
A P P E N D I X A

Street Lighting Design Guide

Revised March 20, 2015



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.

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. SUBMITTAL REQUIREMENTS

A complete submittal (Plans, Specifications, and Supporting Calculations) for a proposed street lighting system must include plans showing equipment locations and details, a signed specifications title page with project specifications, and illumination & line loss calculations. Plans must be prepared by a Washington State licensed engineer experienced in roadway illumination. Proposed deviations to standard practice should be discussed and agreed upon with the review engineer prior to submittal and must be explained in a submittal letter.

The submittal shall show the proposed locations of all landscaping. The design of the street lighting system shall be such that no street trees are placed within 25 feet of a new street light.

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.

There are a number of streets that require special decorative lighting in addition to the standard street lighting systems. These locations are defined in the Bellevue Land Use Code and in Conceptual Design Plans, Non-Arterial Streets in Bellevue Central Business District, available from the Transportation Department.

A. Plans

All plans for street lighting improvements must be provided on 22" x 34" sheets. The preferred scale is 1" = 20'; the minimum acceptable scale is 1" = 40'. These plans must show the new luminaires, their stations, installation details, landscaping or street trees, building awnings, and overhangs. The plans must also show any adjacent existing luminaires (and future luminaires when applicable) and existing junction boxes as necessary to show the complete electrical system. Plans must be signed and sealed by a Professional Engineer licensed in the state of Washington.

Typical lighting details are included in the Transportation Department Design Manual, Standard Drawings. The engineer should use these as a guide in preparing project-specific plan details. The street lighting plans should include details of the service cabinet or connections to existing service cabinet, conduit locations, and wire notes including a connection to Puget Sound Energy if necessary.

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. A disk is available containing the current program to select City of Bellevue Special Provisions for your specific project.

C. Supporting Calculations

Street lighting is to be designed using the illuminance method for calculations, and the design should be completed using AGI32 software. Digital design files from AGI32 are to be provided to the city for all designs, along with line loss calculations for the system.

III. DESIGN PARAMETERS

A. Fixtures and Poles

Only certain fixture types will be accepted for use in Bellevue (see Table 1 below) because replacement fixtures must conform to the photometrics of the original design, and the City can keep in stock only a limited assortment of replacement fixtures.

Light-Emitting Diode (LED) street lighting systems are now commonly used in new and retrofit lighting applications in the city because they offer uniform and effective lighting while consuming less energy. LED lighting systems are preferred, but the technology is still improving and may not work for some of the major/wider arterials in the city. The designer should begin design with LED luminaires and work closely with the Traffic Engineer, to determine design parameters such as pole type, arm style, mounting height, and photometric files to be used.

TABLE 1: APPROVED FIXTURES AND USEAGE

Location	Design Parameters
Downtown	Square concrete pole with Kim CCS fixture
Old Bellevue	Square concrete pole with Sterner shoebox fixture (HPS) for street scale Round concrete pole with Cyclone post-top fixture for ped-scale lighting
Major Arterials Outside Downtown	Square concrete pole with Sterner shoebox fixture (HPS)
Collector and Tertiary Arterials Outside Downtown	Round/Multi-sided Pole with Ameron Elliptical style arm and cobrahead-type fixture
BelRed Subarea Arterials	See Appendix B: The BelRed Corridor Plan
BelRed Local Streets	See Appendix B: The BelRed Corridor Plan

B. Lighting Levels

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 may be designed to the higher uniformity value.

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 Traffic 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

Local Streets:

Streets not classified as Major, Collector, or Tertiary (see Figure 1) are considered local streets. No specific design guideline is established for local streets. For new plats or other newly developed local streets city-owned systems are preferred and luminaires should be located as follows:

- at intersections
- at horizontal curves
- at street ends
- at marked pedestrian crossings
- at traffic calming devices
- and at no greater than 300 foot intervals

Luminaires for local streets should be LED and mounting heights should generally be 25 feet in single family residential areas, with arms in the 6ft-8ft range.

For new projects where local streets do not have significant single family residential land-use adjacent to the roadway, and serve multi-family, commercial, light industrial, school, or other institutional areas, streets may be designed to the Tertiary light level. Verify with the Traffic Engineer prior to proceeding with the design.

Sidewalks and Paths:

For sidewalks adjacent to the roadway, whether curbside or separated by a small 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 Traffic Engineer prior to starting design.

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.

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

IV. PROCEDURES

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

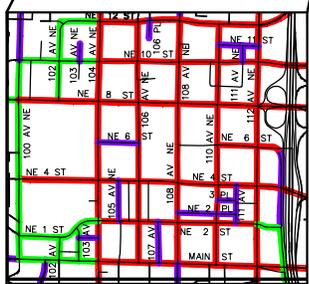
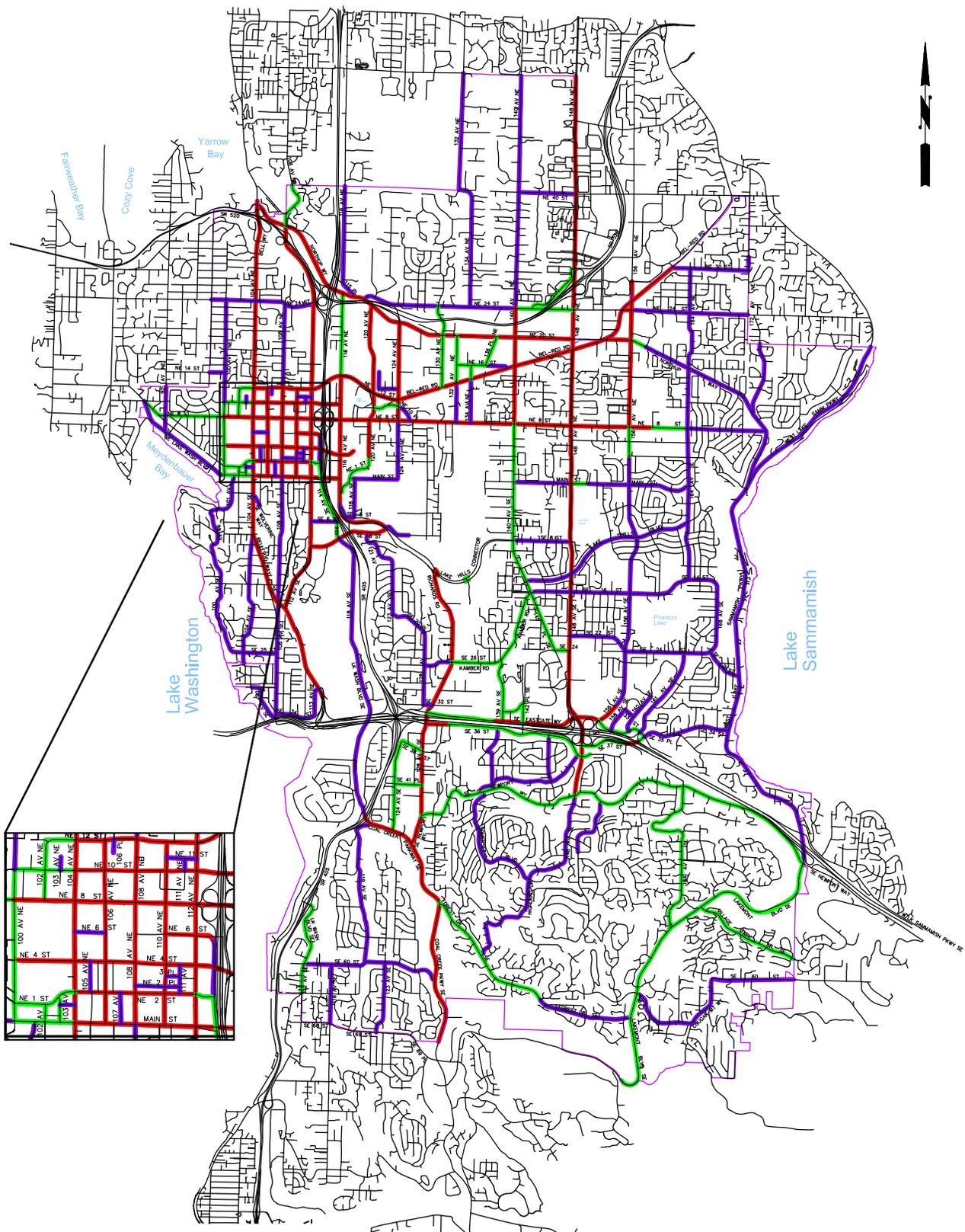
A. Development Projects

1. Refer to Transportation Development Review staff to see if street lighting analysis is required. If analysis shows that street lighting is required, continue as below.
2. For city-owned systems, obtain the services of a qualified licensed engineer. Use this Design Guide to prepare preliminary Plans and Specifications. Confirm design parameters with the Traffic Engineer as necessary. For PSE systems, contact Intolight.
3. Submit (through the Permit Center) the Plans and Specifications for review. The Plans and Specifications will be reviewed and comments will be returned to the applicant.
4. Incorporate any review comments and re-submit, through the Permit Center, per the permit requirements.
5. After the Plans and Specifications have been approved and permits have been issued, install the system. All work must be done 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.
6. Call for final Transportation inspection and acceptance.
7. When the improvements have been completed, inspected, and accepted, update the plans with all as-built information and provide them to the Transportation Development Review Staff.

B. Capital Investment Program (CIP) Projects:

Street lighting is typically included on CIP projects affecting Major, Collector, and Tertiary Arterials. Street lighting improvements may range in scope from completely new city owned systems to systems owned and maintained by PSE that utilize existing PSE poles. City owned systems are preferred due to cost savings in on-going maintenance and energy and the ability for the city to move forward with technology changes in lighting.





STREET LIGHT CLASSIFICATION LEGEND

- Major
- Collector
- Tertiary



**FIGURE 1
STREET LIGHT LEVEL MAP**

REVISION DATE	01/15
DEPARTMENT	TRANS

