

1.8 Electrical Distribution & Streetlighting

Underground electrical distribution lines, lights and light poles, lot service lines and other necessary appurtenances to service all lots, blocks, walkways and road allowances shall be provided for the development as required by Alectra Utilities, as detailed in this section and in the relevant Standard Drawings. Provisions for future traffic signals shall be made at all collector-to-collector, collector-to-arterial and arterial-to-arterial intersections and at any additional locations specified by the City in accordance with the City Standard Drawings.

Trenching details for utilities shall conform to the latest standards and specifications of Alectra Utilities.

1.8.1 Design Approval Process

The following section outlines the basic procedure to obtain approval for streetlight drawings.

1.8.1.1 Prior to Detailed Design

The Streetlight Design Consultant (SDC) is responsible for determining the style of streetlight assembly required by the City in consultation therewith. The type of Walkway Lights and Laneway Lights are to be determined by the City in consultation with other appropriate departments or, where applicable, shall conform to the community's urban design guidelines.

The SDC is responsible for accurately determining the applicable Right-of-Way (ROW) cross-sections to be utilized for the project.

On finalisation of the ROW cross-sections, the SDC is responsible for determining, in conjunction with the City, the roadway classification of the streets within the limits of construction. The SDC will use these roadway classifications to complete photometric analysis based on IES RP-08-18 guidelines and include this information on the Detailed Design Drawings.

1.8.1.2 Detailed Design

The SDC is responsible for ensuring that the streetlight design complies with City of Vaughan Standards and Specifications in terms of all materials, location of plant, levels of illumination and absence of conflict.

The SDC is responsible for ensuring that the Streetlight Design is accurately shown on the Hydro Distribution Design Drawings prepared and submitted to Alectra Utilities.

Streetlight Drawings shall be identified utilizing an "SL-00" nomenclature in the lower right-hand corner of the drawings. Streetlight Submissions will include the following drawings identified as follows:

- Detailed Streetlighting Design Drawing (SL-01 to SL-x as required). Where applicable, Photometric grid layouts and analysis results should be included on these drawings.
- General Streetlighting Detail Drawing (SL-(x+1))
- All drawings must be submitted on the City of Vaughan Standard Border complete with the City of Vaughan Standard Signature Block.
- All drawings must be sealed by a qualified Professional Engineer.

If the Design deviates from City Standards in any way, the SDC is responsible for listing the exception and detailing why it is necessary. The City will review the exception and advise the SDC accordingly.

The list of exceptions pertaining to the Streetlighting must also be noted on the Civil Drawings. The SDC is responsible for ensuring an accurate representation of the streetlighting exceptions on the Civil Drawings.

1.8.1.3 [Cost Estimate](#)

As part of the streetlighting design submissions, the SDC will provide a detailed cost estimate for the installation.

1.8.1.4 [Submission to the City of Vaughan](#)

The SDC will submit, to the City, six (6) full sets of the following:

- The Detailed Design Drawings
- The General Detail Drawings
- The Streetlighting Cost Estimate
- A letter stipulating that the design is completed in accordance with the current City of Vaughan Standards and Specifications.

1.8.1.5 [Review by the City of Vaughan](#)

City Staff will review the Streetlighting Submission as part of the complete Subdivision Submission Package or Capital Works Project. Comments will be made, as deemed necessary, and forwarded to the Prime Subdivision Consultant or Capital Works Project Manager.

Comments from the City do not preclude the Certifying Engineer's responsibility for the design. Should the City suggest changes compromising the integrity of the design, then it is incumbent upon the Engineer to advise the City of Vaughan, in writing, and to have the matter resolved.

1.8.1.6 [Shop Drawing Approval](#)

The SDC will be responsible for reviewing and approving all manufacturer's streetlight assembly shop drawings to ensure compliance with City of Vaughan Standards and Specifications.

The SDC will note, on all fixture shop drawings the manufacturer's photometric file number to which the fixture must adhere.

1.8.1.7 [Engineer's Certification](#)

The SDC will be responsible for providing formal Certification to the City at various stages of the project.

- Design Certification:
The SDC will certify that the Streetlight System has been designed in accordance with the City of Vaughan Standards and Specifications.
- Pre-Maintenance Certification:
The SDC will certify that the streetlight assemblies are all plumb, undamaged, operating in a proper manner and located as per the design drawings.
- Pre-Assumption Certification:
The SDC will certify that the streetlight assemblies are all plumb, undamaged, operating in a proper manner and located as per the design drawings.

The City of Vaughan may require, at their discretion, formal certifications of streetlight operation at any time during the course of the project.

1.8.2 Design Guidelines

The following Section outlines the Design Guidelines to which the Streetlighting Design Consultant must adhere.

1.8.2.1 [Professional Certification](#)

Streetlight System designs must be completed by a Professional Engineer licensed to practice professional engineering in the Province of Ontario, who has expertise in this field of endeavour.

1.8.2.2 [Approved Streetlight Assemblies](#)

Three types of streetlighting assemblies are to be utilized in new developments. All luminaries shall have LED light source with a Colour Rendering Index (CRI) > 70 and a Correlated Colour Temperature (CCT) of 3000K:

- **Decorative** – Lantern Style Streetlights with decorative scroll arms mounted on a tapered, octagonal, black, direct buried concrete pole.
- **Cobrahead** – Streetlights with tapered elliptical aluminum arms mounted on a tapered, round, mould finished, direct buried concrete pole.
- **Cobrahead** – Streetlights with tapered elliptical aluminum arms mounted on a tapered, octagonal, black, direct buried concrete pole. Arm and mounting hardware to be factory finished in powder coat black to match the fixture.

The SDC will be responsible for establishing the use of an Approved Streetlight Assembly, in conjunction with the City, prior to submission of the streetlight design.

Note that in the case of in-fill type subdivisions, it is the SDC's responsibility to confirm with the City if current specifications are to be utilized or existing streetlight installation are to be matched.

1.8.2.3 [Service Area](#)

All roadways and walkways within the limits of the subdivision and boundary roads shall be designed to have full illumination as per City Standards and Specifications and IES RP-08-18 guidelines. Illumination on all roads must be designed to meet medium pedestrian conflict criteria. Laneways must be designed to meet low pedestrian conflict criteria. Roads, at locations where high pedestrian conflict criteria is met, must be designed to meet high pedestrian conflict.

1.8.2.4 [Specifications](#)

- The streetlighting system is to be designed to meet the average maintained illumination levels and relevant uniformity ratios for each type of road and walkway. The design engineer should ensure that deviations within these limits are minimized on any given street to ensure proper illumination and uniformity.
- In accordance with I.E.S. RP-08-18 Roadway Illumination Guidelines, luminance criteria shall be used for streetlighting designs. Where roadway patterns are not conducive to luminance calculations, Illuminance calculations will be considered.
- In accordance with I.E.S. RP-08-18 Roadway Illumination Guidelines, intersections shall have an average illumination equal to the sum of the illumination averages of the intersecting roadways. This criterion also applies where new development roads intersect with existing roads. For the purposes of photometric analysis, asphalt within the limits of the daylight corners of intersections shall constitute the intersection.
- Streetlights and Streetlight Pedestals, if utilized, must be installed on the extension of side lot lines. If the road pattern and subdivision lotting prevent the illumination requirements from being met with this

stipulation, the SDC is required to notify the City in writing and obtain approval for the non-standard pole location prior to installation. Lot flankages and intersections are excluded from this stipulation. If the house faces the flankage, the SDC must ensure that the streetlights are placed such that they are on the daylight bar or the back lot line.

- A minimum of 3.0 m clearance is required between streetlight poles and hydro transformers, fire hydrants and street trees. A minimum of 1.0 m clearance is required between streetlight poles and driveways. In locations where streetlight poles and hydrants/transformers must be located on the same extension of the side lot line, an offset of 1.5 m will be permitted for both appurtenances. In locations where streetlight poles are to be placed adjacent to a catchbasin lead, the streetlight shall be offset 1.0 m from the extension of the property line to ensure adequate clearance. In locations where streetlight poles conflict with storm/sanitary lateral connections, the storm/sanitary lateral connections are to be relocated by the Civil Consultant to avoid the conflict.
- The illumination levels at 90° road bends will be treated as an intersection.
- Where pavement widths widen at major intersections to accommodate turning lanes, the SDC may locate streetlights on both sides of the street if required, to achieve the required illumination.
- Where medians are utilized, double fixtured streetlights mounted 180° apart, on the same pole, should be installed on the centreline of the medians wherever possible and in accordance with safe zones as defined in IES RP-08-18.
- Where walkways intersect with the Municipal Right of Way, the SDC must ensure that there is either a walkway light or a streetlight located within 2.0 m of the walkway entrance to ensure pedestrian safety.
- For properties abutting a public laneway, illumination of the laneway is required and can be accommodated through lighting on the exterior of garages. These lights will be electrically connected to the homeowner's distribution panel. The homeowner is responsible to maintain and keep operative the garage light illuminating the laneway. If a section or sections of a public laneway do not have garage front illumination, standard streetlighting illumination shall be installed.

1.8.2.5 Fixture Wattages

- Fixture wattages must be specified on the streetlight drawings by the SDC to meet the required lighting levels without causing adverse glare. All streetlighting and laneway lighting shall be of a LED light source with a CT of 3000 K and a CRI > 70.

1.8.2.6 Fixture Voltages

- All luminaires must be rated for a voltage range of 110V to 277V to accommodate system voltages of 120V or 240V.

1.8.2.7 Provisions for Signals

- Provisions for future traffic signals shall be made at all collector-to-collector, collector-to-arterial and arterial-to-arterial intersections and at any additional locations specified by the City in accordance with the City Standard Drawings.

1.8.2.8 Streetlighting Circuitry

- Streetlighting circuitry shall be run from a utility transformer to a suitably rated in-pole breaker mounted in the hand hole of the first pole in the circuit. The remaining poles in the circuit shall be daisy chained from the first pole. The use of power pedestals will only be permitted if multiple circuits are to be run from a single source utility transformer.

1.8.2.9 Photometric Designs

- Photometric designs shall use a Total Light Loss Factor (TLLF) for illumination design calculations in accordance with the luminaire manufacturer's recommendations. However, the TLLF shall not exceed 0.85.
- Photometric designs shall include calculations for sidewalks where applicable.

1.8.2.10 Multi Use Paths (MUP)

- Illumination designs for multi use paths shall be in accordance with IES RP-08-18 guidelines and with consultation with the City.
- The back light from roadway luminaires is to be used to illuminate a MUP adjacent to the pavement.
- Should it be necessary to raise the illumination on the roadway beyond 1.25 times the design requirements to achieve the required illumination on an adjacent MUP, dedicated light standards for the MUP shall be used.

1.8.2.11 Streetlighting with the Vaughan Metropolitan Centre (VMC) Boundaries

- All streetlighting designs within the VMC boundaries shall be in consultation with the City's VMC Division

1.8.3 **Material Specifications**

The following Section outlines the Streetlight Material Specifications to be utilized in the City of Vaughan.

1.8.3.1 Canadian Standards Association

- All streetlighting material must be approved and certified by CSA or a CSA recognized affiliate for use in Canada.

1.8.3.2 Warning Tape

- In accordance with E.S.A. standards and specifications, warning tape must be placed 0.3m below final grade over all streetlight ducts installed in an open trench method.

1.8.3.3 Ducts

- Duct for streetlight installed in an open trench is to be 50 mm PVC DB2 Type Duct.
- 50 mm Black Poly Pipe is to be used from the PVC DB2 Type Duct to the pole hand hole.
- If duct is installed by directional boring, 50 mm HDPE pipe shall be used.

1.8.3.4 Streetlight Supply Pedestal

- Pedestal shall be corrosion resistant, weatherproof lockable enclosure and factory powder coated in Equipment Green colour.
- Base to be an approved pre-cast base suitable for the pedestal.
- The Pedestal and its base shall be in accordance with City standard drawings.
- Grounding must be in accordance with all applicable E.S.A. standards and specifications.

1.8.3.5 Streetlight Cables

- Streetlight bus cables shall be of copper conductors with insulation rated for underground use such as RWU-90. The standard cable size shall be #6 SWG.
- All streetlight cables shall be colour coded in accordance with ESA Regulations. The streetlight bus cables shall contain 1#6 stranded copper green jacketed ground wire.
- Streetlight Service Drops (Riser Cables) from hand hole in pole to fixture are to be 2#12 Copper RWU-90 c/w 1#12 ground wire.
- The voltage rating of all streetlight cables shall be 300V, 600V or 1000V based on the circuit voltage and in accordance with ESA regulations.

1.8.3.6 Fusing

- In-Line weatherproof Fuse Holders are to be installed in the pole hand holes. 120V power supply circuit shall have a single fuse holder installed on the hot leg and a 240V power supply circuit shall have a dual fuse holder installed on both hot legs. All fuse holders and fuses shall be CSA approved for use in Canada. Recommended manufacturers are Elastimold or Bussmann c/w 15Amp Fuses.

1.8.3.7 Streetlight Control

- Each streetlight fixture is to be controlled by a Telecell (node) as manufactured by Telensa Inc., of model # T2-A1N-B-3, for use in the City of Vaughan, and mounted on an ANSI C136.41 compliant 7-pin NEMA twist-lock photocell receptacle.

1.8.3.8 Section Removed

1.8.3.9 Mounting Arms

- Tapered elliptical arms are to be used in conjunction with Cobrahead streetlight assemblies. The length of the arm will be determined by the offset from pavement and the height of pole.
- Factory finished, powder coated, black scroll arms are to be used with Decorative Lantern style streetlight assemblies.
- Where black poles and black cobrahead fixtures are used, the tapered elliptical arms shall be factory powder coated black. The length of the arm is dependent upon the offset from pavement and the height of the pole.

1.8.3.10 Fixtures

- Where the City requires that the streetlighting system match existing, then the SDC will be responsible for specifying the matching fixture complete with photometrics that meet or exceed City's specifications.
- All fixtures used for streetlighting, sidewalks and Multi-Use Trails must be of a LED light source with CRI>70 and a CCT of 3000K and be rated for the system voltage.
- All Fixtures must be equipped with ANSI C136.41 complaint 7-pin NEMA twist-lock photocell receptacle, factory wired for 0-10V dimming control.
- SDC must specify the photometric file to which the manufacturer must adhere.
- Luminaires shall contain a surge protection device (SPD) to protect against a 10KA, 20KV surge level and meet application and testing requirements per ANSI/IEEE C.62.41.2 for Category C High operation and ANSI/IEEE C62.45. SPDs shall be designed and installed to fail in the off position to help identify failed units and to continue to protect LED drivers and light engines from further power surges.
- Luminaires shall be certified to CSA C22.2 # 250.0-08, as amended, or have an equivalent listing from a recognized testing laboratory for the approved sale and use in Canada. Applicable certification labels shall be applied inside each unit.
- Luminaires must be International Dark Sky Association (IDA) compliant.
- Luminaires shall be listed in the Qualified Products List of the Design Lights Consortium (DLC) and meet the technical performance requirements of Version 4.1 or later, that are vetted by the DLC for LED street lighting products.
- All proposed fixtures shall carry a 10 year warranty transferrable to the City.
- All LED luminaires must be labeled to indicate wattage and distribution type in accordance with ANSI C136.15.

1.8.3.11 Concrete Poles

- Where the City requires that the streetlighting system match existing, the SDC shall submit existing pole details to the City for approval and/or comments prior to any design work.

- The cable raceway in the pole must be of sufficient diameter to accommodate a double run of streetlight cable.
- The handhole shall have an inside dimension of 267mm x 89mm and shall be box type of 50,000 P.S.I. High Density Cast Zinc A.S.T.M. ingot spec. #B669-82 complete with a close fitting inset cover (flush with the outside of the pole) of the same material and tamperproof screws.
- The pole must have a copper ground wire at the handhole in accordance with CSA Standards.

1.8.3.12 Concrete Walkway Poles

- Park and open space walkway light standards are to meet City standards as per detail MLA-601 and the following criteria:
 - 6096mm octagonal black etched concrete poles, mounted at a 4572mm height
 - 2-5/16 inch Richmond Series inserts cast into pole for luminaire mounting arm
 - Black handhole cover with tamperproof screws

1.8.4 Installation Specifications

The following Section outlines the Streetlight Installation Specifications to be utilized in the City of Vaughan.

1.8.4.1 E.S.A. Inspection

The streetlighting installation contractor is responsible for obtaining an E.S.A. Connection Authorization that is to be provided to Alectra Utilities for final connection.

1.8.4.2 Ducts

- Streetlight ducts are to be 50 mm PVC Type 2 Direct Buried Ducts (DB2) in the main trench from the power source to the streetlight location.
- 50 mm Black Poly Pipe is to be used from the PVC DB2 Type Duct to the pole hand hole.
- All duct splices are to be solvent welded.
- Where ducts cross the road, the 50 mm PCV DB2 type duct is to be installed through the 100 mm PVC DB2 type duct a continuous installation.
- All bends in ducts shall be of long radii to reduce cable fatigue when pulling streetlight conductors through.
- Duct installed by directional boring shall be of continuous 50mm HDPE pipe.

1.8.4.3 Trench

- Streetlight ducts are to be co-located in Joint Use Trenches where possible
- Trenches are to be of sufficient depth to provide a minimum cover of 750mm over the direct buried streetlight duct.
- Streetlight ducts are to be surrounded by a 150mm Brick Sand Envelope.
- Warning tape must be installed 300mm below final grade, over all streetlight duct locations.

1.8.4.4 Streetlight Cables

- Streetlight cables may only be installed through ducts after trench is backfilled.
- Streetlight cables shall not be spliced outside pole hand holes. Underground splicing is not permitted.
- Sufficient length of cable shall be available in the pole hand hole to allow service personnel to access connections in the hand hole.

1.8.4.5 Fusing

The streetlighting circuit shall be fused at the transformer and each streetlight shall be fused at the streetlight hand hole.

1.8.4.6 [Pole Installation](#)

Holes for pole installation must be made by auger or by vacuum method. Should field conditions prevent the use of either method of installation, then the Streetlight System Inspector will dictate an alternate method.

1.8.4.7 [Grounding](#)

Streetlight pedestals are to be grounded to E.S.A. requirements, utilizing a ground plate at the pedestal location. A continuous ground wire from the pedestal to each streetlighting circuit shall be installed with the streetlighting circuit conductors. All additional grounding shall be in accordance with Alectra Utilities and ESA Regulations.

1.8.4.8 [Energization of the Streetlighting System](#)

Energization of the streetlighting system will be subject to ESA's connection authorization. Alectra Utilities will make all required connections at the supply points subsequent to ESA authorization.

1.8.4.9 [Prior to Assumption](#)

Prior to assumption, all streetlights are to be verified functional at night as per design requirements.

1.8.5 **Walkway Lighting**

The following Section outlines Walkway Lighting Specifications to be utilized in the City of Vaughan.

1.8.5.1 [Pre-Design](#)

The SDC will consult with City staff to determine the type of walkway lighting to be utilized on a given subdivision or, where applicable, shall conform to the community's urban design guidelines.

1.8.5.2 [Design](#)

- The SDC is to complete the Walkway Lighting System Design in accordance with Sections 1.8.1 of this document.
- Walkway illumination shall meet IES RP-08-18 guidelines with a minimum light level of 5 lux.,
- All walkway lights are to be on an independent power supply from a transformer and not fed from the streetlight power supply.
- Due to the variety of walkway arrangements, it is incumbent upon the SDC to complete a photometric analysis to determine the spacing which meets City requirements, and to include this information on the Detailed Design Drawings.
- Where walkways intersect with the municipal right of way, the SDC must ensure that there is either a walkway light or a streetlight located within 2.0 m of the walkway entrance to ensure pedestrian safety.
- All lighting designs are to accommodate individual photocells for each light fixture and 7-pin modules to allow for future adaptive controls for the park lighting network.

1.8.5.3 [Materials](#)

- All material pertaining to the Walkway Lighting System must be C.S.A. approved in accordance with the E.S.A. standards and specifications.
- All material pertaining to the Walkway Lighting System must be in complete accordance with Section 1.8.3 of this document.
- The SDC will consult the city to determine the colour and the finish of the walkway products including pole type, fixtures and luminaries.

1.8.5.4 [Installation](#)

Installation of the walkway lighting system is to be in accordance with Section 1.8.4 of this document.

1.8.6 Service for Parks

1.8.6.1 Regional & District Parks

The approved electrical distribution plan will include a three phase, 27.6K transformer power supply to be available on the park side of the road allowance fronting the park. The provision of the three-phase supply can either be a high voltage distribution switchgear located at the edge of the park with a vacant switch dedicated for park use only, or three phase supply cables on the road allowance adjacent to the park property.

1.8.6.2 Neighbourhood Parks

The approved electrical distribution plan will include a 120/240 volt, single phase, three wire power supply. The power supply drop will consist of a 3 conductor #3/0 aluminum underground cable drop located 1 m from the street line and 1 m from the property line inside the park block. The cable feed will originate from the closest (within 75 m cable length) single phase pad mounted transformer and will be left coiled and attached to a 2" x 4" wood stake, visible above ground.

1.8.6.3 Urban Parks/Public Square Parks

The approved electrical distribution plan will include a three phase, 27.6K transformer power supply to be available at the road allowance property line of the park. The provision of the three phase supply can either be a high voltage distribution switchgear located at the edge of the park with a vacant switch dedicated for park use only, or three phase supply cables on the road allowance adjacent to the park property. The three phase power distribution supply source must be available on the park side of the road and not require a future road crossing to access the cables.

***Electrical distribution for Public Squares may vary and be dependent on programming requirements, the facility concept plan and the adjacent land use and building functions.*

1.8.6.4 Trail Underpasses for Bridges and Culverts:

The approved electrical distribution plan will be based on an approved design to install or future proof for lighting installations based on the following criteria:

- electrical chasing/conduits are to be provided from the local power source to the bridge or underpass location based on the approved electrical design to future proof for future electrical equipment installations (if not provided at the time of construction). Chasing/conduits to terminate in a concrete handwell for ease of future access.
- For an underpass culvert design, design for a trough to be installed in the culvert box 45 degree corner notch to allow for cable management and integrating lighting fixtures. An approximate size of 150x75 mm is to be considered (dependent on the power requirements).
- For an underpass culvert, the light fixtures to be in the corner notches or a vertical wall mounted location. For bridge underpasses, light fixtures could also be located on bridge beams so that light distribution facing towards the pedestrian/cycling path of travel.
- For all lighting designs, fixtures are not to be located centrally overhead within the culvert to reduce user head clearances,
- Fixtures designed to achieve a minimum of 100 lux on average, and 40 lux on average when dimmed in nighttime condition (ANSI/IES RP-8-18+A1 Design and Maintenance of Roadway and Parking Facility Lighting).
- Fixtures to be installed with wire guards to prevent public access to and vandalism of the light fixtures.

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