Division 8
Miscellaneous Construction

**Regulations and Code**

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

(Feb. 19, 2009)

**Electrical Inspection**

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

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

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

**Materials**

Section 8-20.2 is supplemented with the following:

(July 21, 2020)

Section 8-20.2(1) is revised as follows:

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

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

After the fourth paragraph add the following:

Shop drawing for signal standards and lighting standards shall be provided in an electronic format, either AUTOCAD Release 2018 or earlier, as well as complying with Section 6-03.3(7).
The last paragraph which begins "Submittals required shall include..." is deleted.

8-20.3.GR8

Construction Requirements

8-20.3.(3).DT8

(June 1, 2018)

Section 8-20.3(3) is supplemented with the following:

All existing equipment that is to be removed shall not be stockpiled within the job site without the Engineer's approval.

The following signal equipment shall remain the property of the Contracting Agency and shall be disconnected, dismantled, stacked separately, and delivered to the Contracting Agency:

- Traffic Signal Standards and Mast Arms
- Traffic Signal Controller Cabinets
- Electrical Service Cabinet
- Light Standards and Mast Arms
- Emergency Vehicle Detectors
- Vehicle and Pedestrian Displays and Mounting Hardware
- Pedestrian Pushbuttons
- Luminaires
- Video Cameras and Mounting Hardware
- Terminal Cabinets
- Visors
- Back Plates

Prior to the removal of any span wire from strain poles all associated vehicle and pedestrian signal heads, emergency vehicle detectors, video cameras, and signs shall be removed from each span.

Video cameras shall be given to the Engineer upon their removal.

The Contractor shall give the Engineer fourteen (14) calendar days advance written notice prior to delivery for removed materials to the Contracting Agency's storage facilities.

Controller cabinets shall not be removed until all associated electronic equipment is removed by Contracting Agency traffic signals personnel. All other equipment shall be removed by the Contractor and delivered within 24 hours following removal to the Contracting Agency.

The salvaged material listed above shall be delivered to the following address between the hours of 8:30 a.m. and 2:30 p.m.

Robert Westlake
(425) 388-7551
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 ½ 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.
- 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
(March 13, 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.

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.

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 ½ 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 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 ± 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 ± 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.
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.

Conduit

8-20.3(5).GR8

(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.

Junction Boxes, Cable Vaults, and Pull Boxes

8-20.3(6).GR8

(March 17, 2009)

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

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

All splices shall be made in the presence of the Engineer.
The second sentence of the seventh paragraph is revised to read as follows:

Splice insulation shall be heat shrink.

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Pedestrian Heads & Dets.

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

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

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

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.


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.

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.

A copy of the "Application For Utility Service" and a copy of the pay voucher for
each intersection will be provided to the Contractor.
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.

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.

Testing

Section 8-20.3(11), second sentence of the fourth paragraph, which begins “The Contractor shall provide the Engineer a minimum of 5 days ...” is deleted and replaced with the following:

A Pre-Turn On Coordination Meeting attended by the Engineer and the Contractor is required a minimum of fourteen (14) calendar days prior to turn on. The turn on schedule and date shall be arranged and confirmed at the meeting. All functional tests and other tests required by the Contract Specifications shall be completed to the satisfaction of the Engineer 48 hours prior to the turn on date.

Sections 8-20.3(11), fourth paragraph, replace all references to “Contracting Agency electronics technician” with “Operating Agency signal technician”.

The following is added to the end of Section 8-20.3(11):

On the same day, and following successful turn on, the Contractor shall adjust all optically-programmed signal heads and all louvered signal heads, as designated by the Engineer. Additionally, the Contractor shall remove all conflicting signs and signal equipment not specified to remain, as directed by the Engineer.

Signal Systems

Signal Heads

Section 8-20.3(14)B, the first paragraph is supplemented with the following:
Signal head shall be covered before the signal turn-on. If there are yellow tapes on the back plates, the whole assembly shall be covered completely.

8-20.3(14)C.GR8

*Induction Loop Vehicle Detectors*

8-20.3(14)C.DT8

(April 17, 2009)

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

Item 4 is supplemented as follows:

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

Item 6 is supplemented as follows:

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

Item 7 is supplemented as follows:

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

*Sawcut Cleaning*

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

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

Item 11 is supplemented as follows:

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

**Case A**

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

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<th>TEST PARAMETER</th>
<th>SPECIFICATION LIMITS</th>
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<tbody>
<tr>
<td>Safe Heating Temperature</td>
<td>410°F</td>
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<tr>
<td>Pour Temperature</td>
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<tr>
<td>Penetration, 77°F, 6 oz, 5 sec.</td>
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<tr>
<td>Penetration, 126°F, 2 oz, 5 sec.</td>
<td>50 dmm max.</td>
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<td>Softening Point °F</td>
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<tr>
<td>Ductility, 125°F, in.</td>
<td>6°F min.</td>
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<tr>
<td>Mandrel Bend, 0°F, 90 degrees,</td>
<td>Pass 2 of 3</td>
</tr>
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</table>
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:

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

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

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

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

Pre-approved list:
- Crafco Loop Detector Sealant #34271
- 3M Detector Loop Sealant 5000
- DEERY Loop Sealant LW

Item 12 is supplemented as follows:

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

Signal Standards

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

Signal standards shall be round tapered, not polygonal tapered.

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

Temporary Signal and Illumination System

Section 8-20 is supplemented with the following:
Description
This work shall consist of supplying, installing, maintaining, and removing temporary signal system(s) at the intersections of ***$$$1$$$***, and adjusting signal equipment as detailed in the Plans and these Special Provisions.

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

Contracting Agency Supplied Items:
The Contracting Agency will supply the following items each temporary signal and illumination system.

<table>
<thead>
<tr>
<th>Description</th>
<th>Unit Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 336 Controller Cabinet (pole-mounted &amp; fully wired)</td>
<td><em><strong>$12$</strong></em></td>
</tr>
<tr>
<td>Type 170E Signal Controller</td>
<td><em><strong>$2$</strong></em></td>
</tr>
<tr>
<td>Model 210E Conflict Monitor</td>
<td><em><strong>$3$</strong></em></td>
</tr>
<tr>
<td>Model 400 or 2400 Modern</td>
<td><em><strong>$4$</strong></em></td>
</tr>
<tr>
<td>Model 200 Load switches</td>
<td><em><strong>$5$</strong></em></td>
</tr>
<tr>
<td>Video Detection Board: TRAFICON VIP 3.1D or 3.2D</td>
<td><em><strong>$6$</strong></em></td>
</tr>
<tr>
<td>Rainbow Camera and Lens complete in Housing</td>
<td><em><strong>$7$</strong></em></td>
</tr>
<tr>
<td>Model 222 Vehicle Detector Amplifiers</td>
<td><em><strong>$8$</strong></em></td>
</tr>
<tr>
<td>Model 242 or Model 244 Pedestrian Detector Isolators</td>
<td><em><strong>$9$</strong></em></td>
</tr>
<tr>
<td>Model 752 Pre-Emption Discriminators</td>
<td><em><strong>$10$</strong></em></td>
</tr>
<tr>
<td>Model 721 Pre-Emption Detectors</td>
<td><em><strong>$11$</strong></em></td>
</tr>
<tr>
<td>Model 204 Flashers</td>
<td><em><strong>$12$</strong></em></td>
</tr>
<tr>
<td>Controller Cabinet Print</td>
<td><em><strong>$13$</strong></em></td>
</tr>
<tr>
<td>Pole Mounting Hardware Kit</td>
<td><em><strong>$14$</strong></em></td>
</tr>
</tbody>
</table>

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

Snohomish County Public Works Cathcart Maintenance Center (PWCMC)
8915 Cathcart Way
Snohomish, WA 98296

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

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

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.

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

**Measurement**

Section 8-20.4 is supplemented with the following:
The temporary signal and illumination system shall be measured per lump sum for each signal and illumination system installed, tested, operated, and removed complete per the Plans, and as specified herein.

**Payment**

Section 8-20.5 is supplemented with the following:

"Temporary Signal and Illumination System", per lump sum.

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

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

**Division 9**

**Materials**

**Illumination, Signal, Electrical**

**Conduit, Innerduct, and Outerduct**

**Rigid Metal Conduit Fittings and Appurtenances**

(November 10, 2011)

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

1. Delete “electroplated” from the first sentence.
2. Paragraph one is supplemented with the following:
   
   Galvanizing repair paint requirements for conduit couplings shall also apply to end bushings.

Add the following after the fifth paragraph:

**Conduit Coatings**

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

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

**Surface Mounting Conduit Attachment Components**

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

**Conduit Expansion and/or Deflection Fitting**

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

9-29.1(5).DT9

(June 21 2018)

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

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

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

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

Pre-approved list:
- MaxCell MXE series Innerduct

9-29.2.GR9

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

9-29.2(1).DT9

(April 4, 2017)

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

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

9-29.3.GR9

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

9-29.3(1).DT9

(August 3, 2009)

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

9-29.3(cable).DT9

**Communication Cables and Interfaces**

(September 5, 2013)

Quality Assurance

All materials described in this section shall meet or exceed the applicable provisions of the following documents:

1. CFR Title 7, Section 1755.900, RUS Specification for Filled Fiber Optic Cables
3. TIA/EIA-455-28-C, Method for Measuring Tensile Failure Point of Optical Waveguide Fibers
4. TIA/EIA-455-34-A, Interconnection Device Insertion Loss Test
5. TIA/EIA-455-95-A, Absolute Optical Power Test for Optical Fibers and Cables
6. EIA-598-B, Color Standard for Optical Fibers

Fiber Optic cable

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

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

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

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

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

The cable shall be constructed with the following components:

1. A dielectric central strength member
2. Buffer tubes containing optical fibers
3. Aramid (Kevlar) yarn
4. Outer MDPE jacket

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

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

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

Fiber Optic Cable Testing

The installed optical fiber cable shall be tested for compliance with the transmission requirements of this specification, the cable and hardware manufacturer's specifications, and prescribed industry standards and practices.
Prior to commencing acceptance testing, the Contractor shall complete the installation of the fiber optic system. This includes sealing the splice closures, completing the splicing and dressing in the distribution panels, and racking the cables in the pull boxes and cable vaults.

All testing values shall be in metric.

**Types of Testing**

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

- **Power Meter testing**
- **Optical Time Domain Reflectometer (OTDR) testing**

**Power Meter Testing**

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

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

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

1. Fiber/Strand #
2. Fiber type (Singlemode 1 or Multimode)
3. Cable, tube, and fiber IDs
4. Near end and far end test locations
   - Use device names in Contract plans
5. End-to-end attenuation
   - In each direction and the bidirectional average
6. Length of span being tested
7. Date, time, and operator
8. Wavelength

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

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

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

Each new fiber shall be tested in both directions at the 1310 and 1550 nanometer wavelengths. Existing fibers that are spliced to or re-spliced as part of this Contract shall also be tested in both directions and at both wavelengths.
The following information shall be documented for each fiber test measurement:

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

Fiber Optic Performance Requirements
1. Splice Loss:
   - Shall not exceed 0.20 dB in one direction
   - Bidirectional Average shall not exceed 0.15 dB
2. Reflectance:
   - Shall not exceed -55 dB

Fiber Cable Testing Documentation
The Contractor shall submit one hard copy and one electronic copy of the fiber test results to the Engineer for approval. Only one OTDR test result shall be on each page. The Contractor shall take corrective actions on portions of the fiber installation determined to be out of compliance with these specifications.

Upon acceptance of the cable installation and test results, the Contractor shall submit three hard copies and three electronic copies of the fiber test results to the Engineer.

Hard copy submittals shall be bound in 3-ring binders. The electronic submittals shall
be on compact discs and include one licensed copy of the applicable OTDR reader program.

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

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

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.

**Singlemode Fiber Optic Cable**

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

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

**Electrical Conductors and Cable**

(February 5, 2020)

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

Wire for Trafisense 2 shall be Advanced Digital Cable, Inc., 18AWG 3 conductor, type TFN CNDR, TC or TC-ER, 90 deg, 600v, sunlight resistant, direct burial

May 1, 2020

**CCTV Cable**

CAT5E cable shall meet the following requirements:

<table>
<thead>
<tr>
<th>Rated temp</th>
<th>75°C/160°F</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certification</td>
<td>CMX</td>
</tr>
<tr>
<td>Reference standards</td>
<td>TIA/EIA 568 &amp; ISO/IEC 11801</td>
</tr>
</tbody>
</table>
Outer jacket | LSZH, UV resistant, printed foot marks
---|---
Inner jacket | PVC
Insulation | PE
Conductor | 24AWG solid copper, 4 twisted pairs
Direct bury | Yes

9-29.3(2)F.DT9

**Detector Loop Wire**

(November 26, 2019)

Section 9-29.3(2)F is replaced with the following:

Detector loop wire shall be 14 AWG stranded copper conductors, PE or PVC loose tube, per IMSA 51-7.

9-29.3(2)H.DT9

**Three Conductor Shielded Cable**

(October 24, 2018)

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

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

9-29.3(2)I.DT9

**Electrical Conductors and Cable**

(June 29, 2010)

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

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

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

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

All pairs of each underground cable shall be tested for continuity, polarity, shorts, grounds, longitudinal balance, and both resistive and impedance losses consistent with the manufacturer’s specifications and standard telecommunication industry requirements.
Each TWP copper cable intended primarily for data communication applications shall be tested end-to-end from the controlled environment vault cable termination point to the interface at the traffic control device. The transmission test procedure shall include the continuity testing of each pair within each TWP cable from the outlet in the termination panel in the vault to the termination outlet at each device location.

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

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

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.
LED Luminaires

Section 9-29.10 is supplemented with the following:

Solid state lighting LED fixture shall meet the following requirements.

<table>
<thead>
<tr>
<th>Luminaire Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Correlated Color Temperature (CCT)</td>
</tr>
<tr>
<td>Color Rendering Index (CRI)</td>
</tr>
<tr>
<td>Off-state Power Consumption</td>
</tr>
<tr>
<td>On-state Power Consumption</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Warranty</td>
</tr>
<tr>
<td>Weight</td>
</tr>
<tr>
<td>Operating Environment</td>
</tr>
<tr>
<td>Cooling System</td>
</tr>
<tr>
<td>Dimensions (Approx.)</td>
</tr>
<tr>
<td>Housing</td>
</tr>
<tr>
<td>IESNA Luminaire Classification</td>
</tr>
<tr>
<td>Mounting Arm Connection</td>
</tr>
<tr>
<td>House Shield</td>
</tr>
</tbody>
</table>
**LED Module/Array Requirements**

<table>
<thead>
<tr>
<th>Light Distribution</th>
<th>LED module(s)/array(s) shall deliver at least 70% of initial lumens, when installed for a minimum of 50,000 hours.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Light Distribution</td>
<td>Should be in accordance with IESNA Type II or III Medium Lighting Distribution.</td>
</tr>
</tbody>
</table>

**Power Supply/Driver Requirements**

<table>
<thead>
<tr>
<th>Power Factor</th>
<th>Power supply should have a minimum Power Factor of 0.9.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max Amperage at LED</td>
<td>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.</td>
</tr>
<tr>
<td>Transient Protection</td>
<td>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.</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>Power Supply shall operate between -20 C and 50 C.</td>
</tr>
<tr>
<td>Frequency</td>
<td>Output operating frequency must be ≥ 120 Hz (to avoid visible flicker) and input operating frequency of 60 Hz.</td>
</tr>
<tr>
<td>Interference</td>
<td>Power supplies shall meet FCC47 CFR Part 15/18 (Consumer Emission Limits).</td>
</tr>
<tr>
<td>Noise</td>
<td>Power supply shall have a Class A sound rating per ANSI Standard C63.4.</td>
</tr>
</tbody>
</table>

**Roadway Application Requirements**

<table>
<thead>
<tr>
<th>Minimum Light Output</th>
<th>For Equivalent Replacement of 100W HPS, Luminaire shall deliver a minimum of 3700 lumens (initial)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Luminaire Efficacy</td>
<td>Luminaire Light Output (includes fixture efficiency and thermal effects)/ Luminaire Input Power</td>
</tr>
<tr>
<td>Minimum Luminaire Efficacy</td>
<td>50 lm/W</td>
</tr>
</tbody>
</table>

**Measurement/Performance/Safety Standards**

<table>
<thead>
<tr>
<th>ANSI C78.377.2008</th>
<th>Specifications for the Chromaticity of Solid State Lighting Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>IESNA LM-79-08</td>
<td>IESNA Approved Method for the Electrical and Photometric Measurements of Solid-State Lighting Products</td>
</tr>
<tr>
<td>IESNA LM-80-08 (Recommended)</td>
<td>IESNA Approved Method for Measuring Lumen Maintenance of LED Lighting</td>
</tr>
</tbody>
</table>
The manufacturer shall install a permanently attached decal on the bottom outside of each luminaire door. The manufacture shall install a fixture type, from the size column shown in the table below. The decal shall follow the NEMA label standard. Except as noted in the following pre-approved list of this section, samples of each item shall be submitted to the Engineer for approval.

Pre-approved list:

<table>
<thead>
<tr>
<th>SIZE AND TYPE</th>
<th>CODE</th>
<th>MANUFACTURER</th>
<th>MFR PART NUMBER</th>
<th>LUMENS</th>
</tr>
</thead>
<tbody>
<tr>
<td>100W Type II MED</td>
<td>G</td>
<td>ACUITY</td>
<td>ATBM-C-MVOLT-R2-P7</td>
<td>9,000</td>
</tr>
<tr>
<td>100W Type II MED</td>
<td>G</td>
<td>ACUITY</td>
<td>ATBM-D-MVOLT-R2-P7</td>
<td>9,000</td>
</tr>
<tr>
<td>100W Type II MED</td>
<td>H</td>
<td>ACUITY</td>
<td>ATBM-C-MVOLT-R3-P7</td>
<td>9,000</td>
</tr>
<tr>
<td>140W Type II MED</td>
<td>K</td>
<td>ACUITY</td>
<td>ATBM-E-MVOLT-R2-P7</td>
<td>13,400</td>
</tr>
<tr>
<td>140W Type II MED</td>
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<td>ATBM-F-MVOLT-R2-P7</td>
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<td>160W Type II MED</td>
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<td>ACUITY</td>
<td>ATB2-80BLRFR10-MVOLT-R3-P7</td>
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<td>CREE</td>
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</tr>
<tr>
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<td>CREE</td>
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<tr>
<td>100W Type III MED</td>
<td>H</td>
<td>CREE</td>
<td>BXSP B HT 3ME B 40K US UL SVR(7PIN) SPX</td>
<td>9,612</td>
</tr>
<tr>
<td>140W Type III MED</td>
<td>K</td>
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<td>BXSP C HT 2ME F 40K US UL SVR(7PIN) SPX</td>
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<tr>
<td>140W Type II MED</td>
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<td>CREE</td>
<td>BXSP C HT 3ME B 40K UL SVR(7PIN) SPX</td>
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<td>EOI</td>
<td>ESU-FA-012 M08 B30N-575KIU1-1512N</td>
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<td>LEOTEK</td>
<td>GCM-20H-MV-WW-2-GY-580-PCR7</td>
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<td>LEOTEK</td>
<td>EC1-6M-MV-NW-4-GY-700-PCR7</td>
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<td>LEOTEK</td>
<td>CGL-40F-MV-NW-2-GY-700-PCR7-WL</td>
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<td>EC4-14M-MV-NW-2-GY-700-PCR7</td>
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<tr>
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<td>275W TYPE II MED</td>
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<td>LEOTEK</td>
<td>GC2-80F-MV-NW-3-GY-1A-PCR7</td>
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</tr>
</tbody>
</table>
9-29.12(2).DT9
Traffic Signal Splice Material

(January 10, 2012)
Section 9-29.12(2) is deleted in its entirety and replaced with the following:

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

9-29.13.GR9
Control Cabinet Assemblies

9-29.13(2)A.DT9
Traffic Signal Controller Assembly Testing
(August 19, 2020)

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

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

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

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

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

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

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

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

1. Serial numbers when applicable.

2. Written certification that equipment of the same make and model has been tested according to NEMA Environmental Standards and Test Procedures and has met or exceeded these standards. The certificate shall include equipment model number and where, when, and by whom the tests were conducted. This certificate shall accompany each shipment of controllers.

3. The Contractor shall provide wiring diagrams, including a duplicate set on standard CD or DVD containing the diagrams for all controllers in AUTOCAD Release 2018 or earlier and two blue tone prints for each controller and cabinet supplied. The sheet size shall be 22 inches by 34 inches.

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

(September 15, 2021)

Section 9-29.13(3), is supplemented with the following:
The Unit Chassis that are needed for the 2070ATC are:

1. Model 2070-1C – Linux CPU module
2. Model 2070-2E+ – Field I/O for 170 cabinet
3. Model 2070-3D – Front panel, display B (16 lines of 40 Char.)
4. Model 2070-4A – Power supply, 10 amp
5. Model 2070-7T – GPS Serial Communications Module

9-29.13(4).DT9
Traffic-Signal Controller Software
(September 15, 2021)

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

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

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

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.

9-29.13(7).DT9
Wiring Diagrams
(August 19, 2020)

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

A standard CD or DVD is required. The drawing shall be in AutoCAD Release 2018 or earlier. Cabinet wiring diagram prints shall not be water soluble.

9-29.13(10)B.DT9
Auxiliary Equipment for Type 170E, 2070 Assemblies
(September 30, 2021)

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.

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

All auxiliary equipment slots shall use nylon guides.

The alternate (panduct) raceway shall not be allowed.

The DB-9 socket shall not be installed on the print holder drawer. The cable shall be 6 feet long and the DB-9 socket shall be in a protective casing.

Supplemental loads shall be placed only on the green and yellow outputs of load switches 1, 3, 5, and 7.

One feeder bus, one line lug, and two end caps shall all be mounted on DIN rail and installed in the upper right side of the cabinet with sufficient clearance to allow field wiring to each breaker. Power shall be provided from the TB 1 power terminal position 6.

The conflict monitor shall be capable of logging current and past monitor configurations and the voltage on each output channel at the time of a ‘FAILED’ state. When the monitor detects a conflicting indication or other condition that causes a monitor ‘FAILED’ state to occur, the cabinet shall immediately enter flash and stop time. After the conflict monitor has been reset the controller shall immediately take control of the signal displays and resume timing at the beginning of arterial green.

One PDA-2 power supply shall be provided with one transfer relay and two Model 204 flashers installed.

One Model 420 Auxiliary Output File shall be installed and wired in each 332 controller cabinet. The Auxiliary Output File shall comply with CalTrans TSCES, 1989 edition,
and it amendments. The rear terminals shall be permanently labeled as shown on the Plans.

A neutral bus having at least 20 connection points shall be provided. Two separate buses may be provided if the total number of termination points is greater than 20.

Two 12 position barrier type terminal blocks shall be installed in the upper rear right side of the cabinet, and shall be labeled “TB-CAM” and “TB-VD”.

One power strip shall be installed and wired with 12 widely spaced outlets (6 front/6 rear) and 15A circuit breaker in Double 332 controller cabinet. The power strip shall be designed for standard 19 inch racks (1U high).

The cabinet auxiliary equipment shall be supplied in the quantities and model numbers shown, and shall be delivered with the cabinet for testing:

<table>
<thead>
<tr>
<th>Model</th>
<th>Quantity Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Model 200 Load Switch</td>
<td><em><strong>$2$</strong></em></td>
</tr>
<tr>
<td>2 Model 222E 2-Ch. Detectors *</td>
<td><em><strong>$3$</strong></em></td>
</tr>
<tr>
<td>3 Model 224E 4-Ch. Detectors</td>
<td><em><strong>$4$</strong></em></td>
</tr>
<tr>
<td>4 Model 430 Flash Transfer Relay</td>
<td><em><strong>$5$</strong></em></td>
</tr>
<tr>
<td>5 Model 764 4-Ch. Opticom Discriminators</td>
<td><em><strong>$6$</strong></em></td>
</tr>
<tr>
<td>6 Model 242 DC Isolator</td>
<td><em><strong>$7$</strong></em></td>
</tr>
<tr>
<td>7 Model 252 AC Isolator</td>
<td><em><strong>$8$</strong></em></td>
</tr>
<tr>
<td>8 Model 2070ATC controller</td>
<td><em><strong>$9$</strong></em></td>
</tr>
<tr>
<td>9 Model 2070 Master controller</td>
<td><em><strong>$10$</strong></em></td>
</tr>
<tr>
<td>10 2018 KCLip RMS Conflict Monitor</td>
<td><em><strong>$11$</strong></em></td>
</tr>
<tr>
<td>11 Fiber Optic Distribution Panel</td>
<td><em><strong>$12$</strong></em></td>
</tr>
<tr>
<td>12 Fiber Optic Splice Tray</td>
<td><em><strong>$13$</strong></em></td>
</tr>
<tr>
<td>13 Managed Field Switch</td>
<td><em><strong>$14$</strong></em></td>
</tr>
<tr>
<td>14 EDI Monitorkey Programmer</td>
<td><em><strong>$15$</strong></em></td>
</tr>
</tbody>
</table>

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**

Etherwan EX78900 series Managed Field Switch

- EX78934-0VB: 12-port 10/100/1000BASE-T(X) PoE + 4-port 1/10G SFP ±
- EX-1250TSP-MB4L-AS: Two (2) Gigabit 10km 1310nm SM Duplex LC SFP
- SFPTIS10M: Two (2) 10 Gigabit 10km 1310nm SM Duplex LC SFP transceivers
- NDR-480-48 VDC: 48 volt din rail power supply

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 Pigtails

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

<table>
<thead>
<tr>
<th>Pin</th>
<th>I/O</th>
<th>Function</th>
<th>Pin</th>
<th>I/O</th>
<th>Function</th>
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<tr>
<td>1</td>
<td>*****</td>
<td>Logic Ground</td>
<td>53</td>
<td>I-2:7</td>
<td>Not Assigned</td>
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<tr>
<td>2</td>
<td>O-1:1</td>
<td>4P Don't Walk</td>
<td>54</td>
<td>I-2:8</td>
<td>UPS ON BATT</td>
</tr>
<tr>
<td>3</td>
<td>O-1:2</td>
<td>4P Walk</td>
<td>55</td>
<td>I-3:1</td>
<td>5 Ext, Calling Count</td>
</tr>
<tr>
<td>4</td>
<td>O-1:3</td>
<td>4 Red</td>
<td>56</td>
<td>I-3:2</td>
<td>1 Ext, Calling Count</td>
</tr>
<tr>
<td>5</td>
<td>O-1:4</td>
<td>4 Yellow</td>
<td>57</td>
<td>I-3:3</td>
<td>7 Ext, Calling Count</td>
</tr>
<tr>
<td>6</td>
<td>O-1:5</td>
<td>4 Green</td>
<td>58</td>
<td>I-3:4</td>
<td>3 Ext, Calling Count</td>
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<tr>
<td>7</td>
<td>O-1:6</td>
<td>3 Red</td>
<td>59</td>
<td>I-3:5</td>
<td>5 Ext, Calling Count</td>
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<tr>
<td>8</td>
<td>O-1:7</td>
<td>3 Yellow</td>
<td>60</td>
<td>I-3:6</td>
<td>1 Ext, Calling Count</td>
</tr>
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<td>9</td>
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<td>3 Green</td>
<td>61</td>
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<td>2P Don't Walk</td>
<td>62</td>
<td>I-3:8</td>
<td>3 Ext, Calling Count</td>
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<td>11</td>
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<td>2P Walk</td>
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<td>I-4:5</td>
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<td>12</td>
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<td>2 Red</td>
<td>64</td>
<td>I-4:6</td>
<td>6 Ext, Calling Count</td>
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<tr>
<td>13</td>
<td>O-2:4</td>
<td>2 Yellow</td>
<td>65</td>
<td>I-4:7</td>
<td>4 Ext, Calling Count</td>
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<td>14</td>
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<td>8 Ext, Calling Count</td>
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<tr>
<td>15</td>
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<td>67</td>
<td>I-5:1</td>
<td>Ped 2 Pushbutton</td>
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<td>16</td>
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<td>68</td>
<td>I-5:2</td>
<td>Ped 6 Pushbutton</td>
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<td>17</td>
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<td>1 Yellow</td>
<td>69</td>
<td>I-5:3</td>
<td>Ped 4 Pushbutton</td>
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<td>18</td>
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<td>1 Green</td>
<td>70</td>
<td>I-5:4</td>
<td>Ped 8 Pushbutton</td>
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<td>EV-A Preempt</td>
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<td>I-5:7</td>
<td>EV-C Preempt</td>
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<td>74</td>
<td>I-5:8</td>
<td>EV-D Preempt</td>
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<td>7 Yellow</td>
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<td>26</td>
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<td>7 Green</td>
<td>78</td>
<td>I-6:4</td>
<td>4 Ext, Calling, Count</td>
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<tr>
<td>27</td>
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<td>6P Don't Walk</td>
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<td>8 Ext, Calling, Count</td>
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<td>O-4:2</td>
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<td>I-6:6</td>
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<tr>
<td>29</td>
<td>O-4:3</td>
<td>6 Red</td>
<td>81</td>
<td>I-6:7</td>
<td>Flash Sense</td>
</tr>
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<td>30</td>
<td>O-4:4</td>
<td>6 Yellow</td>
<td>82</td>
<td>I-6:8</td>
<td>Stop Time</td>
</tr>
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<td>O-4:5</td>
<td>6 Green</td>
<td>83</td>
<td>O-6:1</td>
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</tr>
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<td>32</td>
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<td>84</td>
<td>O-6:2</td>
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<td>O-4:7</td>
<td>5 Yellow</td>
<td>85</td>
<td>O-6:3</td>
<td>OLD Red</td>
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<td>34</td>
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<td>86</td>
<td>O-6:4</td>
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<td>2 Ext, Calling Count</td>
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<td>O-7:4</td>
<td>OLB Yellow</td>
</tr>
<tr>
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<td>I-1:6</td>
<td>6 Ext, Calling, Count</td>
<td>96</td>
<td>O-7:5</td>
<td>OLB Green</td>
</tr>
<tr>
<td>45</td>
<td>I-1:7</td>
<td>4 Ext, Calling, Count</td>
<td>97</td>
<td>O-7:6</td>
<td>OLA Red</td>
</tr>
<tr>
<td>46</td>
<td>I-1:8</td>
<td>8 Ext, Calling, Count</td>
<td>98</td>
<td>O-7:7</td>
<td>OLA Yellow</td>
</tr>
<tr>
<td>47</td>
<td>I-2:1</td>
<td>2 Calling</td>
<td>99</td>
<td>O-7:8</td>
<td>OLA Green</td>
</tr>
<tr>
<td>48</td>
<td>I-2:2</td>
<td>6 Calling</td>
<td>100</td>
<td>O-5:5</td>
<td>Not Assigned</td>
</tr>
<tr>
<td>49</td>
<td>I-2:3</td>
<td>4 Calling</td>
<td>101</td>
<td>O-5:6</td>
<td>Flash Output</td>
</tr>
<tr>
<td>50</td>
<td>I-2:4</td>
<td>8 Calling</td>
<td>102</td>
<td>O-5:7</td>
<td>Detector Reset</td>
</tr>
<tr>
<td>51</td>
<td>I-2:5</td>
<td>RR 1 Preempt</td>
<td>103</td>
<td>O-5:8</td>
<td>Watch Dog Timer</td>
</tr>
<tr>
<td>52</td>
<td>I-2:6</td>
<td>RR 2 Preempt</td>
<td>104</td>
<td>*****</td>
<td>Logic Ground</td>
</tr>
</tbody>
</table>

Controller C-1 Connector Pin Assignments

9-29.13(10)D.DT9

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

(August 19, 2020)

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

Controller cabinets shall be Model Double 332.

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

9-29.14.GR9

**Vacant**

9-29.14.DT9

Section 9-29.14 including title is revised to read as follows:

**Backup Power Source (BPS)**

(March 24, 2020)

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

**Enclosure:**

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

**Documentation:**

Manufacturer's documentation shall be provided and shall include schematics, spare parts lists, manuals and appropriate system/controller settings. A full schematic of the BPS cabinet wiring shall be provided.
Warranty:
A two (2) year warranty shall be provided for the BPS and batteries.

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

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

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

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

9-29.16.GR9
Vehicular Signal Heads, Display and Housing

9-29.16(2).DT9
Conventional Traffic Signal Heads

9-29.16(2).A.DT9
(May 12, 2014)
Optical Units
Section 9-29.16(2)A is supplemented with the following:

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

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

**Pre-Approved List**


**WARRANTY**

The LED traffic signal module shall be warranted against any failure due to workmanship, material defects or intensity within the first 60 months of field operation. The LED traffic signal module shall meet or exceed minimum luminous intensity values during the 60 months of field operation.

Replacement LED signal modules shall be provided within 5 days after receipt of failed LED signal modules at no cost to the Contracting Agency, except the cost of shipping the failed modules.

**9-29.16(2)B.DT9**

**Signal Housing**

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

Each traffic signal section shall have two downward facing weep holes drilled in the bottom horizontal surface of the housing. Weep holes shall be 3/16" in diameter in two opposite corners and shall not be blocked by any obstructions.

Signal Housings shall be McCain Traffic Signal Housing.

**9-29.16(2)F.DT9**

**Back Plates**

(March 25, 2020)

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

Back plates shall be furnished and attached to the signal heads. Back plates shall be 5 inches wide ABS or polycarbonate, flat black on both sides.

Two (2) inches wide Type 4 prismatic reflective 3M yellow tape shall be installed around the exterior edge of the plate.

**9-29.17.DT9**

**Signal Head Mounting Brackets and Fittings**

(September 19, 2013)

Section 9-29.17 is supplemented with the following:

Type A, B, H, and K terminal compartments shall have a single weep hole in the bottom. Weep holes shall be 3/16" in diameter and shall not be blocked by any obstructions. No internal feature is to be damaged when the weep holes are drilled.
9-29.18.GR9

Vehicle Detector

9-29.18(a).dt9
(August 19, 2020)

Section 9-29.18 is supplemented with the following:

Video Detection

The Video Detection System shall consist of FLIR video detection equipment, auxiliary equipment, cameras, housings, and mounts, and all required mounting hardware, cables, connectors, and wiring. The video detection equipment shall be of the quantities shown and shall be delivered to the Cathcart Way Operations Center (CWOC) with the controller cabinet for testing.

<table>
<thead>
<tr>
<th>Model</th>
<th>Quantity Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video Detection Board: TRAFICON VIP 3D.2</td>
<td>$51$</td>
</tr>
<tr>
<td>Video Detection Board: TRAFICON VIP 3D.1</td>
<td>$52$</td>
</tr>
<tr>
<td>TRAFICON 4-I/O Expansion Board</td>
<td>$53$</td>
</tr>
<tr>
<td>TRAFICON 2-I/O Expansion Board</td>
<td>$54$</td>
</tr>
<tr>
<td>Keypad for programming Video Detection Board</td>
<td>$55$</td>
</tr>
<tr>
<td>Monitor for programming Video Detection Board</td>
<td>$56$</td>
</tr>
<tr>
<td>TRAFICON VIEWCOM/E MAXs Remote Monitoring Board</td>
<td>$57$</td>
</tr>
<tr>
<td>FLIR TrafiSense2</td>
<td>$58$</td>
</tr>
<tr>
<td>FLIR Thermal Traffic Detection Camera</td>
<td>$59$</td>
</tr>
<tr>
<td>Rainbow Camera and Lens complete in Housing</td>
<td>$60$</td>
</tr>
<tr>
<td>FLIR TI-BPL2 Edge</td>
<td>$61$</td>
</tr>
<tr>
<td>FLIR 4 I/O Edge USB</td>
<td>$62$</td>
</tr>
<tr>
<td>3 Amp Power Supply w/ Breaker&amp;Fuse Block-Din Rail</td>
<td>$63$</td>
</tr>
</tbody>
</table>

FLIR vendor will analyze the intersection and determine the appropriate field of view and corresponding part number.

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

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

Camera and Lens: FLIR TrafiSense2, FC-Series T, Rainbow CLD54, or equivalent approved by the Engineer meeting these minimum Specifications:

FLIR TrafiSense2
<table>
<thead>
<tr>
<th><strong>Camera</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Resolution</td>
<td>VGA (640x480)</td>
</tr>
<tr>
<td>Frame rate</td>
<td>30 FPS</td>
</tr>
<tr>
<td>Type</td>
<td>Long wave Infrared (7 – 14 µm)</td>
</tr>
<tr>
<td>Compression</td>
<td>H.264, MPEG-4, MJPEG</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Model</strong></th>
<th><strong>Part #</strong></th>
<th><strong>Resolution</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>TrafiSense2 690</td>
<td>10-7470</td>
<td>VGA</td>
</tr>
<tr>
<td>TrafiSense2 645</td>
<td>10-7474</td>
<td>VGA</td>
</tr>
<tr>
<td>TrafiSense2 632</td>
<td>10-7476</td>
<td>VGA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Housing</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Material</td>
<td>Aluminum</td>
</tr>
<tr>
<td>Dimensions (incl. mounting bracket)</td>
<td>Vertically mounted 45 cm x 16 cm x 12 cm (9.8 in x 6.3 in x 4.7 in) / Horizontally mounted 41 cm x 18 cm x 12 cm (16.2 in x 7.1 in x 4.7 in)</td>
</tr>
<tr>
<td>Sunshield</td>
<td>Integrated</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Power, outputs, communications</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Contact closures</td>
<td>2 direct, 16 for BPL versions, via TI x-stream BPL interface (PN 10-6085)</td>
</tr>
<tr>
<td>Broadband over Power Line or Power over Ethernet</td>
<td>For communication of output state events, configuration &amp; monitoring (streaming video)</td>
</tr>
<tr>
<td>Input Power</td>
<td>12-42VAC, 12-60VDC</td>
</tr>
<tr>
<td>Current Consumption</td>
<td>&lt; 230 mA @ 24VDC (&lt; 320mA @ 24VDC peak at startup)</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>&lt; 5.5W (&lt; 7.5W peak at startup)</td>
</tr>
<tr>
<td>Set-up</td>
<td>Web interface</td>
</tr>
<tr>
<td>Traffic monitoring, event and data reporting</td>
<td>TMS FLUX, Public API for 3rd party integration</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Regulatory</strong></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>EU Directives</td>
<td>EMC 2014/30/EU, RoHS 2011/65/EU</td>
</tr>
<tr>
<td>Environmental</td>
<td></td>
</tr>
<tr>
<td>Shock &amp; Vibration</td>
<td>NEMA TS2</td>
</tr>
<tr>
<td>Materials</td>
<td>All weatherproof (UV-resistant)</td>
</tr>
<tr>
<td>Protection Grades</td>
<td>Housing = IP68, Connectors = IP67</td>
</tr>
<tr>
<td>Temperature Range</td>
<td>NEMA TS2. From -34°C to +74°C (-29°F to 165°F)</td>
</tr>
<tr>
<td>FCC</td>
<td>FCC part 15 Class A</td>
</tr>
</tbody>
</table>

**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

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

<table>
<thead>
<tr>
<th>Rating:</th>
<th>IP 66</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input Voltage</td>
<td>90-240 VAC single phase 50-60 Hz</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>1.7 W nominal at 110 VAC 18 W peak w/heaters</td>
</tr>
<tr>
<td>Operating Temperature Range</td>
<td>-58°F to 167°F (continuous operation) -40°F to 167°F (cold start)</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>-67°F to 185°F</td>
</tr>
<tr>
<td>Humidity</td>
<td>0-95% relative</td>
</tr>
<tr>
<td>Shock</td>
<td>MIL-STD-810F &quot;Transportation&quot;</td>
</tr>
<tr>
<td>Vibration</td>
<td>10g shock pulse with a 11ms half-sine profile</td>
</tr>
<tr>
<td>Cable Entry:</td>
<td>Liquid-tight strain relieved fitting suitable for the cable provided with the camera assembly</td>
</tr>
<tr>
<td>Mounting</td>
<td>Two ¼-20” threaded holes, 1” spacing along centerline front to back</td>
</tr>
<tr>
<td>Sunshield</td>
<td>Provided</td>
</tr>
</tbody>
</table>

**Rainbow CLD54**

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

### Included Accessories
CS/C mount adapter, 4-pin iris connector

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

<table>
<thead>
<tr>
<th>Specification</th>
<th>Minimum Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Focal Length</td>
<td>6.5~65mm</td>
</tr>
<tr>
<td>Field of View</td>
<td>6.5mm: 40.5° x 31.0°</td>
</tr>
<tr>
<td></td>
<td>65mm: 4.2° x 3.2°</td>
</tr>
<tr>
<td>Back Focal Distance</td>
<td>9.85mm</td>
</tr>
<tr>
<td>Iris</td>
<td>F1.4~Approx. F360 with ND Spot Filter</td>
</tr>
<tr>
<td>Zoom</td>
<td>Motorized</td>
</tr>
<tr>
<td>Focus</td>
<td>Motorized</td>
</tr>
<tr>
<td>Mount</td>
<td>CS/C</td>
</tr>
<tr>
<td>Filter Size</td>
<td>43mm PO.75</td>
</tr>
</tbody>
</table>

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

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

### 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:

<table>
<thead>
<tr>
<th>Specification</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak Surge Current</td>
<td>5Ka</td>
</tr>
<tr>
<td>Technology</td>
<td>Hybrid, Solid State</td>
</tr>
<tr>
<td>Attenuation</td>
<td>0.1dB @ 10 Mhz</td>
</tr>
<tr>
<td>Response Time</td>
<td>&lt;1 nanosecond</td>
</tr>
<tr>
<td>Protection</td>
<td>Line to Ground</td>
</tr>
<tr>
<td>Clamp Voltage</td>
<td>6 V</td>
</tr>
<tr>
<td>Connectors</td>
<td>BNC</td>
</tr>
<tr>
<td>Impedance</td>
<td>75 ohms</td>
</tr>
</tbody>
</table>
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 in the Plans and this Specification.

9-29.18(A)1.DT9

Video Cable Connectors

(September 19, 2013)

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

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

9-29.18(1).DT9

Induction Loop Detectors

(September 15, 2021)

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. Eberle Design LMD 602
2. Eberle Design Oracle 2E

9-29.19.GR9

Pedestrian Push Buttons

9-29.19.DT9

Accessible Pedestrian Signal (APS)

(May 6, 2021)

Accessible Pedestrian Signals shall be Polara, iNS Navigator 2-wire/ICCU-S2 and ACCP system with Option T (9”x15”) countdown sign, braille text, and custom voice message (Part number. iNS23TB1-Y).
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.

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

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

Amplifier, Transformer, and Terminal Cabinets
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"
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(2).dt9

**Closed Circuit Television (CCTV) System**
(April 13, 2022)

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 system shall have a multidirectional camera and/or a clear lower dome Pan, Tilt and Zoom (PTZ) camera.

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

**Multidirectional Camera Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Type</td>
<td>4 x 5MP Progressive scan RGB CMOS 1/2.5-inch</td>
</tr>
<tr>
<td>Lens</td>
<td>Autofocus lenses, fixed iris, F2.0, focal length, 2.8 mm</td>
</tr>
<tr>
<td>Horizontal Angle of View</td>
<td>360°</td>
</tr>
<tr>
<td>Vertical Angle of View</td>
<td>84°</td>
</tr>
<tr>
<td>Day/Night</td>
<td>Automatically removable IR-cut filter</td>
</tr>
<tr>
<td>Light Sensitivity</td>
<td>Color 0.4 lux at 50 IRE, F2.0</td>
</tr>
<tr>
<td>B/W</td>
<td>0.03 lux at 50 IRE, F2.0</td>
</tr>
<tr>
<td>Shutter Range</td>
<td>1/32500-1/20 sec</td>
</tr>
<tr>
<td>Compression</td>
<td>H.264/H.265</td>
</tr>
<tr>
<td>Maximum Resolution</td>
<td>4 x 2592 x 1944</td>
</tr>
<tr>
<td>Frame Rate</td>
<td>Up to 20 fps</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>-40°F to 122°F</td>
</tr>
<tr>
<td>Operating Humidity</td>
<td>10 to 100% RH</td>
</tr>
<tr>
<td>Port</td>
<td>RJ-45 10Base-T/100Base-TX/1000Base-T PoE</td>
</tr>
</tbody>
</table>

**PTZ Camera Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor Type</td>
<td>1/2.8-inch Progressive scan CMOS</td>
</tr>
<tr>
<td>Lens</td>
<td>F1.4-4.0, Varifocal, 4.3-137.6 mm</td>
</tr>
<tr>
<td>Horizontal Angle of View</td>
<td>58.3°-2.4°</td>
</tr>
<tr>
<td>Vertical Angle of View</td>
<td>34.9°-1.3°</td>
</tr>
<tr>
<td>Day/Night</td>
<td>Automatically removable IR-cut filter</td>
</tr>
<tr>
<td>Light Sensitivity</td>
<td>Color 0.06 lux at 30 IRE, F1.4</td>
</tr>
<tr>
<td>B/W</td>
<td>0.008 lux at 30 IRE, F1.4</td>
</tr>
<tr>
<td>Color</td>
<td>0.09 lux at 50 IRE, F1.4</td>
</tr>
<tr>
<td>Shutter Range</td>
<td>1/66500- 2 sec</td>
</tr>
</tbody>
</table>
Pan/Tilt/Zoom  
- Pan: 360° endless, 0.03°-700°/s
- Tilt: +20° to -90°, 0.05°-500°/s
- Zoom: 32x optical, 12x digital

Compression  
- H.264/H.265

Maximum Resolution  
- 1920 x 1080

Frame Rate  
- Up to 60 fps

Electronic Image Stabilization  
- Yes

Operating Temperature  
- -58°F to 122°F

Operating Humidity  
- 10 to 100% RH

Port  
- RJ-45 10Base-T/100Base-TX PoE

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

- capable of supporting up to 75 lbs.
- versatile in that it may be mounted directly to a wall or adapted to a parapet, corner or pole when used with the proper optional adapter.
- constructed of cast aluminum and finished in gray polyester powder coat.
- featured with an integral 120/230VAC to 24VAC, 50/60 Hz, 100va transformer to power all environmental and dome functions.
- featured with selectable input power via a slide switch.
- designed with a front access cover plate for the transformer.
- designed with transformer that shall be fused with one, 1.6A, 120VAC fast acting fuse and one, 500mA, 230VAC fast acting fuse.
- capable of cable access either through the arm from openings in the mounting plate or .75" conduit fittings may be drilled on either side of the mount. Drill starts (dimples) shall be designed into the mount, one on either side for conduit hole location.
- designed with cable feed-through.
- mounted to a solid surface via four 3/8" fasteners suitable for the mounting surface.

The dome mount shall be provided with a manufacturer’s warranty covering repair or replacement of defective parts for a period of three years from the date of shipment.

<table>
<thead>
<tr>
<th>Model</th>
<th>Quantity Provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 19&quot; Flat Panel LCD, Monitor 3.3&quot; D x 16.6&quot; W x 14.7&quot; H</td>
<td>$$1$$</td>
</tr>
<tr>
<td>2 CCTV, Multidirectional Camera System</td>
<td>$$2$$</td>
</tr>
<tr>
<td>3 CCTV, PTZ Camera System</td>
<td>$$3$$</td>
</tr>
<tr>
<td>4 CCTV, Multidirectional/PTZ Camera System</td>
<td>$$4$$</td>
</tr>
</tbody>
</table>

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

Pre-Approved List
- Pelco 400 Series LCD Monitor (PMCL419)
- Axis Q6100-E Network Multidirectional Camera with Axis T8154 60 W SPF Midspan POE Power Supply (5901-004), Axis T91L61 Wall and Pole Mount (5801-721), and Axis ACI Conduit Adapter ¾" NPS (5505-641)

- Axis Q6135-LE PTZ Camera with Axis T8154 60 W SPF Midspan POE Power Supply (5901-004), Axis T91L61 Wall and Pole Mount (5801-721), and Axis ACI Conduit Adapter ¾" NPS (5505-641)

- Axis Q6100-E Network Multidirectional Camera with Axis Q6135-LE PTZ Camera, Axis T8154 60 W SPF Midspan POE Power Supply (5901-004), Axis T91L61 Wall and Pole Mount (5801-721), and Axis ACI Conduit Adapter ¾" NPS (5505-641)

- Pelco Spectra (S7230L-EW0) Dome Outdoor Camera with POE90U1BT-US POE injector, IWM24-GY and PA402 Mount