

# **STREET LIGHTING DESIGN MANUAL**

## **CITY OF OSHAWA**

### **1 Street Lighting Design and Installation Requirements - General**

Street lighting design in the City of Oshawa shall be based on ANSI / IESNA RP-8-00 (Illuminating Engineering Society of North America's American National Standard Practice for Roadway Lighting, issued June 27, 2000) and the MEA - MSL-95 (Municipal Electric Association's Guide to Municipal Standard Construction, Street Lighting, Part 6, Section IV, Typical Design Procedures, and Section V, Lighting Special Sections), dated September 1995. MEA sections IV and V are based directly on ANSI/IES RP-8, 1983 with some modifications.

Street lighting design in Oshawa must provide uniform lighting at a level that is adequate and comfortable for vehicular and pedestrian movement on the City's roads and sidewalks. All street lighting systems in the City of Oshawa shall be designed by a qualified lighting designer using the luminance method as described in RP-8-00 (unless noted otherwise), as well as incorporating both the City and Oshawa PUC Networks Inc.'s standards and specifications as given below. Street lighting design in Oshawa must take into consideration all of the approved luminaires of a given type in order to allow interchangeability of luminaires during maintenance operations.

Recommended maximum spacings or arrangements given in the following sections are to be used for the specific cross section or road layout shown. Variations in cross section or road layout must be dealt with on an individual design basis and a specific lighting design and its associated calculations must be submitted to the City for review.

It is the responsibility of the street lighting designer to ensure they have the latest revisions of the City of Oshawa's street lighting standards and specifications and a current list of approved suppliers prior to designing the street lighting system.

As of January 1, 2003, all street lighting design and construction is subject to ESA inspection and approval. All materials used for street lighting in the City of Oshawa must meet CSA specifications.

Decorative street lighting may be used in the City only with the City's permission and in accordance with the City's requirements and specifications.

### **2 IES Illuminance and Luminance Design Criteria**

The design requirements for luminance and illuminance given below in Tables 1 and 2 are taken from ANSI/IES RP-8-00. The values given for luminance shall govern; the values given for illuminance are for use in intersection and sidewalk designs. All roads requiring a medium or higher pedestrian conflict designation will require the preparation and submission of a suitable design to the City for review.

**TABLE 1****LUMINANCE DESIGN CRITERIA FOR STANDARD OSHAWA ROADS**

Road and Area Classification	Average Maintained Luminance ( $\text{cd/m}^2$ )	Maximum Luminance Ratios		Maximum Veiling Luminance Ratios $L_v$ to $L_{ave}$	Pedestrian Conflict Area Classification
		$L_{max}$ to $L_{min}$	$L_{ave}$ to $L_{min}$		
Local Residential Roads (IES Local - Low) Oshawa Standard Cross Sections OS-201, OS-202 & OS-203	0.3	10 to 1	6 to 1	0.4 to 1	LOW
Local Industrial Roads (IES Local – Low/Medium) Oshawa Standard Cross Section OS-204	0.4	10 to 1	6 to 1	0.4 to 1	LOW
Residential Collector Roads (IES Collector - Low) Oshawa Standard Cross Section OS-204	0.4	8 to 1	4 to 1	0.4 to 1	LOW
Arterial Roads (IES Major - Low) Oshawa Standard Cross Sections OS-205 & OS-206	0.6	6 to 1	3.5 to 1	0.3 to 1	LOW

**TABLE 2****ILLUMINANCE DESIGN CRITERIA FOR ROADS AND SIDEWALKS**

Road and Area Classification	Minimum Average Maintained Illuminance (horizontal only) (R2 & R3 Pavements) $E_{ave}$ in lux	Maximum Illuminance Uniformity Ratio $E_{ave}$ to $E_{min}$
Local Residential Roads (IES Local - Low) Oshawa Standard Cross Sections OS-201, OS-202 & OS-203	4	6 to 1
Local Industrial Roads (IES Local – Low/Medium) Oshawa Standard Cross Section OS-204	4	6 to 1
Residential Collector Roads (IES Collector - Low) Oshawa Standard Cross Section OS-204	6	3 to 1
Arterial Roads (IES Major - Low) Oshawa Standard Cross Sections OS-205 & OS-206	9	3 to 1
<b>Sidewalks and Bikepaths</b>		
<b>Pedestrian Conflict Area Classification</b>		
Low Density Residential	3	6 to 1
Medium Density Residential	4	4 to 1

Note: Meeting the IES  $E_{vmin}$  (minimum vertical illuminance at 1.5 metres above the sidewalk/bikeway measured in both directions parallel to the main pedestrian flow) specification is not being required by the City at this time due to the short spacings needed to meet the requirement.

**2.1 Maximum Recommended Spacings for Street Lighting on the City of Oshawa’s Standard Sections OS-201 to OS-206, Inclusive:**

Using the luminaire/pole combinations listed in Table 5 under Equipment Specifications, the table below gives the maximum allowable spacings for standard "cobra-head" street lights for straight sections, gradual curves and gently sloping grades for single sided, two sided staggered and two sided opposite arrangements.

The spacings given below are to be used for the design of street lighting on streets having the same dimensions for the essential items of the road cross section indicated, i.e., pavement width, luminaire offset and sidewalk width and offset. Variations in any of these essential items, such as pavement width in or near intersections, must be dealt with on an individual design basis and a specific lighting design and its associated calculations must be submitted to Oshawa PUC Networks Inc. for review on behalf of the City.

**TABLE 3**  
**MAXIMUM RECOMMENDED SPACINGS ON STRAIGHT SECTIONS FOR FLAT GLASS “COBRA-HEAD” STREET LIGHTS**

Luminaire Wattage	Type of R.O.W. Oshawa Standard Cross Section Number	Single Sided Spacing (on S/W side)	Two Sided Spacing; Staggered	Two Sided Spacing; Opposite
100 watt HPS	15 m. Minor Local Residential - Oshawa Standard OS-201	45 m	Not Applicable	Not Applicable
100 watt HPS	18 m. Minor Local Residential - Oshawa Standard OS-202	45 m	45 m	Not Applicable
100 watt HPS	20 m. Local Residential Double - Oshawa Standard OS-203	41 m	41 m	Not Applicable
150 watt HPS	20 m. Local Industrial Oshawa Standard OS-204	Not Recommended	55 m	67 m
150 watt HPS	20 m. Residential Collector - Oshawa Standard OS-204	35 m Not Recommended	55 m	67 m
250 watt HPS	26 m. Collector Road - Oshawa Standard OS-205	Not Recommended	52 m	60 m
250 watt HPS	26 m. Arterial Road - Oshawa Standard OS-206	Not Recommended	56 m	65 m

**2.2 Maximum Recommended Spacings for Decorative Street Lights on the City of Oshawa’s Standard Sections:**

Using the decorative luminaire/pole combinations listed in Table 6, the table below gives the maximum allowable spacings for decorative street lights for straight

sections, gradual curves and gently sloping grades for single sided and two sided, staggered arrangements.

**TABLE 4**

**MAXIMUM RECOMMENDED SPACINGS ON STRAIGHT SECTIONS FOR DECORATIVE STREET LIGHTS**

Luminaire Wattage	Type of R.O.W. Oshawa Standard Cross Section Number	Single Sided Spacing (on S/W side)	Two Sided Spacing; Staggered	Two Sided Spacing; Opposite
100 watt HPS	15 m. Minor Local Residential - Oshawa Standard OS-201	45 m	Not Applicable	Not Recommended
100 watt HPS	18 m. Minor Local Residential - Oshawa Standard OS-202	45 m	38 m	Not Recommended
100 watt HPS	20 m. Local Residential - Oshawa Standard OS-203	45 m	33 m	Not Recommended
150 watt HPS	20 m. Local Industrial - Oshawa Standard OS-204	Not Recommended	Not Recommended	Not Recommended
150 watt HPS	20 m. Residential Collector - Oshawa Standard OS-204	33 m	40 m	50 m
250 watt HPS	26 m. Collector Road - Oshawa Standard OS-205	Not Recommended	Not Recommended	Not Recommended
250 watt HPS	26 m. Collector Road - Oshawa Standard OS-206	Not Recommended	Not Recommended	Not Recommended

**2.3 Lighting For Urban Intersections**

The luminance method is difficult to use with the design of lighting for intersections due to the basic assumptions inherent in luminance design and the methods used in its calculation. Therefore illuminance criteria and calculations are recommended for use in the design of intersections. Intersections should be illuminated to a level equal to the sum of the recommended average illumination levels for each of the intersecting roads. These levels are given in Table 2, above.

Typical lighting layouts for intersections are given in ANSI/IES RP-8-00 in Annex "D", Figure D3 on page 40.

**2.4 ESA Lighting Design Requirements**

The new ESA regulations that came into effect as of January 1, 2003 are intended to separate the street lighting system from the electrical distribution system and to allow parties other than the local distribution company to maintain the street lights.

In order to accomplish this, the lighting designer must place a fused disconnect between the electrical distribution system and the street lighting system. The method approved by the City of Oshawa at this time is to run a street light service to the first street light pole in a street lighting circuit and place a fused disconnect in the handhole of the pole.

A maximum of a 5% voltage drop will be allowed in the street lighting cable beyond the fused disconnect.

A ground plate (minimum size 1,000 mm<sup>2</sup>) must be installed adjacent to the pole base at least 1 m. below final grade and connected to the bonded neutral block of the service entrance.

All materials, including the secondary service to the disconnect switch, must be CSA approved and will be subject to ESA inspection and approval.

## **2.5 Curves and Hills**

Tables 3 and 4, Maximum Spacings on Straight Sections for the two types of luminaire/pole combinations, are to be used on relatively straight and level sections only. When lighting curves and/or hills, the spacings in the aforementioned tables should be modified in accordance with the procedures given in ANSI/IES RP-8-00 in Annex "D", Figure D2 on page 39.

## **2.6 Culs-de-sac**

There are several design problems to be dealt with when designing lighting for culs-de-sac. They are:

- the area to be lit is not readily adaptable to the standard luminaires used in Oshawa;
- the space available for the placement of the luminaires/poles is generally quite limited due to the convergence of driveways in the boulevard areas; and
- due to the basic assumptions inherent in luminance design and the methods used in its calculation, the use of luminance criteria in culs-de-sac (or any other "dead-end" arrangement) is not recommended. Illuminance criteria and calculations are recommended for use in the design of culs-de-sac.
- Use of a type 5 distribution decorative post top luminaire is recommended for use on the cul-de-sac island.
- Street lighting designs for culs-de-sac shall be submitted to the City for review and approval.

## **3 Material Specifications**

All street lighting equipment used in the City of Oshawa must meet the current City of Oshawa's street lighting standards and specifications. It is the responsibility of the street lighting contractor to ensure they have the latest revisions of the City's street lighting specifications and list of approved suppliers prior to ordering any materials. All street lighting components are to be manufactured in strict accordance with the City's current requirements.

All street lighting equipment used in the City of Oshawa must meet CSA standards and specifications and is subject to ESA inspection and approval.

### **3.1 Street Light Poles**

Street light poles used in the City of Oshawa must be manufactured in accordance with the City’s street light pole specifications as given below (latest revision) and the Municipal Electrical Association’s (M.E.A.) Guide to Municipal Standard Construction, Street Lighting, Part 6, Section VIII, Sub-section 5 (Specification for Poles), latest revision. All poles must meet CSA specifications and are subject to ESA inspection and approval.

**3.2 “Cobra Head” Luminaire/Pole/ Bracket Combinations**

In general, the following “cobra head” luminaire/pole combinations are to be used in the City of Oshawa.

**TABLE 5**

**“COBRA HEAD” LUMINAIRE/POLE/BRACKET COMBINATIONS**

Road Type	Luminaire	Standard Pole	Pole Finish	Bracket
15 m. Minor Local Residential Oshawa Standard OS-201	100 Watt	32.5 foot (9.9 m)	standard gray concrete	6 foot (1.8 m)
18 m. Minor Local Residential Oshawa Standard OS-202	100 Watt	32.5 foot (9.9 m)	standard gray concrete	6 foot (1.8 m)
20 m. Local Residential Oshawa Standard OS-203	100 Watt	32.5 foot (9.9 m)	standard gray concrete	6 foot (1.8 m)
20 m. Local Industrial Oshawa Standard OS-204	150 Watt	32.5 foot (9.9 m.) round concrete pole	standard gray concrete	6 foot (1.8m.)
20 m. Residential Collector Oshawa Standard OS-204	150 Watt	32.5 foot (9.9 m.) round concrete pole	standard gray concrete	6 foot (1.8m.)
26 m. Collector Road Oshawa Standard OS-205	250 Watt	45 foot (13.7 m.) round concrete pole	standard gray concrete	6 foot (1.8m.)
26 m. Arterial Road Oshawa Standard OS-206	250 Watt	45 foot (13.7 m.) round concrete pole	standard gray concrete	6 foot (1.8m.)

**3.3 Decorative Luminaire/Pole/ Bracket Combinations**

In general, the following decorative luminaire/pole combinations are to be used in the City of Oshawa.

**TABLE 6**

**DECORATIVE LUMINAIRE/POLE/BRACKET COMBINATIONS**

Road Type	Luminaire	Standard Pole	Pole Finish	Bracket
15 m. Minor Local Residential Oshawa Standard OS-201	100 Watt	30.0 foot (9.15 m) black octagonal pole	polished midnight lace	6 foot (1.8 m)

18 m. Minor Local Residential Oshawa Standard OS-202	100 Watt	30.0 foot (9.15 m) black octagonal pole	polished midnight lace	6 foot (1.8 m)
20 m. Local Residential Oshawa Standard OS-203	100 Watt	30.0 foot (9.15 m) black octagonal pole	polished midnight lace	6 foot (1.8 m)
20 m. Local Industrial Oshawa Standard OS-204	Not Applicable	Not Applicable	Not Applicable	Not Applicable
20 m. Residential Collector Oshawa Standard OS-204	150 Watt	30.0 foot (9.15 m) black octagonal pole	polished midnight lace	6 foot (1.8 m)
26 m. Collector Road Oshawa Standard OS-205	Not Applicable	Not Applicable	Not Applicable	Not Applicable
26 m. Collector Road Oshawa Standard OS-206	Not Applicable	Not Applicable	Not Applicable	Not Applicable

When ordering street light poles to the City of Oshawa's standards, the appropriate City Street Light Specification Numbers, OSL-XX (latest revision), for the pole, the bracket and the luminaire must be specified together. The City's Street Light Specification Numbers can be found in Table 7.

### 3.4 **Standard Round Concrete Street Light Poles**

- **22.0 foot (6.7 metre) Class A Centrifugally Cast Round Concrete Pole**  
 The 22.0 foot (6.7 metre) concrete street light pole shall be a direct buried Class A pre-stressed round concrete pole with provision for electrical ground, natural concrete finish and come with a 3" O.D. X 3.5" steel tenon suitable for use with the City's post top luminaire, OSL-07, and manufactured in accordance with the City of Oshawa Street Light Specification Number OSL-01, (latest revision). Approved suppliers and their catalogue numbers for this pole are given in Table 7 at the end of this section.
- **32.5 foot (9.9 metre) Class B Centrifugally Cast Round Concrete Pole**  
 The 32.5 foot (9.9 metre) concrete street light pole shall be a direct buried Class B pre-stressed round concrete pole with provision for electrical ground, natural concrete finish and suitable for use with a 6.0 foot (1.8 metre) tapered aluminum bracket and manufactured in accordance with the City of Oshawa Street Light Specification Number OSL-02, (latest revision). Approved suppliers and their catalogue numbers for this pole are given in Table 7 at the end of this section.
- **45.0 foot (13.7 metre) Class B Centrifugally Cast Round Concrete Pole**  
 The 45.0 foot (13.7 metre) concrete street light pole shall be a direct buried Class B pre-stressed round concrete pole with provision for electrical ground, natural concrete finish and suitable for use with a 8.0 foot (2.4 metre) tapered aluminum bracket and manufactured in accordance with the City of Oshawa Street Light Specification Number OSL-03, (latest revision). Approved suppliers and their catalogue numbers for this pole are given in Table 7 at the end of this section.

### 3.5 **Decorative Black Concrete Street Light Poles**

- **22.0 foot (6.7 metre) Class A Centrifugally Cast Black Octagonal Tapered Concrete Pole**

The 22.0 foot (6.7 metre) black octagonal tapered concrete street light pole shall be a direct buried Class A pre-stressed concrete pole with provision for electrical ground, midnight lace polished finish, a 3.5" diameter X 4" long steel post top tenon and a luminaire and manufactured in accordance with the City of Oshawa Street Light Specification Number OSL-04, (latest revision). Approved suppliers and their catalogue numbers for this pole are given in Table 7 at the end of this section.

- **30.0 foot (9.14 metre) Class B Centrifugally Cast Black Octagonal Tapered Concrete Pole**

The 30.0 foot (9.14 metre) black octagonal tapered concrete street light pole shall be a direct buried Class B pre-stressed concrete pole with provision for electrical ground, midnight lace polished finish a side mount decorative bracket and luminaire and manufactured in accordance with the City of Oshawa Street Light Specification Number OSL-05, (latest revision). Approved suppliers and their catalogue numbers for this pole are given in Table 7 at the end of this section.

### **3.6 Luminaires**

All luminaires used in the City of Oshawa must be manufactured in accordance with the City of Oshawa's luminaire specifications as given below (latest revision) and must conform to the M.E.A. Guide to Municipal Standard Construction, Street Lighting, Part 6, Section VIII, Sub-section 2.1 (Specification for High Pressure Sodium Roadway Lighting Luminaires), latest revision. All "cobra-head" luminaires shall come complete with a bird stop.

All luminaires must meet CSA standards and specifications and are subject to ESA inspection and approval.

### **3.7 "Cobra-head" Luminaires**

- **100 Watt "Cobra-head" Luminaire**

The 100 watt "cobra-head" shall be a gray small housing flat glass luminaire giving a light distribution pattern to match the manufacturer's IES photometric file number as specified in the City of Oshawa Street Light Specification Number OSL-06, (latest revision), and shall come complete with:

- a 100 watt high pressure sodium lamp
- a 120 volt CWI Class H ballast pre-wired for 120 volts
- a twist lock photocontrol receptacle and photocontrol cell

Approved suppliers and their catalogue numbers for this luminaire are given in Table 7 at the end of this section.

- **100 Watt Post Top Luminaire**

The 100 watt post top luminaire for use on the islands in Culs de Sac shall be a gray post top luminaire giving a Type 5 light distribution pattern. Approved suppliers are specified in the City of Oshawa Street Light Specification Number OSL-07, (latest revision). The luminaire shall come complete with:



- a 100 watt high pressure sodium lamp
- a 120 volt CWI Class H ballast pre-wired for 120 volts
- a twist lock photocontrol receptacle and photocontrol cell

Approved suppliers and their catalogue numbers for this luminaire are given in Table 7 at the end of this section.

■ **150 Watt "Cobra-head" Luminaire**

The 150 watt "cobra-head" shall be a gray small housing flat glass luminaire giving a light distribution pattern to match the manufacturer's IES photometric file number as specified in the City of Oshawa Street Light Specification Number OSL-08, (latest revision), and shall come complete with:

- a 150 watt high pressure sodium lamp
- a 120 volt CWI Class H ballast pre-wired for 120 volts
- a twist lock photocontrol receptacle and photocontrol cell

Approved suppliers and their catalogue numbers for this luminaire are given in Table 7 at the end of this section.

■ **250 Watt "Cobra-head" Luminaire**

The 250 watt "cobra-head" shall be a gray small housing flat glass luminaire giving a light distribution pattern to match the manufacturer's IES photometric file number as specified in the City of Oshawa Street Light Specification Numbers OSL-09, (latest revision), and shall come complete with:

- a 250 watt high pressure sodium lamp
- a 120 volt CWI Class H ballast pre-wired for 120 volts
- a twist lock photocontrol receptacle and photocontrol cell

Approved suppliers and their catalogue numbers for this luminaire are given in Table 7 at the end of this section.

**3.8 Decorative Luminaires**

■ **100 Watt Decorative Luminaire**

The 100 watt decorative shall be a black "coach light" style luminaire giving a light distribution pattern to match the manufacturer's IES photometric file number as specified in the City of Oshawa Street Light Specification Number OSL-10, (latest revision), and shall come complete with:

- a 100 watt high pressure sodium lamp
- a 120 volt CWI Class H ballast pre-wired for 120 volts
- a twist lock photocontrol receptacle and photocontrol cell

Approved suppliers and their catalogue numbers for this luminaire are given in Table 7 at the end of this section.

■ **100 Watt Post Top Decorative Luminaire (Type 5 for Culs de Sac)**

The 100 watt decorative luminaire for use on the islands in Culs de Sac shall be a black "coach light" post top style luminaire giving a light distribution pattern to match the manufacturer's IES photometric file number as specified in the City of Oshawa Street Light Specification Number OSL-11, (latest revision), and shall come complete with:

- a 100 watt high pressure sodium lamp
- a 120 volt CWI Class H ballast pre-wired for 120 volts
- a twist lock photocontrol receptacle and a photocontrol cell

Approved suppliers and their catalogue numbers for this luminaire are given in Table 7 at the end of this section.

■ **150 Watt Decorative Luminaire**

The 150 watt decorative shall be a black “coach light” style luminaire giving a light distribution pattern to match the manufacturer’s IES photometric file number as specified in the City of Oshawa Street Light Specification Number OSL-12, (latest revision), and shall come complete with:

- a 150 watt high pressure sodium lamp
- a 120 volt CWI Class H ballast pre-wired for 120 volts a twist lock photocontrol receptacle and photocontrol cell

Approved suppliers and their catalogue numbers for this luminaire are given in Table 7 at the end of this section.

**3.9 Brackets**

All street light brackets used in the City of Oshawa must be manufactured in accordance with the Oshawa PUC Networks Inc./City of Oshawa’s specifications as given below (latest revision). All brackets must meet CSA specifications and are subject to ESA inspection and approval.

■ **Tapered Elliptical Aluminum Brackets**

Standard street light brackets for use with "cobra-head" luminaires must conform to the M.E.A. Guide to Municipal Standard Construction, Street Lighting, Part 6, Section VIII, Sub-section 4 (Specification for Tapered Aluminum Brackets), latest revision.

The brackets shall be a 1.8 metre (6 foot) tapered elliptical aluminum bracket. Approved suppliers and their catalogue numbers for the standard brackets are listed in the City of Oshawa Street Light Specification Number OSL-13.

■ **Decorative Brackets**

Decorative street light brackets must generally conform to the M.E.A. Guide to Municipal Standard Construction, Street Lighting, Part 6, Section VIII, Sub-section 4 (Specification for tapered Aluminum Brackets), latest revision, with the changes necessary to apply to arms for decorative fixtures.

The brackets shall be a 1.8 metre (6.0 foot) nominal curved brackets with a decorative scroll below the bracket. Approved suppliers and their catalogue numbers for this bracket are listed in the City of Oshawa Street Light Specification Number OSL-17.

**3.10 Photo-Electric Controllers**

Photo-electric controllers for the City of Oshawa shall be 120 volt NEMA twist lock controllers with a time delay feature, turn on level at 1 FC and turn off at 3 FC.

Approved suppliers and their catalogue numbers for the photo-electrical controllers are listed in the City of Oshawa Street Light Specification Number OSL-21. All photo-electrical controllers must meet CSA specifications and are subject to ESA inspection and approval.

### **3.11 Lamps**

Lamps shall conform to the City of Oshawa Street Light Specification Numbers OSL-18, 19 and 20. They shall be clear high pressure sodium mogul screw base lamps with the wattage as specified and a minimum average rated life of 24,000 hours. All lamps must meet CSA specifications and are subject to ESA inspection and approval.

### **3.12 Handhole Mounted Service Entrance**

Regarding the ESA Lighting Design Requirements mentioned in section 2.4, above, the City requires the ESA mandated service entrance be located in the street light pole handhole. OPUCNI drawing UGS-021 gives the details of this service entrance system.

Approved suppliers and their catalogue numbers for the materials to be used for this service entrance are listed in the City of Oshawa Street Light Specification Number OSL-22.

### **3.13 Street Light Cable Duct (If required by the City)**

Street light cable duct shall be 50 mm. (2") PVC flexible, direct buried tubing meeting CSA specification C22.2#227.1. Approved suppliers for the 50 mm duct are listed under the City of Oshawa Street Light Specification Number OSL-24. All duct must meet CSA specifications and is subject to ESA inspection and approval.

### **3.14 Street Light Wiring from the Handhole to the Luminaire**

Street light wiring from the handhole to the luminaire shall be 2 conductor #14 AWG, compressed stranded copper, XLPE jacket, black wire, CSA rated. Approved suppliers for the #14 conductor are listed under the City of Oshawa Street Light Specification Number OSL-25.

### **Street Light Distribution Cable from Transformer to Disconnect**

Street light wiring from the transformer to the handhole mounted disconnect on the first street light in a circuit shall consist of 2 - #8 AWG, class B concentric stranded, annealed uncoated copper conductors with type TWU insulation (one conductor black and one white), twisted with a lay of 30 to 60 times the outside diameter over the insulation of the conductor. Approved suppliers for the #8 conductor are listed under the City of Oshawa Street Light Specification Number OSL-26.

### **Alternate Street Light Distribution Cable from Transformer to Disconnect**

Alternate street light wiring from the transformer to the handhole mounted disconnect on the first street light in a circuit may consist of 3 - #6 AWG, compressed stranded uncoated copper conductors, 300v. NMWU PVC insulation, PVC jacket overall; manufactured in accordance with CSA Specification C22.2, No. 48.

The #6 cable shall be used where the #8 will not be sufficient to meet voltage drop and/or ampacity requirements.

Approved suppliers for the #2 conductor are listed under the City of Oshawa Street Light Specification Number OSL-27.

## **4 INSTALLATION SPECIFICATIONS**

### **4.1 General**

The contractor shall ensure that the construction and installation of the street lighting system will be completed in a good and workmanlike manner and in accordance with the latest revisions of the specifications, standards and drawings of the City of Oshawa and the **Association of Municipal Electrical Utilities (of Ontario) Guide to Municipal Standard Construction**, Part 3, - Underground - MSU (AMEU Guide).

Street lights shall be located on the boulevard in accordance with the City of Oshawa's standard cross sections and as shown on the trenching plans and typical road sections while maintaining proper clearances from fire hydrants, driveways, transformers, switching units or any other services.

### **4.2 Cable**

Street light cables shall be installed in conformity with the AMEU Guide's standards and requirements for the placement of cables and in accordance with OPUCNI's Drawing Number **XXXXX-XX**, with a minimum of 600 mm cover. Where possible, the street light cable/duct shall be placed in the common trench on the same level as the secondary and/or communication cables.

Where the street light poles are not in place at the time of the cable installation, the end of the cable shall be coiled and staked at the intended pole location in a similar manner to the secondary service cables except that at least 3 m. of cable and duct (when using flexible duct) shall be left above grade. Where the cable is to continue on to another light, the cable shall be looped and not cut and at least 6 m. in total shall be left above grade.

Cables are to be inserted into the poles via the cable access ports and the ground wire shall be connected to the internal ground lug at the hand hole by means of a #6 AWG compression connector lug, City of Oshawa Street Light Specification Number OSL-28.

All connections to ground and to the luminaire conductors are to be made at the hand hole and taped or otherwise insulated after installation.

All connections inside the transformer shall be made by Oshawa PUC.

#### **4.3 Street Light Cable Duct (If Required)**

If required by the City, the 50 mm duct shall be installed in accordance with the Association of Municipal Electrical Utilities (of Ontario) Guide to Municipal Standard Construction, Part 3 - Underground - MSU, Section VII - Ducts. In general, the ducts shall be placed in accordance with Oshawa PUC Standard Drawing XXXXX. When street light ducts are placed under driveways, the top 300 mm of the backfill shall be compacted to 100% Standard Proctor Density with granular "A".

#### **4.4 Poles**

Installation of street light poles is to be in accordance with the City of Oshawa Standard Drawings OSLD-01 to OSLD-05 and the manufacturer's requirements.

In general, poles are to be installed in XXXXXXXX vacuum holes to the depths given in the above referenced drawings. The bottom of the hole must be cleaned of loose material before placing the pole and a CSA approved ground plate installed below the pole base.

The Contractor shall take care to ensure that no damage occurs to the electrical or street lighting system or other utilities during the installation of street light poles.

#### **4.5 Luminaires and Brackets**

Installation of street light luminaires and brackets shall be in accordance with the manufacturer's requirements. In general, luminaires and brackets are to be installed and wired prior to the pole being erected.

The photo-electric controller shall be positioned to face north.

The Contractor shall take care to ensure that no damage occurs to the pole, luminaire, bracket or wiring during their assembly and erection.