

DIVISION 7

Street Lighting



Department of Public Works and Utilities
Engineering Division

DIVISION 7. STREET LIGHTING

7-10 GENERAL

This section describes Street Lighting Standards for developments within the City of Bremerton. Street Light(s) or Street Lighting referred to in this standard is defined as that street lighting owned and maintained by the City of Bremerton. Existing lighting on public rights of way that is not currently owned and maintained by the City shall be replaced by new lighting, designed and installed in accordance to City Standards. The owner or developer shall pay for design and installation and deed to the City once the City has approved of such installations.

This street lighting standard sets minimum illumination levels and uniformity for various classifications of roadways within the City of Bremerton. Conformance with the standards can be obtained by either use of a prescriptive (predesigned) lighting layout for local access and subcollector (only) or by calculations that result in meeting the desired illumination.

Three types of street lighting installations are permitted:

Non-Central Business District

Standard, using metal galvanized tapered poles and mast arms, referred to as Type 1, ranging in mounting heights from 25 to 40 feet. Luminaire heads are of the "Cobra" type, with cutoff optics, to minimize light trespass.

Decorative non central business district, using a pole with a cast iron base and a fluted steel shaft, and a prismatic glass acorn style fixture, with a typical mounting height of 13 feet

Control of the street lighting is by a master photocell. This photocell controls a lighting relay in a pad mount electrical service cabinet. The photo cell will be mounted atop the nearest light pole. The photo cell will be a twist lock configure with the window pointing north and instant on operation.

The standard design lighting system will provide the lowest installed cost, as the poles can be higher than decorative and spaced further apart. However, the lower mounting height of the decorative fixture provides a more pedestrian friendly installation that would be more appropriate for residential applications.

These standards serve to strike a balance between the need for low maintenance and standardization against the installed cost.

Central Business District

The street lighting in the central business district shall be decorative poles, bases, and luminaries as constructed by Spring City Electrical Manufacturing Company, Spring City, PA 19475. The style shall be the Hudson River Park style and illustrated in the Bremerton Standard Detail Drawings 7022, 7023.

7-10.1 Standards and Regulations: All electrical equipment shall conform to the requirements of these Specifications, the plans and special provisions, all material and work shall conform to the requirements of:

- Latest adopted (by Washington State) edition of the National Electrical Code (NEC).
- Laws, Rules, & Regulations for Installing Electric Wires & Equipment, Department of Labor & Industries, State of Washington (L&I).
- National Electrical Manufacturers Association (NEMA).
- American Society for Testing and Materials (ASTM).
- Illumination Engineering Society (IES).
- American Standards Association (ASA).
- American National Standards Institute (ANSI).
- Washington State Standard Specifications for Road, Bridge and Municipal Construction (Standard Specifications).
- Washington State Standard Plans for Road, Bridge and Municipal Construction (Standard Plans).
- City of Bremerton Street Lighting Design Standard Drawings (City Standard Drawings).
- Puget Sound Energy (Puget Power).
- Other City ordinances or requirements that may apply.
- All material must be Underwriters laboratories Listed (UL)

Prior to start of work, all necessary licenses, permits and approvals shall be obtained. The Contractor shall comply with all laws, ordinances, rules, orders, and regulations relating to the performance of the work, the protection of adjacent property and the maintenance of all other facilities. The Contractor will be required to comply with all the provisions of these instruments and shall save and hold the City harmless from any damage which may be incurred as a result of the Contractor's failure to comply with all the terms of these permits.

The Contractor is advised that an Electrical Work Permit from the State Department of Labor and Industries shall be required for this project.

Street lighting shall be designed in conformance with these specifications, and the American National Standard Roadway Lighting, ANSI/IES RP-8, 1983 except as modified by this standard.

Conformance shall be obtained by:

- Calculations meeting the requirements of this standard.
- Use of a prescriptive (predesigned) specification as contained in this standard.

7-10.2 Roadway Classification: Roadway classifications are based on Bremerton Standard Detail Drawing 3001 for Functional Roadway Classification. The following summarizes the classifications.

Commercial/Industrial - Any area zoned as such.

Principal Arterial - A roadway having a Design Hourly Volume of greater than 400.

Minor Arterial - A roadway having a Design Hourly Volume of greater than 200 but less than 400.

Collector Arterial - A roadway having a Design Hourly Volume of less than 200.

Sub-Collector Arterial (One Way & Two Way) - A roadway with an Ultimate Average Daily Traffic of less than 1000 but greater than 400.

Local Access (One Way & Two Way) - A roadway with an Ultimate Average Daily Traffic of less than 400.

7-10.3 Area Designation:

Commercial - A district of continuous adjacent retail businesses at least 1,000 feet in length, with lighted store fronts, parking lots, etc.

Intermediate - A partially built-up area consisting of approximately 50 percent adjacent land use for retail businesses at least 600 feet in length, with lighted store fronts, parking lots, etc.

Residential - An area of continuous residences with occasional businesses.

7-10.4 Street Lighting Required: Street lighting shall be required for all lots and parcels being developed or constructed upon unless exempted by the City Engineer. Street lighting will also be required for any frontage of existing streets not already illuminated.

In addition, street lighting may be required for lots and parcels containing existing structures which are being improved or altered, depending on the nature and extent of the work. Illustrations of street lights generally required are shown on Bremerton Standard Detail Drawing 7006 and 7007 in the Appendix to this section. Data and

calculations supporting the satisfaction of the above requirements shall be submitted for review using the form Bremerton Standard Detail Drawing 7001 or the prescriptive design standards included herein shall apply.

7-10.4(A) Intersections: Intersections shall have at least one street light.

7-10.4(B) Cul-de-sacs: Cul-de-sacs shall have a street light within the bulb. The location of the street light within the bulb shall conform to Bremerton Standard Detail Drawing 7007 in the Appendix to this section.

7-10.4(C) Locations and Placement: The position of the street light poles shall conform to Bremerton Standard Detail Drawing 7013 with placement typical of Bremerton Standard Detail Drawing 7006 and 7007.

Install lighting poles on the sidewalk side of street when the street has a sidewalk on only one side. Exceptions may exist to this condition when lighting a curve or corner with sidewalk on the outside of the radius. These conditions shall be identified and discussed with the City Engineer to determine the desired pole locations.

7-10.5 Street Lighting Not Required: Street lighting is not required for a single residence.

7-10.6 Developer's Responsibility for Relocation of Existing Street Lights: Existing street lighting that must be relocated or repositioned, as a result of the construction of new streets or driveways into a development shall be the responsibility of the developer.

7-10.7 Utility Company Authorization: A written notice from the serving utility company, stating that line clearances and service have been checked and are adequate, shall be submitted to the Engineer for all developments.

7-10.8 Submittals: Four (4) sets of submittals shall be provided. Submittals shall either be mailed or dropped off to City of Bremerton Public Works & Utilities, 100 Oyster Bay Ave, Bremerton, Washington 98312, attention Electronics Supervisor. The submittals shall consist of:

- Catalog cuts that clearly identifies all poles, base type, lighting fixtures, service cabinets, junction boxes, lamps, and photoelectric eyes splice tanks, wire, fuse holders and products that are to be used in this project.
- Completed Bremerton Standard Detail Drawing 7001 Lighting Design Summary.
- Lighting System Design drawing showing pole locations and conduit runs, per Bremerton Standard Detail Drawing 7008.
- Pole Schedule giving pole heights, base type, pole arm lengths, pole identification numbers, and luminaire wattages, per Bremerton Standard Detail Drawing 7008.
- Conduit Wiring Schedule giving conduit run number, conduit size and type, number and size of lighting conductors in each conduit run, number and size of

- Riser diagram per Bremerton Standard Detail Drawing 7018.
- Any other information or calculations necessary to verify that the submitted design meets this specification.

7-20 STREET LIGHTING - SPECIFICATIONS

7-20.1 Street Light Poles: All street light poles shall be of the type specified in this standard. Standard - using Galvanized metal tapered poles and mast arms, referred to as Type I, (all associated hardware shall be galvanized) ranging in mounting heights from 25 to 40 feet. Decorative non central business district - using a pole with a cast iron base and a fluted steel shaft with a typical mounting height of 13 feet.

Spring City decorative Poles shall be used in the central Business District (CBD). As directed by the City Engineer.

7-20.1(A) Lighting Pole Identification: Lighting poles are identified using a street address based system. All pole numbers to be used will be identified on the submitted plans. Due to the fluted surfaces of the decorative poles, the contractor should submit for approval the intended method of attachment and type of identification to be used. All standard poles shall use the following standards.

Identification:

- Use a 2 inch high, black legend on reflective silver background.
- Face the curb, with the bottom of the legend 8 feet above the light pole base.
- Consists of the Standard address number obtained by the city engineer prior to installation.
- Orientation of legend is vertical.

Nominal Voltage Identification:

- Labeled over the lighting standard handhole.
- 1 inch high, black legend on orange background.
- The top of the legend shall be 4 inches above the top of the handhole.
- Legend is to be "240 VOLTS".

7-20.1(B) Spare Lighting Poles: Depending on the type of poles and quantity of poles used in this project, spare replacement poles may be required. The spare replacement poles shall be delivered to a site in the City as directed by the City

Engineer. The following table determines the number of replacement poles to be provided to the City:

Poles Used in Project	Standard Poles	Decorative Poles
1 to 4 poles	0	0
5 to 9 poles	0	1
10 to 19 poles	1	1
20 to 49 poles	1	2
50 or more poles	4% of the poles used - rounded down to the nearest whole number	6% of the poles used - rounded down to the nearest whole number

7-20.2 Luminaires: The type of street light luminaire and lamp wattage shall be specified on the plans. The luminaires shall be high-pressure sodium type with internal ballasts. All luminaires shall be of the same make.

The light distribution pattern for each luminaire shall be specified on the plans.

7-20.2(A) Standard Luminaires

Cobra Head Luminaires shall have:

- 90 degree cutoff optics, type MCIII distribution.
- A hinged and removable power module door containing the HPS ballast.
- Charcoal filter with an elastomer gasket.
- Corrosion resistant hardware.
- Magnetic regulator ballast.
- Multi-tap voltage ballast.
- Must be UL Listed.
- A photoelectric control receptacle shall not be used or installed.
- Gray paint finish.

Cobra Head Luminaires shall be of the following type:

General Electric Lighting Models to match city existing system.

- (Small frame 70 watt HPS)
- (Small frame 100 watt HPS)
- (Small frame 150 watt HPS)
- (Large frame 200 watt HPS)
- (Large frame 250 watt HPS)
- (Large frame 310 watt HPS)
- (Large frame 400 watt HPS)

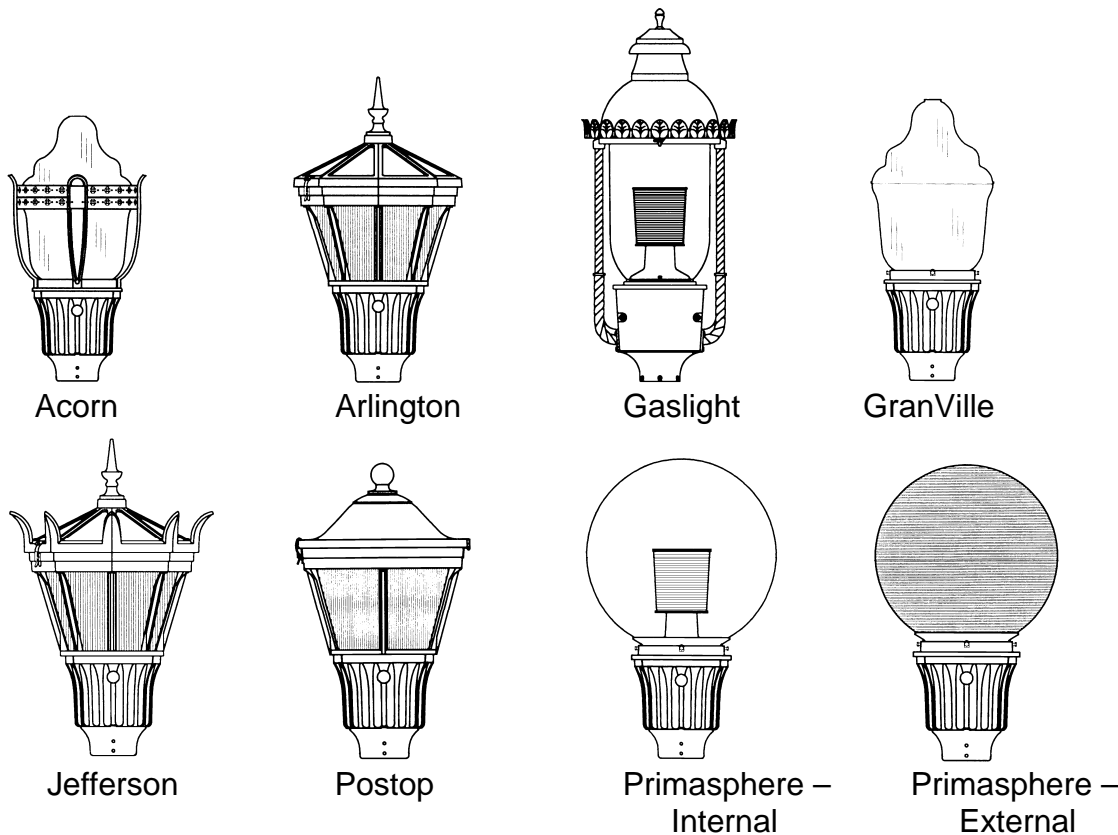
Luminaires are to be leveled as directed by the Engineer.

7-20.2(B) Decorative Non-Central business district Luminaires: All decorative luminaire fixtures used shall be of the Unique Solutions' Utility Luminaire Series by Holophane. This series is designed for ease of maintenance with the plug-in electrical module common to each of the luminaires in Unique Solutions' Utility Luminaire Series. Any of the several styles of fixtures available in the Unique Solutions' Utility Luminaire Series may be used. This will allow neighborhoods or areas to have a choice of fixture styles without requiring a large inventory of maintenance parts. All of these fixtures contain a precision optical system that maximizes post spacing while maintaining uniform illumination.

35 - 100 watt 120 volt High Pressure Sodium (HPS) ballasts shall be High Power Factor Reactor type. All other HPS ballasts shall be High Power Factor Autotransformer type.

The luminaire shall be UL listed as suitable for wet locations at a maximum 60 degree C ambient temperature.

The following list of images identifies the fixtures available in the Unique Solutions' Utility Luminaire Series. These images are only meant to give the general appearance of each fixture. The actual appearance may be slightly different depending on selected options when ordered.



7-20.2(C) Lamps

All lamps shall be clear and per the following ANSI specifications for 55 volts:

Wattage	ANSI Specification
70	S62ME-70
100	S54SB-100
150	S56SD-150
200	S66MN-200
250	S50VA-250
310	S76MR-310
400	S51WA-400

All lamps shall be manufactured by Sylvania.

The month and year that the lamp is installed in the luminaire shall be indicated on the base of the lamp by scribing through the month and year code with a sharp object, in a manner acceptable to the Engineer.

Central Business District

The lights in the central business district shall have the following specifications:
(See Bremerton Standard Detail Drawing 7014A, 7014B)

Luminaire Specifications

Style: Hudson River Park Pedestrian
 Height: 29 ¾"
 Width: 33" Dia.
 Material: Cast and spun aluminum
 Globe: Refractive Polycarbonate
 Finish: Prime paint then finish paint,
 Sherwin Williams Acrolon - Long Beach Blue
 Lamping: 100 Watt high pressure sodium (lamp by others)
 Voltage: Quad wired at 240 volt
 Socket: Medium Base
 Distribution: Type III (asymmetric distribution)
 Photo Control: Optional twist lock photo cell

Cross Arm Specifications

Style: Hudson River Park Roadway Twin
 Height: 47 ¾"
 Width: 8'-0" from center line of luminaire to center line of luminaire
 Material: Cast aluminum
 Finish: Prime paint then finish paint,
 Sherwin Williams Acrolon - Long Beach Blue

Lamp Post Specifications

Style: Hudson River Park

Height: 17'-9 3/4"

Base: 18" x 29 3/16"

Material:

Shaft: Extruded 6063-T6 aluminum shaft

Base: 1 piece, heavy wall cast ductile iron
per A.S.T.M. A 536-84 grade 65-45-12

Finish: Prime paint then finish paint,
Sherwin Williams Acrolon - Long Beach Blue

Access Doors: (2) located in base secured with captive tamper proof
hex socket security machine screws

Ground Stud Provisions: Drill and Tap inside wall of base to accommodate a 1/4" - 20
ground stud (ground study by Spring City)

Anchor Bolts: 1" Dia. anchor bolts (by others)

Bolt Projection: 5" required

Please Note: 1. All hardware shall be stainless steel
2. All visible hardware shall be finish painted to match post color

Base Specifications

Style: Hudson River Park

Height: 5'-0"

Width: 18" x 29 3/16"

Material:

Upper Casting: 1 piece, heavy wall cast aluminum alloy SR319,
per A.S.T.M. B26-95

Lower Casting: 1 piece, heavy wall cast ductile iron
per A.S.T.M. A 536-84 GRADE 65-45-12

Finish: Prime paint then finish paint,
Sherwin Williams Acrolon - Long Beach Blue

Access Doors: (2) located in base secured with captive tamper proof hex
socket security machine screws

Ground Stud

Provisions: Drill and tap inside wall of base to accommodate a 1/4"-20 ground stud
(ground stud by Spring City)

Anchor Bolts: 1" Dia. anchor bolts (by others)

Bolt Projection: 5" required

Please Note: 1. All hardware shall be stainless steel
2. All visible hardware shall be finish painted to match post color

7-20.3 Photoelectric Controls: Photoelectric controls(see Bremerton Standard
Detail Drawings 1717), where indicated on the plans, shall be a twist-lock type,
designed to turn on at 3 foot-candles, rated to operate over the voltage range of 105 to

285 volts AC, 60 Hz. The three (3) prong turn lock shall meet the requirements of ANSI C136.10-1988. The photoelectric control shall be rated to switch 1,000 watts minimum incandescent on. Photoelectric control installation shall be per Bremerton Standard Detail Drawing 1717.

7-20.4 Electrical Connections At Light Pole Bases: Electrical connections at light pole bases shall be per Bremerton Standard Detail Drawing 7010.. Fuse connectors shall be installed at every light pole base. All lighting branch circuit conductors above ground potential shall be served by a fused connector.

7-20.4(A) Luminaire Fusing: Fuse connectors shall be manufactured by SEC (Signal Electric Company). . The fuse holders shall be readily accessible from the Light Pole handhole, and have eighteen inches (18) of slack in the conductors.

Luminaire fusing for Lighting Poles shall conform to Bremerton Standard Detail Drawing 7019.. Fuses shall be 13/32" x 1 1/2" Dual Element Time Delay Fuse - Bussman Type FNM, Reliance MEN, Gould-Shawmut TRM, or approved equal with the appropriate current rating.

7-20.5 Service: The Service Cabinet shall be Underwriter Laboratory listed and labeled for service entrance use. Metering is required on all installations. See City of Bremerton Standard Detail Drawing 7016. Lighting branch circuits are sized to maximum 80% of the branch circuit ampacity. Lighting branch circuits can be 20 or 30 amperes. Available fault current at the service point of the Service Cabinet is assumed to be 10,000 Amperes. Contractor is responsible to determine available fault current. If greater than 10,000 AIC a higher rated AIC main breaker is required, and conformance with NEC Article 110-8 and 110-9 is required. The minimum service size is 200 amp at 240 volt. Service size may be increased to as large as 250 amps at 240 volts based on the engineered approved drawings.

7-20.5(A) Electrical Service: The electrical service shall be obtained from Puget Sound Energy by the Contractor upon the Contractor's request. and full expense. The contractor shall energize the street lighting service in the contractor's name and operate the system trouble free for a period of 60 days. At such time after acceptance testing has been performed, approved and all work has been accepted by the City the electrical service will then be transferred to the City of Bremerton street lighting account. The account # is 027-588-978-0, sub account 322-986-643-3 with Puget Sound Energy. If any additional questions contact the Public Works Operations at 360-473-5346. The Contractor shall ascertain the requirements of Puget Sound Energy and shall seek approval from Puget Sound Energy and the Engineer as to locations and type of construction for connecting and mounting service hardware. All service cabinet(s) shall be locked at all times that work is not being performed on the equipment.

Service conductors shall be as indicated on the wiring schedule and also must be copper type USE, XHHW, XLP...

All street lighting systems shall have underground service provided. Service points to pole or pad mount transformer shall be provided within a utility easement immediately adjacent to or within the right-of-way and shall be open and easily accessible to the street frontage.

7-20.5(B) Electrical Service Cabinet (General): The length of conductors within the Service Cabinet shall be sufficient to neatly train the conductor to the terminal point with no excess. Multiple conductors shall be neatly bundled, and secured with suitable nylon ties. Terminations shall be made so that there is no bare conductor at the terminal. The conductor insulation shall bear against the terminal or connector shoulder.

All galvanized conduit in contact with concrete shall be wrapped with 2" wide, 10 mil thick electrical tape, Scotchrap 50 or approved equal, half lapped. Coat with suitable primer.

The base of the service cabinet shall be sealed to the concrete pad with a polyurethane sealant meeting ASTM C-920, Type S, Class 25, Grade NS. The color shall approximately match the color of the Service Cabinet.

Grounding of the service cabinet shall be per Bremerton Standard Detail Drawing 7012 & 7010.

Electrical Service fed from Underground Source:

- Verify requirements for connections to pad mount transformer with Puget Sound Energy Engineer.
- Service entrance conduit can be rigid metallic galvanized or PVC non-metallic schedule 40.
- Terminate conduit 2 feet from transformer vault.
- End bell for PVC conduit.
- Phenolic bushing for rigid metallic galvanized.
- Provide 6" of sand backfill above and below exposed conductors.
- Electrical Service fed from overhead source.
- Continuous conduit from service cabinet to Puget Sound Energy Pole.
- Extend up pole to height as determined by Puget Sound Energy engineer.
- Install a PVC weather head.
- Rigid metallic galvanized conduit.
- Pole riser per. Bremerton Standard Detail Drawing 7018.

7-20.5(C) Electrical Service Cabinet

Service cabinet to be per Bremerton Standard Detail Drawing 7016 or 7016A, as manufactured by Skyline Electric and Manufacturing Co., Seattle WA., Or Browns Field Manufacturing Snohomish Washington. Bremerton Standard Details 7016A

Cabinet shall be UL labeled. (Brownsfield, see Bremerton Standard Detail 7016 & 7015)

NEMA 3R construction, pad mount, 25" wide x 30" deep x 60" high.

12 gage pre-galvanized steel.

Removable equipment mounting pan.

Stainless steel vault handles, 3 point latch.

Best cabinet locks with Blue Construction Cores.

Cabinet doors: Lift off, heavy-duty barrel hinges, closed cell neoprene gasket, hinged on left.

Cabinet vents: Two screened and gasketed, one near top of cabinet end, other near bottom.(not in meter section).

All internal fasteners to be pan head Phillips SS.

Exterior finish: Polyurethane powder coat, ASA 61 Gray.

Interior finish: white enamel paint.

Internal wireway.

Provide 1/2" diameter mounting holes in bottom flange.

Wiring: Cabinet wiring to be stranded, type MTW or SIS copper.

Panelboard: Minium 120/240 VAC, 1 Phase, 200 amp mains, 16 space, 10KAIC, with 60-amp minimum back fed main breaker. Secure breaker with PK2MB retaining kit.

Provide following branch circuits: (See Bremerton Standard Detail Drawings 7020).

- 20/2 Illumination, one per each lighting contactor required
- 15/1 Control
- 50/1 Signal Branch
- 15/1 Receptacle ranch

Lighting Contactor(s): 30 amp, 2 pole, 600 volt, 120 volt coil, Square D 8903-SMO-1 (Number of lighting contactors dependent upon lighting requirements).

Meterbase :200 Amp 5 jaw with bypass block , with 5 jaw at 9:00 position.

7-20.6 Junction Boxes: All junction boxes(See Bremerton Standard Detail Drawing 7011), including the size, shall be shown and identified on the submitted plans. All connections and splices shall be made only within junction boxes. Install junction boxes: Two way (in the splice) or three way (Wye or T) are the only acceptable methods. All splices made to the illumination circuits in junction boxes will be made in a 3m Scotchcast 82-B1 2 piece ridged plastic resin filled splice tank designed for that purpose. 2 way (in line) and 3 way (Y tap) are acceptable

- At locations where more than two conduit runs intersect.
- Where conduit runs are more than 300 feet long.
- Where shown on the submitted plans.
- At critical angle points.

- Locations as directed by the Engineer.
- In the sidewalk whenever possible.
- Flush with the sidewalk grade, firmly bedded and aligned as directed by the Engineer.

7-20.6(A) Concrete Junction Boxes with (See Bremerton Standard Detail Drawings 7011) Galvanized Steel Lids: Enter conduit from the direction of the run terminating within 3 inches of the box wall near. Concrete junction boxes with steel lids shall be Type 1 as identified in Standard Plans, galvanized, with grounding strap, and locking lid, bearing the legend "LT", in conformance with Washington State Standard Plan No. J-11A Alternate B.

Concrete junction boxes with steel lids shall be used in all locations including where the junction box will be in the sidewalk.

7-20.6(B) Concrete junction boxes with concrete lids may not be used unless prior consent by the City Engineer has been obtained in writing.

The concrete junction box with concrete lid shall be a Fogtite model B9 with concrete lid or approved equal.

7-20.7 Conductors: All conductors, including quantity and size, shall be identified on the submitted plans.

Voltage drop:

- Size lighting branch circuits for 5% voltage drop.
 - Size service entrance conductors for 3% voltage drop.
 - Calculations showing voltage drop for lighting branch circuits are required.
- Voltage drop calculations shall take into account the losses due to the ballast.

Wire conductors for underground feeder runs, service entrance and for circuitry from the in-line fuse in the poles to the junction box shall be six hundred (600) volt, single conductor stranded copper type XLP, USE/RHH/RHW in accordance with the Insulated Power Cable Engineer's Association Specifications. Conductors used in the service cabinet are per section 3451.7

Wire conductors inside the pole from the luminaire to the in-line fuse shall be per Standard Specification Section 9-23.3 (5); six hundred (600) volt, Pole and Bracket cable. If the luminaire requires fixture wire temperature greater than 75 C, the outer portion of the cable jacket shall be stripped for that portion of the cable inside the luminaire. The single conductors shall be sheathed with braided fiberglass sleeving of the temperature rating recommended by the luminaire manufacturer.

Minimum conductor size for lighting branch circuits is #8 AWG, including equipment ground. Minimum conductor size for photoelectric control is #12 AWG and the same type as mentioned above.

7-20.7(A) Conductor Color Coding: Color coding shall be accomplished by colored thermoplastic electrical tape, if the conductor is not of the required color. Conductors shall be taped for a minimum of 2", lapping each turn 1/2.

Equipment grounding conductors and the grounded conductor shall be color coded per the National Electrical Code.

Cable used inside the light poles shall be color coded black and red.

At each junction box, light standard handhole, and service cabinet, street lighting conductors shall be color coded black and red, with black being the "A" leg, and red being the "B" leg of the 120/240 volt AC service.

Remote wiring from the Service Cabinet to the photoelectric control shall be color coded as follows:

- Black-Line
- White-Neutral (grounded conductor)
- Red-Load

These control conductors cable shall be contained in a single PVC jacket and rated for the proper application and environment.

7-20.8 Conduit: All conduit runs, including the size, shall be shown and identified on the plans. The minimum conduit size (See Bremerton Standard Detail Drawing 1711) for each conduit run shall be determined according to the National Electrical Code, with the minimum size between junction boxes being one and one half (1 1/2") diameter conduit for lighting branch circuits. Larger conduit may be required at the discretion of the City.

A minimum of the first ten (10) feet of conduit out of a junction box, in a run that goes to another junction box, shall be rigid metallic galvanized regardless of conduit type used for the remainder of the run. The purpose of this is to provide sufficient strength and durability in the case of hard wire pulls.

A spare 2" conduit shall be installed between each junction box (See Bremerton Standard Detail Drawing 1711).

Conduit to be installed above ground and conduit installed underground across roadways shall be rigid metallic galvanized conforming to Article 346 of the National Electrical Code. All conduit installed underground shall have Polyethylene Underground Hazard Marking Tape, 6 inches wide, red, legend "Caution-Electric Line Buried below", placed approximately 12" above the conduit.

All galvanized conduit in contact with concrete shall be wrapped with 2" wide, 10 mil thick electrical tape, Scotchwrap 50 or approved equal, half lapped. Coat with a suitable primer.

All conduits installed under sidewalk and driveway areas shall be Schedule 40 rigid polyvinyl (PVC) unless otherwise noted on the plans. PVC conduit shall conform to Article 347 of the National Electric Code.

Size of all conduits shall be shown on the Plans.

A 200 pound breaking strength polyolefin pull string shall be pulled into all conduit runs, except the service entrance conduit and conduit for grounding electrode conductor. All empty conduits shall be plugged or capped immediately after pulling through a cleaning mandrel and installation of the pull string.

7-20.8(A) Grounding of Illumination System: The illumination system shall be bonded and grounded in accordance with Bremerton Standard Detail Drawing 7010 & 7012. Grounding bushings, where required, shall be OZ Gedney, type HLBG or Thomas & Betts, Blackjack type BG.

7-20.9 Acceptance Testing: All testing shall be performed in the presence of a representative of the City and recorded on Bremerton Standard Detail Drawing 7009. The project will not be considered acceptable and completed until the completed Bremerton Standard Detail Drawing 7009 is submitted to the City Engineer.

All measurements will be made with an instrument designed for that purpose and acceptable to the City. The Contractor may use its own instruments to verify readings. If a discrepancy exists, the readings taken with the City's instrument will be considered as the correct readings. If the contractor disputes the City's readings, the City will produce calibration documentation for the instrument or verify the readings with a third instrument.

7-20.9(A) Insulation Testing: To perform this test the Contractor shall disconnect all luminaires at the fuse connector in the hand holes of each pole. Then test the insulation resistance at 500 volts with a suitable testing device. An acceptable reading shall be at least one megaohm at 500 volts for one minute.

7-20.9(B) Operational Testing: The Contractor shall verify the correct operation of the lighting test switch, the master photocell, and the ground fault circuit interrupter receptacle.

7-20.9(C) Voltage Readings: The Contractor shall take voltage readings at the supply side of the lighting contactor. The voltage readings will be taken with the contactor open (no lights energized) and the contactor closed (all lights on). The readings to be taken are Leg A to ground, Leg B to ground, and Leg A to Leg B.

7-20.9(D) Amperage Readings: The Contractor shall take current readings using a clamp on amp meter with the lighting contactor closed (all lights on). The readings to be taken are Leg A at the output of the lighting contactor and Leg B at the output of the lighting contactor.

7-20.9(E) Record Drawings: The contractor shall provide redlined prints of the plans showing as-built information of the field wiring prior to acceptance of the job by the City. Drawings to be delivered or mailed to City of Bremerton Public Works 100 Oyster Bay Ave, Bremerton Washington, 98312, attention Electronics Supervisor. Final Record Drawing plans shall be delivered in Auto Cad Drawing format.