standard, written notice will be given by the City to each affected homeowner that lawn lamps on private property will no longer be maintained / replaced by the City. Such maintenance / replacement will be the responsibility of the homeowner as of the date the written notice is given. Electric power to the individual lawn lamps will continue to be paid for by the homeowner.

4.12.2 Chimo Area of Katimavik

The lighting approach for the Chimo area of the Katimavik neighborhood is to replace the existing lawn lamps with full continuous type street lighting. The lighting equipment is to be selected in adherence to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***. Consultation with residents directly affected by the lawn lamp replacement will be undertaken prior to lighting equipment selection. Such upgrades will occur incrementally at the time the existing lawn lamps reach the end of their life cycle as determined by the Manager of the Public Works Department's Traffic Services Branch and as

Council approves required budgets. When the lawn lamps are replaced with street lighting equipment, the lighting levels will be upgraded to meet the requirements of Table 2.1 *Recommended Average Roadway Lighting Levels*.

4.13 MAJOR RE-LIGHTING PROJECT

A major re-lighting project occurs when the existing street lighting equipment (including poles, luminaires and underground ducts and cables) has reached the end of its life expectancy and based on available funds, it is scheduled for replacement with new lighting equipment in adherence to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***. When the re-lighting project occurs without any major roadway reconstruction, then the extent of the re-lighting project will be the replacement of the old equipment with new and maintaining the existing lighting levels except as outlined in Section ***4.6 Lighting For The Former City of Ottawa Area***. If the major re-lighting project occurs in conjunction with a major roadway reconstruction involving a change in roadway geometry, then the re-lighting project must include a lighting design to ensure the appropriate lighting levels are achieved on the new roadway geometry as shown in Table 2.1 *Recommended Average Roadway Lighting Levels.* Major roadway reconstruction involves one or more of the following; underground utilities work, sidewalk and/or curb reconstruction and/or roadway geometry changes.

CHAPTER 5 LIGHTING EQUIPMENT

5.1 BACKGROUND

The City of Ottawa has developed performance criteria for street lighting poles and luminaires which must meet or exceed those identified in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***. These requirements are in place to ensure lighting systems provide quality lighting that are efficient in terms of energy consumption, operation and maintenance.

The City of Ottawa has adopted LED technology for its street lighting luminaires. LED lighting is changing the landscape of street and area lighting at a rapid pace. The rapid evolution of the technology will bring new street lighting luminaire offerings which will be more cost effective and energy efficient, require less maintenance and provide longer life. As required, the Public Works Department's Street Lighting Asset Management Section may, at its discretion, recommend to the Manager of Public Works Department's Traffic Services Branch, the substitution or addition of similar style luminaires to the inventory in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***.

The City of Ottawa has adopted the Lumen IQ smart street lighting monitoring and dimming system. Lumen IQ™ is an integrated, wireless monitoring and control system that allows owners of lighting assets to dim luminaires according to user-defined schedules, measure energy consumption, monitor streetlight operation, and identify and action maintenance events such as luminaire outages.

Lumen IQ remote dimming and monitoring nodes must be supplied with all new luminaires. Please review requirements with the Public Works Department's Street Lighting Asset Management Section.

All lighting equipment in this Policy, including but not limited to poles, luminaires, bracket arms, banner arms and lamps, meets or exceeds the City of Ottawa Material Specifications. Where approved by the Manager of the Public Works Department's Traffic Services Branch in consultation with the Planning and Growth Management Department's Policy Development and Urban Design Branch, the City may substitute similar style fixtures per ***Appendix B Street Lighting Selection Criteria and Equipment Inventory*** on an as-needed basis (e.g. manufacturer no longer makes the approved item) and for other technical reasons.

5.2 LUMINAIRE CORRELATED COLOUR TEMPERATURE

All new street lighting LED luminaires shall have a correlated colour temperature of between 3000K and 4000K for all rights-of-way.

5.3 LUMINAIRE CLASSIFICATION SYSTEM

The IESNA utilizes a BUG (Backlight, Uplight & Glare) classification system, which categorizes luminaires based on their lumen output in the following various zones:

i. High Angle Light Zone

ii. Forward Light Zone

iii. Back Light Zone and,

iv. Up Light Zone

All decorative and standard LED luminaires described in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory*** have a BUG classification.

5.4 POLE COLOURS

The approved colours for all the lighting poles are included in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***. Pole colour finishes shall be in conformance with the City of Ottawa Material Specifications which supplements this Policy.

5.5 DECORATIVE LIGHTING EQUIPMENT

"Special Area" lighting equipment is included in ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***. "Special Areas" are to be lit using uniform lighting installations with the decorative style poles and luminaires. Figure 5.2 to 5.7 sets out the different street lighting equipment and assemblies for 'tall-height', ''mid-height' and 'short-height' poles with luminaires and bracket arms. The assemblies are also summarized in Table 5.1 *Roadway Lighting Equipment for "Special Areas"*. Lighting of all rights-of-way in "Special Areas" may use equipment shown in Figures 5.2 to 5.7 and in accordance with Table 5.1. Other combinations of the approved decorative poles and luminaires if requested through a public consultation process shall be subject to approval from the Manager of the Public Works Department's Traffic Services Branch in consultation with the Planning and Growth Management Department's Policy Development and Urban Design Branch.

5.5.1 'Short-Height' Lighting Equipment

'Short-height' lighting equipment is typically comprised of a 4.3 metre high decorative pole or a 4.6 metre standard pole and a top mounted (post top) decorative luminaire. The 'short-height' pole is a pedestrian-scale pole mainly providing sidewalk lighting with a slight contribution to the roadway lighting. The maximum allowable lumen output for luminaires on this type of pole is 4000 lumens. Because of the short height of the pole, higher lumen output may produce glare that can be distracting to both the motorists and the pedestrians. Due to the low lumen output, 'Short-height' poles are always used in conjunction with 'Tall-height' poles in order to achieve the recommended average levels shown in Table 2.1 *Recommended Average Roadway Lighting Levels* for the roadway. Short height poles should generally only be used along Traditional Main streets, BIA main streets, Village main streets and other "special area" rights-of-way that consist of continuous and active mixed-use frontages e.g. identified portions of Arterial Main streets and Mixed-use Centres.

'Short-height' lighting equipment is illustrated in Figures 5.5 *Decorative Lighting Assemblies For 'Short-Height' Poles.* For 'short-height' lighting installations, the 'short-height' poles and Group B luminaires can be interchanged to create different lighting assemblies compared to those shown in Figures 5.5 *Decorative Lighting Assemblies For 'Short-Height' Poles.*

5.5.2 'Mid-Height' Lighting Equipment

'Mid-height' lighting equipment is typically comprised of a 6.0 metre high pole and a decorative luminaire either top-mounted (post top) or side-mounted with a bracket arm. Mid-height equipment is available for use in "Special Areas" that have narrow rights-of-way except for local streets in BIA's and Villages as previously mentioned.

'Mid-height' lighting equipment is shown in Figures 5.6. For 'mid-height' lighting installations, the 'mid-height' poles and luminaires can be interchanged to create different lighting assemblies.

5.5.3 'Tall-Height' Lighting Equipment

'Tall-height' lighting equipment is comprised of a 9.8 metre or a 10.7 metre high pole with a decorative luminaire, side mounted onto the pole with a bracket arm. This equipment is to be used in conjunction with 'short-height' poles as outlined in Section **5.51 *'Short-Height" Lighting Equipment*** as determined through the public consultation process described in **Section 3.1 *Lighting Strategy for "Special Areas"***.

'Tall-height' lighting equipment is shown in Figure 5.7 *Decorative Lighting Assemblies for 'Tall-Height' Poles.*

FIGURE 5.1 GROUP A COBRA-HEAD STYLE LUMINAIRES

A1 - Semi Cut Off Cobra Head(Marker Lighting Only)

A2 - Full Cut Off Cobra Head

FIGURE 5.2 GROUP B LUMINAIRES FOR "SPECIAL AREAS"

A maximum of 10 decorative fixtures for special areas will be approved and available at any given time. New inventory of pedestrian lighting will visually relate to the decorative tall mount lighting options and will be made available in a range of historic and contemporary styles. Decorative mid height fixture options can stylistically stand on their own as they are not installed in combination with tall or pedestrian scale lighting.

B1 – Post Mounted Square Lantern

B2 – Side Mounted Square Lantern

B3 – Cone Style

FIGURE 5.3 GROUP C LUMINAIRES FOR "SPECIAL AREAS"

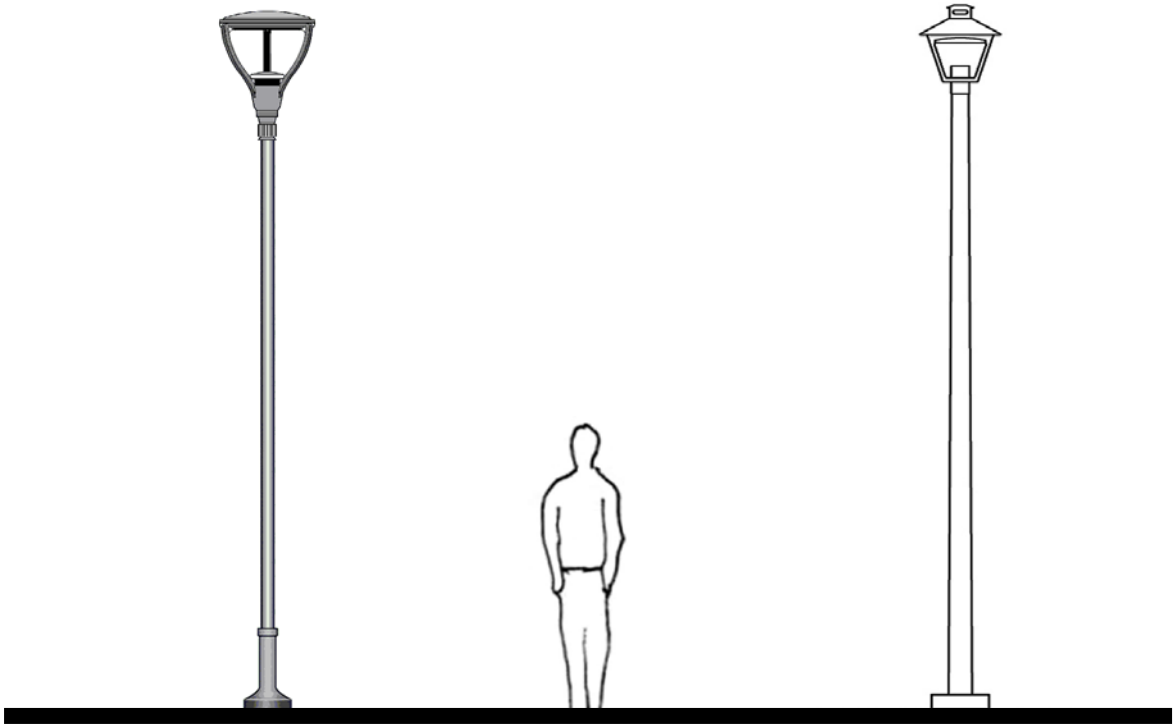
C1 – Round Cylinder

FIGURE 5.4 GROUP D LUMINAIRES FOR "SPECIAL AREAS"

D1 – Wing Style

D2 – Sleek Style

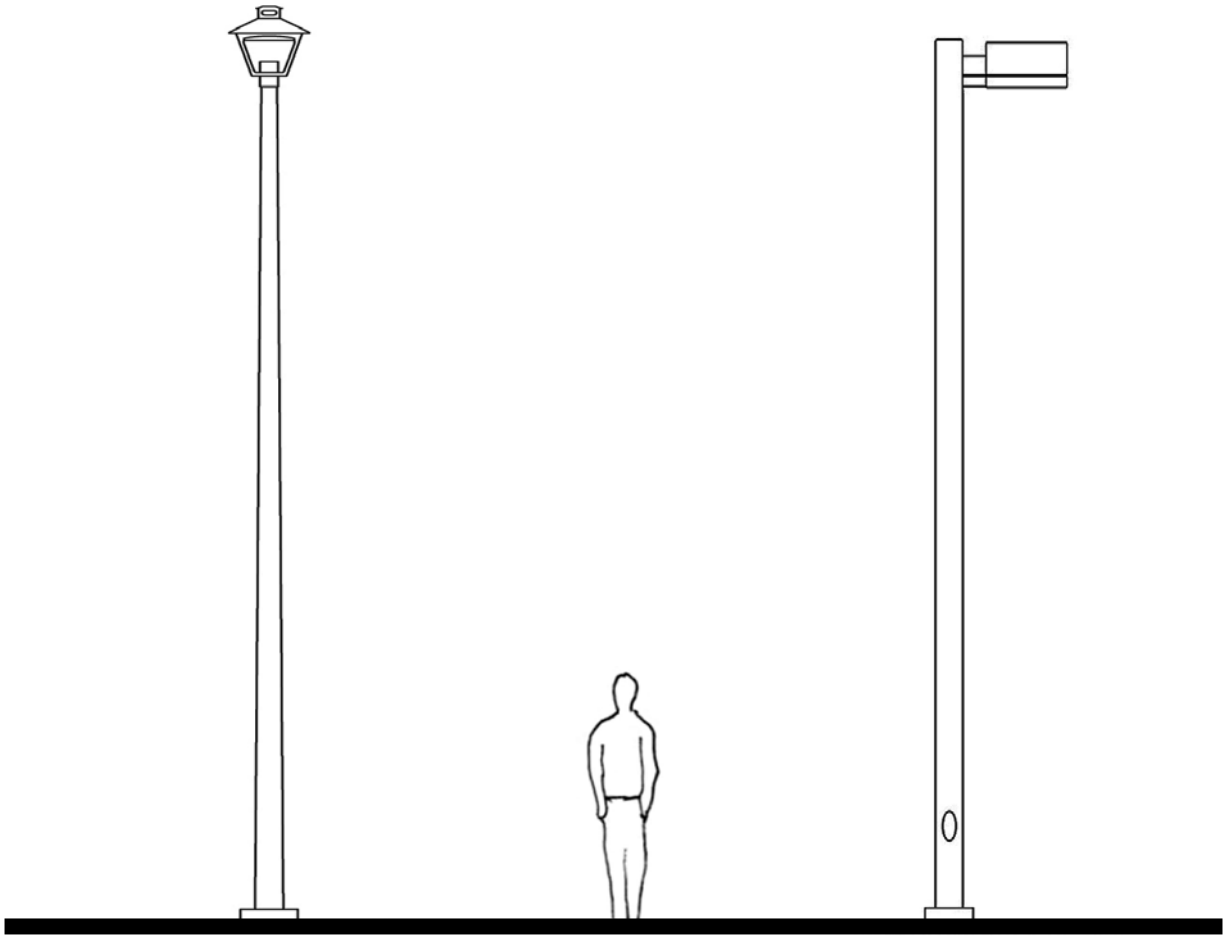
FIGURE 5.5 DECORATIVE LIGHTING ASSEMBLIES FOR 'SHORT-HEIGHT' POLES



B3 – Cone Style Luminaire
Standard Pole
Shroud

B1 – Square Lantern Luminaire
Standard Pole

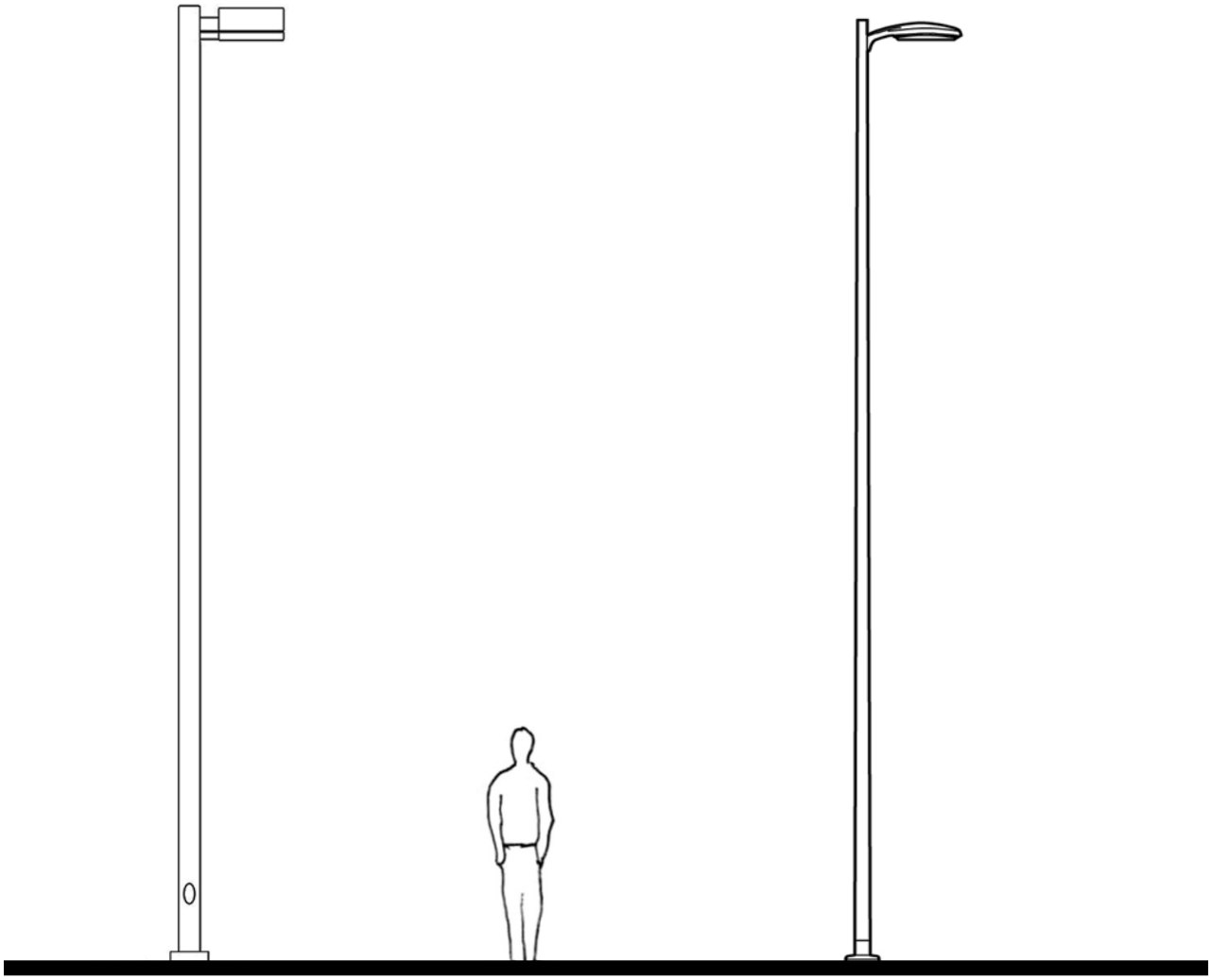
FIGURE 5.6 DECORATIVE LIGHTING ASSEMBLIES FOR 'MID-HEIGHT' POLES



B1 – Square Lantern Luminaire
Standard Pole

C1 – Round Cylinder Luminaire
Standard Pole

FIGURE 5.7 DECORATIVE LIGHTING ASSEMBLIES FOR 'TALL-HEIGHT' POLES



C1 – Round Cylinder Luminaire
Standard Pole

D1 – Wing Style Luminaire
Standard Pole

Table 5.1 Roadway Lighting Equipment for "Special Areas"

ROADWAY CLASS	LUMINAIRES		Lumen Output (Note 1)			POLE HEIGHT ABOVE GRADE (Note 1)									POLE LAYOUT		
						'Tall'			'Mid'			'Short'					
			7000-13000	5000-8500	1900-3700	10.7m Concrete	9.8m Aluminum	9.8m (Note 2)	6.1m Concrete	6.1m Aluminum	6.0m Aluminum	4.6m Concrete	4.6m Aluminum	4.3m Aluminum	'Tall-Height'	'Mid-Height'	'Tall-Height' and/or 'Short-Height'
ARTERIAL & MAJOR COLLECTOR & COLLECTOR	Group B	B1		✓					✓	✓						✓	
		B2			✓							✓	✓				✓
		B3			✓									✓			✓
	Group C		✓			✓	✓								✓		
				✓					✓	✓						✓	
	Group D		✓			✓	✓								✓		
				✓					✓	✓						✓	
LOCAL	Group B	B1		✓					✓	✓						✓	
		B2			✓							✓	✓				✓
		B3		✓										✓			✓
	Group C			✓					✓	✓							
	Group D			✓					✓	✓							

Notes: 1. Lamp Wattage and Pole Height may be increased for use at intersections if necessary to achieve the minimum lighting levels.

5.6 "ALL OTHER AREAS"

"All Other Areas" are locations other than "Special Areas" as designated by the *City of Ottawa Official Plan Schedules A & B*. 3 and by this Policy. The majority of the approved lighting equipment for "All Other Areas" was adopted from the *City of Ottawa Residential Street Lighting Policy 2001*. The approved lighting equipment for "All Other Areas" will be chosen in adherence to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***. All street lighting luminaires in "All Other Areas" meet the ANSI / IESNA RP-8-14 *Roadway Lighting*1 definition of Semi-Cut Off or Full Cut Off when applicable.

Full Cut-Off luminaires are now mandatory in all areas for the exception of marker type lighting.

Semi Cut-Off luminaires will be used for marker lighting due to their inherent 'beacon effect' making the intersection more identifiable to motorists. The exception for marker light is that full cut-off luminaires shall be used for urban and rural super mailbox locations.

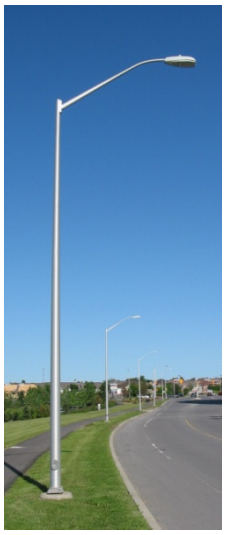
5.7 LUMINAIRE GROUPING FOR "ALL OTHER AREAS"

The luminaires for "All Other Areas" were grouped together for convenience based on their general appearance and then further subdivided in subgroups (Semi Cut Off & Full Cut Off) by luminaire distribution as described by *RP-8-14 Roadway Lighting*1. There are four luminaire groups including; Cobra-Head Style Luminaires, Lantern Style Luminaires, Round Style Luminaires, and 'Shoe Box' Style Luminaires.

When selecting luminaires, poles and brackets, please refer to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***.

5.8 STANDARD POLES FOR ROADWAY LIGHTING

FIGURE 5.8 STANDARD LIGHT POLES FOR "ALL OTHER AREAS"



Aluminum Pole

Round Concrete Pole

Octagonal Concrete Pole

Tapered Concrete Pole

5.9 ROADWAY LIGHTING EQUIPMENT CONTEXT

Table 5.2 *Roadway Lighting Equipment Context for "All Other Areas"* provides recommended standards for lighting equipment in various Road / Area classifications for "All Other Areas". The recommendations provide a variety of lighting options with pole heights being matched up with luminaires and lumen output. Table 5.2 will ensure a consistent approach to the installation of lighting poles and luminaires within the rights-of-way throughout the city.

Table 5.2 Roadway Lighting Equipment for "All Other Areas"

ROADWAY CLASS		AREA CLASS	LUMINAIRES							Lumen Output Range					POLES									
			Group A		Group B			Group C	Group D	9000-17000	7000-13000	5000-8500	3000-5000	1900-3750	Aluminum				Concrete					
			A1	A2†	B1	B2	B3								11.3 m	9.8 m	8.2 m	4.6 m	12.5 m	10.7 m	9.8 m	9.1 m	6.1 m
URBAN AREA	ARTERIAL	Mixed Use Centre/Central Area	NOT APPLICABLE TO "ALL OTHER AREAS"																					
		Employment/Enterprise Area		✓				✓	✓	✓	✓	✓			✓	✓			✓					
		General Urban Area		✓				✓	✓	✓	✓	✓			✓	✓			✓	✓				
	MAJOR COLLECTOR	Mixed Use Centre	NOT APPLICABLE TO "ALL OTHER AREAS"																					
		Employment/Enterprise Area		✓				✓	✓	✓	✓	✓			✓	✓			✓	✓				
		General Urban Area		✓				✓	✓	✓	✓	✓			✓	✓			✓	✓				
	COLLECTOR	Mixed Use Centre/Central Area	NOT APPLICABLE TO "ALL OTHER AREAS"																					
		Employment/Enterprise Area		✓		✓		✓	✓			✓	✓			✓				✓	✓			
		General Urban Area	Ⅱ	✓		✓		✓	✓			✓	✓			✓				✓	✓			
	LOCAL	Mixed Use Centre/Central Area	NOT APPLICABLE TO "ALL OTHER AREAS"																					
		Employment/Enterprise Area		✓		✓		✓	✓				✓	✓			✓					✓		
		General Urban Area		✓		✓		✓	✓				✓	✓			✓					✓		
			✓			✓							✓	✓										✓
RURAL AREA	ARTERIAL	All Other Areas	✓	✓	✓		✓						✓			✓				✓				
	COLLECTOR	All Other Areas	✓	✓	✓		✓						✓			✓				✓				
	LOCAL	All Other Areas		✓	✓		✓						✓			✓	✓			✓		✓		
OTHERS-THROUGH-BLOCK PEDESTRIAN WALKWAYS								✓	✓					✓				✓						✓

† If A2 luminaires are used for full illumination up to a boundary area from urban to rural then A2 luminaires shall be extended into the rural area as described in Section 3.3.5.1 *Full Continuous Lighting up to a Boundary Road.*

CHAPTER 6 DESIGN CONSIDERATIONS

In the design and implementation of roadway lighting, there are many things to consider, such as light pollution, transition of illumination, curvilinear road sections, etc. in order to provide a 'proper' lighting system.

6.1 LIGHT POLLUTION

Light pollution is a term used to describe the negative effects of the use of lighting such as light trespass, sky glow, and glare. With the proper use of light luminaires and pole heights, light pollution can be minimized. The implementation of a maximum semi cut-off luminaire (5% up-light1) and the use of full cut-off luminaires (0% up-light1) will reduce the amount of unwanted light into the environment.

6.2 RURAL AREA HORIZONTAL CURVES

The illumination of rural area horizontal curves shall be dealt with on a case-by-case basis and shall be subject to the availability of electric power and capital funding. If approved, the lighting of any rural area horizontal curve shall be complete with semi cut-off class luminaires with maximum lumen output of 5000 lumens. The lighting equipment shall conform to ***Appendix B Street Lighting Selection Criteria and Equipment Inventory***.

6.3 STREET AND SIDEWALK LIGHTING SHADED BY TREES

The City acknowledges that seasonally, street and sidewalk lighting shaded by the foliage of trees is sometimes unavoidable. The resulting reduction in levels of roadway and sidewalk lighting is acceptable provided that the original design and installation of street lighting equipment was properly coordinated with the location of the trees. Therefore, street trees will not be trimmed to accommodate the street lighting, except as may be approved in special circumstances by the Manager of the Public Works Department's Traffic Services Branch.

CHAPTER 7 STREET LIGHTING WARRANTS

7.1 PRIORITIZATION OF LIGHTING

Capital funding for street lighting on unlit and under lit roadways, including its installation, operation and maintenance, is limited, and must be allocated on a priority basis to projects that will yield the greatest cost benefit ratio. Therefore, the City has applied a Weighting Scheme to various roadway factors such as site conditions (including, for example, the presence of schools, parks, community centres), road class, area class, bus routes and traffic volumes, to name a few. Each candidate roadway is scored based on the sum of the weights for the various factors applicable to the respective roadway. The scores for each roadway are then sorted numerically with the highest scoring roadway being given the highest priority to receive a lighting upgrade. Although a roadway may be high in the priority list, it is also subject to a lighting warrant analysis to meet specific lighting warrants before capital funding is allocated to construct the new lighting.

7.1.1 Roadway Lighting Prioritization Database

The Roadway Lighting Prioritization Database (RLPD) is a separate document used to assist in the implementation of this Policy. The RLPD was extracted and developed using the City of Ottawa *GIS Maintenance Database* and Hydro Ottawa *Existing Lighting Conditions Mapping*. The RLPD will be updated as required over time by the City to reflect new installations of street lighting, the addition of new roadways, and revisions to road and area classifications as per the *City of Ottawa Official Plan Schedule Maps* since the amalgamation of the City of Ottawa.

7.2 ROADWAY LIGHTING WARRANTS

Although a roadway may have high priority for street lighting it may not necessarily require the lighting. The use of roadway lighting warrants will assist the City in establishing a consistent method of evaluating the need for right-of-way lighting. The warrants provide conditions that must be satisfied to justify the installation of lighting. Warrants give conditions that should be satisfied to justify the installation of lighting, however, meeting warranting conditions does not obligate the City of Ottawa to provide lighting or contribute to its cost.

Roadway Lighting Warrants shall be undertaken as described by the *Guide to the Design of Roadway Lighting*2.

APPENDIX A GLOSSARY

A.1 ABBREVIATIONS

ANSI – American National Standards Institute,

BUG – Backlight, Uplight & Glare,

CSA – Canadian Standard Association,

ESA – Electrical Safety Authority,

IEEE – Institute of Electrical and Electronics Engineers,

IESNA – Illuminating Engineering Society of North America,

ROW – Right-of-Way

TAC – Transportation Association of Canada,

MTO – Ministry of Transportation Ontario

A.2 DEFINITIONS

Average Illuminance: Average Illuminance, generally referred to as '$E_{avg.}$' and measured in 'Lux', is the arithmetical average of individual illuminance values calculated at predetermined points within an area. For example, Average Illuminance on a section of roadway can be determined by overlaying an imaginary grid on that section of the roadway, calculating illuminance values at each grid point and then taking an average of all the values.

Average Luminance: Average Luminance or Average Pavement Luminance for a surface, generally referred to as '$LP_{avg.}$' and measured in 'Candelas per square metre (cd/m^2), is the arithmetical average of individual Luminance values calculated at predetermined points on the surface. Similar to calculating Average Illuminance, Average Pavement Luminance for a section of roadway can be determined by overlaying an imaginary grid on that section of the roadway, calculating Luminance values at each grid point and then taking an average of all the values.

Candela (cd): The unit of luminous intensity formerly termed "candle". One candela equals one lumen per steradian.

Coefficient of Utilization (CU): A design factor that represents the percentage of bare lamp lumens that are utilized to light the pavement surface. This factor is based on the luminaire position relative to the lit area.

Footcandle (fc): The English unit of Illuminance; illuminance on a surface one square foot in area on which there is uniformly distributed a light flux of one lumen. One foot-candle equals 10.76 lux.

Glare: The sensation produced by the luminance within the visual field that is sufficiently greater than the luminance to which the eyes are adapted to cause annoyance, discomfort or loss in visibility or visual performance.

Illuminance (E): Illuminance is a measure of the "amount" of light a light source projects on to a surface. More precisely, it is the density of luminous flux (Lumens) falling on a surface and decreases with

distance of the surface from the source (Inverse Square Law). The metric units for measurement of illuminance are "Lux", which is equal to 1 Lumen/m^2 area.

Initial Lamp Lumens (LL): Initial bare bulb lumen output of a light source.

Light: Radiant energy that is capable of being perceived by the eye and producing a visual sensation. The visible portion of the electromagnetic spectrum extends from approximately 380 to 770 nanometres.

Light Emitting Diodes (LED): A semiconductor diode that converts applied voltage to light and is used in lamps, luminaires and digital displays.

Lumen (lm): defined as:
A unit of measure of the quantity of light. One lumen is the amount of light which falls on an area of one square foot, every point of which is one foot from the source of one candela. A light source of one candela emits a total of 12.57 lumens; or

A measure of luminous flux emitted by a source. The output of a lamp is expressed by the manufacturers in Lumens (e.g. 400 watt high pressure sodium lamp produces 50000 initial lumens).

Luminaire: A complete unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the power supply.

Luminance: Luminance of a roadway surface, simply explained, is the intensity of reflected light per unit area of the surface in the direction of the viewer. Luminance indicates the "brightness" of the roadway surface ahead of the observer when viewed from a given location in a given direction. Luminance at any location (point) on the roadway surface varies with the incident angles of light from various light sources on to the surface, the reflectance properties of the pavement, and the viewing angle of the stationary observer at the point.

Lux (lx): The SI unit of illuminance; defined as the amount of light on a surface of one square metre, all points of which are one metre from a uniform source of one candela. One lux equals 0.0929 foot-candle.

Maintained Average Illuminance/Luminance: Light output of a roadway lighting system deteriorates over time due to many factors. Though many of these factors are complex in nature to quantify, two major factors are depreciation of lamp lumen output due to its age (referred to as Lamp Lumen Depreciation or 'LLD'), and accumulation of dirt inside the luminaire as well as on the outside of the glassware (referred to as Luminaire Dirt Depreciation or 'LDD'). The product of these two factors is referred to as Light Loss Factor or 'LLF'.

Nuisance Light: Nuisance light can be defined as the presence of a bright source within the observer's field of view, which the observer finds objectionable and/or intrusive. This adverse effect includes the increase in brightness of the night sky (Sky Glow) and glare experienced by people in the vicinity of luminaires.

Q Factor: A measure to overall "lightness" of the surface

Sky Glow: The term used to describe the added sky brightness caused by the scattering of extraneous light reflecting from the dust particles in the atmosphere.

Spill Light: Spill light can be defined as illumination of an area beyond the primary area that the light source is intended to illuminate.

Steradian: A solid angle subtending an area on the surface of a sphere equal to the square of the sphere radius.

Uniformity: Uniformity of lighting refers to "Quality" of lighting. The lighting must be uniformly spread over an area for good visibility since the human eye requires a finite amount of time to adapt to changes in light levels. The uniformity of lighting for an area, for both Illuminance and Luminance method, is determined by calculating the ratio of Average Illuminance/Luminance to Minimum Illuminance/Luminance within the area.

Veiling Luminance: Also known as Disability Glare, it is the direct luminance superimposed on the retina by external light sources, which causes a "veil" of light and reduces the contrast of an image. The veiling luminance can be produced by a roadway luminaire, headlights of an oncoming vehicle, advertising signs along the roadway, and stray commercial/residential lighting adjacent to the roadway. Veiling luminance produced by only roadway luminaires is considered in the lighting calculations.

Visibility: The quality or state of being perceivable by the eye. In roadway lighting it is usually defined in terms of the distance at which an object can just be perceived.

Warrant: The justification for the installation of roadway lighting based on several factors as defined in the Transportation Association of Canada "Guide for the Design of Roadway Lighting"

A.3 REFERENCES

The following published documents have been used as the basis for establishing lighting design criteria:

Canadian Standard Association:
CSA C22.2 No. 211.2-06 (R2011) - Rigid PVC, Unplasticized Conduit

CSA C22.2 No. 227.1-97 (R2002) - Electrical Non-metallic Tubing (Bi-national standard, with UL 1653)

Illuminating Engineering Society of North America:
IESNA DG-5-94 - Recommended Lighting for Walkways and Class 1 Bikeways

IESNA LM-67- 94 - Calculation Procedures and Specifications of Criteria for Lighting Calculations

IESNA RP-8-14 - Roadway Lighting ANSI Approved

IESNA RP-22-05 - Recommended Practice for Tunnel Lighting

IESNA TM-3-95 - A Discussion of Appendix E – "Classification of Luminaire Light Distributions"

IESNA TM-10-00 - Addressing Obtrusive Light (Urban Sky Glow and Light Trespass) in Conjunction with Roadway Lighting

IESNA TM-11-00 - Light Trespass; Research, Results and Recommendations

Transportation Association of Canada (TAC):
Guide for the Design of Roadway Lighting

Ministry of Transportation, Ontario (MTO):

Roadside Safety Manual

APPENDIX B STREET LIGHTING SELECTION CRITERIA AND EQUIPMENT INVENTORY[1]

APPENDIX C MAIN STREET ROADS

C.1 BUSINESS IMPROVEMENT AREAS

Please consult with the City of Ottawa's Economic Development & Innovation Departments' Economic Development Branch for the latest BIA boundaries.

Business Improvement Areas in Table 7.1 are listed only by street or area name. Refer to section D.1 *Business Improvement Areas* of **Appendix D *Map Schedules*** for the boundaries of each BIA.

Table C.1.1 Business Improvement Area Existing Main street Roads

BIA DISTRICT		MAIN STREET ROADS WITH EXISTING DECORATIVE LIGHTING*	NOTES
1.	Bank Street	Bank Street	
2.	Byward	Dalhousie, ByWard Market, Sussex, McKenzie, Murray Street, Clarence Street, York Street, George Street.	Only a short section of Murray west of Parent has decorative lights.
3.	Preston Street	Preston Street	
4.	Rideau Street "1" and "2"	Rideau Street, Sussex, Colonel By.	
5.	Somerset Heights	Somerset Street	
6.	Somerset Village	Somerset Street	Under construction
7.	Sparks Street	Sparks Street	In pedestrian mall

[1] Please contact the Public Works Department's Street Lighting Asset Management Section for the latest "*Street Lighting Selection Criteria and Equipment Inventory*" document for complete details.

BIA DISTRICT		MAIN STREET ROADS WITH EXISTING DECORATIVE LIGHTING*	NOTES
8.	Vanier	Beechwood Ave., Montreal Road	
9.	Westboro Village	Richmond Road	
10.	Barrhaven	(None)	
11.	Carp	Carp Road, Donald B. Munro Drive.	
12.	Manotick	Manotick Main Street, Bridge Street, Tighe Street, Mill Street.	
13.	Orleans	(None)	

* These roads are not necessarily designated in the *City of Ottawa Official Plan* schedule maps as *Main street* roads but do have existing decorative (full / partial) lighting.

C.2 RURAL AREA VILLAGES

Refer to the *City of Ottawa Official Plan Schedule G – Rural Road Network* for the location of the complete list of suggested rural area village main streets. .

Table C.2.1 Suggested Rural Area Village *Main streets*

VILLAGE		MAIN STREET ROADS	NOTES
1.	Galetta	Galetta Side Road**, Mohr's Road**.	Approx. 1270m standard lighting.
2.	Kinburn	Kinburn Side Road**, Loggers Way**.	Approx. 1260m standard lighting.
3.	Fitzroy Harbour	Fitzroy Street**, Harbour Street**.	Approx. 1400m standard lighting.

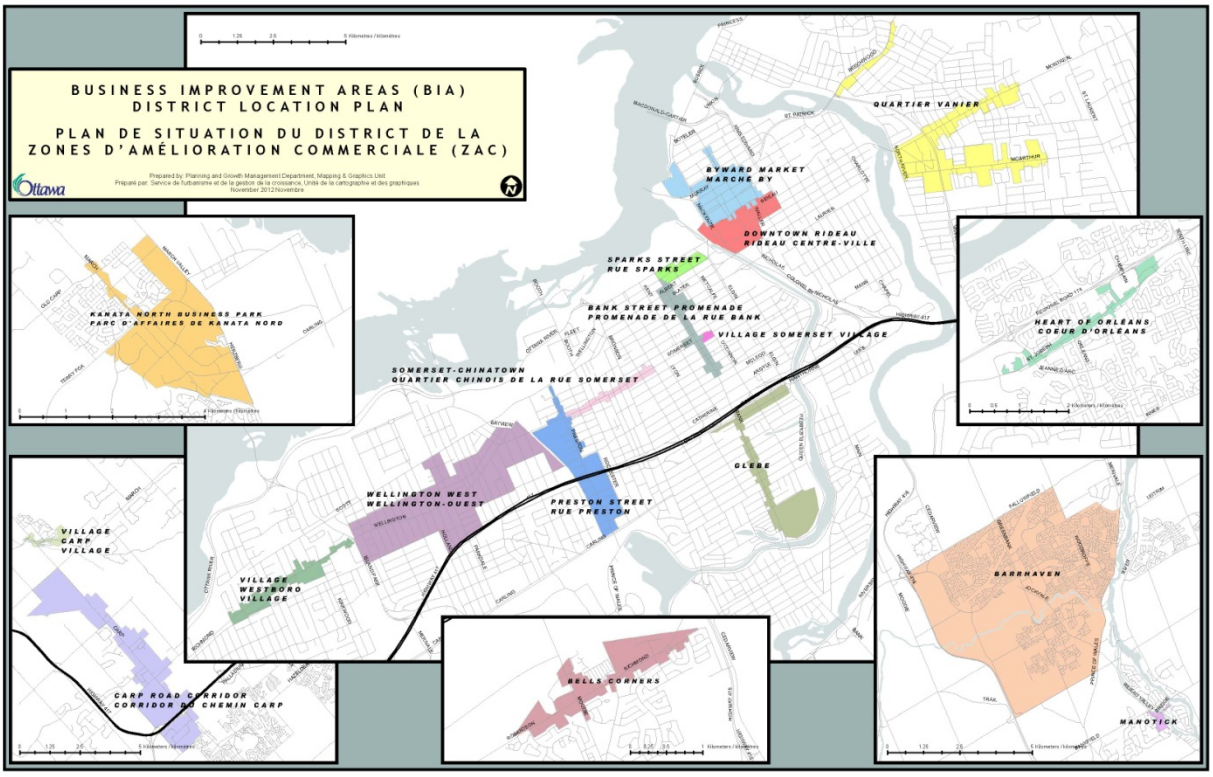
VILLAGE		MAIN STREET ROADS	NOTES
4.	Constance Bay	Constance Bay Road**.	Approx. 460m standard lighting.
5.	Dunrobin	Dunrobin Road**	Approx. 300m standard lighting.
6.	Carp	Carp Road*, Donald B. Munro Drive.*	Approx. 2190m standard lighting & 470m of decorative lighting.
7.	Ashton	Ashton Station Road.***	Marker only
8.	Munster	Munster Side Road, Bleeks Road.***	Marker only
9.	Richmond	Perth Street*, McBean Street**.	Approx. 3980m standard lighting & 380m of decorative lighting.
10.	Fallowfield	Steeple Hill Crescent.	No existing lighting.
11.	Manotick	Manotick Main Street*, Bridge Street*, Maple Avenue**, Scharfield Road**, Ann Street**, Beaverwood Road**, Tighe Street*, Mill Street*, Currier Street (west).	Approx. 2870m standard lighting & 960m of decorative lighting.
12.	North Gower	Roger Stevens Drive**, Fourth Line Road**, Church Street**, Prince of Wales Drive**.	Approx. 2700m standard lighting.
13.	Kars	Rideau Valley Drive**, Old Wellington Street*, Washington Street*, Kars Rectory Street*, Lord Nelson Street, Waterloo Street*.	Approx. 1030m standard lighting & 750m of decorative lighting. *(note that most of these are local back streets and may not be included as main streets for decorative lighting)*
14.	Osgoode	Osgoode Main Street**.	Approx. 2400m standard lighting.
15.	Greely	Parkway Road**, Meadow Drive**, Ellesworth Lane.	Approx. 2200m standard lighting.

VILLAGE		MAIN STREET ROADS	NOTES
16.	Metcalfe	8th Line Road**, Victoria Street**.	Approx. 3000m standard lighting.
17.	Kenmore	Yorks Corners Road.***	Marker only
18.	Vernon	Bank Street**, Lawrence Street**.	Approx. 2480m standard lighting.
19.	Marionville	Marionville Road**, Gregoire Road**.	Approx. 830m standard lighting.
20.	Vars	Buckland Road*, Farwell Street*.	Approx. 1080m standard lighting & 540m of decorative lighting.
21.	Carlsbad Springs	Russell Road.***	Marker only
22.	Navan	Trim Road**, Meteor Road** and Colonial Road**.	Approx. 2750m standard lighting.
23.	Notre-Dame-des Champs	Navan Road, Mer Bleue Road.***	Marker only
24.	Sarsfield	Colonial Road**, Sarsfield Road**.	Approx. 1480m standard lighting.
25.	Cumberland	Old Montreal Road*, Cameron Street*, Dunning Road**.	Approx. 1610m standard lighting & 650m of decorative lighting.
26.	Burritt's Rapids	Burritt's Rapids Drive.***	Marker only

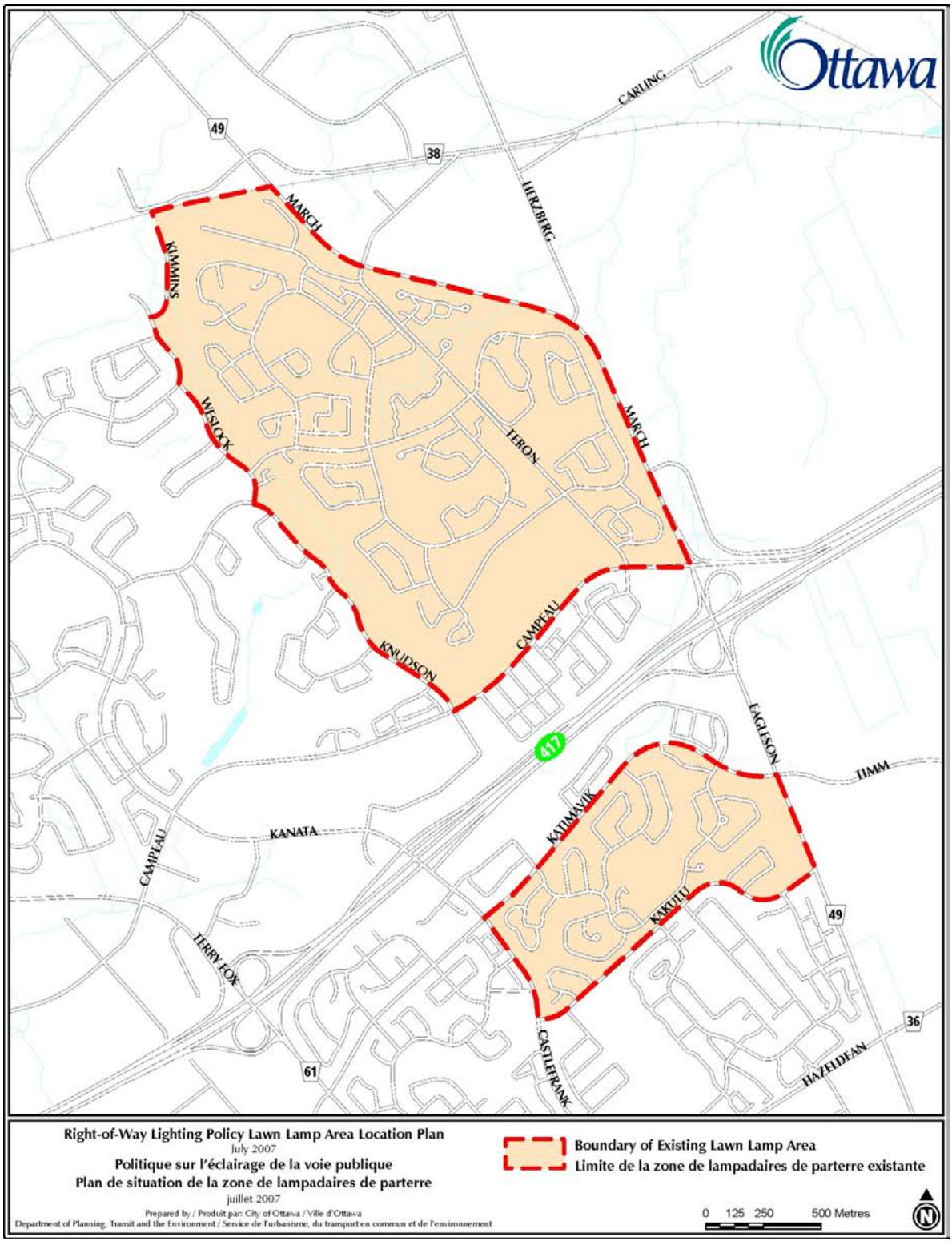
* Existing decorative / standard (continuous) lighting.
** Existing standard (continuous) lighting.
*** Existing marker ("crossroads") lighting.

APPENDIX D MAP SCHEDULES

D.1 BUSINESS IMPROVEMENT AREAS

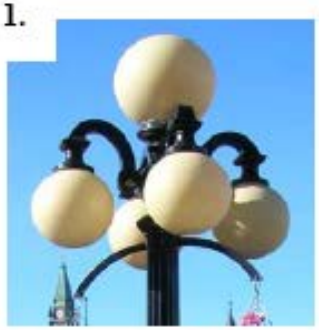


D.2 EXISTING LAWN LAMPS



APPENDIX E LIGHTING STYLES IN EXISTING HERITAGE CONSERVATION DISTRICTS

1.



Location:
Lowertown West

2.

Location:
Lowertown West
Byward Market
Somerset Street

3.

Location:
Sparks Street

4.

Location:
Lowertown West
Byward Market
Confederation Blvd.

5.

Location:
Sandy Hill

6.

Location:
Minto Bridges
Fleet Street

7.

Location:
Lowertown West

APPENDIX F LUMINANCE VERSUS ILLUMINANCE

Right-of-way lighting designs are to be undertaken using the Luminance criteria for all tangent roadway sections as opposed to the Illuminance method. Luminance has become the preferred criteria for roadway lighting because it defines what the eye sees (meaning the light that is reflected from the roadway surface to the observer who is located 83m upstream from the calculation point and is looking downward at an angle of 1 degree). To perform this calculation, reflectance tables for the roadway surface are required. *IESNA RP-8* defines these reflectance values for four types of roadway surfaces, R1 to R4, where R1 is a concrete road surface and R2 to R4 are asphalt road surfaces of varying aggregate sizes/textures. Due to the requirements of the Luminance criteria (including the calculation method with the observer 83m upstream from the point of interest looking 1 degree downward and the reflectance tables), it will not be suitable for designing roadway lighting of curved roadway sections, intersections and sidewalks.

For curved roadway sections the observer is typically looking along the curve less than 83m ahead making it impractical to apply the Luminance criteria. For intersections, the light levels are typically increased due to the concentration of vehicular and pedestrian activity. This increase in light levels affects the Veiling Luminance calculations for glare which uses average Luminance to determine the glare ratio. Consequently, in order to correctly assess the Veiling Luminance of a roadway lighting design, Luminance calculations must be done in advance of or ahead of the intersection. For sidewalks, there is usually two components to the lighting design as recommended by the *IESNA RP-8*; horizontal or sidewalk surface (for detecting obstacles in the pedestrian's path) and vertical or pedestrian surface (for facial recognition). Although one can dispute that we could define Luminance criteria for the horizontal sidewalk surface using R1 reflectance values, *IESNA RP-8* does not currently have recommended levels. Furthermore, it is not possible to perform Luminance calculations on a vertical plane since neither reflectance values for a surface that simulates a pedestrian nor calculation methods are available for performing such a calculation. Therefore Luminance cannot be used for sidewalk lighting.

Subsequently, the Illuminance criteria will still be used to design roadway lighting of curvilinear roadway sections, intersections and sidewalks. Illuminance is suitable in these instances as it is a measure of the amount of light that strikes a surface independent of an observer and reflectance properties of the surface and it can also be calculated on both a horizontal (roadway/sidewalk) and vertical (pedestrian) surface. Illuminance criteria will also be used as a verification tool for field measurements of designed lighting levels to actual light levels achieved on the roadway/sidewalk

Luminance and Illuminance should not be used in conjunction with each other in designing roadway lighting as it has a significant impact on the lighting installation in terms of higher initial capital construction cost, increase maintenance and operation costs, increased energy consumption and increase light pollution. The following sample calculation demonstrates the impact of utilizing both criteria for roadway lighting designs:

Design Criteria for a Typical Arterial Roadway in an Employment Enterprise Area

A. Roadway Lighting Levels as indicated in Table 2.1 *Recommended Average Roadway Lighting Levels*:

1. Average Luminance = 0.9 Cd/m^2
2. Average to Minimum Uniformity = 3:1
3. Veiling Luminance (Glare Ratio) = 0.3

} Luminance Criteria

4. Average Illuminance = 13 Lux
5. Average to Minimum Uniformity = 3:1

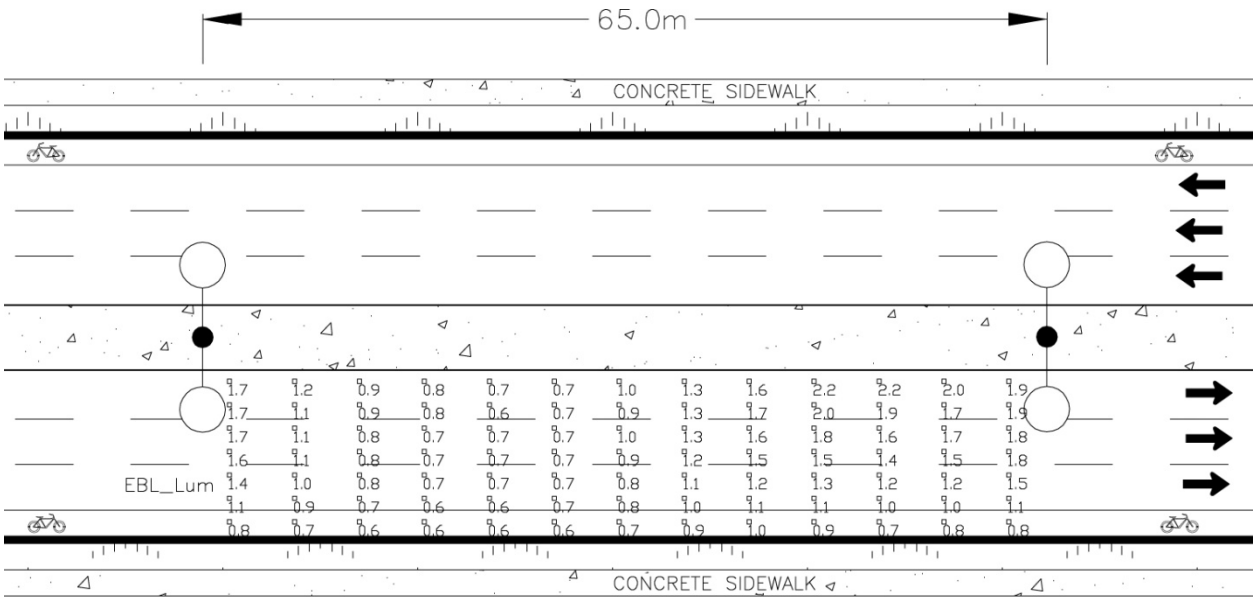
} Illuminance Criteria

B. Lighting Equipment:

1. 400 Watt HPS s*emi cut off cobra head Series 125* by American Electric Lighting, model SC-12500436-3, photometric curve # AE3853,
2. 2.4m Luminaire Bracket (Table 7.10 *Luminaire Bracket Arms*), and
3. 11.3m Aluminum pole (Table 7.11 *Aluminum Poles)*.

Figure F.1 *Roadway Lighting Design Using Luminance,* illustrates a lighting design of a typical arterial roadway section using the Luminance criteria. The design resulted in a lighting layout with about 16 light poles per kilometre with pole spacing of 65m. The designed average Luminance achieved was 25% higher than the recommended average. The increased lighting is inherent in any lighting design in attempting to satisfy all the lighting criteria (in this case; Average, Uniformity & Glare). 'Over Lighting' should be minimized as much as possible as discussed in **Section 2.1 *Lighting Design Calculations***.

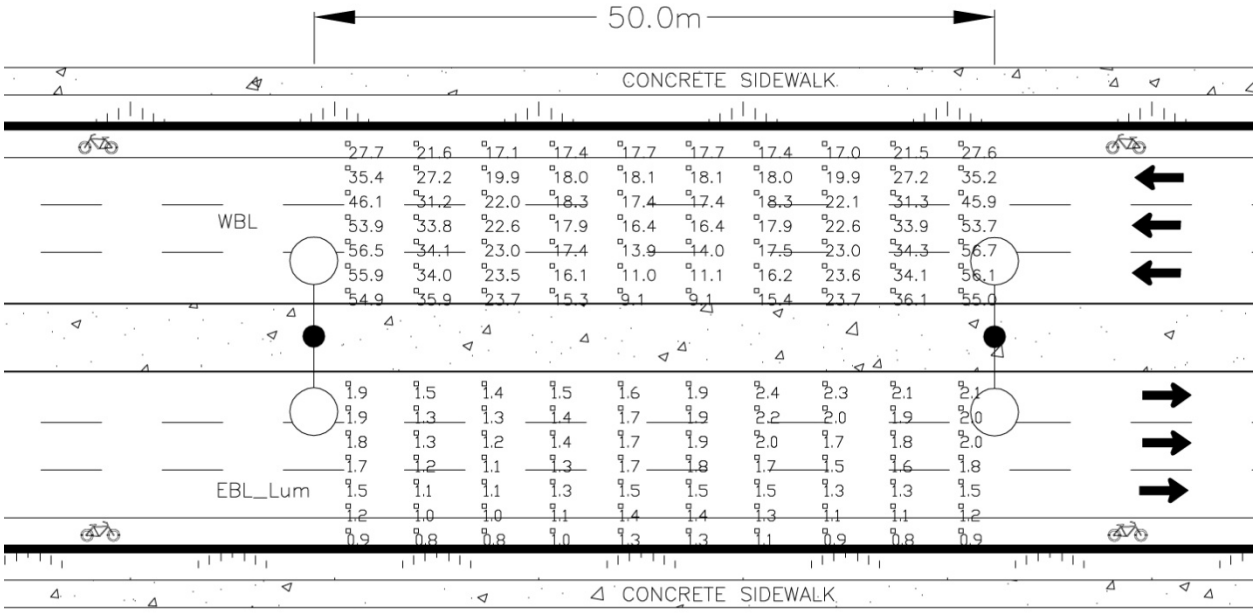
FIGURE F.1 ROADWAY LIGHTING DESIGN USING LUMINANCE



Numeric Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	LVRatio
EBL_Lum	Luminance	Cd/Sq.M.	1.12	2.2	0.6	1.87	0.00
EBL_Lv	VLuminance	Cd/Sq.M.	0.16	0.32	0.05	3.20	0.28

Figure F.2 *Roadway Lighting Design Using Luminance & Illuminance*, illustrates a lighting design for the same arterial roadway section using both Luminance and Illuminance criteria. This design resulted in a lighting layout with 20 Poles per kilometre with pole spacing of 50m. In attempting to achieve both criteria the designed average levels for Luminance was 65% higher than needed and for Illuminance it was 103% higher than actually recommended. The 'over lighting' again is a direct result of trying to achieve all the criteria for both Luminance and Illuminance (i.e. Average Luminance & Illuminance, Glare for Luminance and Uniformity for Luminance and Illuminance).

FIGURE F.1 ROADWAY LIGHTING DESIGN USING LUMINANCE & ILLUMINANCE



Numeric Summary							
Label	CalcType	Units	Avg	Max	Min	Avg/Min	LVRatio
WBL	Illuminance	Lux	26.41	56.7	9.1	2.90	N.A.
EBL_Lum	Luminance	Cd/Sq.M.	1.48	2.4	0.8	1.84	0.00
EBL_Lv	VLuminance	Cd/Sq.M.	0.22	0.38	0.08	2.75	0.26

In summary, using both Luminance and Illuminance methods produced a lighting design layout requiring an additional 4 poles per kilometre. The additional lighting poles resulted in significantly higher lighting levels than recommended; for both criteria Luminance average was 65% higher than recommended whereas with Luminance criteria only it was 25% higher. The higher lighting levels will result in increased energy consumption and light pollution. The sample calculation illustrates the advantages of using the Luminance criteria only for roadway lighting design such as reduced 'over lighting' in designed levels, increased poles spacing resulting in cost savings in the initial construction costs and ongoing operational and maintenance costs. For this reason Luminance shall always take precedence over Illuminance except for lighting designs where Luminance is not practical (e.g. curvilinear roadway sections, intersections and sidewalks).

APPENDIX G FOOTNOTES

[1] **American National Standard Institute** / **Illuminating Engineering Society of North America** (ANSI / IESNA)

[2] **Transportation Association Canada (TAC)**

[3] **City of Ottawa Official Plan**

[4] **Ministry of Transportation Ontario**, Roadside Safety Manual

[5] **Electricity Act 1998**

[6] **Official Plan Schedule G – Rural Roads Network**

[7] **Official Plan Schedule E – Urban Roadway Network**