A P P E N D I X A

Street Lighting Design Guide

Revised February 15, 2018


CITY OF BELLEVUE
WASHINGTON

I. GENERAL

The street lighting system should be a complete, unified design that addresses the various mobility needs within the City of Bellevue. Lighting levels should be appropriate for street function, classification, and pedestrian use. The lighting system should also have a pleasing appearance and complement surrounding features.

It is not practical, economically feasible, nor desirable to complete the illumination system for the entire City at one time. Development and road construction projects are constantly changing city streets. When consistent design criteria are applied to each project, an effective and functional overall lighting system can be established over time.

The City must maintain a consistent style, operational mode, and maintenance program in order to keep the overall lighting system manageable. This Street Lighting Design Guide has been prepared to assist the city, developers, and anyone involved in improvements to accomplish this objective.

II. PROCEDURES

The following is a summary of the procedures for obtaining approval of street lighting designs within the City.

A. Refer to the Transportation Development Review Engineer (herein referred to as "Review Engineer") who is assigned to review the proposed project to obtain site specific guidelines. They will provide requirements specifying if the system is to be City owned (typical) or if it can be allowed on existing PSE infrastructure (requires Review Engineer Approval). The review staff will also provide guidelines on the pole, fixture, and arm based on the location of the project.

B. Submit (through the Permit Center or *mybuildingpermit.com*) the following:

   1. Plans
   2. Specifications
   3. AGi32 Calculation File

   Proposed deviations to standards should be discussed and agreed upon with the Review Engineer prior to submittal and documented in a submittal letter. The submittal will be reviewed and comments will be returned to the applicant.

C. Incorporate any review comments and re-submit, through the Permit Center or *mybuildingpermit.com*.

D. After the Review Engineer verifies that all comments have been addressed and standards met, the plans and specifications will be approved and permits issued. All work must be completed by a qualified electrical contractor with experience in outside electrical work. Call for City inspections prior to starting work, as noted on the right-of-way use permit.

E. Call for final Transportation inspection and acceptance. Street lighting is required to be completed prior to issuance of a Temporary Certificate of Occupancy or the Certificate of Occupancy; Financial assurance devices will not be accepted in lieu of work.

F. When the improvements have been completed, inspected, and accepted, update the plans with all as-built information and provide them to the Review Engineer.

III. SUBMITTAL REQUIREMENTS

A. Plans

The preferred scale is 1" = 20', provided on 24" x 36" sheets.

These plans must show any adjacent existing luminaires, the new luminaires, stations, offset dimensions, installation details, existing and proposed street trees, building awnings, overhangs, details of the service cabinet or connections to existing service cabinet, conduit locations, junction boxes, above and underground utilities, wire notes including a connection to Puget Sound Energy, and any additional information necessary to complete the electrical system.

Final plans must be signed and sealed by a Professional Engineer licensed in the state of Washington.

B. Specifications

The City of Bellevue uses the Standard Specifications for Road, Bridge, and Municipal Construction as published by the Washington State Department of Transportation and modified by the City of Bellevue Special Provisions.

C. Supporting Calculations

Street lighting is to be designed using the illuminance method for calculations prepared with AGi32 software. Digital design files from AGi32 are to be provided to the City, along with line loss calculations for the system.

IV. DESIGN PARAMETERS

Where street frontage improvements are required, new facilities shall be built to the current street light standards. If there is an existing street light system, the portion of system required to meet the Photometric Design Values along the frontage shall be brought into compliance with the current street light standards.

The Review Engineer may approve deviations from the standards and requirements of Appendix A based upon meeting sound engineering judgement, maintenance interests, appearance interests, and if it is in the public interest.

A. Poles

Street lighting is required to be installed on City owned facilities. Existing City owned poles that meet the current standards may be relocated and reused with Review Engineer approval to meet Photometric Design Values. Existing street lighting on PSE poles may need to be relocated onto City owned facilities.

In rare circumstances the Review Engineer may approve a deviation to allow new and existing street lighting to be installed and remain on PSE owned utility poles.

Luminaire mounting heights typically range from 25' – 40' in height. It is important to check with the Review Engineer to verify the pole height required for new street light poles based on the location of the proposed project.

B. Light Pole Base

The light pole base shall be based upon the required street light pole. A detail of the street light base shall be included in the submittal.

C. Fixture

Light-Emitting Diode (LED) street lighting fixtures are required for new and retrofit installation. The wattage of the fixture will be recommended by the applicant's engineer based on the street light analysis. In no case shall the system be designed higher than 20% above the minimum average values. HPS fixtures may be approved and/or are required in specific cases by the Review Engineer.

Retrofit installations will require an adapter plate. Contact the Review Engineer for specific type of adapter plate required and include appropriate details in final plans.

D. Arm

The arm length shall be recommended by the applicant's design engineer based on the street light analysis and on maintaining consistency along the public road.

E. Typical Design Parameters

There are a number of streets and neighborhoods that require special decorative lighting in addition to the standard street lighting systems. Several of these locations are defined in Table 1:

TABLE 1: APPROVED FIXTURES AND USAGE

Location	Design Parameters
Downtown (except Old Bellevue)	Pole: Square concrete pole Typical Heights: 8.5m, 10m, 12.2m Fixture: Kim CCS LED fixture
Old Bellevue (except Main Street)	<u>Street Scale</u> Pole: Square concrete pole Typical Heights: 8.5m or 10m Fixture: Kim CCS LED fixture <u>Pedestrian Scale</u> Pole: Round concrete pole Fixture: Cyclone post-top LED
Main Street in Old Bellevue	Pole: Round concrete pole Fixture: Cyclone post-top LED
Major Arterials Outside Downtown	Pole: Square concrete pole Typical Heights: 10m or 12.2m Fixture: Leotek Arieta LED
Collector and Tertiary Arterials Outside Downtown	Pole: Round pole with Ameron Elliptical style arm Fixture: Leotek Cobrahead LED
BelRed Subarea Arterials	See Appendix B: The BelRed Corridor Plan
Local Streets	Pole: Site Specific Fixture: Site Specific
Multi-family, Commercial, Light Industrial, School, or other institutional areas or streets	May be designed to the Tertiary Light Level. Verify with the Traffic Engineer prior to Design.

The above approved fixtures and usage is for typical cases although there may be site specific deviations. Check with Review Engineer for confirmation prior to design.

F. Additional Design Parameters

The designer should contact the project owner to verify final building layout and the location of windows that could be affected by the location of the required street light poles and luminaires. Consideration should be given to windows when locating poles and deciding on pole heights to minimize impacts to adjacent buildings. If light poles are proposed near windows, house-side shields should be utilized and reflected in the design calculations.

The design of the street lighting system shall be such that no street trees are placed within 25-feet of a new street light.

A spare 3-inch conduit shall be provided along the entire project frontage stubbing out into spare junction boxes at each end of the project frontage. Provide intermediate junction boxes if conduit runs are greater than 300ft.

V. PHOTOMETRIC DESIGN VALUES

A. Lighting Levels

1. Arterial Streets

Bellevue's Transportation Department organizes streets into three classifications for arterial street light levels - Major, Collector, and Tertiary. These classifications are shown on Figure 1 with associated design parameters in Table 2.

For tertiary, Table 2 shows two values for uniformity. Lower uniformity should be provided for completely new city owned systems, whereas retrofit projects (where existing light poles are being utilized) or projects using existing PSE poles (with Review Engineer approval) may be designed to the higher uniformity value.

2. Local Streets

Streets not classified as Major, Collector, or Tertiary (see Figure 1) are considered local streets. No specific photometric design values have been established for local streets. For new short plats, long plats, or on newly developed local streets, city-owned systems are preferred and luminaires shall be installed as follows:

- at intersections
- at horizontal curves
- at vertical curves
- at street ends
- at marked pedestrian crossings
- at traffic calming devices
- at locations where there are vehicle or pedestrian safety concerns
- and at no greater than 250-foot intervals

3. Sidewalks and Paths

For sidewalks adjacent to the roadway, whether curbside or separated by a maximum 4-foot wide planter strip, no separate calculations are conducted for light levels on the sidewalk area. This is the standard practice, in recognition that the sidewalk will be illuminated by the lighting system installed for the roadway and adjoining properties.

For Multipurpose Paths (MPPs) installed in lieu of or in addition to sidewalks and bike lanes, lighting is typically required with a minimum maintained average light level of 5 lux and a uniformity ratio of 10:1. Verify requirements for MPPs with the Review Engineer prior to starting design.

4. Calculation Values

Values shown in Table 2 are for both HPS and LED systems. A maintenance factor of 0.73 is to be used for all HPS systems and 0.80 for all LED systems.

B. PSE Modification

PSE Modification to design may apply on tertiary or collector arterials that:

1) Serve a residential area with a significant amount of single family residential driveways, and
2) Have above-ground electrical distribution on PSE poles that will remain above-ground after the project is complete.

Verify PSE Modification lighting design with the Review Engineer prior to proceeding with the design. For PSE Modification designs, the lighting design is typically limited to the PSE pole locations. Designs should meet the average light levels shown in Table 2 only to the extent practical, as the pole spacing and mounting heights may preclude the ability to reasonably meet minimum average light levels. Uniformity is not considered in PSE Modification designs. In-fill poles (new poles with lights only) are only required when necessary to meet the average light level at a marked midblock pedestrian crossing or an uncontrolled marked crosswalk at an intersection. Example PSE Modification Streets are:

- West Lake Sammamish Parkway
- 108th Avenue SE – Bellevue Way SE to SE 34th Street
- Northup Way NE – 160th Ave NE to West Lake Sammamish Pkwy

TABLE 2: ILLUMINANCE METHOD PHOTOMETRIC DESIGN VALUES

ROADWAY SEGMENTS

CLASSIFICATION	LIGHT LEVEL MINIMUM MAINTAINED AVERAGE VALUES* (LUX)		UNIFORMITY RATIO EAVG/EMIN
	ASPHALT CONCRETE	PORTLAND CEMENT CONCRETE	
MAJOR	13	9	4
COLLECTOR	9	6	4
TERTIARY	5	4	4 (New Systems) 6 (Retrofits)

INTERSECTIONS

CLASSIFICATION	LIGHT LEVEL MINIMUM MAINTAINED AVERAGE VALUES* (LUX)		UNIFORMITY RATIO EAVG/EMIN
	ASPHALT CONCRETE	PORTLAND CEMENT CONCRETE	
MAJOR – MAJOR	26	18	4
MAJOR – COLLECTOR	22	15	4
MAJOR – TERTIARY	18	13	4
COLLECTOR – COLLECTOR	18	12	4
COLLECTOR – TERTIARY	14	10	4
TERTIARY - TERTIARY	10	8	4 (New Systems) 6 (Retrofits)

MARKED MIDBLOCK PEDESTRIAN CROSSING**

CLASSIFICATION	LIGHT LEVEL MINIMUM MAINTAINED AVERAGE VALUES* (LUX)		UNIFORMITY RATIO EAVG/EMIN
	ASPHALT CONCRETE	PORTLAND CEMENT CONCRETE	
MAJOR	26	18	N/A
COLLECTOR	18	12	N/A
TERTIARY	10	8	N/A

*Systems should be designed no higher than 20% above minimum average values

**Includes uncontrolled marked crosswalks at intersections