

Illumination Design Manual

March 2015

City of Redmond
PO Box 97010
Redmond, WA 98073-9710

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FOREWORD

GENERAL

This manual establishes uniform procedures for the preparation of design plans to install illumination systems within the City of Redmond. It is not intended as a textbook or as a substitute for solid working knowledge, experience, and judgment of the principles of illumination design, but rather as a guide to provide the Design Engineer with sufficient information to prepare the plans for City review and approval.

SPECIAL CONSIDERATIONS FOR LOCAL ACCESS ROADWAYS

All of the requirements of this document pertain to all lighting systems within the City of Redmond at all locations EXCEPT the following:

Lighting systems on all Local Access roadways in all area classifications except Central Business District (CBD) will be owned, designed, and installed by Puget Sound Energy (PSE). Any such system, however, shall meet the requirements contained on Table 1-D related to average maintained illumination level, uniformity ratio, illumination unit type, mounting height, and luminaire wattage. Decision Point Lighting may also apply under certain circumstances. The owner or PSE shall be responsible for submitting material to the City for review and approval of the items noted on Table 1-D. The owner shall be responsible for all coordination with Puget Sound Energy to receive approval from the City for the design and installation of the system.

Roadway classifications are contained in Appendix A, and area classifications are contained on the area classification map in Appendix B.

I. GENERAL DESIGN STANDARDS

The Design Engineer preparing plans for an illumination system shall comply with the requirements of this Illumination Design Manual as well as the following publications:

- A. City of Redmond Special Provisions.
- B. City of Redmond Standard Details.
- C. Current edition of the *Standard Specifications for Road, Bridge, and Municipal Construction* published by the Washington State Department of Transportation (WSDOT), including all Amendments.
- D. Current edition of the Standard Plans for Road, Bridge, and Municipal Construction published by WSDOT.
- E. National Electric Safety Code (NESC).
- F. Applicable requirements of the State of Washington Department of Labor and Industries (L&I).
- G. NFPA 70, the National Electric Code, as adopted and modified by the State of Washington and the City of Redmond.
- H. Roadway Lighting (RP-8) published by the Illuminating Engineering Society.
- I. *The Lighting Handbook* published by the Illuminating Engineering Society.
- J. *The Overlake Village Street Design Guide* for design within the Overlake Village neighborhood limits.

All illumination design plans, special provisions, and other documents shall be prepared under the supervision of a Washington State registered Civil or Electrical Engineer. Plans and special provisions shall be sealed and signed by the Design Engineer.

II. DESIGN PROCESS

Illumination plans go through one of two approval processes, the Pre Review Entitlement Process (PREP) or the Capital Investment Program (CIP). See Figure II-1, City of Redmond Approval Process, for more detail. The Initial and Final submittals described in this manual coincide with the 30-60-90 PREP review procedure.

The following steps describe the typical process for the design of an illumination system in the City of Redmond.

A. Kickoff Meetings:

1. Meeting with City of Redmond: The Design Engineer shall first meet with City of Redmond staff (contact Paul Cho at 425 556-2751, e-mail at pcho@redmond.gov) to confirm the following parameters:
 - Roadway and adjacent area classification
 - Facility evaluation extents
 - Project improvements to the facility (such as major driveways or road intersections)
 - Type of illumination system to be installed
 - System layout
 - Provisions for interfacing with existing systems or provisions for future expansion
 - Responsibility to maintain, operate and pay for the system

See next the section, Design Guidelines, for more details on these design parameters.

2. Meeting with Puget Sound Energy (PSE): whether it will be a City-owned and maintained system or a PSE/Intolight system, the Design Engineer shall meet with PSE to identify the 120/240 single phase service power location and specific connection requirements.

B. Conforming system requirements: if analysis shows existing system meets present City of Redmond requirements, provide a no-action justification memo along with supporting documentation.

1. Prove the existing system meets present standards from this manual for the following:
 - a. Light levels
 - b. Poles and luminaires
 - c. Layout
2. Supporting documentation shall include the following:
 - a. Photometric analysis
 - b. Equipment inventory

- C. System Design: If the existing lighting does not meet standards, guidance on design is detailed in the following section, Design Guidelines. Along with the information in the manual, the Design Engineer shall work with the City to confirm design parameters, fixture, drive current, light loss factors (LLF) and appropriate photometric files.
- D. Plan Submittals: Typically two plan submittals, the Initial and the Final, will be required by the City. Each submittal shall include one (1) copy of the drawings and other required data. Items submitted shall be in conformance with the applicable portions of Appendix C, Illumination Plan Checklist.

Plan sheets shall be submitted as part of the complete civil design package for the project. The civil design package intake will not be accepted for review unless a completed Intake Submittal, as detailed below, is included.

1. Initial Submittal: Material to be presented at the Intake Submittal meeting shall include plan sheets, AGI32 system evaluation of illumination levels, and identification of potential conflicts with utilities or other features and specific areas that require potholing. See Appendix C for submittal requirements; a completed copy of the checklist should be included with the Submittal.
2. Final Submittal: Material to be presented at the Final Submittal meeting shall include the remainder of the items required for a complete plan submittal, calculations for voltage drops and service breaker sizing, and response to initial submittal review comments. See Appendix C for submittal requirements; a completed copy of the checklist should be included with the Submittal.

Prior to the Final Submittal meeting, the Design Engineer shall coordinate the effort to pothole critical locations identified during the Intake Submittal.

3. Resubmittal and Approval: If outstanding design issues still exist, the City may require the Design Engineer to submit a new set of Plans for further review and comment prior to approval. If no such issues exist, the submittal for approval shall consist of one set of full size Mylars. The Plans shall contain the Standard City Approval Block.

III. DESIGN GUIDELINES

- A. Classification: The system and level of design will depend on project location and adjacent area use. First identify the roadway classification of the roadway segment on which the system will be designed. All roadway segments within the City are listed in Appendix A. Once the appropriate table has been identified, the adjacent area classification will be determined using the area classification map in Appendix B.
- B. Facility evaluation extents: Where a half-street improvement is required in conjunction with a development, the roadway width to be used for illumination design purposes will be the actual width of the roadway at the time of design and not half of the ultimate width. In addition, all existing luminaires that have a photometric impact or are a part of the design calculation area shall be evaluated for upgrades to present standards.
- C. Type of system to be installed: In an effort to transition to Light-Emitting Diode (LED) street lighting systems, LED systems shall be installed for all new and retrofit designs. Even if the photometric values are met, LED replacement is still required on frontage improvements.

Details on the type of pole and luminaire to be installed are outlined in Appendix D. However, in specific locations, additional or different combinations may be required:

- 1. In the Central Business District, the Type F units may also be installed in conjunction with the Type A units.
 - 2. In specific areas, such as Overlake Village and Old Town, special types of poles and luminaires may be required.
- D. System layout: Once the acceptable luminaire selection has been made using Appendix D, the appropriate placement parameters must be set.
- 1. Configuration: The system layout shall be staggered. The following exceptions are only allowed upon approval by the City:
 - a. Opposite system layout may be specified on wider roadways or to match existing facilities.
 - b. Single-sided systems may be used only in the event that poles cannot be installed on the opposite side of the roadway due to overhead or underground utility conflicts or other obstructions.
 - 2. Spacing: The Design Engineer shall develop the optimum pole spacing for the established criteria as necessary to provide the target illumination levels and Uniformity Ratios (URs) shown.

Once optimum pole spacing is established, it shall be adjusted so that:

- a. No unit is located closer than 5 feet to a driveway. Poles should ideally be placed such that driveways are not located at the darkest point between luminaires.
- b. A unit is located at the approximate PC/PT at one corner of each unsignalized intersection.
- c. A unit is located at each corner of a signalized intersection. New luminaires shall be on signal poles.

- d. A unit is located within 10 feet upstream of a mid-block crosswalk (see section E.2 for more requirements at crossings).

Pole locations shall be adjusted between these control points to provide uniform spacing.

- 3. Lateral Location: See City of Redmond Standard Detail 420A for guidance on junction box locations and lateral location of poles.

In no instance shall the center of the pole be located less than the minimum requirement from the back of curb per City of Redmond Standard Detail 420A.

In all cases with luminaire arms, the pole shall provide a luminaire overhang of approximately 2 feet from face of curb. See Appendix D for maximum arm lengths.

- a. Where sidewalk is present: pole with luminaire arm shall be located at the back of sidewalk. Pole with no luminaire arm shall meet minimum offset requirement from back of curb. Sidewalk widening may be required to provide required ADA-compliant clearance around the pole.
- b. Where no sidewalk is present: if curb is present, pole shall meet minimum offset requirement from back of curb. If no curb is present, pole shall meet clear zone requirements.
- c. At midblock crossings: the crossing shall be illuminated with two luminaires, each one located 10 ft. upstream (as vehicular traffic approaches the crossing) of the crossing for positive contrast.
- d. At raised medians: the design engineer shall consider median luminaire placement to meet minimum average light levels. However, any median-mounted luminaire shall meet clear zone requirements.

- E. Lighting Levels: lighting requirements for roadway segments are defined in Appendix D. Other segments of a project shall adhere to the following:

- 1. Intersections: Intersections shall have a minimum average light level equal to 1.5 times the average light level requirement of the intersecting street with the highest classification. Intersection uniformity shall be less than or equal to the uniformity ratio of the intersecting street with the highest classification.
- 2. Sidewalks and Crossings: All marked crossings shall be illuminated with at least one luminaire oriented parallel to the crossing. Average maintained light levels within pedestrian facilities shall be as follows:

Table III-1. PEDESTRIAN DESIGN CRITERIA

Pedestrian Facility	Min. Maintained Avg. (fc)	Uniformity Ratio (Avg/Min)
Marked Crossing and Mid-block Crossing	1.0	3:1
Unmarked Crosswalk at Intersection	Same as adjacent Intersection	
Curb Ramps (marked crossings)	1.0	n/a
Sidewalk:		
<i>Commercial/CBD/Old Town</i>	1.0	4:1
<i>Overlake Village</i>	0.8	4:1
<i>Residential</i>	0.4	4:1

- F. System Evaluation: AGi32 software must be used in the design of an illumination system and the following calculation criteria must be input into the program:
1. Light Loss Factor (LLF): 0.85 is to be used for all LED fixtures and 0.62 for all HPS and Metal Halide fixtures.
 2. Initial Lumens Values: Typically included in the IES file provided by the manufacturer. For the latest IES file of the identified fixture, contact the manufacturer.
 3. Analysis Method: use the illuminance method for all calculations, unless directed otherwise by the City.
 4. Default Drive Current: 530mA. Confirm with City.
 5. Color Temperature: Acceptable range between 4000k and 4500k.
 6. Calculation Areas shall be laid out on a 5ft by 5ft grid as follows:
 - a. Intersections: The intersection area extends to face of curb (or edge of traveled way) and stop bar, and includes marked and unmarked crosswalks.
 - b. Roadway segments: the roadway area extends to the face of curb or edge of traveled way and includes bike lanes.
 - c. Sidewalks: the area extends from face of curb to back of sidewalk and is evaluated for the entire length of the project.
- G. Installation and Material Requirements: The information included in this section is intended to provide guidance as to the type of materials and installation procedures to be used. The Design Engineer shall refer to Sections 8-20 and 9-29 of the WSDOT Standard Specifications, the WSDOT Standard Plans, Sections 8-20 and 9-29 of the City of Redmond Special Provisions, and the City of Redmond Standard Details for complete material and installation requirements.
1. Pole Foundations: Pole foundations shall follow City of Redmond standard plans and shall be confirmed by the City. Where unsuitable soils are encountered, as determined by the City of Redmond, the Design Engineer shall provide an alternate design based on a soils analysis. Foundations shall be placed against undisturbed earth.

Service cabinet foundations shall conform to City of Redmond Standard Details 459A or 459C depending on whether or not a traffic signal controller cabinet is also being installed.

2. Conduit:

- a. Conduit placed above ground or between the service point (power pole or vault) and the service cabinet shall be hot-dip galvanized, rigid steel.
- b. Conduit beneath the roadway or shoulder area shall be Schedule 80 rigid Polyvinyl Chloride (PVC) and a spare conduit shall be provided for all roadway crossings.
- c. Conduit placed elsewhere shall be Schedule 40 rigid PVC.
- d. Two conduits shall be installed along frontage improvements. Conduit shall be extended to and terminate in a junction box at the end of project limits.
- e. Minimum size conduit shall be 2 inches. Other conduit sizes shall be 3 inches and 4 inches; no half sizes shall be used.
- f. Signal, detection, or communication wires shall not be placed in the same conduit with illumination wires.
- g. Maximum conduit fill shall be 26 percent for new installations and 40 percent for retrofit installations. See Table III-2 for conduit fill requirements for various trade sizes. Conduit fill shall be based on the total area of the circuit wires within the conduit. Wire size to calculate conduit fill shall be as follows:

- No. 8 Wire: 0.056 sq. in.
- No. 6 Wire: 0.073 sq. in.
- No. 4 Wire: 0.097 sq. in.
- No. 2 Wire: 0.133 sq. in.

Table III-2. CONDUIT FILL

Trade Size	Schedule 40		Schedule 80	
	26 Percent Fill	40 Percent Fill	26 Percent Fill	40 Percent Fill
2"	0.856 sq. in.	1.316sq. in.	0.747sq. in.	1.150sq. in.
3"	1.890 sq. in.	2.907 sq. in.	1.675 sq. in.	2.577 sq. in.
4"	3.264 sq. in.	5.022 sq. in.	2.927 sq. in.	4.503 sq. in.

3. Junction Boxes:

- a. Junction box installation shall conform to the WSDOT Standard Plans and City of Redmond Standard Details 464.

- b. A junction box shall be placed within 10 feet of each luminaire pole as well as adjacent to the service cabinet. See City of Redmond Standard Detail 420A for typical locations.
- c. Junction boxes shall be placed so that no conduit run is greater than 300 linear feet.
- d. Junction boxes shall be placed at all locations where the conduit turns 90 degrees or more horizontally.
- e. Junction boxes shall not be located within the traveled way, pedestrian ramps, or driveways. Junction boxes located in sidewalk or any other Pedestrian Accessible Route shall have non-slip lids.
- f. Type 3 junction boxes shall not be used. All large junction boxes shall be Type 8, dual lid units.
- g. The size of the junction box shall be determined by the total of the conduit diameters entering the box as follows:

Type 1 Junction Box:	Maximum of 6 inches
Type 2 Junction Box:	Maximum of 12 inches
Type 4 Junction Box:	Maximum of 6 inches
Type 8 Junction Box:	Maximum of 24 inches

- h. Conduit containing illumination circuits shall not be routed through junction boxes containing conduit for signal, detection, and/or communication conduits.
- i. Traceable mule tape must be installed in all empty conduit.

4. Wiring:

- a. Main circuit wires shall be sized to provide a maximum of 4 percent voltage drop at the end of each branch circuit.
- b. Minimum wire size shall be No. 8.
- c. A ground wire shall be included in all illumination runs and shall be equal in size to the largest conductor.
- d. Circuits from different services shall not enter the same junction box.

5. Service Cabinets:

- a. Service cabinets shall conform to City of Redmond Standard Detail 461. Where a signalized intersection is being constructed in conjunction with the illumination system, the illumination system may be energized from the service cabinet at the signal.
- b. Where the service cabinet is installed to service only an illumination system, it shall be located near the midpoint of the system to minimize voltage drops.
- c. All services shall be metered.

- d. Services shall be 120/240 volt single phase.
 - 6. Photoelectric Control: The illumination system shall be energized from a single long-life photoelectric cell mounted on the luminaire nearest to the service cabinet. All other luminaires in the system shall incorporate a 7-pin receptacle, capped for a future photoelectric cell, if applicable.
 - 7. Splices and Disconnect Kits: Splices in the junction box to connect the individual luminaires to the main circuit shall be made with a SEC Connector Company model 1791-DP kit. A fused quick disconnect kit shall be provided in each pole base.
- H. Transit Stops: The Design Engineer shall coordinate with transit agencies when any bus stops, park & ride facilities, or light rail stations are to be illuminated as part of any proposed system. The following publications provide guidance on illumination requirements for the transit agencies that operate within the City of Redmond:
- 1. King County Metro: refer to Metro Transportation Facility Design Guidelines.
 - 2. Sound Transit: refer to Design Standards and Guidelines for Sound Transit Projects: Sounder & ST Express Passenger Facilities, Chapter 12.
- I. Temporary Illumination: Any temporary illumination design must be included as part of the submittal package, unless otherwise approved by the City or if the existing system can be maintained. Temporary illumination is required when work includes any of the following situations (and does not maintain existing illumination system until a permanent system has been powered):
- 1. Replacement of existing illumination system
 - 2. Complex roadway realignment or channelization
 - 3. Multi-lane split around obstruction
 - 4. Temporary traffic signals
 - 5. Night-time pedestrian detour
 - 6. All intersections where traffic control is in place

All components of a temporary illumination system shall be crashworthy with breakaway features, outside the clear zone, or protected from traffic.

Where existing illumination is to be removed, it shall not be removed until a temporary system is operational.

The temporary lighting shall satisfy the greater of the “construction lanes and detours” light level and uniformity ratios in accordance with WSDOT *Design Manual* Chapter 1040 or the specific intersection light level and uniformity ratios, as defined in this chapter under Calculation Areas.

All temporary lighting shall be connected to grid power.

APPENDIX A

Roadway Classifications

Roadway Classifications¹

Principal Arterial Streets

Avondale Road NE (Union Hill Road to Avondale Way)
Avondale Road NE (Avondale Way to Avondale north city limits)
Redmond Way (east city limits to Bear Creek Parkway east)
Bear Creek Parkway (Redmond Way west to Redmond Way east)
Bel-Red Road (NE 20th Street to West Lake Sammamish Parkway)
Redmond Way (west city limits to Bear Creek Parkway west)
Redmond-Woodinville Road – NE 116th Street – NE 124th Street
Redmond-Woodinville Road – NE 90th Street – NE 116th Street
West Lake Sammamish Parkway NE – Bel-Red Road to NE 51st Street
West Lake Sammamish Parkway NE – NE 51st Street to Redmond Way
NE 90th Street – Willows Road to 160th Avenue NE
NE 90th Street – 160th Avenue NE to Red-Wood Road
NE 124th Street – west city limits to Avondale Road
148th Avenue NE – NE 20th Street to Willows Road
154th Avenue NE – West Lake Sammamish Parkway to NE 90th Street

Minor Arterial Streets

NE 20th Street (148th Avenue NE to Bel-Red Road)
NE 24th Street – 148th to Bel-Red Road
152nd Avenue NE (NE 20th Street to NE 31st Street)
Redmond-Woodinville Road (NE 90th Street to Cleveland Street)
Redmond Way (Bear Creek Parkway to 170th Avenue NE)
Avondale Way NE (Avondale Road NE to Redmond Way)
164th Avenue NE Extension (76th Avenue NE to Cleveland Street)
East Lake Sammamish Parkway NE (Redmond Way to 187th Avenue NE)
Leary Way NE (West Lake Sammamish Parkway to NE 80th Street)
NE Union Hill Road (NE to Avondale Way to east city limits)
Novelty Hill Road (east city limits to Avondale Road NE)
Old Redmond Road (west city limits to West Lake Sammamish Parkway)
West Lake Sammamish Parkway NE (Bel-Red Road to south city limits)
Willows Road (Redmond Way to north city limits)
NE 24th Street – city limits to West lake Sammamish Parkway NE
NE 31st/NE 36th Streets (152nd Avenue NE to 156th Avenue NE)
NE 40th Street (west city limits to West Lake Sammamish Parkway)
NE 51st Street (148th Avenue NE to West Lake Sammamish Parkway)
NE 80th Street – Leary Way to 164th Avenue NE
NE 85th Street (154th Avenue NE to 166th Avenue NE)
140th Avenue NE (Redmond Way to south city limits)
156th Avenue NE (NE 51st Street to NE 24th Street)
170th Place NE/Avenue NE (Redmond Way to Avondale Way)
188th Avenue NE – between Union Hill Road and Redmond-Fall City Road

Collector Arterial Streets

Cleveland Street (160th Avenue NE to 168th Avenue NE)
NE 27th Street/NE 28th Street (150th Avenue NE to 156th Avenue NE)

NE 60th Street (154th Avenue NE to 156th Avenue NE)
NE 76th Street (Redmond Way to 188th Avenue NE)
NE 79th Street (Redmond Way to Avondale Way NE)
NE 80th Street (132nd Avenue NE to Redmond Way)
NE 80th Street (164th Avenue NE to 169th Avenue NE)
NE 83rd Street (158th Avenue NE to 166th Avenue NE)
NE 104th Street/NE 109th Street (Redmond-Woodinville Road to Avondale Road NE)
NE 110th Street (162nd Avenue NE to 166th Avenue NE)
NE 111th Street (166th Avenue NE to 172nd Avenue NE)
NE 116th Street (Red-Wood Road to Avondale Road NE)
NE 116th Street (Willows Road to 154th Place NE)
31st/36th Street NE (148th Avenue NE to 152nd Avenue NE) (Including Bridge over SR 520)
NE 28th Street (Overlake Access Ramp to 152nd Avenue NE)
150th Avenue NE (NE 36th Street to 51st Street NE)
151st Avenue NE (NE 20th Street to NE 28th Street)
154th Avenue NE (NE 60th Street to Old Redmond Road)
154th Place NE (Red-Wood Road to NE 116th Street)
156th Avenue NE (NE 51st Street to NE 60th Street)
159th Place NE (Bear Creek Parkway to Leary Way)
160th Avenue NE (Redmond Way to Red-Wood Road)
161st Avenue NE (NE 90th to Bear Creek Parkway)
162nd Avenue NE (NE 110th Street to NE 116th Street)
166th Avenue NE (NE 76th Street to 111th Street NE)
169th Avenue NE (NE 79th Street to NE 80th Street)
172nd Avenue NE (West Lake Sammamish Parkway to NE 30th Street)
172nd Avenue NE (NE 111th Street to NE 116th Street)
178th Place NE (Union Hill Road to NE 76th Street)
178th Place NE/180th Avenue NE (NE 76th Street to Union Hill Road)
180th Avenue NE (Redmond Way to NE 76th Street)
185th Avenue NE (Union Hill Road to SR 202/Redmond-Fall City Road)

Connector Streets

NE 65th Street (185th Avenue NE to 192nd Avenue NE)
NE 73rd Street (185th Avenue NE to 192nd Avenue NE)
NE 76th Street (Leary Way to Bear Creek Parkway)
NE 80th Street (169th Avenue NE to 172nd Avenue NE)
NE 80th Street (185th Avenue NE to 188th Avenue NE)
NE 95th Street (166th Avenue NE to 171st Avenue NE)
NE 100th Street (166th Avenue NE to 171st Avenue NE)
158th Avenue NE (NE 85th Street to Redmond Way)
168th Avenue NE (Redmond Way to NE 79th Street)
171st Avenue NE (NE 80th Street to NE 100th Street)
172nd Avenue NE (NE 116th Street to NE 128th Street)
187th Avenue NE (East Lake Sammamish Parkway to SR 202)
192nd Avenue NE (Union Hill Road to NE 65th Street)
Avondale Way (Redmond Way to NE 76th Street)

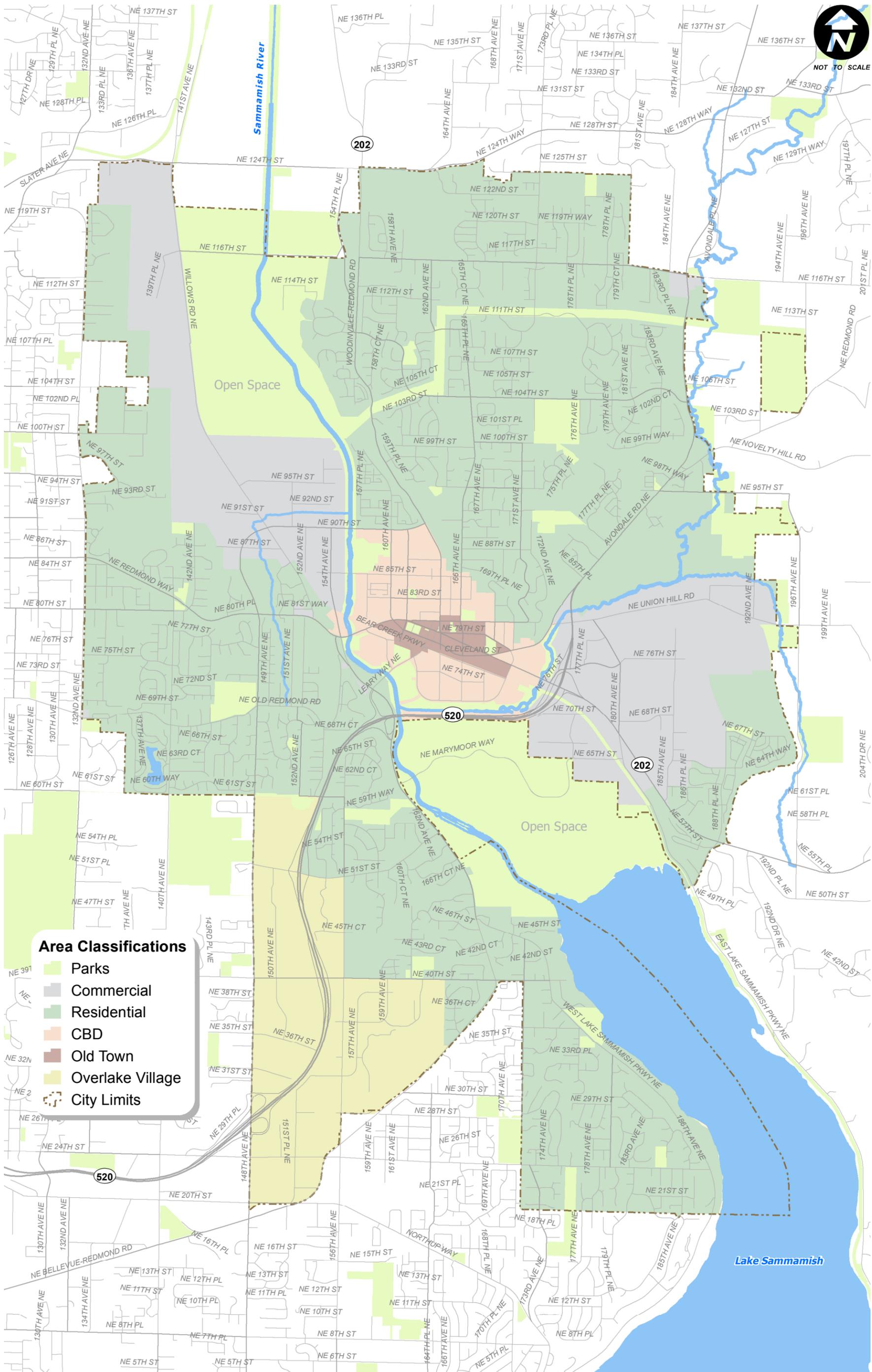
¹As revised in *City of Redmond Comprehensive Plan*.

APPENDIX B

Area Classification Map



NOT TO SCALE



Area Classifications

- Parks
- Commercial
- Residential
- CBD
- Old Town
- Overlake Village
- City Limits

City of Redmond - Area Classification Map

Illumination Design Manual

APPENDIX C

Illumination Plan Checklist

Illumination Plan Checklist

As a minimum, the following shall be included on an illumination plan submittal:

Cover Sheet

If the illumination design is a stand-alone project, the plans shall include a cover sheet. If the illumination design is a part of a larger plan set, a separate cover sheet for the illumination portion is not necessary. When used, the cover sheet shall include the following as a minimum:

INITIAL FINAL

- | | | |
|--------------------------|--------------------------|--|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. City of Redmond project name and number |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. Vicinity map showing the project area and surrounding road system (up to an approximate five-block radius) |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Sheet index |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. Legend of existing and proposed items drafted in accordance with American Public Works Association (APWA) standards and symbols |

If a cover sheet is not required, the legend shall be included on the plan sheet

- | | | |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | 5. A standard City of Redmond construction signature block, including the City logo |
|--------------------------|--------------------------|---|

Plan Sheet(s)

All existing features shall be shown in screened gray scale and all proposed features shall be shown in bold. Where the roadways are straight, two sections in “plan/plan” format may be included on a single sheet. As a minimum, plan sheets shall contain the following:

INITIAL FINAL

- | | | |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | 1. A minimum scale of 1 inch = 40ft
Exception: A minimum scale of 1 inch = 20ft may be used if it makes half-size sheets more clear and easy to interpret |
| <input type="checkbox"/> | <input type="checkbox"/> | 2. North arrow, oriented up or to the right |
| <input type="checkbox"/> | <input type="checkbox"/> | 3. Scale bar |
| <input type="checkbox"/> | <input type="checkbox"/> | 4. Street names |
| <input type="checkbox"/> | <input type="checkbox"/> | 5. Location of the proposed poles, conduit, junction boxes, and service cabinets |
| <input type="checkbox"/> | <input type="checkbox"/> | 6. Location and type (overhead or underground) of service point |
| <input type="checkbox"/> | <input type="checkbox"/> | 7. Construction centerline with stationing |
| <input type="checkbox"/> | <input type="checkbox"/> | 8. Right-of-way and easements |
| <input type="checkbox"/> | <input type="checkbox"/> | 9. Underground and overhead utilities, both proposed and existing to remain |
| <input type="checkbox"/> | <input type="checkbox"/> | 10. Curb, sidewalks, and lane lines, both proposed and existing to remain |
| <input type="checkbox"/> | <input type="checkbox"/> | 11. Driveways |
| <input type="checkbox"/> | <input type="checkbox"/> | 12. Retaining structures |
| | <input type="checkbox"/> | 13. Four-digit identification number for all luminaires: <ul style="list-style-type: none">• First digit shall identify the service• Second digit shall identify the circuit• Third and fourth digit shall identify the luminaire starting with the lowest number nearest the service cabinet as 01 |

INITIAL FINAL

- 15. Reference to the sheet that contains the construction notes, conduit/wire schedule, pole schedule, and any other items referenced on the plan sheet, if provided on a separate sheet
- 16. A City of Redmond construction signature block

<p>APPROVED FOR CONSTRUCTION</p> <p>_____</p> <p>FOR: Linda E. De Boldt, P.E. Director of Public Works City of Redmond</p> <p>Date: _____</p> <p>Plan Chk Engr: _____</p> <p>Storm: _____</p> <p>Utility: _____</p> <p>Fire _____</p> <p>Trans / Engr: _____</p> <p>Planning: _____</p>	<p>This approval is for the design concept only. These plans appear to be in conformance with the City Of Redmond design standards for construction. This approval shall not be construed as authorizing construction not in accordance with applicable City standards. The City reserves the right to require revisions to the approved plans to assure conformance with City of Redmond design standards for construction at any time that it is discovered that the proposed construction does not otherwise meet the applicable construction standards. The owner is required to provide designs and plans in accordance with applicable City standards and assures that construction is accomplished in accordance with those standards. The owner and/or design engineer and/or developer may be required to make necessary approved field revisions to correct any errors or omissions found on the approved plan.</p>
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- 17. "NEC Compliant" block

<p>CITY OF REDMOND DEPARTMENT OF PUBLIC WORKS</p>	
<p>The Electrical Contractor shall obtain a City of Redmond Electrical Permit before commencing any work.</p>	
<p>All work shall conform to the City of Redmond Standard Details and Specifications, these plans and the latest edition to the National Electrical Code.</p>	
Signature _____	Date _____

- 18. The name, phone, number, and address of the design firm completing the lighting plans

Notes, Schedules, Detail Sheet(s)

When notes, schedules and detail cannot be clearly and conveniently shown on the plan sheets, they shall be included on a separate sheet.

INITIAL FINAL

- 1. General Notes: General notes to accompany all projects shall include, but not be limited to, the following:
 - All conduit shall be installed by open trench unless otherwise indicated on the plans
 - Contractor responsibilities
 - Utility contact information
 - Proposed and existing junction boxes must be bonded, per NEC

INITIAL FINAL

- □ 2. Construction Notes: Construction notes shall include, but not be limited to, the following:
 - Pole and foundation installation
 - Service cabinet and foundation installation
 - Junction box installation (where not adjacent to pole)
 - Connection to the power source
 - Removal of existing equipment
 - Special conduit installation such as boring or installation on structures
- 3. Pole Schedule: A Pole Schedule shall be included with all projects and shall contain as a minimum the following information:
 - Luminaire identification number (four-digit number referenced above)
 - Pole station and offset from construction centerline (provide northing and easting if centerline stationing is not feasible)
 - Foundation diameter and depth
 - Unit type (combination pole and luminaire as noted in Item 4 below)
 - Luminaire mounting height
 - Luminaire arm length
 - Luminaire type, wattage, and distribution pattern
 - Detail reference (special foundation, pads, special installation, etc.)
 - Indicate whether the system is city owned or Intolight owned
 - Other information as required for clarity
- 4. Junction Box Schedule: A Junction Box Schedule shall be included with all projects and shall contain as a minimum the following information:
 - Type
 - Station and offset
 - Other information as required for clarity and installation
- □ 5. If multiple units are being used, the following legend shall be placed as applicable adjacent to the Pole Schedule:
 - Type A Unit: Square concrete pole with decorative (shoebox) fixture on a mast arm per City of Redmond Standard Detail 420
 - Type B Unit: Round steel pole with cobra-head fixture on a mast arm per City of Redmond Standard Detail 430
 - Type C Unit: Round steel pole, 5-foot 9-inch radius davit with cobra-head fixture on a mast arm per City of Redmond Standard Detail 425 and WSDOT standard plans
 - Type D Unit: Fourteen-foot-high Victorian style steel pole with pole top mounted decorative style luminaire per City of Redmond Standard Detail 471
 - Type E Unit: Decorative (Other): Hanging decorative luminaire on fluted decorative steel pole per City of Redmond Standard Detail 470
 - Type F Unit: Twelve- to fifteen-foot-high Victorian style concrete pole with pole top mounted decorative style luminaire per City of Redmond Standard Detail 430B
 - Type OV Roadway Unit: Twenty-one-foot-high platinum silver steel tapered pole with dual arm mount Curvilinear Cutoff CCS luminaires per City of Redmond Standard Detail
 - Type OV Sidewalk Unit: ten-foot-high platinum silver steel pole with Bounce single-decorative luminaire per City of Redmond Standard Detail

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- 6. Wire/Conduit Schedule: A wire/conduit schedule shall be included with all projects and shall include as a minimum the following information:
 - Run identification number
 - Size and type of material of conduit
 - Size and number of conductors
 - Circuit number
 - Percent fill for each conduit
- 7. Breaker/Contactor Schedule: Main breaker, branch breakers, and contactor sizes shall be identified if different from the standard cabinet requirements identified on the City of Redmond Standard Detail 461
- 8. Details: Details shall include, but not be limited to, the following:
 - Pads around the pole base and junction box
 - Installation on structures
 - Installations near or in conjunction with retaining structures
 - Service connection requirements
 - Service cabinet foundation (for a standalone installation) located by station and offset. Where the service cabinet is located at a signalized intersection and also services the intersection signal, it shall be located and described on the signal plan.
 - Trench and backfill including pavement restoration
- 9. Single Line Wiring Schematic Detail shall be included and shall contain the following information:
 - Luminaires, junction boxes, and service cabinets shall be shown in their relative location to one another, but does not be to any particular scale. All luminaries shall be labeled with the four-digit identification number
 - Different Type Units shall be shown by different symbols
 - Individual circuits shall be clearly shown by different line types
 - A legend shall be included on the sheet to identify all symbols used on the diagram
 - Street names and a north arrow shall be included

Supporting Calculations

The following information must be included in the submittal package:

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- 1. The AGi32 software output (data sheet and electronic file) shall include the following system parameter details:
 - Roadway classification
 - Roadway width
 - Adjacent area classification
 - Luminaire mounting height
 - Luminaire type
 - Luminaire wattage
 - Calculated average maintained illumination level in horizontal foot-candles (Hfc)
 - Calculated uniformity ratio (UR) for Average:Minimum illumination
 - Design average maintained illumination level in Hfc per Appendix D
 - Design uniformity ratio (UR) for Average:Minimum illumination per Appendix D
 - Light Loss Factor (LLF)

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- 2. The AGi32 software output (graphical figure) shall be plotted at a legible resolution and include the following design details:
 - Pole spacing
 - System layout
 - Calculated average maintained illumination level in horizontal foot-candles (Hfc)
 - Calculated uniformity ratio (UR) for Average:Minimum illumination
 - Design average maintained illumination level in Hfc per Appendix D
 - Design uniformity ratio for Average:Minimum illumination per Appendix D
- 3. System Calculations:
 - Line Loss for a 4% maximum voltage drop and a No. 8 minimum wire size
 - Breaker sizing

APPENDIX D

Illuminance Method Design Criteria

Table 1-D. Illuminance Method Design Criteria

Roadway ⁹										
ROADWAY ¹ CLASSIFICATION	Area Classification ²	Target Light Levels		Luminaire Mounting Height	Maximum Arm Length	Maximum Wattage ⁸	City Standard Detail	Fixture ^{5,7}	Pole ⁵	City Unit Type
		Minimum Maintained Average (fc)	Uniformity Ratio (Avg/Min)							
PRINCIPAL ARTERIAL	Commercial	1.6	3:1	40	12	271	430	cobra head	round steel	B
	Overlake Village	1.2	3:1	40	16	271	TBD	curvilinear	round steel	C
	Residential	0.8	3:1	40 ⁴	16	271	430	cobra head	round steel	C
				35 ³	12	183				
	CBD	1.6	3:1	35	3	182	420	decorative shoebox	square concrete	A
				12-15	n/a	112	430B	decorative post top	Victorian, concrete	F
Old Town	1.6	3:1	35	decorative	112	470	decorative hanging	fluted decorative steel	E	
			14	n/a	88	471	decorative post top	Victorian, steel	D	
MINOR ARTERIAL	Commercial	1.1	3:1	40	12	271	430	cobra head	round steel	B
	Overlake Village	0.8	3:1	40 ⁴	16	271	TBD	curvilinear	round steel	C
				35 ³	12	183				
	Residential	0.5	4:1	35 ⁴	12	183	430	cobra head	octagonal concrete	C
				35 ³	12	135				
	CBD	1.1	3:1	35	3	182	420	decorative shoebox	square concrete	A
12-15				n/a	112	430B	decorative post top	Victorian, concrete	F	
Old Town	1.1	3:1	35	decorative	112	470	decorative hanging	fluted decorative steel	E	
			14	n/a	88	471	decorative post top	Victorian, steel	D	
COLLECTOR ARTERIAL	Commercial	1.1	3:1	40	12	271	430	cobra head	octagonal concrete	B
	Overlake Village	0.8	3:1	35	12	183	TBD	curvilinear	round steel	C
	Residential	0.6	4:1	35	12	135	430	cobra head	octagonal concrete	C
	CBD	1.1	3:1	35	3	182	420	decorative shoebox	square concrete	A
				12-15	n/a	112	430B	decorative post top	Victorian, concrete	F
	Old Town	1.1	3:1	35	decorative	112	470	decorative hanging	fluted decorative steel	E
14				n/a	88	471	decorative post top	Victorian, steel	D	

ROADWAY ¹ CLASSIFICATION	Area Classification ²	Target Light Levels		Luminaire Mounting Height	Maximum Arm Length	Maximum Wattage ⁸	City Standard Detail	Fixture ^{5,7}	Pole ⁵	City Unit Type
		Minimum Maintained Average (fc)	Uniformity Ratio (Avg/Min)							
CONNECTOR ARTERIAL	Commercial	0.8	6:1	35	12	183	430	cobra head	round steel	B
	Overlake Village	0.65	6:1	30	8	135	TBD	curvilinear	round steel	C
	Residential	0.4	6:1	30	8	135	430	cobra head	octagonal concrete	B
LOCAL ACCESS ⁶	Commercial	0.8	6:1	35	12	183	430	cobra head	round steel	B
	Overlake Village	0.65	6:1	30	8	135	TBD	curvilinear	round steel	C
	Residential	0.4	6:1	25	12	92	430	cobra head	octagonal concrete	B
				Decision Point Lighting ¹⁰		12-15	n/a	112	430B	decorative post top
	CBD	0.8	6:1	35	3	182	420	decorative shoebox	square concrete	A
12-15				n/a	112	430B	decorative post top	Victorian, concrete	F	

1. See Table 1-A in Appendix A.
2. See area classification map in Appendix B.
3. Use for roadway width of 36ft or less
4. Use for roadway width over 36ft
5. See Sections 9-29.6 and 9-29.10 of the City of Redmond Special Provisions for complete pole and luminaire specifications.
6. Poles and luminaires on Local Access roadways in all areas except the CBD shall be owned, installed, and operated by Puget Sound Energy.
7. The light distribution pattern must be Type III, unless approved otherwise by the City of Redmond.
8. Maximum wattage values are for LED fixtures only. Coordinate with City of Redmond for High Pressure Sodium and Metal Halide maximum wattage values.
9. See the Design Guidelines section of the design manual for direction on pedestrian facility and intersection illumination criteria.
10. Decision Point Lighting may be applied to residential local access streets with 300 ft maximum spacing between luminaires. Luminaires are placed at intersections, crossings, changes in roadway geometry, dead ends, hazards, etc.