

1 DIVISION8.GR8

2 **Division 8**
3 **Miscellaneous Construction**

4
5 8-20.1(1).GR8

6 **Regulations and Code**

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8 8-20.1(1).Dt8

9 (February 19, 2009)

10 Section 8-20.1(1) is supplemented with the following:

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12 **Electrical Inspection**

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14 The Department of Labor and Industries' Electrical Inspector shall inspect and
15 approve the electrical portions of the project. Before work begins, the
16 Contractor shall contact the Department of Labor and Industries Electrical
17 Inspector at (425)290-1310 to coordinate a schedule of electrical inspection.
18 Work shall be done in accordance with WAC 296-46B-010. This project shall
19 conform to the current adopted version of the NEC. When electrical inspection
20 of work is required, the Contractor shall notify the Electrical Inspector at least
21 two days in advance. The Electrical Inspector's inspection and approval of all
22 electrical work is required before final acceptance of the project.

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24 Since these signal(s) are being constructed on public right-of-way and will be
25 operated and maintained by Snohomish County, a Snohomish County Traffic
26 Signal Electrician will be required to inspect and approve electrical portions of
27 the project.

28

29 Final inspection and approval is required before the Contract can be completed.
30 The Contractor shall contact the County Signal Maintenance Supervisor at
31 (425)388-7551 a minimum of two (2) calendar days in advance of the agreed
32 upon points where electrical inspection is required, and give written notice to
33 the Engineer.

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35 8-20.2.GR8

36 **Materials**

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38 8-20.2.INST1.GR8

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40 Section 8-20.2 is supplemented with the following:

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42 8-20.2(2).DT8

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44 (June 1, 2018)

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46 Section 8-20.2(2) is revised as follows:

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48 Add the word "calendar" after "20" in the first paragraph.

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50 Delete "If required to do so," in the first sentence of the second paragraph.

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52 After the fourth paragraph add the following:

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1 Shop drawing for signal standards and lighting standards shall be provided
2 in an electronic format, either AUTOCAD Release 2006 or later, as well as
3 complying with Section 6-03.3(7).
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5 The last paragraph which begins "Submittals required shall include..." is
6 deleted.
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8 8-20.3.GR8
9 **Construction Requirements**

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11 8-20.3(3).DT8
12 (June 1, 2018)
13 Section 8-20.3(3) is supplemented with the following:
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15 All existing equipment that is to be removed shall not be stockpiled within the
16 job site without the Engineer's approval.
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18 The following signal equipment shall remain the property of the Contracting
19 Agency and shall be disconnected, dismantled, stacked separately, and
20 delivered to the Contracting Agency:
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- 22 • Traffic Signal Standards and Mast Arms
- 23 • Traffic Signal Controller Cabinets
- 24 • Electrical Service Cabinet
- 25 • Light Standards and Mast Arms
- 26 • Emergency Vehicle Detectors
- 27 • Vehicle and Pedestrian Displays and Mounting Hardware
- 28 • Pedestrian Pushbuttons
- 29 • Luminaires
- 30 • Video Cameras and Mounting Hardware
- 31 • Terminal Cabinets
- 32 • Visors
- 33 • Back Plates

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35 Prior to the removal of any span wire from strain poles all associated vehicle
36 and pedestrian signal heads, emergency vehicle detectors, video cameras, and
37 signs shall be removed from each span.
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39 Video cameras shall be given to the Engineer upon their removal.
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41 The Contractor shall give the Engineer fourteen (14) calendar days advance
42 written notice prior to delivery for removed materials to the Contracting
43 Agency's storage facilities.
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45 Controller cabinets shall not be removed until all associated electronic
46 equipment is removed by Contracting Agency traffic signals personnel. All
47 other equipment shall be removed by the Contractor, and delivered within 24
48 hours following removal to the Contracting Agency.
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50 The salvaged material listed above shall be delivered to the following address
51 between the hours of 8:30 a.m. and 2:30 p.m.

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Cathcart Way Operations Center (CWOC)
8915 Cathcart Way
Snohomish, WA 98296

Pole shaft and Mast Arm Identification

All removed mast arms and pole shaft shall be identified by paper identification tags recording pole number, intersection location (such as SR XXX, jct XXX), and mast arm length.

The tags shall be 4-inch by 6-inch (minimum) and be taped to corresponding pole shafts and mast arms. Information on the mast arm tag shall match the information on the corresponding pole shaft tag. Each tag shall be entirely covered with clear acetate tape. The tape shall be wrapped on full circle around the shaft or arm with a 1/2 inch minimum overlap at the ends and sides.

The Contractor shall bundle the complete signal standard assembly together. The assembly consists of pole shaft, mast arm, and connecting bolts. Connecting bolts shall be attached to the original mast arm base plate.

Dismantled equipment shall be clearly marked and all hardware saved in a heavy duty burlap bag attached to the corresponding signal standard or mast arm. The Contractor shall be responsible for loading, delivering, and unloading the salvaged signal equipment, as designated by the Engineer.

The Engineer shall determine the condition of the signal equipment. Only undamaged material parts will be accepted by the Contracting Agency.

If the Contractor's operation causes damage to removed equipment that is to be returned, it shall be repaired or replaced by the Contractor to the Engineer's satisfaction at no additional cost to the Contracting Agency.

The Contractor shall remove and dispose of properly all debris and signal equipment not identified for return to the Contracting Agency.

Equipment to Remain

Care shall be taken to protect and preserve all existing equipment that is not being removed under this Contract. Any existing equipment to remain that is damaged by the Contractor will be repaired or replaced to the Engineer's satisfaction, at no additional expense to the Contracting Agency.

Items to be Removed

The Contractor shall:

- Remove all wires for discontinued circuits from the conduit system.
- Remove elbow sections of abandoned conduit entering junction boxes.
- Remove abandoned conduit that is less than 18 inches below finished grade, unless otherwise indicated in the Plans.

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- Removal of foundations shall be performed in accordance with Section 2-02.3(1).
- Backfill voids created by removal of foundations and junction boxes. Backfilling and compaction shall be performed in accordance with Section 2-09.3(1)E.

8-20.3(4).GR8

Foundations

8-20.3(4).DT8

(September 6, 2017)

Section 8-20.3(4) is supplemented with the following:

Drilled Shafts For Traffic Signal Pole Foundations

This Special Provision covers the operations required to drill shafts for pole foundations, removal of all soil and rock materials encountered, disposal of all excavated materials, furnishing and placement of casing (if required), removal and disposal of any obstructions encountered, furnish and place steel reinforcement cages and concrete, and the work necessary to complete the drilled shaft construction, in accordance with these Special Provisions and as specified in the Plans.

Materials

Concrete

Concrete shall meet all requirements for Concrete Class 4000P as specified in Section 6-02, with the following exceptions:

1. The slump of the concrete shall be between 5 inches to 7 inches when tested in accordance with WSDOT Field Operating Procedure (FOP) for AASHTO T 119 at the jobsite.
2. The Contractor may use a water-reducing admixture in accordance with Section 6-02.3(3), the manufacturer's written recommendations, and as designated by the Engineer in order to attain a slump of 5 inches to 7 inches.

Reinforcing Steel

All reinforcing steel shall meet the requirements of Section 9-07 and in accordance with the Plans.

Casing

1. The casing shall be of steel and of ample strength to withstand handling stresses and the external pressure of the caving soil and/or water.
2. The casing shall be watertight and clean.
3. The inside diameter of the casing shall provide as a minimum the specified diameter of the shaft. No extra compensation will be allowed for concrete required to fill an oversized casing or an oversized excavation.

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4. Sonotube or equivalent may be used in the top 3 feet to facilitate forming.

Construction Sequence

All excavation for the foundations in which the drilled shafts are to be constructed shall be completed before shaft construction begins. After shaft construction is completed, all loose or displaced materials shall be removed from around the shafts, leaving a clean solid surface to receive the footing concrete.

Shaft Excavation

1. Shafts shall be excavated to the required depth as shown in the Plans or as designated by the Engineer. The excavation shall be completed in a continuous operation using equipment capable of excavating through the type of material expected to be encountered. (Boring Log is available at the office of the Engineer.) The concrete shall be placed immediately after the completion of shaft excavation and cleanout without any undue delay.
2. If the shaft excavation is stopped with the approval of the Engineer, the shaft shall be secured by the installation of a safety cover. It shall be the Contractor's responsibility to ensure the safety of the shaft and the surrounding soil and the stability of the sidewalls. A temporary casing should be used if necessary to ensure such safety and stability.
3. Where caving conditions are encountered, due to soft soils or water intrusion, no further excavation will be allowed until the Contractor selects a method to prevent ground movement. The Contractor may elect to place a temporary casing or use other methods approved by the Engineer.
4. The Contractor shall use appropriate means such as a clean-out bucket, to clean the bottom of the excavation such that a minimum of 50 percent of the base of each shaft will have less than 1 inch of sediment at the time of placement of the concrete. The maximum depth of sediment or any debris at any place on the base of the shaft shall not exceed 2 inches.
5. When unexpected obstructions, which require specialized equipment and/or labor are encountered, the Contractor shall notify the Engineer promptly and the obstructions shall be removed and the excavation continued as designated by the Engineer.

Excavation Inspection

1. The Contractor shall provide equipment for checking the dimensions and alignment of each permanent shaft excavation. The dimensions and alignment shall be determined by the Contractor under the direction of the Engineer.
2. Final shaft depths shall be measured with a suitable weighted tape or other approved methods after final clean-out.

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3. Shaft cleanliness will be determined by the Engineer, by visual inspection.
4. The excavated shaft shall be approved by the Engineer prior to placing any steel or concrete into the shaft.

Reinforcing Steel Cage Construction and Placement

1. The reinforcing steel cage consisting of longitudinal bars, ties, cage stiffener bars, spacers, centralizers, and other necessary appurtenance shall be completely assembled and placed as a unit immediately after the shaft excavation is inspected and accepted prior to concrete placement. The reinforcing cage shall be rigidly braced to retain its configuration during handling and when lowered into the shaft, during placement of concrete and extraction of the casing from the shaft. No loose bars will be permitted. The reinforcing steel fabricator shall include bracing and any extra reinforcing steel required to fabricate the cage in the working drawings.
2. If the bottom of the constructed shaft elevation is lower than the bottom of the shaft elevation in the Plans, a minimum of 1/2 of the longitudinal bars required in the upper portion of the shaft shall be extended the additional length. Tie bars shall be continued for the extra depth, spaced on 2 feet centers, and the stiffener bars shall be extended to the final depth. These bars may be lap spliced, or unspliced bars of the proper length may be used. Welding to the planned reinforcing steel will not be permitted unless specifically shown in either the Plans or Special Provisions.
3. The reinforcing steel in the shaft shall be tied and supported so that the reinforcing steel will remain within allowable tolerances given in this Specification. Concrete spacers or other approved noncorrosive spacing devices shall be used at sufficient intervals (near the bottom and at intervals not exceeding 5 feet up the shaft) to insure concentric spacing for the entire cage length. Spacers shall be constructed of approved material equal in quality and durability to the concrete specified for the shaft.
4. The elevation of the top of the steel cage shall be checked before and after the concrete is placed. If the rebar cage is not maintained within the specified tolerances, corrections shall be made by the Contractor as designated by the Engineer. No additional shafts shall be constructed until the Contractor has modified his rebar cage support in a manner satisfactory to the Engineer.

Concrete Placement

Concrete placement shall commence within 2 hours after completion of the excavation and shall be placed in one continuous operation to the top of the shaft. Concrete shall be placed through a tremie. The tremie used shall consist of a tube of one-piece construction. Concrete shall be placed through a hopper at the top of the tube so that the concrete is deposited through the center of the reinforcing steel to prevent segregation of the aggregates and splashing of concrete on the reinforcement cage. The

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Contractor's proposed method for depositing concrete shall have approval of the Engineer prior to concrete placement. The concrete on the top 5 feet of the shaft shall be vibrated.

Casing Removal

During casing removal, a minimum 5-foot head of concrete must be maintained to balance the soil and water pressure at the bottom of the casing. This casing shall be well coated with form oil prior to concrete placement.

Construction Tolerances

1. The centerline of the drilled shaft shall be within 3 inches of Plan position in the horizontal plane, at the Plan elevation for the top of the shaft.
2. The vertical alignment of the shaft excavation shall not vary from the Plan alignment by more than 1/4 inch per foot of depth.
3. After all the concrete is placed, the top of the reinforcing steel cage shall be no more than 1/2 inch above and no more than 1/2 inch below the Plan position.
4. The minimum diameter of the drilled shaft shall be 1 inch less than the specified shaft diameter.
5. The top elevation of the shaft shall have a tolerance of $\pm 1/2$ inch from the Plan top of shaft elevation.
6. Excavation equipment and methods shall be designed so that the completed shaft excavation will have a flat bottom. The cutting edges of excavation equipment shall be normal to the vertical axis of the equipment within a tolerance of $\pm 3/8$ inch per 12 inches of diameter.

Drilled shaft excavations constructed in such a manner that the concrete shaft cannot be completed within the required tolerances are unacceptable. When approved, corrections may be made to an unacceptable drilled shaft excavation by any approved combination of the following methods:

1. Overdrill the shaft excavation to a larger diameter to permit accurate placement of the reinforcing steel cage with the required minimum concrete cover.
2. Increase the number and/or size of the steel reinforcement bars.

The approval of the correction procedures is dependent on analysis of the effect of the degree of misalignment and improper positioning. Correction methods may be approved as design analysis indicate. Redesign drawings and computations prepared by the Contractor's Engineer shall be signed by a Professional Engineer licensed in the State of Washington. Materials and work necessary, including engineering analysis and redesign, to effect corrections for out of tolerance drilled shaft excavations shall be furnished at no cost to the County.

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Submittals

1. Before placing the reinforcing steel, the Contractor shall submit working drawings type 1 to the Engineer as specified in Section 1-05.3 for the reinforcing cage.
2. Work shall not proceed until the appropriate submittals have been approved in writing by the Engineer.

8-20.3(5).GR8

Conduit

8-20.3(5).DT8

(July 12, 2018)

Section 8-20.3(5) is supplemented as follows:

All conduits shall be Schedule 80 PVC, unless otherwise specified in the Plans.

All PVC conduits shall contain #8 bonded ground wire.

After final assembly in place, as soon as the mandrel has been pulled through, a flat profile detectable, prelubricated, sequential footage marked woven polyester pull tape with a minimum tensile strength of 1250 pounds shall be pulled through each future, spare, or empty conduit and all conduits scheduled for fiber optic communication.

Once a pull tape is used and pulled out in a conduit, another pull tape shall be installed for future use.

A #14 AWG stranded orange USE insulated wire shall be placed directly above ITS conduit installed in trenches. Splices shall be crimped using a non-insulated butt splice, soldered and covered with moisture blocking heat shrink. 20 feet shall be left in each vault or pull box.

Directional bored conduits shall have a #14 AWG stranded USE insulated orange locate wire pulled through the conduit.

Each trench for fiber optic conduit installations shall include a “caution-buried fiber optic line below” detectable burial tape 1’ below finished grade.

Each trench for traffic signal conduit installations shall include a 1’ caution – buried electric line below” detectable burial tape 1’ below finished grade.

8-20.3(6).GR8

Junction Boxes, Cable Vaults, and Pull Boxes

8-20.3(6).DT8

(March 17, 2009)

Section 8-20.3(6) is supplemented as follows:

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Wiring shall not be pulled into any conduit until all associated junction boxes have been adjusted to or installed in their final grade and location, unless installation is necessary to maintain system operation. If wire is installed for this reason, sufficient slack shall be left to allow for final adjustment.

Junction boxes are to be placed outside of the sidewalk, unless otherwise directed by the Engineer.

If junction boxes are placed in the sidewalk, they shall not be placed closer than 12 inches from the edge of any sidewalk or sidewalk joint. The frame and lid shall be from 0 to 3/16 inch below a straight edge laid across the sidewalk, and the lid shall be flat to a maximum of 1/16 inch positive camber. Premolded joint filler for expansion joints shall be placed around junction boxes installed in sidewalks.

Maximum spacing between junction boxes, cable vaults, and pull boxes for fiber optic communication shall not exceed 1,000 feet.

8-20.3(8).GR8

Wiring

8-20.3(8).DT8
(April 5, 2013)

Section 8-20.3(8) is revised as follows:

The third paragraph is deleted and replaced with the following:

All splices in underground illumination circuits and inductive loop circuits shall be installed in junction boxes. The only splice allowed in vehicle detection circuits shall be the splice connecting the detector lead-in conductors to the shielded home run cable. Splices for induction loop circuits shall be heat shrink type with moisture blocking material, sized for conductors. All connections with #10 and smaller wire shall use compression butt joint copper crimped connectors installed with a positive-action (ratchet) tool, except for quick disconnects as described in Section 9-29.7. The non-insulated die shall be an indent type and the insulated die shall be of a smooth shape capable of crimping pre-insulated terminals and connectors. The tool shall be a compound-lever type with a ratchet mechanism to ensure positive closure for the full crimping cycle. The tool shall be field adjustable to proper calibration with common tools and materials. Each individual conductor shall then have an approved waterproof heat-shrink tube installed, which completely covers the compression connector and extends a minimum of one-half inch beyond each end of the compression connector. All conductor connections shall be offset from adjacent connections by a minimum of one inch. A final approved waterproof heat shrink tube shall then be installed over the pair of splices in each circuit.

Wire ends for pre-empt detection, vehicle detection, pedestrian detection (except for coax video detection cable) communication, and vehicle and pedestrian displays shall have suitably sized horseshoe spade connectors

1 crimped onto stripped and cleaned wire ends using an approved crimp tool
2 designed for the purpose.

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4 All splices shall be made in the presence of the Engineer.

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6 The second sentence of the seventh paragraph is revised to read as follows:

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8 Splice insulation shall be heat shrink.

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11 8-20.3(8) CHART.DT8
12 **(September 19, 2013)**
13 **Field Wiring Chart**

14	501	AC+ Input	516-520 Railroad Pre-empt
15	502	AC- Input	5A1-5D5 Emergency Pre-empt
16	503-510	Control-Display	541-580 Coordination
17	511-515	Sign Lights	581-599 Spare

18	Movement Number	1	2	3	4	5	6	7	8	9
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21 Vehicle Head

22	Red	611	621	631	641	651	661	671	681	6*1
23	Yellow	612	622	632	642	652	662	672	682	6*2
24	Green	613	623	633	643	653	663	673	683	6*3
25	Spare	614	624	634	644	654	664	674	684	6*4
26	Spare	615	625	635	645	655	665	675	685	6*5
27	AC-	616	626	636	646	656	666	676	686	6*6
28	Red Auxiliary	617	627	637	647	657	667	677	687	6*7
29	Yellow Auxiliary	618	628	638	648	658	668	678	688	6*8
30	Green Auxiliary	619	629	639	649	659	669	679	689	6*9

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33 Pedestrian Heads & Dets.

34	Hand	711	721	731	741	751	761	771	781	7*1
35	Man	712	722	732	742	752	762	772	782	7*2
36	AC-	713	723	733	743	753	763	773	783	7*3
37	Detection	714	724	734	744	754	764	774	784	7*4
38	Common-Detection	715	725	735	745	755	765	775	785	7*5
39	Spare	716	726	736	746	756	766	776	786	7*6
40	Spare	717	727	737	747	757	767	777	787	7*7
41	Spare	718	728	738	748	758	768	778	788	7*8
42	Spare	719	729	739	749	759	769	779	789	7*9

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45 * Overlap Phase Designator 9,A, B, - - - - -.

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48 8-20.3(10).GR8

49 ***Service, Transformer, and Intelligent Transportation System (ITS) Cabinets***

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51 8-20.3(10).OPT1.DT8
52 (June 1, 2018)

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Section 8-20.3(10), Service transformers, and Intelligent Transportation System (ITS) Cabinet, is supplemented with the following:

The Contractor shall obtain 120/240 volt, 60 HZ, AC electrical services approved by Snohomish County PUD No. 1 as shown in the Plans for traffic signal display and detection system(s) at the intersection(s) of ***\$1\$\$***.

The service addresses:

\$2\$\$

\$3\$\$

The Contractor shall provide the conduit and conductors in accordance with the NEC from the electrical pedestal, as shown on the Plans, to inside the service panel with sufficient conductor length to make the necessary connections conforming to the details shown.

Wires used as extensions of existing circuits shall have the same NEC rating as the existing wires.

Conductors used for power or illumination shall meet the following requirements:

1. Use single conductors, Class B stranded, annealed copper per ASTM B3, IPCBA-NEMA S-19-81, as currently amended.
2. Cross-linked polyethylene insulation jacket per U.L. Standard 854 for type USE and U.I. Standard 44 for type RHH-RHW.
3. Ampacity rating shall conform to current NEC requirements.

Service Connection Fees

The Contractor shall be responsible for making the necessary arrangements and payment of connection fees to the serving utility (Snohomish County Public Utility District No. 1, Customer Engineer, 2320 California Ave, Everett, WA) to complete the service connection(s), and shall coordinate with the serving utility on exact locations. The serving utility will make the final connection between the electrical service and the power source by extending the conduit and using the conductors provided under this Contract as shown on the Plans.

An "Application For Utility Service" for each intersection will be mailed by the Contractor to the Snohomish County PUD No. 1 as the first order of work.

Telephone/DSL Service

The Contractor shall provide and install the conduit and conductors as shown on the Plans, and including all necessary conduit fittings, risers, standoffs, weatherheads and other materials to reach the telephone connection location as shown on the Plans or designated by the Engineer. Prior to pouring foundations and installing conduit the Contractor shall verify the connection locations with the utility.

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The Contractor shall contact Snohomish County Traffic Management Coordinator Darin Speed at 425-262-2698, when the Contractor is ready for the telephone service to be activated. The Contracting Agency will arrange for the utility to activate the telephone service. The utility will provide the necessary equipment and make the final connections at the connection location.

8-20.3(10).OPT2.DT8

Service
(June 1, 2018)

Section 8-20.3(10), Service transformers, Intelligent Transportation System Cabinet, is supplemented with the following:

The Contractor shall obtain 120/240 volt, 60 HZ, AC electrical services approved by Snohomish County PUD No. 1 as shown in the Plans for traffic signal display and detection system(s) at the intersection(s) of ***\$1\$\$***:

The service addresses:

\$2\$\$

\$3\$\$

The Contractor shall provide the conduit and conductors in accordance with the NEC from the electrical pedestal, as shown on the Plans, to inside the service panel with sufficient conductor length to make the necessary connections conforming to the details shown.

Wires used as extensions of existing circuits shall have the same NEC rating as the existing wires.

Conductors used for power or illumination shall meet the following requirements:

1. Use single conductors, Class B stranded, annealed copper per ASTM B3, IPCBA-NEMA S-19-81, as currently amended.
2. Cross-linked polyethylene insulation jacket per U.L. Standard 854 for type USE and U.I. Standard 44 for type RHH-RHW.
3. Ampacity rating shall conform to current NEC requirements.

Service Connection Fees

The Contractor shall make the necessary arrangements with the serving utility (Snohomish County Public Utility District No. 1, Customer Engineer, 2320 California Ave, Everett, WA) to complete the service connection(s), and shall coordinate with the serving utility on exact locations. The serving utility will make the final connection between the electrical service and the power source by extending the conduit and using the conductors provided under this Contract as shown on the Plans.

1 A copy of the "Application For Utility Service" and a copy of the pay voucher for
2 each intersection will be provided to the Contractor.
3
4 **Telephone/DSL Service**
5 The Contractor shall provide and install the conduit and conductors as shown on
6 the Plans, and including all necessary conduit fittings, risers, standoffs,
7 weatherheads and other materials to reach the telephone connection location as
8 shown on the Plans or designated by the Engineer. Prior to pouring foundations
9 and installing conduit the Contractor shall verify the connection locations with the
10 utility.
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12 The Contractor shall contact Snohomish County Traffic Management Coordinator
13 Darin Speed at 425-262-2698, when the Contractor is ready for the telephone
14 service to be activated. The Contracting Agency will arrange for the utility to
15 activate the telephone service. The utility will provide the necessary equipment and
16 make the final connections at the connection location.
17
18 8-20.3(11).GR8
19 **Testing**
20
21 8-20.3(11).DT8
22 (September 5, 2013)
23
24 Section 8-20.3(11), second sentence of the fourth paragraph, which begins "The
25 Contractor shall provide the Engineer a minimum of 5 days ..." is deleted and
26 replaced with the following:
27
28 A Pre-Turn On Coordination Meeting attended by the Engineer and the
29 Contractor is required a minimum of fourteen (14) calendar days prior to turn
30 on. The turn on schedule and date shall be arranged and confirmed at the
31 meeting. All functional tests and other tests required by the Contract
32 Specifications shall be completed to the satisfaction of the Engineer 48 hours
33 prior to the turn on date.
34
35 Sections 8-20.3(11), fourth paragraph, replace all references to "Contracting
36 Agency electronics technician" with "Operating Agency signal technician".
37
38 The following is added to the end of Section 8-20.3(11):
39
40 On the same day, and following successful turn on, the Contractor shall adjust
41 all optically-programmed signal heads and all louvered signal heads, as
42 designated by the Engineer. Additionally, the Contractor shall remove all
43 conflicting signs and signal equipment not specified to remain, as directed by
44 the Engineer.
45
46 8-20.3(14).GR8
47 **Signal Systems**
48
49 8-20.3(14)B.GR8
50 **Signal Heads**
51

1 8-20.3(14)B.DT8
2 (May 27, 2010)
3 Section 8-20.3(14)B, the first paragraph is supplemented with the following:
4

5 Signal head shall be covered before the signal turn-on. If there are yellow
6 tapes on the back plates, the whole assembly shall be covered completely.
7

8 8-20.3(14)C.GR8
9 **Induction Loop Vehicle Detectors**

10
11 8-20.3(14)C.DT8
12 (April 17, 2009)
13 Section 8-20.3(14)C is supplemented with the following:
14

15 Item 4 is supplemented as follows:
16

17 The loop locations shall be marked on the pavement by the Contractor and
18 approved by the Engineer prior to sawcutting. At no point shall any of the
19 sawcuts pass closer than 12 inches to any utility cover.
20

21 Item 6 is supplemented as follows:
22

23 Loop installation shall not take place in temperatures below 40°F.
24

25 Item 7 is supplemented as follows:
26

27 The sawcuts shall be of uniform depth and any sharp edges, abrasions, or
28 ridges shall be removed prior to placing the wire.
29

30 **Sawcut Cleaning**

31 The high pressure washer shall operate at 1000 psi minimum pressure as
32 certified by the manufacturer's label on the machine or as measured by an in
33 line pressure gauge.
34

35 All requirements of Section 1-07.15, "Temporary Water Pollution/Erosion
36 Control" shall be observed as specified in the Contract and in the Plans when
37 the sawcut cleaning is performed.
38

39 Item 11 is supplemented as follows:
40

41 Loop detector sealant shall conform to one of the following specifications,
42 chosen based on Case A or Case B application:
43

44 **Case A**

45 Induction Loop Detectors installed and sealed into the finish lift of
46 asphalt shall conform to these criteria:
47

TEST PARAMETER	SPECIFICATION LIMITS
Safe Heating Temperature	410°F
Pour Temperature	380°F
Penetration, 77°F, 6 oz, 5 sec.	10-25 dmm

Penetration, 126°F, 2 oz, 5 sec.	50 dmm max.
Softening Point °F	410°F min
Ductility, 125°F, in.	6°F min.
Mandrel Bend, 0°F, 90 degrees, 10 sec., 1/2 " diameter	Pass 2 of 3

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Case B

Induction Loop Detectors installed and sealed into the pavement surface prior to finish lift of asphalt (or into a paving course which is to be resurfaced within one year) shall conform to this criteria:

TEST PARAMETER	SPECIFICATION LIMITS
Safe Heating Temperature	421°F
Pour Temperature	390°F max.
Penetration, 77°F, 6 oz, 5 sec.	65 dmm
Flow at 140°F (D3407)	0
Softening Point °F	210°F min.
Resilience (D3407)	50%
Penetration at 140°F	130%

7
8
9

Case B shall be used unless otherwise specified in the Plans.

10
11
12

The loop sealant shall be applied in accordance with the manufacturer's recommendations.

13
14
15

Except as noted in the following pre-approved list of this Section, samples of each item shall be submitted to the Engineer for approval.

16
17
18

Pre-approved list:

- Crafcoc Loop Detector Sealant #34271
- 3M Detector Loop Sealant 5000
- DEERY Loop Sealant LW

19
20
21

Item 12 is supplemented as follows:

22
23
24

If the area around the conduit stub-out is greater than 2 inches in width, hot mix asphalt concrete shall be installed.

25
26
27

8-20.3(14)E.GR8

Signal Standards

28
29
30

8-20.3(14)E.dt8

(June 1, 2018)

Section 8-20.3(14)E is supplemented with the following:

31
32
33

Signal standards shall be round tapered, not polygonal tapered.

34
35
36
37

For each breakaway base provided, include one complete set of spare breakaway bolts.

1 8-20.Dt8
 2 **Temporary Signal and Illumination System**
 3 (July 5, 2012)
 4 Section 8-20 is supplemented with the following:

5
 6 **Description**

7 This work shall consist of supplying, installing, maintaining, and removing temporary
 8 signal system(s) at the intersections of *****\$\$\$1\$\$\$*****, and adjusting signal equipment as
 9 detailed in the Plans and these Special Provisions.

10
 11 **Materials**

12 Materials shall conform to the applicable portions of Section 8-20.2 of the Standard
 13 Specifications and Special Provisions, except as modified herein.

14
 15 Contracting Agency Supplied Items:

16 The Contracting Agency will supply the following items each temporary signal and
 17 illumination system.
 18

Model 336 Controller Cabinet (pole-mounted & fully wired)	***\$1\$\$\$***
Type 170E Signal Controller	***\$2\$\$\$***
Model 210E Conflict Monitor	***\$3\$\$\$***
Model 400 or 2400 Modem	***\$4\$\$\$***
Model 200 Load switches	***\$5\$\$\$***
Video Detection Board: TRAFICON VIP 3.1D or 3.2D	***\$6\$\$\$***
Rainbow Camera and Lens complete in Housing	***\$7\$\$\$***
Model 222 Vehicle Detector Amplifiers	***\$8\$\$\$***
Model 242 or Model 244 Pedestrian Detector Isolators	***\$9\$\$\$***
Model 752 Pre-Emption Discriminators	***\$10\$\$\$***
Model 721 Pre-Emption Detectors	***\$11\$\$\$***
Model 204 Flashers	***\$12\$\$\$***
Controller Cabinet Print	***\$13\$\$\$***
Pole Mounting Hardware Kit	***\$14\$\$\$***

19
 20 Contracting Agency supplied materials shall be scheduled for pickup through the Traffic
 21 Operations Supervisor during normal working hours between 7:00 a.m. and 2:30 p.m., at
 22 the following address:

23
 24 Snohomish County Public Works Cathcart Maintenance Center (PWCMC)
 25 8915 Cathcart Way
 26 Snohomish, WA 98296
 27

28 The Contractor shall give five (5) calendar days advance notice to the Engineer and
 29 Traffic Operations Supervisor to request release of the supplied materials. The
 30 Contractor may request release of the agency supplied materials only after any required
 31 electrical service has been installed, inspected, and approved.
 32

33 After successful turn-on of each permanent traffic signal display and detection system,
 34 the Contractor shall place the Contracting Agency supplied items on a pallet and contact
 35 the Snohomish County Public Works Maintenance Facility within five (5) calendar days to
 36 arrange for delivery.
 37

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Equipment List and Drawings

If there is no temporary signal system design in the Plans, the Contractor shall submit to the Engineer within twenty (20) calendar days following execution of the Contract the design drawings and computations for each temporary signal system. The design drawings and computations shall be prepared, stamped, and signed by the Contractor's Engineer. The Contractor's Engineer shall be a Professional Engineer licensed in the State of Washington. The Contractor's Engineer shall use the field soils logs or geotechnical engineering report for foundation design. The design shall be in accordance with Standard Plan J-15.15-00. The Contractor's submittal and the Engineer's review of the temporary signal and illumination system design shall be in accordance with the Special Provision, "Illumination, Traffic Signal Systems, and Electrical", subsection, "Equipment List and Drawings". The temporary signal system(s) shall provide phasing for both vehicle and pedestrian movements at the intersection. The Contractor's temporary signal design will be subject to approval or disapproval by the Engineer and shall include:

- Vehicle and Pedestrian Detection
- Wiring for Signal Phasing
- Pole Locations
- Pole and Guy Computations
- Signal Display
- Controller Location
- Power Service Location
- Emergency Pre-empt
- Illumination
- Communication

The Contractor's proposed temporary signal system design shall be compatible with the Contracting Agency's existing traffic operation system.

Construction Requirements

The temporary signal and illumination systems shall be provided, tested, and installed per the Standard Specifications, applicable Standard Plans, and applicable Special Provisions, and shall conform to the applicable codes, and requirements of Section 8-20 and Section 9-29.

No new equipment for permanent signal system shall be used for temporary signal systems.

The Contractor shall supply temporary illumination and communication where existing illumination and communication are removed. The temporary illumination shall comply with Section 9-29.10.

All work shall be coordinated in a manner that does not disrupt the public safety and traffic flow through the project. Existing systems shall be in operation at all times until the temporary systems have been tested and approved for normal operation. Approved temporary systems, as detailed herein, shall be in operation at all times between the shut down of the existing systems and turn-on of the permanent systems. The Contractor shall adjust signal head locations as directed by the Engineer to accommodate changes in lane configuration and traffic flow during construction as part of this item of work.

1 The turn on of the temporary signal and illumination system shall comply with Section 8-
2 20.3(11) of these Special Provisions.

3
4 **Measurement**

5 Section 8-20.4 is supplemented with the following:

6
7 The temporary signal and illumination system shall be measured per lump sum for
8 each signal and illumination system installed, tested, operated, and removed
9 complete per the Plans, and as specified herein.

10
11 **Payment**

12 Section 8-20.5 is supplemented with the following:

13
14 "Temporary Signal and Illumination System", per lump sum.
15 The unit contract price per lump sum for "Temporary Signal and Illumination System"
16 shall be full compensation for all labor, tools, materials, and equipment required to
17 submit, provide, install, operate, reposition, maintain, and remove each system as
18 specified.

19
20 All costs for the associated electrical inspections shall also be included in the lump
21 sum contract price for each "Temporary Signal and Illumination System".

22
23 DIVISION9.GR9

24 **Division 9**
25 **Materials**

26
27 9-29.DT9

28 **ILLUMINATION, SIGNAL, ELECTRICAL**

29
30 9-29.1.DT9

31 **Conduit, Innerduct, and Outerduct**

32
33 9-29.1(2).DT9

34 **Rigid Metal Conduit Fittings and Appurtenances**
35 (November 10, 2011)

36
37 Section 9-29.1(2) is revised as follows:

38
39 Delete "electroplated" from the first sentence.

40
41 Paragraph one is supplemented with the following:

42
43 Galvanizing repair paint requirements for conduit couplings shall also apply to end
44 bushings.

45
46 Add the following after the fifth paragraph:

47
48 **Conduit Coatings**

49 GRS Conduit fittings shall be coated with galvanizing repair paint in the same
50 manner as conduit couplings. Electroplated fittings are not allowed.

51

1 Conduit entering concrete shall be wrapped in 2-inch wide pipe wrap tape with a
2 minimum 1 inch overlap for 12 inches on each side of the concrete face. The tape
3 shall have a synthetic rubber adhesive with a fungus inhibitor.
4

5 **Surface Mounting Conduit Attachment Components**

6 Conduit clamp shall be hot-dip, galvanized steel or stainless steel, and shall be one
7 piece, two bolt units with locking nuts. The clamps shall be attached to the unistrut
8 on both sides of the conduit with bolts and associated hardware. The minimum
9 distance between adjacent clamps and between the clamp and the end of the
10 unistrut shall be 1 inch.
11

12 **Conduit Expansion and/or Deflection Fitting**

13 Expansion fittings, deflection fittings, and expansion/deflection fittings embedded in
14 concrete shall be PVC coated.
15

16 9-29.1(5).DT9

17 (June 21 2018)

18 Section 9-29.1(5) is deleted in its entirety and replaced with the following:
19

20 Innerduct shall be a fabric, multi-celled, textile product. Innerduct shall be installed in
21 continuous lengths without intermediate splices throughout the project, except at the
22 location(s) specified in the Plans, or as approved in writing by the Engineer.
23

24 The Contractor shall comply with the innerduct manufacturer's specifications and
25 recommended procedures to install and terminate the innerduct system.
26

27 Except as noted in the following pre-approved list of this section, samples of
28 innerduct shall be submitted to the Engineer for approval.
29

30 Pre-approved list:

- 31 • MaxCell MXE series Innerduct

32
33 9-29.2.GR9

34 **Junction Boxes, Cable Vaults, and Pull Boxes**

35
36 9-29.2(1).DT9

37 (April 4, 2017)

38 Section 9-29.2(1) is supplemented with the following:
39

40 All junction box lids and frames shall be galvanized. Grounding lugs shall be stainless
41 steel and shall be mechanically and electrically bonded.
42

43 9-29.3.GR9

44 **Fiber Optic Cable, Electrical Conductors, and Cable**

45
46 9-29.3(1).DT9

47 (August 3, 2009)

48
49 Section 9-29.3(1) is supplemented with the following:
50

51 9-29.3(cable).DT9

52 **Communication Cables and Interfaces**

1 (September 5, 2013)
2
3 Quality Assurance
4 All materials described in this section shall meet or exceed the applicable provisions of
5 the following documents:

- 6
- 7 1. CFR Title 7, Section 1755.900, RUS Specification for Filled Fiber Optic Cables
- 8 2. ANSI, C8.47-1983, American National Standard for Polyolefin-insulated
- 9 Thermoplastic Jacketed Communication Cables
- 10 3. TIA/EIA-455-28-C, Method for Measuring Tensile Failure Point of Optical
- 11 Waveguide Fibers
- 12 4. TIA/EIA-455-34-A, Interconnection Device Insertion Loss Test
- 13 5. TIA/EIA-455-95-A, Absolute Optical Power Test for Optical Fibers and Cables
- 14 6. EIA-598-B, Color Standard for Optical Fibers

15
16 **Fiber Optic cable**

17 Section 9-29.3(1) is supplemented with the following:

18
19 The Contractor shall provide manufacturer's certification that the submitted cable shall
20 comply with the Rural Utilities Service (RUS) Specification 1755.900 as currently
21 amended and with the requirements set forth in this Special Provision. Any deviations
22 from these specifications shall be conspicuously noted in the Contractor's submittal.

23
24 Each cable shall contain the total number of optical fibers, as specified in the Plans. For
25 all cables with a strand count greater than 36, the fibers shall be placed in loose buffer
26 tubes in groups of 12. For all other cables, the fibers shall be placed in loose buffer
27 tubes in groups of 6.

28
29 The fiber optic cable outer jacket shall be marked with the manufacturer's name, the year
30 of manufacture, the words OPTICAL CABLE, and sequential meter marks. The
31 markings shall be repeated every one meter. The actual length of the cable shall be
32 within +/- 0.1% of the length marking. The marking shall be in contrasting color to the
33 jacket. The marking shall be 2.5mm in height and shall be permanent and weatherproof.

34
35
36 Cable shall be of loose tube design. The tubes shall be surrounded 1 by dry moisture
37 blocking filling compound or tape. The tubes may be filled with dry moisture blocking
38 powder surrounding the fibers.

39
40 The cable shall be constructed with the following components:

- 41
- 42 1. A dielectric central strength member
- 43 2. Buffer tubes containing optical fibers
- 44 3. Aramid (Kevlar) yarn
- 45 4. Outer MDPE jacket

46
47 The Contractor shall provide all materials required for the installation and splicing of the
48 specified communications cables, power cables, and associated interface devices.

49
50 The Contractor shall provide an unconditional warranty on all installed cable for a period
51 of one (1) year.

52

1 At the request of the Engineer, the Contractor shall submit a 3-foot sample cable section
2 to the Engineer for approval for each type of cable to be provided.

3

4 **Fiber Optic Cable Testing**

5 The installed optical fiber cable shall be tested for compliance with the transmission
6 requirements of this specification, the cable and hardware manufacturer's specifications,
7 and prescribed industry standards and practices.

8

9 Prior to commencing acceptance testing, the Contractor shall complete the installation of
10 the fiber optic system. This includes sealing the splice closures, completing the splicing
11 and dressing in the distribution panels, and racking the cables in the pull boxes and
12 cable vaults.

13

14 All testing values shall be in metric.

15

16 **Types of Testing**

17 The types of acceptance testing for optical fiber cable system certification are:

18

19 Power Meter testing

20

21 Optical Time Domain Reflectometer (OTDR) testing

22

23 **Power Meter Testing**

24 Power meter testing shall be used to measure the end-to-end attenuation of each
25 new fiber installed between a field device and a communications hub as well as
26 between communications hubs. Power meter testing shall be performed at the 1310
27 and 1550 nanometer wavelength in both directions.

28

29 Prior to commencing testing, the Contractor shall submit the manufacturer and model
30 number of the test equipment along with certification that the power meter has been
31 calibrated within 12 months of the proposed test dates.

32

33 The following information shall be documented for each fiber test measurement:

34

35 1. Fiber/Strand #

36

37 2. Fiber type (Singlemode 1 or Multimode)

38

39 3. Cable, tube, and fiber IDs

40

41 4. Near end and far end test locations

42

43 • Use device names in Contract plans

44

45 5. End-to-end attenuation

46

47 • In each direction and the bidirectional average

48

49 6. Length of span being tested

50

51 7. Date, time, and operator

52

53 8. Wavelength

54

55 **Optical Time Domain Reflectometer (OTDR) Testing**

56 An optical time domain reflectometer (OTDR) with recording capability shall be
57 utilized to test the end-to-end transmission quality of each optical fiber. Quality tests
58 shall consider attenuation, reflectance, and discontinuities. The OTDR shall be
59 equipped with 1310 nanometer and 1550 nanometer light sources for singlemode
60 optical fibers. The OTDR shall be capable of providing electronic and hard copy
61 records of each test measurement.

62

1 The Contractor shall utilize a dead-zone box (a.k.a. launch reel) containing 1 km of
2 optical fiber, when performing OTDR tests. The dead-zone box shall be located
3 between the OTDR and the fiber optic connector of each strand tested.
4

5 Each new fiber shall be tested in both directions at the 1310 and 1550 nanometer
6 wavelengths. Existing fibers that are spliced to or re-spliced as part of this Contract
7 shall also be tested in both directions and at both wavelengths.
8

9 The following information shall be documented for each fiber test measurement:
10

- 11 1. Fiber/Strand #
- 12 2. Fiber type (Singlemode or Multimode)
- 13 3. Cable and fiber IDs
- 14 4. X-Y plot scaled for fiber length
 - 15 • The X-axis (Distance) shall be scaled such that the beginning of the trace
 - 16 starts with the OTDR/dead-zone interface. The end of the trace shall
 - 17 extend no more than 1 km beyond the end of the test span.
 - 18 • The Y-axis (dB) shall be set to maximize the trace. The bottom of the Y
 - 19 scale shall begin above the noise floor and the top of the scale shall be no
 - 20 more than 5 dB higher than the largest event. No events or reflections
 - 21 shall be cut off.
- 22 5. Near end and far end test locations
 - 23 • Use device names in Contract plans
- 24 6. Date, time, and operator
- 25 7. Wavelength
- 26 8. OTDR Settings
 - 27 • Index of Refraction
 - 28 • Averaging time (Minimum of 30 seconds)
 - 29 • Pulse Width (to provide a smooth trace, excluding events)
- 30 9. Table of Events that includes: Event ID, Type, Location, Loss, and Reflection.
31 • Events are defined as:
 - 32 1. Any reflectance event in excess of -60 dB
 - 33 2. Any loss occurrence in excess of 0.05 dB
 - 34 3. Any splice location regardless of loss
 - 35 4. Beginning 1 and end of span
 - 36 • The beginning of the span shall be denoted by the “A-Marker”.
 - 37 This marker shall be placed just to the left of the spike of the
 - 38 dead-zone box/fiber interface.
 - 39 • The end of the span shall be denoted by the “B-Marker”. This
 - 40 marker shall be placed just to the left of the end-of span
 - 41 reflection spike.

42

43 **Fiber Optic Performance Requirements**

- 44 1. Splice Loss:
 - 45 • Shall not exceed 0.20 dB in one direction
 - 46 • Bidirectional Average shall not exceed 0.15 dB
- 47 2. Reflectance:
 - 48 • Shall not exceed -55 dB

49

50 **Fiber Cable Testing Documentation**

51 The Contractor shall submit one hard copy and one electronic copy of the fiber test
52 results to the Engineer for approval. Only one OTDR test result shall be on each

1 page. The Contractor shall take corrective actions on portions of the fiber installation
2 determined to be out of compliance with these specifications.
3
4 Upon acceptance of the cable installation and test results, the Contractor shall submit
5 three hard copies and three electronic copies of the fiber test results to the Engineer.
6
7 Hard copy submittals shall be bound in 3-ring binders. The electronic submittals shall
8 be on compact discs and include one licensed copy of the applicable OTDR reader
9 program.

10
11 The following information shall be included in each test result submittal:

- 12
13 1. Contract number, contract name, contractor name, and address
14 2. Dates of cable manufacture, installation, and testing
15 3. Cable specifications
16 • Manufacturer data sheet
17 • Helix Factor
18 • Date of manufacture
19 4. Fiber (Glass) specifications
20 • Manufacturer and Part #
21 • Index of Refraction
22 • Optical performance (loss/km)
23 • Mode Field Diameter
24 5. As-Built Records (In accordance with the Special Provisions)
25 6. OTDR test results – No more than one test per page
26 7. Power Meter test results

27
28 Within 30 days of submitting the test results, the Contractor, in the presence of the
29 Engineer, shall re-test a minimum of 5% of the previously tested locations to validate
30 the test results. A 5% sample will be selected randomly from the terminal device
31 locations.

32
33 **Singlemode Fiber Optic Cable**

34 Section 9-29.3(1)A is supplemented with the following:

35 Optical fiber shall meet the requirements of ITU G652 and specifically 2 meet ITU
36 42 G652.D3 attributes. The fibers shall support the transmission of wavelengths for
37 43 Coarse Wavelength Multiplexing (CWDM) as defined in ITU G694.2

38
39 9-29.3(2).OPT1.DT9

40 **Electrical Conductors and Cable**

41 (October 3, 2018)

42
43 Section 9-29.3(2) is supplemented with the following:

44
45 Dual-Element six-conductor shall be a composite of two elements. The first element
46 shall have five 18 AWG stranded copper conductors and each shall have polyethylene
47 insulation, color coded White, Red, Blue, Black, and Brown. Insulation thickness shall be
48 a minimum of 16 mils. The second element shall have one 20 AWG solid copper
49 conductor and shall have foam polyethylene insulation with a minimum thickness of 56
50 mils. This shall be surrounded by a 95% bare copper braid with an outer polyethylene
51 insulation jacket with a minimum thickness of 35 mils.
52

1 Both elements shall be enclosed in an outer black PVC jacket having a minimum
2 thickness of 30 mils with ratings of 600V and 165°F. Both ratings shall be permanently
3 ink imprinted on the outer jacket. The total diameter of the entire assembly shall be 0.50"
4 ± 0.025".

5
6 Electrical conductors and cable shall be Isotec part X341667-001.

7
8 9-29.3(2).OPT2.DT9
9 **Three Conductor Shielded Cable**
10 (October 24, 2018)

11
12 Section 9-29.3(2)H is deleted in its entirety and replaced with the following:

13
14 Three conductor shielded cable (3CSh) for the detector circuit for optical fire preemption
15 receivers shall be Model 138 Opticom cable,

16
17 9-29.3(2)I.DT9
18 **Electrical Conductors and Cable**
19 (June 29, 2010)

20 Section 9-29.3(2)I is supplemented with the following:

21
22 **Twisted-Pair (TWP) Copper Cable Testing**

23 The Contractor shall perform a Field Acceptance Test on the installed cable. Each pair
24 shall be tested for frequency attenuation between the communication hub and each ITS
25 device. The Contracting Agency will provide a witness during the tests and the test
26 results shall be documented as prescribed elsewhere in this specification.

27
28 Any pairs showing attenuation greater than 2 dB per mile at 1 kHz shall be cause for
29 rejection of the cable. The Contractor shall replace any cable failing this test at no
30 additional expense to the Contracting Agency. The Contractor shall provide all test
31 equipment necessary to perform the tests.

32
33 All pairs of each underground cable shall be tested for continuity, polarity, shorts,
34 grounds, longitudinal balance, and both resistive and impedance losses consistent with
35 the manufacturer's specifications and standard telecommunication industry
36 requirements.

37
38 Each TWP copper cable intended primarily for data communication applications shall be
39 tested end-to-end from the controlled environment vault cable termination point to the
40 interface at the traffic control device. The transmission test procedure shall include the
41 continuity testing of each pair within each TWP cable from the outlet in the termination
42 panel in the vault to the termination outlet at each device location.

43
44 The Contractor shall ensure that all individual wires in all TWP cables have been
45 terminated consistent with the wire insulation color to termination pin requirements set
46 forth in this Special Provision.

47
48 The Contractor shall document the transmission quality test results for 50% of the pairs
49 in each cable of the installed TWP cable and provide documentation for each cable that
50 the cable meets or exceeds the manufacturer's published specifications and otherwise
51 complies with the requirements set forth in this specification for characteristic impedance,
52 longitudinal balance, resistive and impedance losses, and near-end crosstalk.

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The Contractor shall provide the Engineer with the manufacturer and model number of the test equipment and the equipment calibration procedures to be used prior to conducting all tests.

The Contractor shall test each underground cable end-to-end from the controlled-environment vault-termination block to the terminal block at each cable pedestal or other outside plant terminal equipment. The Contractor shall provide actual test readings for each of the following items to verify the required transmission criteria:

DC Resistance - The resistance of any conductor in any cable shall not exceed 20 ohms per 1000 feet.

DC Resistance Unbalance - The resistance unbalance between the two conductors of any pair shall not exceed 5%.

Ambient Noise Measurements - The Contractor shall measure the ambient noise level in dBm0 to determine the level of noise on each cable being tested. The distant end of the pair being tested should be terminated with a 600-ohm resistor. At the near end, an HP-3551 or equivalent transmission measuring set should be configured for conducting a noise reading test. Cable pairs being sampled shall provide an ambient noise figure of 30 Dbm0 (-60 dBm) or better. The Contractor shall record all readings.

Shield Continuity - Test and measurements shall be made to assure that all underground cable shields are continuous from end-to-end. Each shield shall show a resistance of not more than .75 ohms per 1000 feet.

Within 30 days of submitting the test results, the Contractor, in the presence of the Engineer, shall re-test a minimum of 5% of the previously tested locations to validate the test results. A 5% sample will be selected randomly from the terminal device locations.

9-29.10.dt9

(June 1, 2018)

LED Luminaires

Section 9-29.10 is supplemented with the following:

Solid state lighting LED fixture shall meet the following requirements.

Luminaire Requirements	
Correlated Color Temperature (CCT)	Nominal CCT (K) 4000K +/- 300
Color Rendering Index (CRI)	Luminaires shall have a minimum CRI of 70
Off-state Power Consumption	The power draw of the luminaire (including PE or remote control devices) shall not exceed 0.50 watts when in the off state.
On-state Power Consumption	Shall not consume more than (not including optional monitoring/control device): - 130 W for Equivalent Replacement of 250 W HPS.
Warranty	The fixture and all of its components shall carry a minimum non-prorated 10 year warranty from date of installation. Any fixture that fails during the warranty period,

	regardless of which component may have failed, will be returned to the factory for exchange. The replacements unit will carry its own new 10 year warranty from date of installation.
Weight	Luminaire shall not weigh more than 30 pounds
Operating Environment	Luminaire shall be able to operate normally in temperatures from -20 C to 50 C.
Cooling System	Shall consist of a heat sink with no fans, pumps, or liquids, and shall be resistant to debris buildup that does not degrade heat dissipation performance.
Dimensions (Approx.)	30" long x 16" wide x 7" tall
Housing	Driver must be mounted internally and be replaceable. Driver must be accessible without tools. All screws shall be stainless steel. Captive screws are needed on any components that require maintenance after installation. No parts shall be constructed of polycarbonate unless it is UV stabilized (Lens discoloration shall be considered a failure under warranty.)
IESNA Luminaire Classification	Cutoff or Semi-Cutoff in accordance with absolute photometric tests.
Mounting Arm Connection	Luminaires shall mount on 2.375" O.D. horizontal tenon with no more than four 9/16 inch hex bolts and two piece clamp with vertical tilt adjustments range of +/- 5°.
House Shield	Shall provide option for house side light control

1

LED Module/Array Requirements	
Lumen Depreciation of LED Light Distribution	LED module(s)/array(s) shall deliver at least 70% of initial lumens, when installed for a minimum of 50,000 hours.
Light Distribution	Should be in accordance with IESNA Type II or III Medium Lighting Distribution.

2

Power Supply/Driver Requirements	
Power Factor	Power supply should have a minimum Power Factor of 0.9.
Max Amperage at LED	Two methods are acceptable; the first is for step increments on current to the driver: -525 mA (with option of 350 mA and 700 mA) for Equivalent Replacement of 100 W HPS The second method is driver adjustment for multi current input operation: Standard factory for Equivalent Replacement

	of 100 W HPS setting shall be 21 mA, as delivered from the factory. Adjustment shall not exceed 700 mA.
Transient Protection	Per IEEE C. 62.41-1991, Class A operation. The line transient shall consist of seven strikes of a 100 k HZ ring wave, 6kV level, for both common mode and differential mode.
Operating Temperature	Power Supply shall operate between -20 C and 50 C.
Frequency	Output operating frequency must be \geq 120 Hz (to avoid visible flicker) and input operating frequency of 60 Hz.
Interference	Power supplies shall meet FCC47 CFR Part 15/18 (Consumer Emission Limits).
Noise	Power supply shall have a Class A sound rating per ANSI Standard C63.4.

1

Roadway Application Requirements	
Minimum Light Output	For Equivalent Replacement of 100W HPS, Luminaire shall deliver a minimum of 3700 lumens (initial)
Luminaire Efficacy	Luminaire Light Output (includes fixture efficiency and thermal effects)/ Luminaire Input Power
Minimum Luminaire Efficacy	50 lm/W
Measurement/Performance/Safety Standards	
ANSI C78.377.2008	Specifications for the Chromaticity of Solid State Lighting Products
IESNA LM-79-08	IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products
IESNA LM-80-08 (Recommended)	IESNA Approved Method for Measuring Lumen Maintenance of LED Lighting Sources.
UL Standards (Latest Approved)	<ul style="list-style-type: none"> - 8750 Light-Emitting Diode (LED) Light Sources for Use in Lighting Products - 1598 Luminaires - 1012 Power Units Other Than Class 2 - 1310 Class 2 Power Units - 2108 Low Voltage Lighting Systems

2

3 The manufacturer shall install a permanently attached decal on the bottom outside of each
4 luminaire door. The manufacture shall install a fixture type, from the size column shown in
5 the table below. The decal shall follow the NEMA label standard.

6 Except as noted in the following pre-approved list of this section, samples of each item shall
7 be submitted to the Engineer for approval.

8 Pre-approved list:

9

1

SIZE AND TYPE	CODE	MANUFACTURER	MFR PART NUMBER	LUMENS
100W Type II MED	G	ACUITY	ATBM-C-MVOLT-R2-P7	9,000
100W Type II MED		ACUITY	ATBM-D-MVOLT-R2-P7	9,000
100W Type III MED	H	ACUITY	ATBM-C-MVOLT-R3-P7	9,000
140W Type II MED	K	ACUITY	ATBM-E-MVOLT-R2-P7	13,400
140W Type II MED	K	ACUITY	ATBM-F-MVOLT-R2-P7	13,400
160W Type II MED		ACUITY	ATBM-H-MVOLT-R3-P7	13,400
160W Type II MED	P	ACUITY	ATB2-80BLRFR10-MVOLT-R3-P7	25,050
50W TYPE IV MED	C	CREE	BXSP B HT 4ME A 40K US UL SVR(7PIN) SPX	4,979
100W Type II MED	G	CREE	BXSP B HT 2ME B 40K UL SVR(7PIN) SPX	9,612
100W Type III MED	H	CREE	BXSP B HT 3ME B 40K US UL SVR(7PIN) SPX	9,612
140W Type III MED	K	CREE	BXSP C HT 2ME F 40K US UL SVR(7PIN) SPX	13,732
140W Type II MED	L	CREE	BXSP C HT 3ME B 40K UL SVR(7PIN) SPX	11,011
50W TYPE II MED	A	EOI	ESU-FA-012 M08 B30N-575KIU1- 1512N	
50W TYPE II MED	A	LEOTEK	GCM-20H-MV-WW-2-GY-580-PCR7	4,470
50W TYPE IV MED	C	LEOTEK	EC1-6M-MV-NW-4-GY-700-PCR7	5,000
100W TYPE II MED	G	LEOTEK	CGL-40F-MV-NW-2-GY-700-PCR7- WL	9,300
140W TYPE II MED	K	LEOTEK	EC4-14M-MV-NW-2-GY-700-PCR7	11,700
140W TYPE II MED	L	LEOTEK	EC4-14M-MV-NW-3-GY-700-PCR7	11,700
275W TYPE II MED	P	LEOTEK	GC2-80F-MV-NW-3-GY-1A-PCR7	24,500

2

3

4 9-29.12.GR9

5 **Electrical Splice Materials**

6

7 9-29.12(2).DT9

8 **Traffic Signal Splice Material**

9

10 (January 10, 2012)

11 Section 9-29.12(2) is deleted in its entirety and replaced with the following:

12

13 Induction loop splices shall be moisture blocking two-way (in line) heat shrink, meeting
14 Mil Spec I-23053.

15

16 9-29.13.GR9

17 **Control Cabinet Assemblies**

18

19 9-29.13(2)A.DT9

20 **Traffic Signal Controller Assembly Testing**

21 (June 1, 2018)

22 Section 9-29.13(2)A is supplemented with the following:

23

1 All signal control equipment furnished under this contract shall be tested at Cathcart
2 Way Operations Center (CWOC), 8915 Cathcart Way, Snohomish, WA 98296.
3 Snohomish County reserves the right to utilize other testing facilities such as (1)
4 Washington State DOT Materials Laboratory at Tumwater, WA; (2) Oregon State
5 Department of Transportation Materials Laboratory in Salem, Oregon; or, (3) SML in
6 California. The tests shall check the operation of each individual component as well
7 as the overall operation of the system. The Contractor will include the shipping
8 costs of all equipment to the testing facility and any cost for return of failed
9 equipment not meeting Snohomish County Standards.

10
11 The Contractor shall give fourteen (14) calendar days written notice to the Engineer
12 prior to delivering the signal control equipment to the CWOC. The equipment shall
13 be delivered far enough in advance of actual need to allow for testing by the
14 Contracting Agency or other agencies. This may involve retesting because of
15 failures or rejections. The County may require thirty-five (35) calendar days for
16 testing the signal control equipment. This time will increase if the equipment does
17 not meet the contract requirements or is incomplete.

18
19 If more than thirty-five (35) calendar days are required for any individual testing or
20 retesting by the Contracting Agency, an extension of time will be considered in
21 accordance with Section 1-08.8.

22
23 Tests in environment chamber will only be run as needed for type changes.

24
25 Upon successful completion of testing by Snohomish County Public Works, the
26 signal controller equipment shall be available for pickup at the CWOC located at
27 8915 Cathcart Way, Snohomish, WA 98296. A certificate verifying environmental
28 testing, if required, shall be supplied in the cabinet to Snohomish County for each
29 respective control cabinet.

30
31 The Contractor shall notify the Contracting Agency in writing a minimum of fourteen
32 (14) calendar days before the Contractor is ready to pick up the signal controller
33 cabinet. The Contractor shall not pick up the controller cabinet from the Contracting
34 Agency until the electrical service is energized and all site preparation required to
35 install the controller cabinet is complete.

36
37 **Documentation**

38 A complete documentation set shall be furnished with the control equipment prior to
39 the start of testing. It shall include the following:

- 40
41 1. Serial numbers when applicable.
42
43 2. Written certification that equipment of the same make and model has been
44 tested according to NEMA Environmental Standards and Test Procedures,
45 and has met or exceeded these standards. The certificate shall include
46 equipment model number and where, when, and by whom the tests were
47 conducted. This certificate shall accompany each shipment of controllers.
48
49 3. The Contractor shall provide wiring diagrams, including a duplicate set on
50 standard CD or DVD containing the diagrams for all controllers in AUTOCAD
51 Release 2006 or later and two blue-tone prints for each controller and
52 cabinet supplied. The sheet size shall be 22 inches by 34 inches

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- 4. Wiring diagrams for all auxiliary equipment furnished. One set per cabinet.
- 5. Complete operations and maintenance manuals including complete and correct software listing and flow charts, five sets of operations and maintenance manuals per cabinet, and five sets of software listings and flow charts.
- 6. Complete operations and maintenance manuals for all auxiliary equipment. One set per cabinet.

The operational and maintenance manuals for each traffic signal controller supplied including as a minimum, but not to be limited to the following:

- a. Detailed instructions for maintaining all hardware components, controller, and auxiliary equipment.
- b. A complete parts list detailing all manufacturer's identification codes.
- c. Detailed wiring diagrams and schematics indicating voltage levels and pictorial description, part name, and location for all hardware components, controller, and auxiliary equipment.

All failed or rejected equipment shall be removed from the CWOC within seven (7) calendar days following notification; otherwise, the failed or rejected equipment will be returned, freight collect, to the Contractor.

9-29.13(3).DT9
Traffic-Signal Controller
(May 1, 2019)

Section 9-29.13(3), Item E is supplemented with the following:

The Unit Chassis that are needed for the 2070E are:

- Model 2070-1C – Linux CPU module
- Model 2070-2E – Field I/O for 170 cabinet
- Model 2070-3B – Front panel, display B (8 lines of 40 Char.)
- Model 2070-4A – Power supply, 10 amp

9-29.13(4).DT9
(May 1, 2019)
Traffic-Signal Controller Software

Section 9-29.13(4) is supplemented with the following:

All 2070E controllers shall operate with the current version of Intelight Maxtime controller software.

9-29.13(6).DT9
Emergency Preemption
(September 5, 2013)

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Section 9-29.13(6) is supplemented with the following:

Preemption detectors shall be mounted perpendicular to the approach grade of the roadway; within three percent. Two weep holes shall be drilled in the bottom of each detector before it is installed.

Preemption equipment shall be Opticom.

Opticom

The Contractor shall furnish and install the following:

- 1. Preemption detectors shall be Global Traffic Technologies (GTT) Opticom Model 721.
- 2. Discriminators shall be GTT four channel Model 764 units.
- 2. 9-29.13(6).DT9

9-29.13(7).DT9

Wiring Diagrams

(September 5, 2013)

Section 9-29.13(7) is supplemented with the following:

A standard CD or DVD is required. The drawing shall be in AutoCAD Release 2006 30 or later. Cabinet wiring diagram prints shall not be water soluble.

9-29.13(10)B.DT9

(May 1, 2019)

Auxiliary Equipment for Type 170E, 2070 Assemblies

Section 9-29.13(10)B, Item D is supplemented with the following:

A TB15 twelve position terminal block of the barrier type rated for 20A at 600 volts RMS minimum and meeting the requirements of Chapter 11 of the Type 170 Hardware Specification, FHWA IP-78-16 as currently amended shall be supplied and mounted on the lower center rear left side wall of the controller side of the cabinet, with an auxiliary pre-emption wiring harness. Wire TB-15 to accept eight auxiliary pre-emption detectors and two inputs from the BPS, and label as shown in the Plans.

Section 9-29.13(10)B, Item G is deleted in its entirety and replaced with the following:

- G. An enclosed detection panel shall be mounted on the inside of the front cabinet door near the top of the door. The detection panel shall have detector switches and LEDs, or high intensity lamps for each field detector input circuit. The lamp shall energize upon vehicle or pedestrian detection, or switch actuation for that circuit. The test switch shall be a three-position switch and be provided with a spring loaded momentary "TEST" position that will place a call on that circuit to the controller, an 'OFF' position that will shut off detection, and an 'ON' position that allows the detector circuit to operate normally. All switches shall have a label adjacent to the switch on which detector circuit or loop number information may be written. A means of disconnecting all wiring entering the panel shall be provided. The disconnect shall include a means to jumper detection calls when the panel is disconnected.

1 Section 9-29.13(10)B is supplemented with the following:
2
3 All auxiliary equipment slots shall use nylon guides.
4
5 The alternate (panduct) raceway shall not be allowed.
6
7 The DB-9 socket shall not be installed on the print holder drawer. The cable shall be 6
8 feet long and the DB-9 socket shall be in a protective casing.
9
10 Supplemental loads shall be placed only on the green and yellow outputs of load
11 switches 1, 3, 5, and 7.
12
13 ***\$\$1\$\$*** mini breakers, one feeder bus, one line lug, and two end caps shall all be
14 mounted on DIN rail and installed in the upper right side of the cabinet with sufficient
15 clearance to allow field wiring to each breaker. Power shall be provided from the TB 1
16 power terminal position 6.
17
18 The sixteen channel 2010ECL RMS conflict monitor shall be capable of logging current
19 and past monitor configurations and the voltage on each output channel at the time of
20 a 'FAILED' state. When the monitor detects a conflicting indication or other condition
21 that causes a monitor 'FAILED' state to occur, the cabinet shall immediately enter flash
22 and stop time. After the conflict monitor has been reset the controller shall immediately
23 take control of the signal displays and resume timing at the beginning of arterial green.
24
25 One PDA-2 power supply shall be provided with one transfer relay and two Model 204
26 flashers installed.
27
28 One Model 420 Auxiliary Output File shall be installed and wired in each 332 controller
29 cabinet. The Auxiliary Output File shall comply with CalTrans TSCES, 1989 edition,
30 and it amendments. The rear terminals shall be permanently labeled as shown on the
31 Plans.
32
33 A neutral bus having at least 20 connection points shall be provided. Two separate
34 buses may be provided if the total number of termination points is greater than 20.
35
36 Two 12 position barrier type terminal blocks shall be installed in the upper rear right
37 side of the cabinet, and shall be labeled "TB-CAM" and "TB-VD".
38
39 One power strip shall be installed and wired with 12 widely spaced outlets (6 front/6
40 rear) and 15A circuit breaker in Double 332 controller cabinet. The power strip shall be
41 designed for standard 19 inch racks (1U high).
42
43 The cabinet auxiliary equipment shall be supplied in the quantities and model numbers
44 shown, and shall be delivered with the cabinet for testing:
45

	<u>Model</u>	<u>Quantity Provided</u>
1	Model 200 Load Switch	***\$\$2\$\$***
2	Model 222E 2-Ch. Detectors *	***\$\$3\$\$***
3	Model 224E 4-Ch. Detectors	***\$\$4\$\$***
4	Model 430 Flash Transfer Relay	***\$\$5\$\$***
5	Model 764 4-Ch. Opticom Discriminators	***\$\$6\$\$***
6	Model 242 DC Isolator	***\$\$7\$\$***

7	Model 252 AC Isolator	***\$\$8\$\$***
8	Model 2070E controller	***\$\$9\$\$***
9	Model 2070 Master controller	***\$10\$***
10	2010 ECL RMS Conflict Monitor	***\$11\$***
11	Fiber Optic Distribution Panel	***\$12\$***
12	Fiber Optic Splice Tray	***\$13\$***
13	Managed Field Switch	***\$14\$***
14	EDI Monitorkey Programmer	***\$15\$***

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All Model 200 load switches shall be optically isolated.

* All Model 222E 2-Ch. Detectors shall conform to the requirements for "Vehicle Detectors" located elsewhere in these Special Provisions.

Except as noted in the following pre-approved list of this section, samples of each item shall be submitted to the Engineer for approval.

Where the Plans require a wireless interconnect modem it shall be Intuicom BBS-5824

Pre-Approved List

RuggedCom RS900G Managed Field Switch

- RS900G-HI-D-2SFP: 10-port unit with 85-264 VAC power, DIN rail mount, Eight (8) 10/100 TX ports and Two (2) 1000X SFP/GBIC pluggable optics ports
- 25-10-0100: Two (2) 1000LX SFP transceiver
- 43-10-0008: 18 AWG 3 Prong 6 ft power cable

Mini Breakers

- Breaker ABB S201U-K3A
- Breaker SIE5SX2103-7(3A)
- CB feeder bus SIE5ST2142
- Line lug SIE5ST2166
- End cap SIE5ST2155

Power Strip

- Tripp Lite RS1215-RA

Fiber Optic Splicing Kit

- SP12LCUPC: FIS 12 Fiber 900um LC/UPC SM 3 Meter Pigtaills

All 2070E controllers shall have C1 configured per the table below.

Pin	I/O	Function	Pin	I/O	Function
1	*****	Logic Ground	53	I-2:7	Not Assigned
2	O-1:1	4P Don't Walk	54	I-2:8	UPS ON BATT
3	O-1:2	4P Walk	55	I-3:1	5 Ext, Calling Count
4	O-1:3	4 Red	56	I-3:2	1 Ext, Calling Count
5	O-1:4	4 Yellow	57	I-3:3	7 Ext, Calling Count
6	O-1:5	4 Green	58	I-3:4	3 Ext, Calling Count
7	O-1:6	3 Red	59	I-3:5	5 Ext, Calling Count
8	O-1:7	3 Yellow	60	I-3:6	1 Ext, Calling Count

9	O-1:8	3 Green	61	I-3:7	7 Ext, Calling Count
10	O-2:1	2P Don't Walk	62	I-3:8	3 Ext, Calling Count
11	O-2:2	2P Walk	63	I-4:5	2 Ext, Calling Count
12	O-2:3	2 Red	64	I-4:6	6 Ext, Calling Count
13	O-2:4	2 Yellow	65	I-4:7	4 Ext, Calling Count
14	*****	Logic Ground	66	I-4:8	8 Ext, Calling Count
15	O-2:5	2 Green	67	I-5:1	Ped 2 Pushbutton
16	O-2:6	1 Red	68	I-5:2	Ped 6 Pushbutton
17	O-2:7	1 Yellow	69	I-5:3	Ped 4 Pushbutton
18	O-2:8	1 Green	70	I-5:4	Ped 8 Pushbutton
19	O-3:1	8P Don't Walk	71	I-5:5	EV-A Preempt
20	O-3:2	8P Walk	72	I-5:6	EV-B Preempt
21	O-3:3	8 Red	73	I-5:7	EV-C Preempt
22	O-3:4	8 Yellow	74	I-5:8	EV-D Preempt
23	O-3:5	8 Green	75	I-6:1	UPS LOW BATT
24	O-3:6	7 Red	76	I-6:2	2 Ext, Calling, Count
25	O-3:7	7 Yellow	77	I-6:3	6 Ext, Calling, Count
26	O-3:8	7 Green	78	I-6:4	4 Ext, Calling, Count
27	O-4:1	6P Don't Walk	79	I-6:5	8 Ext, Calling, Count
28	O-4:2	6P Walk	80	I-6:6	Not Assigned
29	O-4:3	6 Red	81	I-6:7	Flash Sense
30	O-4:4	6 Yellow	82	I-6:8	Stop Time
31	O-4:5	6 Green	83	O-6:1	Not Assigned
32	O-4:6	5 Red	84	O-6:2	Not Assigned
33	O-4:7	5 Yellow	85	O-6:3	OLD Red
34	O-4:8	5 Green	86	O-6:4	OLD Yellow
35	O-5:1	Not Assigned	87	O-6:5	OLD Green
36	O-5:2	Not Assigned	88	O-6:6	OLC Red
37	O-5:3	Not Assigned	89	O-6:7	OLC Yellow
38	O-5:4	Not Assigned	90	O-6:8	OLC Green
39	I-1:1	2 Ext, Calling, Count	91	O-7:1	Not Assigned
40	I-1:2	6 Ext, Calling, Count	92	*****	Logic Ground
41	I-1:3	4 Ext, Calling, Count	93	O-7:2	Not Assigned
42	I-1:4	8 Ext, Calling, Count	94	O-7:3	OLB Red
43	I-1:5	2 Ext, Calling Count	95	O-7:4	OLB Yellow
44	I-1:6	6 Ext, Calling, Count	96	O-7:5	OLB Green
45	I-1:7	4 Ext, Calling, Count	97	O-7:6	OLA Red
46	I-1:8	8 Ext, Calling, Count	98	O-7:7	OLA Yellow
47	I-2:1	2 Calling	99	O-7:8	OLA Green
48	I-2:2	6 Calling	100	O-5:5	Not Assigned
49	I-2:3	4 Calling	101	O-5:6	Flash Output
50	I-2:4	8 Calling	102	O-5:7	Detector Reset
51	I-2:5	RR 1 Preempt	103	O-5:8	Watch Dog Timer
52	I-2:6	RR 2 Preempt	104	*****	Logic Ground

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Controller C-1 Connector Pin Assignments

9-29.13(10)D.DT9
(September 5, 2013)

1 **Cabinets for Type 170E and 2070 controllers**

2 Section 9-29.13(10)D, paragraph 1 item 6 is deleted and replaced with:

3
4 An incandescent interior cabinet light shall be mounted at the top of the enclosure
5 near the rear door with door switch to automatically energize when the door opens.
6 The light shall be installed a minimum of 12 inches from the vent fan thermostat.
7 The switch shall be labeled "light". 'White' LED 'rope light' cabinet light shall be
8 mounted around the inside of the door frame of each door and wired to the door
9 switch.

10 Section 9-29.13(10)D is supplemented with the following:

11 Controller cabinets shall be Model Double 332.

12 Model 332 cabinet shall be supplied with a Double 332 Cabinet Riser Frame.

13 Model Double 332 cabinet input file wiring shall be modified to accept "View Com"
14 video monitoring board, as shown in the Plans.

15 9-29.14.GR9

16 **Vacant**

17 9-29.14.DT9

18 (January 16, 2019)

19 **Backup Power Source (BPS)**

20 Section 9-29.14 is supplemented with the following:

21 All controls and switches shall be clearly labeled and easily accessible.

22 **Enclosure:**

23 The inverter/controller unit for the BPS system shall be housed in the Double 332 cabinet.
24 Fixed or rollout shelves, or hinged or swing-out trays may be provided for the batteries in the
25 Battery cabinet attached to the Double 332 cabinet. All batteries shall be secured to their
26 respective shelf or tray.

27 **Documentation:**

28 Manufacturer's documentation shall be provided and shall include schematics, spare parts
29 lists, manuals and appropriate system/controller settings. A full schematic of the BPS
30 cabinet wiring shall be provided.

31 **Warranty:**

32 A two (2) year warranty shall be provided for the BPS and batteries.

33 **Training and Setup:**

34 The supplier of the BPS shall provide at least one hour of on-site (Snohomish County Signal
35 Shop) training to personnel of the Contracting Agency in the setup, operation,
36 troubleshooting, and maintenance of the BPS. Written material covering the operation of the
37 BPS shall be presented. A trained factory representative shall do the initial setup of the unit
38 as delivered for shop function testing and shall be present at field turn on to verify correct
39 installation and operation.

1 **Testing:**
2 Approved units shall be delivered to the Signal Shop for specification conformance checks
3 and function testing at the same time as controllers. After field installation, the contractor
4 shall test the completed BPS and demonstrate that the BPS is capable of supplying backup
5 power to the traffic signal system. The test procedure shall be to turn the 'signal' breaker in
6 the service cabinet off, verify that the BPS supplies battery inverted power to the traffic signal
7 and that the traffic signal operates normally with no noticeable interruption, then restore
8 power by turning the 'signal' breaker back on and verifying that the BPS returns to utility AC
9 power with no noticeable interruption in signal operation. This test shall be performed at
10 least twice in the presence of the Engineer. The test shall not be performed with the signal
11 controller flashing, the signal controller shall be operating normally.

12
13 Except as noted in the following pre-approved list of this section, samples of each item shall
14 be submitted to the Engineer for approval.

15
16 The Backup Power Source (BPS) shall be Clary Corporation SP-1250LX-R with Clary
17 Outpost 1241 batteries and fast recharge option, SPD-302C Bypass switch with
18 generator plug, and SNMP network adapter.

19
20
21 9-29.16.GR9

22 **Vehicular Signal Heads, Display and Housing**

23
24 9-29.16(2).DT9

25 **Conventional Traffic Signal Heads**

26
27 9-29.16(2)A.DT9

28 **(May 12, 2014)**

29 **Optical Units**

30 Section 9-29.16(2)A is supplemented with the following:

31
32 LED traffic signal modules shall have the same appearance as incandescent
33 displays, except Bimodal Arrow signal modules, which may provide an outline
34 appearance.

35
36 Except as noted in the following pre-approved list of this section, samples of each
37 type of LED traffic signal module shall be submitted to the Engineer for approval.
38 Submittals shall include a copy of a test report certified by an independent
39 laboratory that the LED traffic signal module submitted meets I.T.E. Standards for
40 light distribution, chromaticity, and power (consumption, power factor and harmonic
41 distortion). Submittals shall also include two modules of each type to be supplied for
42 shop evaluation.

43
44 **Pre-Approved List**

45 Dialight product numbers 433-2220-001XL15, 433-1210-003XL15, 433-3230-
46 901XL15, 432-2324-001XOD15, 432-1314-001XOD15, 431-3334-901XOD15, 430-
47 6479-001X, P46-3R33-003, P46-3Y33-003, and P46-3G33-003.

48
49 **WARRANTY**

50 The LED traffic signal module shall be warranted against any failure due to
51 workmanship, material defects or intensity within the first 60 months of field

1 operation. The LED traffic signal module shall meet or exceed minimum luminous
2 intensity values during the 60 months of field operation.
3
4 Replacement LED signal modules shall be provided within 5 days after receipt of
5 failed LED signal modules at no cost to the Contracting Agency, except the cost of
6 shipping the failed modules.
7
8 9-29.16(2)B.DT9
9 **Signal Housing**
10 (October 24, 2018)
11
12 Section 9-29.16(2)B is supplemented with the following:
13
14 Each traffic signal section shall have two downward facing weep holes drilled in the
15 bottom horizontal surface of the housing. Weep holes shall be 3/16" in diameter in two
16 opposite corners and shall not be blocked by any obstructions.
17
18 Signal Housings shall be McCain Traffic Signal Housing.
19
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21 9-29.16(2)F.DT9
22 **Back Plates**
23 (May 14, 2012)
24
25 Back plates shall be furnished and attached to the signal heads. Back plates shall be 5
26 inches wide ABS or polycarbonate, flat black on both sides.
27
28 Two (2) inches wide Type 4 prismatic reflective 3M yellow tape shall be installed around the
29 exterior edge of the plate.
30
31 9-29.17.DT9
32 **Signal Head Mounting Brackets and Fittings**
33 (September 19, 2013)
34
35 Section 9-29.17 is supplemented with the following:
36
37 Type A, B, H, and K terminal compartments shall have a single weep hole in the
38 bottom. Weep holes shall be 3/16" in diameter and shall not be blocked by any
39 obstructions. No internal feature is to be damaged when the weep holes are drilled.
40
41 9-29.18.GR9
42 **Vehicle Detector**
43
44 9-29.18(a).dt9
45 (June 1, 2018)
46 Section 9-29.18 is supplemented with the following:
47
48 **Video Detection**
49 The Video Detection System shall consist of TRAFICON video detection equipment,
50 auxiliary equipment, cameras, housings, and mounts, and all required mounting
51 hardware, cables, connectors, and wiring. The video detection equipment shall be of

1 the quantities shown, and shall be delivered to the Cathcart Way Operations Center
 2 (CWOC) with the controller cabinet for testing.
 3

	Model	Quantity Provided
1	Video Detection Board: TRAFICON VIP 3D.2	\$\$1\$\$
2	Video Detection Board: TRAFICON VIP 3D.1	\$\$2\$\$
3	TRAFICON 4-I/O Expansion Board	\$\$3\$\$
4	TRAFICON 2-I/O Expansion Board	\$\$4\$\$
5	Keypad for programming Video Detection Board	\$\$5\$\$
6	Monitor for programming Video Detection Board	\$\$6\$\$
7	TRAFICON VIEWCOM/E MAXs Remote Monitoring Board	\$\$7\$\$
8	FLIR 9 mm Thermal Traffic Detection Camera	\$\$8\$\$
9	FLIR 13 mm Thermal Traffic Detection Camera	\$\$9\$\$
10	FLIR 19 mm Thermal Traffic Detection Camera	\$\$10\$\$
11	Rainbow Camera and Lens complete in Housing	\$\$11\$\$

4
 5 Camera and Housing Assembly: Focus free thermal traffic detection camera or high
 6 resolution 1/3" image format Color CCD camera with a motorized zoom auto-iris lens,
 7 installed and wired in an aluminum weatherproof housing. The power, video, and lens
 8 control wiring shall be provided and be pre-wired to the power supply, camera, and lens.
 9 The wires shall be unterminated.

10
 11 Camera Mounting: Pelco Astro-Brac Extended Tilt & Pan mount, part AB-0169 with
 12 cable mount and 72 inch tube. The cable mount shall be suitable for the mast arm
 13 diameter at each camera installation location.

14
 15 Camera and Lens: FLIR FC-Series T, Rainbow CLD54, or equivalent approved by the
 16 Engineer meeting these minimum Specifications:

17
 18 **FLIR FC-Series T**

Array Format (NTSC)	320 x 240
Detector Type	Uncooled VOx Microbolometer; w/10-year Warranty
Effective Resolution	76,800
Pixel Pitch	25 µm
Field of View (Focal Length)	48° x 37° (FC-348t; 9 mm) 34° x 26° (FC-334t; 13 mm) 24° x 18° (FC-324t; 19 mm)
Spectral Range	7.5 µm to 13.5 µm
Lens	Athermalized, focus-free

20
 21 Housing: Extruded aluminum weatherproof housing suitable for the above camera,
 22 having an integral power transformer for the camera and meeting these Specifications:

Rating:	IP 66
Input Voltage	90-240 VAC single phase 50-60 Hz
Power Consumption	1.7 W nominal at 110 VAC

	18 W peak w/heaters
Operating Temperature Range	-58°F to 167°F (continuous operation) -40°F to 167°F (cold start)
Storage Temperature Range	-67°F to 185°F
Humidity	0-95% relative
Shock	MIL-STD-810F "Transportation"
Vibration	10g shock pulse with a 11ms half-sine profile
Cable Entry:	Liquid-tight strain relieved fitting suitable for the cable provided with the camera assembly
Mounting	Two ¼-20" threaded holes, 1" spacing along centerline front to back
Sunshield	Provided

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Rainbow CLD54

Image Sensor	1/3" Interline Transfer Sony Super II HAD CCD
TV System	NTSC
Picture Elements (pixels)	768 (H) x 494 (V)
Horizontal Resolution	540 TV Lines
Minimum Illumination	0.1lux
Signal to Noise	More than 48dB
Sync System	Internal
Video Output	1 Vp-p 75ohm
Auto-Iris Drive	DC or Video Type (4-pin square connector)
White Balance	ATW/AWC/Manual
Electronic Iris	1/60 – 1/100,00 – On/Off Selectable
BLC (Backlight Compensation)	On/Off Selectable (Standard and Wide Dynamic)
AGC (Automatic Gain Control)	0-18-24-32dB Selectable
Day/Night Function	Color/B&W/Auto
Power Requirement	12VDC/24VDC ±20%, 250mA Max
Operating Condition	+14° ~ 122°F within 85% RH
Included Accessories	CS/C mount adapter, 4-pin iris connector

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Lens: Rainbow L10X65DC4P/CS or equivalent meeting these minimum Specifications:

Focal Length	6.5~65mm
Field of View	6.5mm: 40.5° x 31.0° 65mm: 4.2° x 3.2°
Back Focal Distance	9.85mm
Iris:	F1.4~Approx. F360 with ND Spot Filter
Zoom:	Motorized
Focus	Motorized
Mount:	CS/C
Filter Size	43mm PO.75

8

1 Housing: Extruded aluminum weatherproof housing suitable for the above camera and
 2 lens, and having an integral power transformer for the camera and the defogger,
 3 meeting these Specifications:
 4

Rating:	NEMA 4
Power - IN:	108 to 132 VAC
Power – OUT to camera	24VAC
Window:	1/8" glass with integral thermostatically controlled 10 watt heater
Cable Entry:	Liquid-tight strain relieved fitting suitable for the cable provided with the camera assembly
Mounting	Three ¼-20 threaded holes
Sunshield	Provided

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Wiring:

Video/Power/Lens control:	6-Conductor dual-element conforming to the Specification given above in the supplement to 9-29.3.
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Surge Suppression: Each camera assembly shall have a surge suppressor which shall be installed inside the traffic signal controller cabinet. The surge suppressor shall be an EDCO CX06-BNCY, or equivalent meeting these Specifications:

Peak Surge Current	5Ka
Technology	Hybrid, Solid State
Attenuation	0.1dB @ 10 Mhz
Response Time	<1 nanosecond
Protection	Line to Ground
Clamp Voltage	6 V
Connectors	BNC
Impedance	75 ohms
Environmental	-40°F to 185°F
Mechanical	4½" x 1½" x 1¼"

13

Installation

The Contractor shall install the video cameras and wiring to the cabinet, and make all necessary connections. The cameras shall be picked up for installation at the same time as the controller cabinet.

The product supplier of the video detection system shall supervise the installation and testing of the video equipment. A factory certified representative from the manufacturer shall be on-site during installation. The factory representative shall install, make fully operational, and test the system as indicated on the Plans and this Specification.

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9-29.18(A)1.DT9

Video Cable Connectors

(September 19, 2013)

Section 9-29.18(A)1 is supplemented with the following:

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All RG-59 video cable connections shall be CP-88-2 and CP-89-2T.

9-29.18(1).DT9

Induction Loop Detectors

(March 26, 2009)

Section 9-29.18(1) is supplemented with the following:

The induction loop detectors shall be capable of loop fault diagnostics, shall be self-tuning for inductances from 20 to 2500 microhenries with a Q factor of 5, and have a minimum of 15 sensitivity level settings.

Except as noted in the following pre-approved list of this section, samples of each type of induction loop detector shall be submitted to the Engineer for approval.

Pre-approved list:

1. Global Traffic Technologies Canoga C922
2. Eberle Design LM602
3. Eberle Design Oracle 2E

9-29.19.GR9

Pedestrian Push Buttons

Section 9-29.19 is supplemented with the following:

9-29.19.DT9

Accessible Pedestrian Signal (APS)

(December 12, 2018)

Accessible Pedestrian Signals shall be Polara EZCommunicator 2-wire Navigator APS System, with Option T (9"x15") countdown sign, braille text, and custom voice message (Part number EN23TB1-Y).

9-29.20.GR9

Pedestrian Signal

9-29.20.DT9

(October 24, 2018)

Section 9-29.20 is supplemented with the following:

Pedestrian signal shall be Dialight Product Number 430-6479-001X.

Weep Holes

Each pedestrian signal head shall have one downward-facing weep hole drilled in the bottom horizontal surface of the housing. Weep holes shall be 3/16" in diameter and shall not be blocked by any obstructions.

9-29.24(1).DT9

Service Cabinets

(September 5, 2013)

Section 9-29.24, Item 1 is deleted in its entirety and replaced with the following:

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- I. All service enclosures shall be fabricated of 0.125 inch (minimum) 5052 alloy aluminum H32 ASTM designator or B209 aluminum.

9-29.25.GR9
Amplifier, Transformer, and Terminal Cabinets

9-29.25(1).DT9
(September 6, 2012)

Section 9-29.25, Item 1, is revised to read as follows:

- 1. All cabinets shall be constructed of welded 14 gage, minimum Type 316 stainless steel or 0.125 inch minimum 5052 alloy aluminum H32 ASTM designator minimum.

Line a. of Item 2 is deleted and replaced with the following:

- a. Battery Depth 8", Height 27", Width 24"

Section 9-29.25 is supplemented with the following:

- 11. Terminal blocks shall only be added to a backplane standoff panel mounted to the back of the cabinet. No sidemounted terminal strips shall be permitted.
- 12. The battery cabinet shall be bolted securely to the right side of the controller cabinet when facing the front of the cabinet with 4-1/2 inch bolts, liquid tight seals, flat and lock washers, and nuts. The cabinet shall have a louvered vent, filter, and thermostatically controlled fan. The battery shelves or trays may be fixed or hinged, and the batteries secured. The entry between the battery and controller shall be two 1 inch liquid tight fittings.
- 13. Terminal cabinets shall have one 12 position terminal block that has the following pairs of vehicle/pedestrian phases (2/8, 4/2, 6/4, and 8/6). These terminal blocks shall have one each: 180, 135, and 90 degree male terminal extenders placed on rows 1, 2, 3, 5, and 12.
- 14. Terminal Cabinets dimensions shall be 8"D x 24"H x 18"W.

9-29.25.dt9
Closed Circuit Television (CCTV) System
(September 1, 2016)

Each CCTV system shall be suitable for placement outdoors.

The CCTV system shall be on the QPL or a certificate of compliance shall be submitted by the manufacturer. The certification shall state that the CCTV system meets the following requirements.

CCTV System

The discreet CCTV camera dome system shall have a clear lower dome and varifocal, auto iris lens.

1 The indoor/outdoor CCTV camera dome system shall meet or exceed the following design
2 and performance specifications:

3
4 **Camera Specifications**

5	Sensor Type	1/2.8-inch Type Exmor CMOS
6	Optical Zoom	30X
7	Digital Zoom	12X
8	Maximum Resolution	1920 x 1080
9	Lens	f/1.6~f/4.7, focal length, 4.3 mm (wide)~129.0 10 mm (tele)
11	Horizontal Angle of View	59.5°(wide)~2.1°(tele)
12	Aspect Ratios	16:9
13	Light Sensitivity	f/1.6; 28dB gain at 30 IRE
14	Color (33 ms)	0.20 lux
15	Color (250 ms)	0.025 lux
16	Mono (33 ms)	0.06 lux
17	Mono (250 ms)	0.008 lux
18	Day/Night Capabilities	Yes
19	IR Cut Filter	Yes
20		
21	Wide Dynamic Range	130 dB
22	Iris Control	Auto iris with manual override
23	Backlight Compensation	Yes
24	Automatic Gain Control	Yes
25	Active Noise Filtering	Yes
26	Electronic Image Stabilization	Yes
27	Operating Temperature	-22°F to 122°F
28	Pan Angel	360° continuous rotation
29	Tilt Angel	+1° to -90°
30	Pan Speed	280°/sec
31	Tilt Speed	160°/sec
32	Port	RJ-45 connector for 1080Base-TX

33
34 **Dome Mount**

35 The dome mount shall be a pendant type with a pole mount adapter and shall consist of a
36 medium duty mount designed specifically for mounting the pendant domes to a pole along
37 with any accessories which may be required for a complete dome mount. The dome mount
38 shall meet or exceed the following design and performance specifications and shall be:

- 39
- 40 • capable of supporting up to 75 lbs.
 - 41 • versatile in that it may be mounted directly to a wall or adapted to a parapet,
42 corner or pole when used with the proper optional adapter.
 - 43 • constructed of cast aluminum and finished in gray polyester powder coat.
 - 44 • featured with an integral 120/230VAC to 24VAC, 50/60 Hz, 100va transformer to
45 power all environmental and dome functions.
 - 46 • featured with selectable input power via a slide switch.
 - 47 • designed with a front access cover plate for the transformer.
 - 48 • designed with transformer that shall be fused with one, 1.6A, 120VAC fast acting
49 fuse and one, 500mA, 230VAC fast acting fuse.
 - 50 • capable of cable access either through the arm from openings in the mounting
51 plate or .75" conduit fittings may be drilled on either side of the mount. Drill starts

- 1 (dimples) shall be designed into the mount, one on either side for conduit hole
 2 location.
 3 • designed with cable feed-through.
 4 • mounted to a solid surface via four 3/8" fasteners suitable for the mounting
 5 surface.
 6

7 The dome mount shall be provided with a manufacturer's warranty covering repair or
 8 replacement of defective parts for a period of one year from the date of shipment.
 9

	<u>Model</u>	<u>Quantity Provided</u>
1	19" Flat Panel LCD, Monitor 3.3" D x 16.6" W x 14.7" H	\$\$\$
2	CCTV, Camera Dome System	\$\$\$

10
 11 Except as noted in the following pre-approved list of this section, samples of each item shall
 12 be submitted to the Engineer for approval.
 13

14 **Pre-Approved List**

- 15 • Pelco 400 Series LCD Monitor (PMCL419)
 16 • Pelco Spectra HD (S6230-EG0) Dome Outdoor Camera with IWM24-GY and PA402
 17 Mount
 18