

1 **20.GR8**  
2 **ILLUMINATION, TRAFFIC SIGNAL SYSTEMS, AND ELECTRICAL**  
3

4 FMDESC.DT1  
5 **Description**

6 Section 8-20.1 is supplemented with the following:

7  
8 (\*\*\*\*\*)  
9 \$\$1\$\$

10  
11 GEMAT.DT1  
12 **Materials**

13  
14 FMAT.DT1  
15 Section 8-20.2 is supplemented with the following:

16  
17 **(NWR April 11, 2001)**  
18 **Contracting Agency-Supplied Materials**

19 The Contracting Agency will supply the following materials for the \*\*\* \$\$1\$\$ \*\*\* system:

20

21 <u>Description</u>	22 <u>Quantity</u>
23 *** \$\$2\$\$	24 ***

25 Except for anchor bolts, the Contractor may request release of Contracting Agency-supplied materials only after foundations for the equipment described above have cured.

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29 The Contractor shall notify the Engineer three working days in advance of the date Contracting Agency-supplied materials are required.

30  
31  
32 Contracting Agency-supplied materials, except for the signal controller(s), will be available for pick up, dimensional or bolt pattern verification during normal working hours from the Region Signal Maintenance Office located at:

33  
34  
35  
36 3700 - 9th Ave. S.  
37 Seattle, WA 98134  
38 Attention: Ms. B.J. Bely-Muraglia  
39 Telephone: (206) 764-4014  
40

41 200201.GR8  
42 **Equipment List And Drawings**

43 Section 8-20.2(1) is supplemented with the following:

44  
45 GMMANU.DT1  
46 (NWR November 13, 1996)  
47 Manufacturer's data for materials proposed for use in the contract which require approval shall be submitted in one complete package.  
48  
49

50 GMPLAN.DT1  
51 (NWR April 19, 1995)

1 Pole base to light source distances (H1) for lighting standards with pre-approved  
2 plans shall be as noted in the Plans.  
3  
4 GMENGR.DT1  
5 (NWR April 19, 1995)  
6 Pole base to light source distances (H1) for lighting standards with pre-approved  
7 plans will be determined or verified by the Engineer at the request of the Contractor  
8 prior to fabrication.  
9  
10 GMWOPP.DT1  
11 (NWR April 19, 1995)  
12 Pole base to light source distances (H1) for lighting standards without pre-approved  
13 plans will be furnished by the Engineer as part of the final approved shop drawings,  
14 prior to fabrication.  
15  
16 2002013.GR8  
17 (March 13, 1995)  
18 If traffic signal standards, strain pole standards, or combination traffic signal and  
19 lighting standards are required, final verified dimensions including pole base to  
20 signal mast arm connection point, pole base to light source distances (H1), mast  
21 arm length, offset distances to mast arm mounted appurtenances, and orientations  
22 of pole mounted appurtenances will be furnished by the Engineer as part of the  
23 final approved shop drawings prior to fabrication.  
24  
25 GMSURV.DT1  
26 (NWR June 6, 1996)  
27 If traffic signal standards, strain pole standards, or combination traffic signal and  
28 lighting standards are proposed, final verified dimensions including pole base to  
29 signal mast arm connection point, pole base to light source distances (H1), mast  
30 arm length, offset distances to mast arm mounted appurtenances, and orientations  
31 of pole mounted appurtenances will be furnished by the Engineer as part of the  
32 final approved shop drawings prior to fabrication.  
33  
34 Final ground and roadway cross sections at the locations of the standards shall be  
35 submitted for approval along with the shop drawings.  
36  
37 GMCOND.DT1  
38 **Conduit, Innerduct, and Outerduct**  
39 Section 9-29.1 is supplemented with the following:  
40  
41 (NWR August 10, 2009)  
42 Mechanical plugs for cabinet conduit sealing shall be one of the following:  
43  
44 1. Tyco Electronics - TDUX  
45 2. Jackmoon – Triplex Duct Plugs  
46 3. O-Z Gedney – Conduit Sealing Bushings  
47  
48 The mechanical plug shall withstand a minimum of 5 psi of pressure.  
49

1 GMFITTING.DT1  
2 ***Rigid Metal Conduit Fittings and Appurtenances***  
3 Section 9-29.1(2) is supplemented with the following:  
4  
5 GMCOAT.DT1  
6 **(August 10, 2009)**  
7 **Conduit Coatings**  
8 Electroplated couplings are not allowed.  
9  
10 GMATTACH.DT1  
11 **(NWR March 4, 2009)**  
12 **Surface Mounting Conduit Attachment Components**  
13 Channel supports and all fastening hardware components shall be Type 304  
14 stainless steel. Conduit clamps shall be one piece, two bolt units with lock  
15 washers.  
16  
17 GMBOX.DT1  
18 **(NWR February 26, 2007)**  
19 **Junction Boxes**  
20 **Cover Markings**  
21 Section 9-29.2(4) is supplemented with the following:  
22  
23 Junction boxes shall not be marked when the junction boxes are to be installed  
24 as part of a future raceway system in a bridge structure, vehicle barrier,  
25 pedestrian barrier, or roadway crossing and the future raceway system is not  
26 connected to an illumination, signal, interconnect, or ITS raceway system.  
27  
28 GMWIR.DT1  
29 ***Electrical Conductors and Cable***  
30 Section 9-29.3(2) is supplemented with the following:  
31  
32 GMPFLOOP.DT1  
33 **(NWR July 18, 2005)**  
34 **Preformed Loops**  
35 Preformed detector loops shall be factory assembled. Homeruns shall be pre-wired  
36 and shall be an integral part of the loop assembly. The loop configurations and  
37 homerun lengths shall be assembled for the specific application shown in the  
38 Plans.  
39  
40 All materials used to protect the wire in the preformed loop shall have properties  
41 that shall withstand the temperature and pressure of paving applications without  
42 melting or cracking.  
43  
44 The loop and homerun shall be constructed using synthetic cord reinforced  
45 hydraulic flex hose. Hose for the loop and homerun shall each be one piece. The  
46 only allowable joints or splices in the hose shall be where the homeruns connect to  
47 the loops.  
48  
49 Hose tee connections shall be high temperature synthetic rubber. The tee shall be  
50 of proper size to attach directly to the hose to minimize glue joints. The tee shall  
51 have the same flex properties as the hose.

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The number of turns in the loop shall be as shown in the Plans. Homerun wire pairs shall be twisted a minimum of two turns per foot. No wire splices shall be allowed in the preformed detector loop assembly. The direction of the twist shall be identified as CW for clockwise and CCW for counter clockwise twist. The loops shall be available to order from the manufacturer with both twist directions available.

The loop and homeruns shall be filled and sealed with a flexible sealant. The sealant, when set up, shall not soften at 180 degrees Fahrenheit, nor get brittle at minus 20 degrees Fahrenheit.

All preformed detector loops shall carry a manufacturer's warranty stating that the loops will be free from defects in materials and workmanship for a service period of ten (10) years from the date of purchase.

GMVCABLE.DT1

**(NWR October 5, 2009)**

**Video Detection Cable**

Coaxial cable or combination (composite/Siamese) cable for video detection shall be RG59/U with a manufacturer's rating of 600 Volts (Non UL - manufacturer's voltage rating of the insulation is acceptable). Combination cable shall be in accordance with the video detection system manufacturer's recommendations for the length of cable required.

GMRLOOP.DT1

**Detector Loop Wire**

Section 9-29.3(2)F is revised to read as follows:

(NWR August 10, 2009)

Detector loop wire shall use 14 AWG stranded copper conductors, and shall conform to IMSA Specification 51-7, with cross-linked polyethylene (XLPE) insulation encased in a polyethylene outer jacket (PE tube).

GMCCABLE.DT1

**Twisted Pair Communications Cable**

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

(NWR August 10, 2009)

Aerial communication cable shall meet REA specification PE-38 and shall be 22 gauge. The number of cable pairs shall be as shown in the Plans.

20022.GR8

***Light And Signal Standards***

GMSLSS.DT1

**(NWR May 1, 2006)**

**Steel Light and Signal Standards**

Section 9-29.6(1) is supplemented with the following:

Galvanized steel light and signal standards shall not be painted.

1 FMSLSS.DT1

2 (\*\*\*\*\*)

3 **Decorative Light Standards**

4 \$\$1\$\$

5

6 20022A.DT1

7 Section 9-29.6 is supplemented with the following:

8

9 200221.GR8

10 **(April 6, 2009)**

11 **Light Standards with Type 1 Luminaire Arms**

12 Lighting standards shall be fabricated in conformance with the methods and  
13 materials specified on the pre-approved Plans listed below, provided the following  
14 requirements have been satisfied:

15

16 (a) Light source to pole base distance (H1) shall be as noted in the Plans.  
17 Verification of H1 distances by the Engineer, prior to fabrication, is not  
18 required. Fabrication tolerance shall be ±6 inches.

19

20 (b) All other requirements of the Special Provisions have been satisfied.

21

<u>Pre-Approved Plan</u>	<u>Fabricator</u>	<u>Mounting Hgt.</u>
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Drawing No. DB00654 Rev. C Sheets 1, 2, 3 & 4	Valmont Ind. Inc.	30', 40' & 50'
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Drawing No. W3721-1 Rev. H & W3721-2 Rev. C	Ameron Pole Prod. Div.	40' & 50'
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Drawing No. NWS 3510 Rev. 6-27-08 or NWS 3510B Rev. 6-27-08	Northwest Signal Supply, Inc.	25', 30', 35', 40', 45' & 50'
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Drawing WS-SL-01 Revision 5	American Pole Structures, Inc.	25', 30', 35', 40', 45', 50'
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Drawing 71035-B39 Rev. 6 Sheets 1 & 2 of 2, and B100-B335 Rev. 1	Union Metal Corp.	40'
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27

Drawing 71035-B38 Rev. 7 Sheets 1 & 2 of 2 and B100-B335 Rev. 1	Union Metal Corp.	50'
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Drawing No. WSDOT-LP-01 Rev. 4, Sheets 1 and 2 or WSDOT - LP-01-BE Rev 3 Sheets 1 and 2 or WSDOT - LP-01-C8B Rev 3	West Coast Engineering Group	25', 30', 35', 40', 45', and 50'
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200222.GR8

**(April 6, 2009)**

**Light Standards with Type 1 Luminaire Arms**

Lighting standards shall be fabricated in conformance with the methods and materials specified on the pre-approved plans listed below, provided the following requirements have been satisfied:

- (a) Mounting heights shall be as specified in the Plans.
- (b) Light source to pole base distances (H1) shall be determined or verified by the Engineer prior to fabrication. Fabrication tolerance shall be ±6 inches.
- (c) All other requirements of the Special Provisions have been satisfied.

<u>Pre-Approved Plan</u>	<u>Fabricator</u>	<u>Mounting Hgt.</u>
Drawing No. DB00654 Rev. C Sheets 1, 2, 3 & 4	Valmont Ind. Inc.	30', 40' & 50'
Drawing No. W3721-1 Rev. H & W3721-2 Rev. C	Ameron Pole Prod. Div.	40' & 50'
Drawing No. NWS 3510 Rev. 6-27-08 or NWS 3510B Rev. 6-27-08	Northwest Signal Supply, Inc.	25', 30', 35', 40', 45' & 50'
Drawing WS-SL-01 Revision 5	American Pole Structures, Inc.	25', 30', 35', 40', 45', 50'
Drawing 71035-B39 Rev. 6 Sheets 1 & 2 of 2 and B100-B335 Rev. 1	Union Metal Corp.	40'
Drawing 71035-B38 Rev. 7 Sheets 1 & 2 of 2 and B100-B335 Rev. 1	Union Metal Corp.	50'
Drawing No. WSDOT-LP-01 Rev. 4, Sheets 1 and 2 or WSDOT - LP-01-BE Rev 3 Sheets 1 and 2 or WSDOT - LP-01-C8B Rev 3	West Coast Engineering Group	25', 30', 35', 40', 45', and 50'

200223.GR8

**(December 1, 2008)**

**Light Standards with Type 2 Luminaire Arms**

Lighting standards shall be fabricated in conformance with the methods and materials specified on the pre-approved plans listed below provided the following requirements have been satisfied:

1 (a) Light source to pole base distance (H1) shall be as noted in the Plans.  
2 Verification of H1 distances by the Engineer, prior to fabrication, is not  
3 required. Fabrication tolerance shall be ±6 inches.  
4

5 (b) All other requirements of the Special Provisions have been satisfied.  
6

<u>Pre-Approved Plan</u>	<u>Fabricator</u>	<u>Mounting Hgt.</u>
Drawing No. W3720-1 Rev. F & W3720-2 Rev. C	Ameron Pole Prod. Div.	40' and 50'
Drawing No. DB00653 Rev. C Sheets 1, 2, 3 & 4	Valmont Ind. Inc.	30', 40' and 50'
Drawing No. NWS 3515 Rev. 6-27-08 or NWS 3515B Rev. 6-27-08	Northwest Signal Supply, Inc.	25', 30' 35' 40'-45' & 50'
Drawing No. WS-SL-02	American Pole Structures Inc.	25' to 50'
Drawing No. LD-10095 Rev. 20 Sheet 1 & 2	Union Metal Corp.	40'
Drawing No. LD-10100 Rev. 15 Sheet 1 & 2	Union Metal Corp.	50'
Drawing No. WSDOT-LP-02 Rev. 3 Sheets 1 and 2	West Coast Engineering Group	25', 30', 35', 40', 45', and 50'

31  
32 200224.GR8

33 **(December 1, 2008)**

34 **Light Standards with Type 2 Luminaire Arms**

35 Lighting standards shall be fabricated in conformance with the methods and  
36 materials specified on the pre-approved plans listed below, provided the following  
37 requirements have been satisfied:  
38

39 (a) Mounting heights shall be as specified in the Plans.  
40

41 (b) Light source to pole base distances (H1) shall be determined or verified by  
42 the Engineer prior to fabrication. Fabrication tolerance shall be ±6 inches.  
43

44 (c) All other requirements of the Special Provisions have been satisfied.  
45

<u>Pre-Approved Plan</u>	<u>Fabricator</u>	<u>Mounting Hgt.</u>
Drawing No. W3720-1 Rev. F & W3720-2 Rev. C	Ameron Pole Prod. Div.	40' and 50'
Drawing No. DB00653 Rev. C	Valmont Ind. Inc.	30', 40', and 50'

1	Sheets 1, 2, 3 & 4		
2			
3	Drawing No. NWS 3515	Northwest Signal	25', 30', 35',
4	Rev. 6-27-08 or NWS 3515B	Supply, Inc.	40'-45' & 50'
5	Rev. 6-27-08		
6			
7	Drawing No. WS-SL-02	American Pole	25' to 50'
8		Structures Inc.	
9			
10	Drawing No. LD-10095 Rev. 20	Union Metal	40'
11	Sheets 1 & 2	Corp.	
12			
13	Drawing No. LD-10100 Rev. 15	Union Metal	50'
14	Sheets 1 & 2	Corp.	
15			
16	Drawing No. WSDOT-LP-02	West Coast	25', 30', 35', 40',
17	Rev. 3	Engineering	45', and 50'
18	Sheets 1 and 2	Group	

19  
20 FMHML.DT1

21 **(NWR May 1, 2006)**  
22 **Steel High Mast Light Standards**

23 High mast light (HML) standards and associated anchor bolts and hardware shall  
24 be the appropriate type for the given mounting height, number and type of fixtures,  
25 and lowering device system (as specified by the lowering device manufacturer).  
26 The HML standard shall support and be compatible with the number and type of  
27 luminaires and the lowering device system specified in the Special Provisions. HML  
28 standards shall be galvanized tapered, multiple polygonal steel sections with a  
29 combined height to provide the mounting height specified in the Plans and to  
30 support the lowering device system specified above. The HML standard and  
31 lowering device system shall be capable of lowering the fixtures to within three feet  
32 of the base.  
33

34 All openings shall be installed during fabrication. All openings in the pole shall have  
35 a rain tight gasketed cover attached with stainless steel box bolts.  
36

37 No field welding will be permitted in the assembly of the HML standard.  
38

39 HML standards shall have an external grounding lug welded to the pole base plate  
40 prior to galvanizing.  
41

42 The HML standard design shall be based on the latest AASHTO Standard  
43 Specifications for Structural Supports for Highway Signs, Luminaires and Traffic  
44 Signals. A 90-mph wind loading, and a 1.13 gust factor shall be used, along with  
45 appropriate height, exposure factor, shape and drag coefficients. An effective  
46 projected area of \*\*\* \$1\$ \*\*\* square yards shall be used for each lowering device  
47 complete with light fixtures and shields. The Design Life and Recurrence Interval  
48 shall be 50 years. HML standards shall be designed for fatigue to resist applicable  
49 equivalent static wind load. A fatigue related analysis shall be limited to Fatigue  
50 Category II. The structural design shall take into account the resonant vibration  
51 wind speeds relative to the normal wind speeds occurring on a high frequency.

1 Approved dampening devices shall be installed if required, to adjust the resonant  
2 pole frequency to a suitable value. The analysis of the HML standard shall include a  
3 verification of its stability by analyzing the HML standard in its final deflection  
4 position under load, as defined in the AASHTO specification.  
5  
6 The opening in the pole shaft and any reinforcing related thereto shall be properly  
7 designed and fabricated to ensure a smooth transfer of the design loads and shall  
8 be sufficient to replace the equivalent strength of the shaft lost by the opening. The  
9 reinforcement shall not interfere with the lowering mechanism or portable power  
10 drive unit. The HML standard section modulus through this portion of the pole shall  
11 be equivalent to that which would exist without the opening.  
12  
13 Complete calculations for HML standard structural design, including anchor bolt  
14 details, shall be prepared by a Professional Engineer, licensed under Title 18 RCW,  
15 State of Washington, in the branch of Civil or Structural Engineering or by an  
16 individual holding a valid registration in another State as a Civil or Structural  
17 Engineer.  
18  
19 All shop drawings and the cover page of all calculation submittals shall carry the  
20 Professional Engineer's original signature, date of signature, original seal,  
21 registration number, and date of expiration. The cover page shall include the  
22 contract number, contract title, and sequential index to calculation page numbers.  
23 Two copies of the associated design calculations shall be submitted to the Engineer  
24 in accordance with Section 6-01.9 for approval along with shop drawings. The  
25 submittal shall include the manufacturer's recommendations for installation.  
26  
27 Foundations shall be as shown in the Plans.  
28  
29 Hooked anchor bolts will not be allowed. The exposed end of anchor bolts shall be  
30 threaded a minimum of 12 inches, and shall be galvanized after fabrication a  
31 minimum of 12 inches in accordance with AASHTO M232. Nuts and washers shall  
32 be galvanized after fabrication in accordance with AASHTO M232. The bottom of  
33 anchor bolts shall be threaded as shown in the Plans.  
34  
35 Anchor bolt templates shall be constructed from stock that is a minimum of 3/8 inch  
36 thick by 3 inches wide. The anchor bolt holes shall be centered in the template to  
37 maintain 1/2 inch minimum of metal between outside edge of anchor bolt and the  
38 inside and outside edge of the template.  
39  
40 Each anchor bolt shall be furnished with six heavy hex nuts and two flat washers.  
41  
42 HML standard anchor bolts shall conform to ASTM F 1554 Grade 105, including  
43 supplemental requirements S2, S3, and S5. Nuts shall conform to AASHTO M291  
44 Grade DH. Washers shall conform to AASHTO M293.  
45  
46 In addition to the requirements specified in Section 9-29.6(5), anchor bolts, nuts,  
47 and washers for Type II, III, IV, V signal standard and luminaire poles may conform  
48 to the material requirements specified above for HML standard anchor bolts, nuts  
49 and washers.  
50

1 GMLWDV.DT1  
2 **(NWR May1, 2006)**  
3 **Lowering System for Steel High Mast Light Standards**  
4 The lowering device system for all Steel High Mast Light (HML) standards shall be  
5 Holophane catalog no. LD5. Two Holophane remote control portable power units for  
6 raising and lowering fixtures shall be furnished to the Contracting Agency for use  
7 with these systems. The associated step down transformer shall be \*\*\* \$1\$ \*\*\* volts  
8 and the remote control cable shall be a minimum of 20 feet in length. The  
9 disconnect switch for this system shall use stainless steel hardware. The receptacle  
10 and plug shall be 4 pole, 5 wire grounding NEMA number 22 rated at 60 amps.  
11  
12 The housing cables and power cable shall be black.  
13  
14 The exterior of the lowering device, including the cover, headframe plate, latch  
15 barrels, mounting ring, headframe, luminaire mounting arms, and iris guide arms,  
16 shall be painted with a powder coated polyurethane low luster finish matching  
17 Federal Standard 595B color \*\*\* \$2\$ \*\*\*. The exterior of the lowering device  
18 components shall withstand a 1000-hour salt spray test as specified in ASTM B  
19 117.  
20  
21 GMLSTV.DT1  
22 **(NWR September 15, 2003)**  
23 **Light Standards for Type V Fixtures**  
24 Light standards to support the Type V fixtures shall be fabricated as specified below  
25 and as detailed in the Plans.  
26  
27 The poles shall meet the requirements for the "No Mast Arm" light standard shown  
28 in Standard Plan J-1 and the following:  
29  
30 **Luminaire Bracket Support Flange:**  
31 A flange to support a luminaire bracket shall be welded to the shaft in  
32 accordance with the detail in the Plans.  
33  
34 **Pole Top Tenon and Luminaire Bracket:**  
35 The design shall include a pole top tenon and bracket assembly suitable for  
36 mounting two or three luminaire fixtures per pole. The rotatable assembly shall  
37 rest on the support flange and be anchored by means of set screws. The  
38 removable pole cap shall be metal. Tenon geometries shall be as shown in the  
39 Plans.  
40  
41 **Handhole:**  
42 When mounted on the barrier, the handhole shall be located on the  
43 downstream side.  
44  
45 **Base Details:**  
46 Base details shall conform to Standard Plan J-1b. Bases may be fixed or slip,  
47 as called for in the Plans.  
48  
49 **Median Barrier Installation:**  
50 Base plates shall be modified to conform with the dimensions shown on  
51 Standard Plan C-8b when poles are installed on median barrier.

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**Approvals:**

Shop drawings shall be approved by the Engineer prior to pole fabrication.

200225.GR8

**(August 3, 2009)**

**Traffic Signal Standards**

Traffic signal standards shall be furnished and installed in accordance with the methods and materials noted in the applicable Standard Plans, pre-approved plans, or special design plans.

All welds shall comply with the latest AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. Welding inspection shall comply with Section 6-03.3(25)A Welding Inspection.

Hardened washers shall be used with all signal arm connecting bolts instead of lockwashers. All signal arm AASHTO M 164 connecting bolts shall be tightened to 40 percent of proof load.

Traffic signal standard types and applicable characteristics are as follows:

Type PPB Pedestrian push button posts shall conform to Standard Plan J-7a or to one of the following pre-approved plans:

<u>Fabricator</u>	<u>Drawing No.</u>
Northwest Signal Supply Inc.	NWS 3540 Rev. 6-27-08 and NWS 3540B Rev. 6-27-08
Valmont Ind. Inc.	DB00655 Rev. F
Ameron Pole Prod. Div.	M3723 Rev. G
Union Metal Corp.	TA-10035 Rev. 3
West Coast Engineering Group	WSDOT-PP-01 Rev. 1

Type PS Pedestrian signal standards shall conform to Standard Plan J-7a or to one of the following pre-approved plans:

<u>Fabricator</u>	<u>Drawing No.</u>
Northwest Signal Supply Inc.	NWS 3540 Rev. 6-27-08 and NWS 3540B Rev. 6-27-08
Valmont Ind. Inc.	DB00655 Rev. F
Ameron Pole Prod. Div.	M3723 Rev. G or W3539 Rev. B
Union Metal Corp.	TA-10025 Rev. 14

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	West Coast Engineering Group	WSDOT-PP-02 Rev. 1
	American Pole Structures, Inc.	WS-PP-03 Rev. 1C
Type I	Type I vehicle signal standards shall conform to Standard Plan J-7a or to one of the following pre-approved plans:	
	<u>Fabricator</u>	<u>Drawing No.</u>
	Northwest Signal Supply Inc.	NWS 3540 Rev. 6-27-08 and NWS 3540B Rev. 6-27-08
	Valmont Ind. Inc.	DB00655 Rev. F
	Ameron Pole Prod. Div	M3723 Rev. G or W3539 Rev. B
	Union Metal Corp.	TA-10025 Rev. 14
	West Coast Engineering Group	WSDOT-PP-02 Rev. 1
	American Pole Structures, Inc.	WS-PP-03 Rev. 1C
Type FB	Type FB flashing beacon standard shall conform to Standard Plan J-7a or the following pre-approved plan:	
	<u>Fabricator</u>	<u>Drawing No.</u>
	Union Metal Corp	50200-B58 Rev. 4
	Valmont Ind. Inc.	DB00655 Rev. F
	Ameron Pole Prod. Div.	W3539 Rev. B
	Northwest Signal Supply, Inc.	NWS 3540 Rev. 6-27-08 and NWS 3540B Rev. 6-27-08
Type RM	Type RM ramp meter standard shall conform to Standard Plan J-7a or the following pre-approved plan:	
	<u>Fabricator</u>	<u>Drawing No.</u>
	Union Metal Corp	50200-B58 Rev. 4
	Valmont Ind. Inc.	DB00655 Rev. F
	Ameron Pole	W3539 Rev. B

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Prod. Div.  
Northwest Signal Supply, Inc. NWS 3540 Rev. 6-27-08 and NWS 3540B Rev. 6-27-08

Type CCTV	<u>Fabricator</u>	<u>Drawing No.</u>
	Valmont Industries, Inc.	DB 00759 Rev. H
	Ameron Pole Product Div.	W6CCTV1 Rev D
	West Coast Engineering Group	AP-WSDOT-CP-01-Rev. 3
	American Pole Structures, LLC	WS-CP-01 Rev. 01C

Type II	Characteristics:	
	Luminaire mounting height	N.A.
	Luminaire arms	N.A.
	Luminaire arm length	N.A.
	Signal arms	One Only

Type II standards shall conform to one of the following pre-approved plans, provided all other requirements noted herein have been satisfied. Maximum (x) (y) (z) signal arm loadings in cubic feet are noted after fabricator.

<u>Signal Arm Length (max)</u>	<u>Fabricator-(x) (y) (z)</u>	<u>Drawing No.</u>
65 ft.	Valmont Ind. Inc.-(2894)	DB00625-Rev. M, Shts. 1, 2 & 3
65 ft.	Union Metal Corp. (2900)	71026-B86 Rev. 7 shts. 1, 2, & 3
65 ft.	Ameron Pole-(2900) Prod. Div.	W3724-1 Rev. I & W3724-2 Rev. F
65 ft.	Northwest Signal-(2802) Supply Inc.	NWS 3500 Rev. 6/27/08 or NWS 3500B Rev. 6/27/08
45 ft.	American Pole(1875) Structures, Inc.	WS-T2-L Rev. 6
65 ft.	American Pole (2913) Structures, Inc.	WS-T2-H Rev. 6
65 ft.	West Coast Engineering Group	WSDOT-TS-01 Rev. 3 Sheets 1, 2, and 3
65 ft.	Maico Industries (2894)	WSDOTMA Rev. 3 Sheets 1, 2 and 3

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Type III	Characteristics:	
	Luminaire mounting height	30 ft., 35 ft., 40 ft., or 50 ft.
	Luminaire arms	One Only
	Luminaire arm type	Type 1
	Luminaire arm length (max.)	16 ft.
	Signal arms	One Only

Type III standards shall conform to one of the following pre-approved plans, provided all other requirements noted herein have been satisfied. Maximum (x) (y) (z) signal arm loadings in cubic feet are noted after fabricator.

<u>Signal Arm</u>	<u>Fabricator-(x) (y) (z)</u>	<u>Drawing No.</u>
<u>Length (max)</u>		
65 ft.	Valmont Ind. Inc.-(2947)	DB00625-Rev. M, Shts. 1, 2 & 3 and "J" luminaire arm
65 ft.	Union Metal Corp. (2900)	71026-B87 Rev. 8 Shts. 1, 2 & 3
65 ft.	Ameron Pole-(2900) Prod. Div.	W3724-1 Rev. I & W3724-2 Rev. F and "J" luminaire arm
65 ft.	Northwest Signal-(2802) Supply Inc.	NWS 3500 Rev. 6/27/08 or NWS 3500B Rev. 6/27/08
45 ft.	American Pole (1875) Structures, Inc.	WS-T3J-L, Sht. 1 of 2 Rev. 9, and Sht. 2 of 2 Rev. 4
65 ft.	American Pole (2913) Structures, Inc.	WS-T3J-H, Sht. 1 of 2 Rev. 8, and Sht. 2 of 2 Rev. 4
65 ft.	West Coast Engineering Group	WSDOT-TS-01 Rev. 3 Sheets 1, 2, and 3
65 ft.	Maico Industries (2947)	WSDOTMA Rev. 3 Sheets 1, 2 and 3 and "J" luminaire arm

Type IV Type IV strain pole standards shall be consistent with details in the plans and Standard Plan J-7c or one of the following pre-approved plans:

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<u>Fabricator</u>	<u>Drawing No.</u>
Northwest Signal Supply Inc.	NWS 3520 or NWS 3520B,

Valmont Ind. Inc.	5000-4
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Ameron Pole Prod. Div.	M3650 Rev. A
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Union Metal Corp.	EA-10224 Rev. 8
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American Pole Structures, Inc.	9000-12-037 Rev. A
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Maico Industries	WA-SP-4, Sheets 1 and 2 of 2
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Type V Type V combination strain pole and lighting standards shall be consistent with details in the plans and Standard Plan J-7c or one of the following pre-approved plans:

<u>Fabricator</u>	<u>Drawing No.</u>
Northwest Signal Supply Inc.	NWS 3520 or NWS 3520B

Valmont Ind. Inc.	5000-4
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Ameron Pole Prod. Div.	M3650 Rev. A
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Union Metal Corp.	EA-10225, Rev. 8 Shts. 1 & 2
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American Pole Structures, Inc.	9020-12-007 Rev. B
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Maico Industries	WA-SP-5, Sheets 1 and 2 of 2 and "J" luminaire arm
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The luminaire arm shall be Type 1, 16 foot maximum and the luminaire mounting height shall be 40 feet or 50 feet as noted in the plans.

Type SD Type SD standards require special design. All special design shall be based on the latest AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and pre-approved plans and as follows:

1. A 90 mph wind loading shall be used.
2. The Design Life and Recurrence Interval shall be 50 years for luminaire support structures exceeding 50 feet

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in height, and 25 years for all other luminaire support structures.

- 3. Fatigue design shall conform to AASHTO Section 11, Table 11-1 using fatigue category III.

Complete calculations for structural design, including anchor bolt details, shall be prepared by a Professional Engineer, licensed under Title 18 RCW, State of Washington, in the branch of Civil or Structural Engineering or by an individual holding valid registration in another state as a civil or structural Engineer.

All shop drawings and the cover page of all calculation submittals shall carry the Professional Engineer's original signature, date of signature, original seal, registration number, and date of expiration. The cover page shall include the contract number, contract title, and sequential index to calculation page numbers. Two copies of the associated design calculations shall be submitted for approval along with shop drawings.

Details for handholes and luminaire arm connections are available from the Bridges and Structures Office.

Foundations for various types of standards shall be as follows:

Type PPB	As noted on Standard Plan J-7a.
Type PS	As noted on Standard Plan J-7a.
Type I	As noted on Standard Plan J-7a.
Type FB	As noted on Standard Plan J-7a
Type RM	As noted on Standard Plan J-7a
Type CCTV	As noted in the Plans.
Type II	As noted in the Plans.
Type III	As noted in the Plans.
Type IV	As noted in the Plans and Standard Plan J-7c.
Type V	As noted in the Plans and Standard Plan J-7c.
Type SD	As noted in the Plans.

200226.GR8

**(August 3, 2009)**  
**Traffic Signal Standards**

Traffic signal standards shall be furnished and installed in accordance with the methods and materials noted in the applicable Standard Plans, pre-approved plans, or special design plans.

All welds shall comply with the latest AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals. Welding inspection shall comply with Section 6-03.3(25)A Welding Inspection.

Hardened washers shall be used with all signal arm connecting bolts instead of lockwashers. All signal arm AASHTO M 164 connecting bolts shall be tightened to 40 percent of proof load.

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Traffic signal standard types and applicable characteristics are as follows:

Type PPB Pedestrian push button posts shall conform to Standard Plan J-7a or to one of the following pre-approved plans:

<u>Fabricator</u>	<u>Drawing No.</u>
Northwest Signal Supply Inc.	NWS 3540 Rev. 6-27-08 and NWS 3540B Rev. 6-27-08
Valmont Ind. Inc.	DB00655 Rev. F
Ameron Pole Prod. Div.	M3723 Rev. G
Union Metal Corp.	10035 Rev. 3
West Coast Engineering Group	WSDOT-PP-01 Rev. 1

Type PS Pedestrian signal standards shall conform to Standard Plan J-7a or to one of the following pre-approved plans:

<u>Fabricator</u>	<u>Drawing No.</u>
Northwest Signal Supply Inc.	NWS 3540 Rev. 6-27-08 and NWS 3540B Rev. 6-27-08
Valmont Ind. Inc.	DB00655 Rev. F
Ameron Pole Prod. Div.	M3723 Rev. G or W3539 Rev. B
Union Metal Corp.	TA-10025-A, Rev. 14
West Coast Engineering Group	WSDOT-PP-02 Rev. 1
American Pole Structures, Inc.	WS-PP-03 Rev. 1C

Type I Type I vehicle signal standards shall conform to Standard Plan J-7a or to one of the following pre-approved plans:

<u>Fabricator</u>	<u>Drawing No.</u>
Northwest Signal Supply Inc.	NWS 3540 Rev. 6-27-08 and NWS 3540B Rev. 6-27-08
Valmont Ind. Inc.	DB00655 Rev. F
Ameron Pole Prod. Div.	M3723 Rev. E or W3539 Rev. A

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2		Union Metal Corp.	TA-10025 Rev. 14
3			
4		West Coast	
5		Engineering Group	WSDOT-PP-02 Rev. 1
6			
7		American Pole	WS-PP-03 Rev. 1C
8		Structures, Inc.	
9			
10	Type FB	Type FB flashing beacon standard shall conform to Standard	
11		Plan J-7a or the following pre-approved plan:	
12			
13		<u>Fabricator</u>	<u>Drawing No.</u>
14		Valmont Ind. Inc.	DB00655 Rev. F
15			
16		Union Metal Corp.	50200-B58 Rev. 4
17			
18		Ameron Pole	W3539 Rev. A
19		Prod. Div.	
20			
21		Northwest Signal	NWS 3540 Rev. 6-27-08 and
22		Supply Inc.	NWS 3540B Rev. 6-27-08
23			
24	Type RM	Type RM ramp meter standard shall conform to Standard Plan J-	
25		7a or the following pre-approved plan:	
26			
27		<u>Fabricator</u>	<u>Drawing No.</u>
28		Valmont Ind. Inc.	DB00655 Rev. F
29			
30		Union Metal Corp.	50200-B58 Rev. 4
31			
32		Ameron Pole	W3539 Rev. B
33		Prod. Div.	
34			
35		Northwest Signal	NWS 3540 Rev. 6-27-08 and
36		Supply Inc.	NWS 3540B Rev. 6-27-08
37			
38	Type CCTV	<u>Fabricator</u>	<u>Drawing No.</u>
39		Valmont Industries, Inc.	DB 00759 Rev. H
40		Ameron Pole Product Div.	W6CCTV1 Rev. D
41		West Coast Engineering Group	AP-WSDOT-CP-01 Rev. 3
42		American Pole Structures, LLC	WS-CP-01 Rev. 01C
43			
44	Type II	Characteristics:	
45			
46		Luminaire mounting height	N.A.
47		Luminaire arms	N.A.
48		Luminaire arm length	N.A.
49		Signal arms	One Only
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Type II standards shall conform to one of the following pre-approved plans, provided all other requirements noted herein have been satisfied. Maximum (x) (y) (z) signal arm loadings in cubic feet are noted after fabricator.

<u>Signal Arm Length (max)</u>	<u>Fabricator-(x) (y) (z)</u>	<u>Drawing No.</u>
60 ft.	Valmont Ind. Inc.-(2894)	DB00625-Rev. M, Shts. 1, 2 & 3
65 ft.	Union Metal Corp. (2900)	71026-B86 Rev. 7 Shts. 1, 2 & 3
65 ft.	Ameron Pole-(2900)	W3724-1 Rev. I & W3724-2 Rev. F
65 ft.	Northwest Signal-(2802) Supply Inc.	NWS 3505 Rev. 6/27/08 or NWS 3505B Rev. 6/27/08
45 ft.	American Pole (1875) Structures, Inc.	WS-T2-L Rev. 6
65 ft.	American Pole (2913) Structures, Inc.	WS-T2-H Rev. 6
65 ft.	West Coast Engineering Group	WSDOT-TS-01 Rev. 3 Sheets 1, 2, and 3
65 ft.	Maico Industries (2894)	WSDOTMA Rev. 3 Sheets 1, 2 and 3

Type III	Characteristics:	
	Luminaire mounting height	30 ft., 35 ft., 40 ft., or 50 ft.
	Luminaire arms	One Only
	Luminaire arm type	Type 2
	Luminaire arm length (max.)	16 ft.
	Signal arms	One Only

Type III standards shall conform to one of the following pre-approved plans, provided all other requirements noted herein have been satisfied. Maximum (x) (y) (z) signal arm loadings in cubic feet are noted after fabricator.

<u>Signal Arm Length (max)</u>	<u>Fabricator-(x) (y) (z)</u>	<u>Drawing No.</u>
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1	65 ft.	Valmont Ind. Inc.-(2947)	DB00625-Rev. M, Shts. 1, 2 & 3 and "T" luminaire arm
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5	65 ft.	Northwest Signal-(2802) Supply Inc.	NWS 3505 Rev. 6/27/08 or NWS 3505B Rev. 6/27/08
6			
7			
8	65 ft.	Ameron Pole-(2900) Prod. Div.	W3724-1 Rev. I & W3724-2 Rev. F and "T" luminaire arm
9			
10			
11			
12	65 ft	West Coast	WSDOT-TS-01 Rev. 3 Engineering Group
13			
14		Sheets 1, 2, and 3	
15			
16	65 ft.	Maico Industries (2947)	WSDOTMA Rev. 3 Sheets 1, 2 and 3 and "T" luminaire arm
17			
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19			
20	Type IV	Type IV strain pole standards shall be consistent with details in the Plans and Standard Plan J-7c or one of the following pre- approved plans:	
21			
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24		<u>Fabricator</u>	<u>Drawing No.</u>
25		Northwest Signal	NWS 3525 or NWS 3525B
26		Supply Inc.	
27			
28		Valmont Ind. Inc.	5000-4
29			
30		Ameron Pole	M3650 Rev. A
31		Prod. Div.	
32			
33		Union Metal Corp.	EA-10224, Rev. 8
34			
35		American Pole	9000-12-037 Rev. A
36		Structures, Inc.	
37			
38		Maico Industries	WA-SP-4, Sheets 1 and 2 of 2
39			
40	Type V	Type V combination strain pole and lighting standards shall be consistent with details in the Plans and Standard Plan J-7c or one of the following pre-approved plans:	
41			
42			
43			
44		<u>Fabricator</u>	<u>Drawing No.</u>
45		Ameron Pole	M3650 Rev. A
46		Prod. Div.	
47			
48		Northwest Signal	NWS 3525 or NWS 3525B
49		Supply Inc.	
50			
51		American Pole	9020-12-007 Rev. B

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Structures, Inc.

Maico Industries

WA-SP-5, Sheets 1 and 2 of 2  
and "T" luminaire arm

The luminaire arm shall be Type 2, 16 foot maximum and the luminaire mounting height shall be 40 feet or 50 feet as noted in the Plans.

Type SD

Type SD standards require special design. All special design shall be based on the latest AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals and pre-approved plans and as follows:

1. A 90 mph wind loading shall be used.
2. The Design Life and Recurrence Interval shall be 50 years for luminaire support structures exceeding 50 feet in height, and 25 years for all other luminaire support structures.
3. Fatigue design shall conform to AASHTO Section 11, Table 11-1 using fatigue category III.

Complete calculations for structural design, including anchor bolt details, shall be prepared by a Professional Engineer, licensed under Title 18 RCW, State of Washington, in the branch of Civil or Structural Engineering or by an individual holding valid registration in another state as a civil or structural Engineer.

All shop drawings and the cover page of all calculation submittals shall carry the Professional Engineer's original signature, date of signature, original seal, registration number, and date of expiration. The cover page shall include the contract number, contract title, and sequential index to calculation page numbers. Two copies of the associated design calculations shall be submitted for approval along with shop drawings.

Details for handholes and luminaire arm connections are available from the Bridges and Structures Office.

Foundations for various types of standards shall be as follows:

- |           |                                 |
|-----------|---------------------------------|
| Type PPB  | As noted on Standard Plan J-7a. |
| Type PS   | As noted on Standard Plan J-7a. |
| Type I    | As noted on Standard Plan J-7a. |
| Type FB   | As noted on Standard Plan J-7a. |
| Type RM   | As noted on Standard Plan J-7a. |
| Type CCTV | As noted in the Plans.          |
| Type II   | As noted in the Plans.          |
| Type III  | As noted in the Plans.          |

1                   Type IV        As noted in the Plans and Standard Plan J-7c.  
 2                   Type V        As noted in the Plans and Standard Plan J-7c.  
 3                   Type SD       As noted in the Plans.  
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 5 FMOUT.DT1  
 6                   (\*\*\*\*\*)  
 7                   **Electrical Outlet**  
 8                   \$\$1\$\$  
 9  
 10 FMDECC.DT1  
 11                   (\*\*\*\*\*)  
 12                   **Decorative Concrete Lighting Standard**  
 13                   \$\$1\$\$  
 14  
 15 FMTS.DT1  
 16                   **Timber Light Standards, Timber Strain Poles, Timber Service Supports**  
 17                   Section 9-29.6(3) is supplemented with the following:  
 18  
 19                   (\*\*\*\*\*)  
 20                   \$\$1\$\$  
 21  
 22 GMLUMIN.DT1  
 23                   **Luminaires**  
 24  
 25 GMCOBRA.DT1  
 26                   **Cobra Head Luminaires**  
 27                   Section 9-29.10(1) is supplemented with the following:  
 28  
 29                   (NWR October 5, 2009)  
 30                   Conventional highway luminaires shall be a Type III-Medium-Cutoff Distribution  
 31                   fixture.  
 32  
 33 FMDEC.DT1  
 34                   **Decorative Luminaires**  
 35                   Section 9-29.10(2) is supplemented with the following:  
 36  
 37                   (\*\*\*\*\*)  
 38                   \$\$1\$\$  
 39  
 40 FMHMLTVF.DT1  
 41                   (NWR May 1, 2006)  
 42                   **High Mast Luminaires and Post Top Luminaires**  
 43                   Section 9-29.10(3) is supplemented with the following:  
 44  
 45                   **Type V Fixture for High Mast Light Standards**  
 46                   Type V fixtures for high mast light (HML) standards shall be of the same  
 47                   manufacturer and external appearance, and shall be compatible with the  
 48                   lowering system and associated HML standard called for in these Special  
 49                   Provisions.  
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 51                   Fixtures shall be flat glass lens or open bottom as indicated in the Plans.  
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Flat glass lens fixtures shall be one of the following:

- General Electric HMAA=40 5 5 G 1 G MC5 F
- Holophane HMSD-4ORHP-48-S-8-PS-FD2
- VA25-V-HPS400-480-SG-FG-MR-FDD

Open bottom fixtures shall be one of the following:

- General Electric HMAA=40 5 5 G 1 N MC5 F
- Holophane HMSD-4ORHP-48-S-8-PS-FD2
- Metrolux VA25-V-HPS400-480-SG-OBR-MR-FDD

The entire exterior of the fixture including the ballast/slip fitter mount and the reflector housing shall be finished with a powder coated polyurethane low luster finish matching Federal Standard 595B color chip \*\*\* \$\$1\$\$ \*\*\*. The housing shall withstand a 1000-hour salt spray test as specified in ASTM B 117.

GMXUD.DT1

**(NWR May 1, 2006)**  
**Underdeck and Wall Mount Luminaires**

Section 9-29.10(4) is supplemented with the following:

Underdeck fixtures shall be wall mountable and shall be hose-down rated with a gasket between the doorframe and ballast housings and between the doorframe and lens. Housing shall be low copper alloy cast aluminum with gray paint finish. The luminaires down light efficiency shall be no less than 64% of lamp output, with peak candle power occurring at 65 to 70 degrees, using a heavy borosilicate prismatic glass lens with 180 degree beam spread. Lamps shall have HPF ballasts, per requirements of Section 9-29.9. Lamps shall be high-pressure sodium, with mogul base socket. Lens shall be vandal resistant. The luminaires shall have wire protective guards on the lenses. Fusing shall be provided for all conductors above ground potential.

SIGNLIGHT.DT1

**Sign Lighting Luminaires**

Section 9-29.10(5) is revised to read:

(NWR October 5, 2009)  
Sign Light fixtures and lamps shall be the Induction type.

GMESM.DT1

***Electrical Splice Materials***

GMAIRSPL.DT1

Section 9-29.12 is supplemented with the following:

**(NWR April 19, 1995)**  
**Aerial Splice Enclosures**

Aerial splice enclosures shall meet the requirements of REA specification PE-52 and GTE Automatic Electric Specification GTS-8514. Aerial splice enclosures shall

1 be re-enterable and resealable without requiring special tools or equipment.  
2 Conductor connections shall be sealed, moisture resistant telephone type  
3 connectors approved for outside use. The cable shields shall be bonded using an  
4 approved low resistance shield connector.  
5

6 GMLOOPSP.L.DT1

7 **(NWR May 1, 2006)**

8 **Traffic Signal Splice Material**

9 Section 9-29.12(2) is revised to read:

10

11 Induction loop splices shall be either moisture resistant two way heat shrink  
12 type meeting SAE-AMS I-23053, or re-enterable type with semi-hardening  
13 epoxy filling compound that remains semi-flexible enclosed in a re-enterable  
14 rigid mold with end cap seals.  
15

16

16 GMSIGCON.DT1

17 **Traffic Signal Controllers**

18

19 GMEMPRE.DT1

20 **Emergency Preemption**

21 Section 9-29.13(3) is supplemented with the following:

22

23 GMFCTL.DT1

24

**(NWR May 1, 2006)**

25

**Emergency Preemption Logic - NEMA**

26

26 The traffic signal controller shall have the capability of preempting normal  
27 traffic signal operation.

28

29 The preemption logic shall be an internal software function of the traffic signal  
30 controller.

31

32 The preemption system shall include the additional functions:

33

34 When a preemption call is registered for the phase or phases the  
35 controller is presently serving, the controller shall remain in that phase  
36 until this call is dropped.  
37

38

38 During any preemption phase, "Don't Walk" or "Hand Symbol" shall be  
39 displayed on all pedestrian heads.  
40

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41 GMPRE.DT1

42

**(NWR August 10, 2009)**

43

**Preemption:**

44

44 The system shall be capable of preempting the controller to the phases shown  
45 in the Plans when a signal is received from the field detector.

46

47 Pre-emption equipment shall be either Opticom or Tomar.

48

49 **Opticom**

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50 If Opticom pre-emption equipment is used, the Contractor shall furnish  
51 and install the following:

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1. Pre-emption detectors shall be Opticom Model 711.
2. Discriminators shall be four-channel model 454 units. One is required at each controller.

In addition, where auxiliary Opticom pre-emption is used, the Contractor shall furnish and install the following:

3. A 757 auxiliary optical detector wiring harness where more than one detector is called for per channel.
4. A 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.

**Tomar**

Tomar equipment is allowed provided that it is able to receive and respond to Opticom emitter signals.

If Tomar equipment is used, the Contractor shall furnish and install the following:

1. Pre-emption detectors shall be Tomar Model 2091-SD complete with mount and mounting hardware.
2. Discriminators shall be Tomar Model 3080 four-channel units. One is required per controller.
3. The Contractor shall make all initial range adjustments.
4. The pre-emption function operation tests shall be performed using an Opticom emitter.

GMHARD.DT1

**(NWR November 16, 1995)**

**Emergency Preemption Hardwire:**

Emergency preemption hardwire equipment installed by this contract shall activate the Emergency Preemption Logic in the traffic signal controller when a signal is received from a dry contact closure.

The contact closure shall be activated by a 120-volt input that is isolated from all controller circuitry.

The equipment used to provide the contact closure shall be housed in a separate enclosure located within the controller cabinet.

1 GMRIS.DT1  
2 **(NWR September 16, 2002)**  
3 **Radio Interference Suppressers**  
4 Section 9-29.13(6) is supplemented with the following:  
5  
6 The interference filters shall be hermetically sealed in a substantial metal case  
7 filled with a suitable insulating compound.  
8  
9 FMTAC.DT1  
10 **(NWR March 13, 1995)**  
11 **Traffic Actuated Controllers**  
12 Section 9-29.13(7) is supplemented with the following:  
13  
14 \*\*\* \$\$1\$\$ \*\*\* control equipment shall be used in this contract.  
15  
16 GMNEMA.DT1  
17 (NWR July 22, 1999)  
18 The local signal control unit shall be a fully actuated, eight-phase controller.  
19 Pedestrian functions on a minimum of four phases shall be provided.  
20  
21 The following functions shall also be provided in the local signal control unit:  
22  
23 1. Guaranteed Yellow  
24 The Yellow interval for all phases shall be 3.5 seconds unless the  
25 operator sets a higher value for it.  
26  
27 2. Simultaneous Gap Out  
28 Two concurrently timing phases shall simultaneously reach a rest  
29 state prior to their termination by gap out and prior to advancing  
30 across the barrier. A phase in dual ring operation may re-time its gap  
31 from a rest state upon vehicle actuation.  
32  
33 GMNCAUX.DT1  
34 **(NWR Febraury 22, 2005)**  
35 **Auxiliary Equipment for NEMA Controllers**  
36 Section 9-29.13(7)B is supplemented with the following:  
37  
38 **NEMA Traffic Actuated Controllers**  
39 The cabinet(s) shall contain the following accessories and auxiliary  
40 equipment:  
41  
42 Modem: When a NEMA master controller is installed, it shall have an  
43 external modem with a minimum baud rate of 14.4 Kbit per second.  
44 The modem shall have auto answer and auto hang-up operation.  
45  
46 Convenience Outlet & Lamp Socket: Two convenience outlets and a  
47 lamp socket shall be furnished in the cabinet(s). The outlets shall be  
48 mounted one on each side of the cabinet, near the top shelf, not on  
49 the door. The outlet mounted on the right side shall be ground fault  
50 interrupted protected. A switch shall activate the lamp when the door  
51 is open. These circuits shall be protected by a circuit breaker rated at

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25 Amps. An incandescent 150-watt bulb shall be provided. The light shall be installed a minimum of 12 inches from the vent fan thermostat.

Power Supply: A +24 volt DC regulated power supply capable of supplying 4.8 amperes continuously shall be provided. The power supply shall be shelf mounted and have a connector part number MS3102A-18-1P with the following pinout:

Pin 1	AC+	Pin 3	DC-
Pin 2	AC-	Pin 4	+24V DC

The supply shall be separate from the controller power supply and connected to the second channel of the conflict monitor.

Schematics & Manuals: The cabinet(s) shall have a waterproof envelope with a side access attached to the inside of the door. At the time of delivery the envelope shall have two complete sets of schematics and manuals for all assemblies and sub-assemblies. In addition, the cabinet shall arrive with two sets of cabinet prints including circuit schematics for each model of the following:

1. Controller
2. Conflict Monitor
3. Preemption Equipment
4. Loop Amplifiers
5. Detection

Fourth (D) Connector: A CPC black plastic fourth connector (part no. AMP 205842-1) shall be provided with the following pin assignments:

1	Emergency Preempt 4 Out	2	
3		4	Special Function 2 Out
5		6	
7		8	
9		10	
11	Flash Out	12	
13	Auxiliary Detection #8	14	
15	Special Function 3 Out	16	
17	Auxiliary Detection #1	18	Auxiliary Detection #4
19	System Enable	20	
21		22	Emergency Preempt 2 Out
23	Emergency Preempt Railroad	24	
25	on Special Function 2 In	26	Special Function 1 In
27	Free/Coordinate Out	28	Special Function 1 Out
29		30	Auxiliary Detection #5
31	Auxiliary Detection #3	32	Emergency Preempt 1 Out
33		34	Emergency Preempt 3 Out
35	Special Function 3 In	36	
37	Flash Status In	38	

1	39	Auxiliary Detection #6	40	Auxiliary Detection #7
2	41		42	
3	43		44	
4	45		46	
5	47	Auxiliary Detection #2	48	
6	49	EVP-1 (In)	50	EVP-2 (In)
7	51		52	
8	53		54	
9	55	EVP-3 (In)	56	EVP-4 (In)
10	57	Railroad Preempt (In)	58	
11	59		60	Flash Command In

12  
13 Service Panel Switches

14 Power Switches: There shall **not** be a main power switch inside  
15 the cabinet(s) that shall render all control equipment electrically  
16 dead when turned off. There shall be a controller power switch  
17 that shall render the controller and load switching devices  
18 electrically dead while maintaining flashing operation for  
19 purposes of changing the controller or load switching devices.  
20 The switch shall be a general purpose bat style toggle switch  
21 with an approximately 11/16 in. long bat. The switch shall have a  
22 protective cover, which must be lifted to operate the switch.  
23

24 Stop Time Switch: There shall be a 3 position switch located  
25 inside the cabinet door identified as the Stop Time switch. Its  
26 positions shall be labeled "Normal" (up), "Off" (center), and "On"  
27 (down). With the switch in its Normal position, a stop timing  
28 command may be applied to the controller by the police flash  
29 switch or the conflict monitor unit. When the switch is in its "Off"  
30 position, stop timing commands shall be removed from the  
31 controller. The "On" position of the switch shall cause the  
32 controller to stop timing. The switch shall be a general purpose  
33 bat style toggle switch with an approximately 11/16 in. long bat.  
34 The switch shall have a protective cover, which must be lifted to  
35 operate the switch.  
36

37 Detector Disconnect/Test Switches: All eight controller phase  
38 inputs shall have disconnect/test switches. Pedestrian detection  
39 shall have disconnect/test switches by phase. These switches  
40 shall be located inside the cabinet door and labeled by  
41 associated phase number. The 3 positions of the switches shall  
42 be labeled "Normal" (up) which shall connect the controller to its  
43 detector output; "Off" (Center) which shall isolate the controller  
44 detection input; and "Test" (down) which shall provide a  
45 momentary logic ground to the controller detection input. A see-  
46 through Plexiglas cover shall cover all detector disconnect/test  
47 switches.  
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49 Police Panel Switches

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Red Flash Program: Flash operation must be programmable without removing field wiring (i.e. red/yellow jumpers). The cabinet shall be delivered programmed for all red flash.

Load Switches: Load switching devices shall conform to the physical and electrical characteristics specified in NEMA Publication No. TS1-1976, Part 5 (TS1-5.01 - Triple-Signal Load Switching). They shall use modular solid state relays and have status indicators for each input and output. They shall be interchangeable. The load switches shall be rack-mounted and supported to relieve tension on the connections. Load switches shall be provided for all phases, not just phases used with the current configuration. The cabinet shall be furnished with a 16 position load bay. Load switches shall include indicator lights on both the input and output circuits.

Conflict Monitor Unit: The conflict monitor shall be a unit capable of monitoring proper signal operation of 12 channels. It shall conform to the physical and electrical characteristics specified in the latest NEMA Publication and the following. The monitor shall have a LCD-type display with separate indications for red, yellow, green and walk intervals for each channel. The monitor shall clearly display the status of each input during normal operation and failure condition. No flashing indications will be accepted. The monitor shall log the type of failure, the channels involved, the time and the date for a minimum of 8 events. The monitor shall have a printer port available. All cables and software to communicate with the monitor shall be provided. Clearing the log shall be possible from the front panel.

Pedestrian Detector Field Wiring: All pedestrian detectors shall be connected between logic ground and their appropriate field terminal. The terminals shall be grouped together and located in the lower left side panel.

Cabinet Relays: All mechanical relays shall be commonly available from more than one manufacturer and have 24 Volt DC or 120 Volt AC relay coils. Every socket, which has the capacity of accepting a relay or load switch, shall have the appropriate relay or load switch installed. The relays shall be easily accessible, not covered by equipment or wiring.

Preemption Equipment: Each call channel of the discriminators shall be wired through a disconnect/test switch, located on the service panel, which operates in the same manner as the Detector Disconnect/Test switches. The discriminators shall be located in the detector rack.

No calls shall be placed on the non-preempt phases. Preempt calls shall be inhibited during Flashing operation.

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Loop Detectors: A total of 16 two channel loop detectors are required at each cabinet. Detectors shall be Reno A&E Type "C1203" for NEMA cabinets.

Field Wiring Terminals: There shall be terminal strips for field wiring in the controller cabinet. The terminals shall be numbered in accordance to the field wiring chart included in these specifications. A common bus bar with a minimum of 15 spare terminals shall be available after the cabinet is fully wired. In addition, a 15 terminal bar shall be provided for the pedestrian common and a terminal shall be provided for each signal head neutral. The bus bars shall be located on the left side wall of the cabinet.

Interference Suppressers: All power supplies of equipment used here shall have electrical interference immunity from other devices within the cabinet.

Surge Protector (Lightning Arrester): The cabinet(s) shall have an input voltage surge protector that shall protect the controller power supply input from any voltage surges that could damage it. Interconnect cable terminal strips shall be equipped with lightning surge protectors. The cabinet shall be wired to light LED indicators when surge protection has been activated. The LED indicator shall be mounted facing the front to allow unobstructed view of the indicator. In addition, there shall be a metal oxide varactor (MOV) between ground and hot and between the neutral and ground.

Power Panel Cover: The power panel shall be covered by an easily removable, clear Plexiglas cover.

AC Delay Relay: A delay relay shall be provided which shall delay AC power to the controller and conflict monitor, programmable for 1 to 5 seconds delay, upon restoration of power to the cabinet.

Detector Rack Configuration:  
Detector racks shall have a socket with a 44 pin wiring configuration. Detector racks shall be configured as follows:

DETECTOR RACK

Phase 1	Phase 1	Phase 5	Phase 5	PreEmpt Chan 1
816-817	818-819	856-857	858-859	
Phase 6	Phase 6	Phase 2	Phase 2	
866-867	963-964	826-827	923-924	

DETECTOR RACK

Phase 6	Phase 6	Phase 2	Phase 2	PreEmpt Chan 2
868-869	961-962	828-829	921-922	
Phase 6	Phase 6	Phase 2	Phase 2	
967-968	965-966	927-928	925-926	

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DETECTOR RACK

Phase 3	Phase 3	Phase 7	Phase 7	PreEmpt Chan 3
836-837	838-839	876-877	878-879	
Phase 8	Phase 8	Phase 4	Phase 4	
886-887	983-984	846-847	943-944	

DETECTOR RACK

Phase 8	Phase 8	Phase 4	Phase 4	PreEmpt Chan 4
888-889	981-982	848-849	941-942	
Phase 8	Phase 8	Phase 4	Phase 4	
987-988	985-986	947-948	945-946	

All 800 series numbers are connected to the appropriate NEMA phase controller inputs through a service panel detector switch. All 900 series numbers are connected to the appropriate NEMA plus controller auxiliary detector inputs through a service panel detector switch.

GMCAUX.DT1

**(NWR March 31, 2008)**  
**Auxiliary Equipment for Type 170E, 2070, 2070 Lite, ITS/ATC Controllers**  
Section 9-29.13(7)C is supplemented with the following:

Traffic signal control equipment to be furnished shall be provided with:

1. Flash Indication Jumper Plugs  
One for each vehicle display load switch socket (eight minimum). Provides quick and easy change of indications, either red or yellow, for display during flashing operations.
2. Load Switches  
All load switches shall be model 200 units equipped with replaceable solid state relay modules. Load switches shall be provided for all phases, not just phases used with the current configuration.
3. Detection Panel  
The detection panel configuration shall conform to the details shown in the Plans. Detection test switches shall be provided for each vehicle and pedestrian input on the input file. The indicators shall be high intensity LEDs.
4. Conflict Monitor  
For type 170E controllers, the conflict monitor shall be a Model 210N unit. For 2070, 2070 Lite and ITS/ATC controllers the conflict monitor shall be a Model 2010 ECL unit. The conflict monitor shall be capable of supporting the flashing yellow arrow signal head display configuration.

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5. Loop Detectors

A total of 16 two-channel loop detectors are required at each cabinet. Detectors shall be Reno A & E Type "C1103-SS".

FMCAUX4.DT1

(NWR April 13, 1996)

\*\*\* \$\$\$\$\$\$ \*\*\* Display Panel

The display panel shall depict a generic eight-phase operation. Panel configuration shall conform to the details shown in the Plans. Panel mounting shall be of a type that allows installation of the panel in four different orientations. The connecting cable shall be long enough to allow any mounting orientation. No diodes will be allowed.

GM CAB.DT1

**(NWR January 23, 2006)**

**NEMA Controller Cabinets**

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

Construction shall be of 0.125-inch sheet aluminum (5052 alloy), with mill finish. The cabinet shall not be anodized and the exterior shall not be painted.

A green construction core shall be installed at each core lock. Upon contract completion two master keys for each cabinet shall be delivered to the Engineer.

GMNCAB.DT1

(NWR April 28, 1999)

The cabinet shall be wired for eight vehicle phases, four pedestrian phases, four overlaps, and use with a modem.

The cabinet shall have a computer shelf 16 inches wide and 12 inches deep centered under the lower shelf.

Where the Plans call for a master controller the cabinet shall be wired for use with the master controller.

GMADAPT.DT1

(NWR April 28, 1999)

The adaptor box shall be fabricated from .125-inch aluminum (5052 alloy), with mill finish. The cabinet shall not be anodized and the exterior shall not be painted.

The Contractor shall verify foundation and cabinet dimensions and mounting bolt patterns prior to submitting shop drawings for the adaptor box to the Engineer. The shop drawings shall be submitted for approval 10 working days in advance of fabrication.

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The new controller cabinet, if Contracting Agency-supplied, will be available for bolt pattern verification as identified under the subsection, **Contracting Agency-Supplied Materials** of this provision.

GM170CAB.DT1

(NWR October 16, 2006)

**Type 170E, 170E-HC-11, 2070, 2070 Lite, ATC Controller Cabinets**

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

Construction shall be of 0.125-inch sheet aluminum (5052 alloy), with mill finish.

A green construction core shall be installed at each core lock. Upon contract completion, two master keys for each cabinet shall be delivered to the Engineer.

GMTRANSW.DT1

(NWR August 10, 2009)

**Generator Transfer Switch**

The traffic signal controller cabinet shall be provided with an externally semi-flush mounted transfer switch capable of transferring power from a utility power source to an externally generated power source.

The transfer switch shall be as follows:

Model:	FS500150-PL
Manufacturer:	GenTran PO Box 1001 Alpharetta, Ga 30009 888-GENTRAN (436-8726) <a href="http://www.gen-tran.com">www.gen-tran.com</a>

GM170ADAPT.DT1

(NWR September 16, 2002)

The adaptor box shall be fabricated from .125-inch aluminum (5052 alloy), with mill finish. The cabinet shall not be anodized and the exterior shall not be painted.

The Contractor shall verify foundation and cabinet dimensions and mounting bolt patterns prior to submitting shop drawings for the adaptor box to the Engineer. The shop drawings shall be submitted for approval 10 working days in advance of fabrication.

The new controller cabinet, if Contracting Agency-supplied, will be available for bolt pattern verification as identified under the subsection **Contracting Agency-Supplied Materials** of this provision.

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GMFLASH.DT1  
**(NWR January 23, 2006)**  
**Flashing Beacon Control**

Section 9-29.15 is supplemented with the following:

**Solid State Flasher**

The solid state flasher shall provide two output circuits to permit alternate flashing of signal faces. The flash rate shall be 55 flashes per minute  $\pm 10\%$ . Duty cycle for each circuit shall be 50% on, 50% off  $\pm 2\%$ .

Each circuit shall be rated at 15 amperes and switching shall occur at the zero crossover point of the AC voltage. The voltage range shall be 95 to 135 volts AC. The nominal voltage shall be 120 volts AC. The operating frequency range shall be 60 Hz  $\pm 3.0$  Hz. The two-circuit solid-state flasher shall be designed to operate as specified at any ambient temperature range from -30°F. to +165°F. (-34.4°C. to +73.8°C).

**Cabinet**

The raintight housing shall be aluminum, conforming to the requirements of Section 9-29.25 and this Special Provision. Cabinet dimensions shall be:

<u>Depth</u>	<u>Height</u>	<u>Width</u>
6 inches	10 inches	8 inches

The cabinet door shall have two hinges. The hinges shall meet the requirements for the alternate hinge detailed on Standard Plan J-3b. The cabinet door shall be secured with a spring-loaded construction core lock capable of accepting a Best CX series core. A green construction core shall be installed at each core lock. Upon contract completion two master keys for each cabinet shall be delivered to the Engineer. Socket bases for the flasher unit shall be mounted on a circuit board inside the cabinet.

GMHEAD.DT1  
**(NWR June 16, 2008)**  
**Vehicular Signal Heads**

Section 9-29.16 is supplemented with the following:

**Covering Material**

Signal head covering material shall consist of 4 mil minimum thickness black polyethylene sheeting.

GMFIBER.DT1  
**(NWR March 8, 2000)**  
**Fiber Optic Signal Head**

A 12-inch fiber optic signal section capable of alternately displaying a yellow arrow and a green arrow shall be furnished and installed where specified in the Plans.

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GMOPT.DT1

**(NWR March 8, 2004)**

**Optical Units**

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

All traffic signal displays shall be the Light Emitting Diode (LED) type and shall be from one of the following manufacturers:

Dialight Corporation  
1913 Atlantic Avenue  
Manasquan, NJ 08736  
Telephone: (732) 223-9400  
Fax: (732) 223-8788

GELcore, LLC  
6810 Halle Drive  
Valley View, OH 44125  
Telephone: (216) 606-6555  
Fax: (216) 606-6556

Precision Solar Controls, Inc.  
2960 Market Street  
Garland, TX 75041  
Telephone: (972) 278-0553  
Fax: (972) 271-9583

Each LED signal module shall be designed to be installed in the door frame of a standard traffic signal housing. The lamp socket, reflector holder and lens used with an incandescent lamp shall not be used in a signal section in which a LED signal module is installed. The installation of an LED signal module shall not require any modification to the housing. The LED signal module shall be a single, self-contained device, not requiring onsite assembly for installation into an existing traffic signal housing.

All red and yellow LED signal modules shall be manufactured with a matrix of AlInGaP LED light sources and green LED signal modules shall be manufactures with a matrix of InGaN LED light sources. The LED traffic signal module shall be operationally compatible with controllers and conflict monitors on this project. The LED lamp unit shall contain a disconnect that will show an open switch to the conflict monitor when less than 60% of the LEDs in the unit are operational.

Each LED module shall conform to the current standards in Institute of Transportation Engineers (ITE) VTCSH Part 2 and a Certificate of Compliance with these standards shall be submitted by the manufacturer for each type of signal head. The certificate shall state that the lot of signal heads meets the current ITE specification. A label shall be placed on each LED signal module certifying conformance to this specification. The manufacturer's name, trademark, serial number and other necessary identification shall be permanently marked on the backside of the LED signal module. LED signal modules used on this project shall be from the same manufacturer. A label

1 shall be provided on the LED housing and the Contractor shall mark the label  
2 with a permanent marker to note the installation date.  
3  
4 The manufacturer shall provide a written warranty against defects in materials  
5 and workmanship for the LED signal modules for a period of 60 months after  
6 the installation of the modules. All warranty documentation shall be given to  
7 the Engineer prior to installation.  
8

9 GMBKPLAT.DT1  
10 **(NWR March 31, 2008)**  
11 **Back Plates**

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

13  
14 Back plates shall be constructed of anodized aluminum and shall be mounted  
15 with stainless steel hardware. A 1 inch wide strip of yellow retro reflective,  
16 type IV prismatic sheeting, conforming to the requirements of 9-28.12, shall be  
17 applied around the perimeter of each back plate. The sheeting shall be  
18 applied in accordance with the manufacturer's recommendations. The  
19 application surface of the back plate shall be cleaned, degreased with  
20 isopropyl alcohol and dried prior to application of the sheeting.  
21

22 GMVDET.DT1  
23 **Vehicle Detector**

24 Section 9-29.18 is supplemented with the following:

25  
26 GMLOOP.DT1  
27 (NWR August 10, 2009)  
28 Loop detector amplifiers shall be as follows:

- 29  
30 Model: Model C-1103-SS  
31  
32 Manufacturer: Reno A&E  
33 4655 Aircenet Circle  
34 Reno, NV 89502  
35 Ph: (775) 826-2020  
36 www.renoe.com  
37

38 GMSEAL.DT1  
39 (NWR March 4, 2009)

40 Loop sealant for use in HMA pavement shall be one of the following:

- 41  
42 1. RAI Pro-Seal 6006EX  
43 2. QCM EAS-14  
44 3. 3M Black 5000  
45 4. Craftco Inc. Part #34271  
46

47 When 3M Black 5000 is installed below the final lift of an HMA installation, a  
48 minimum of 5 consecutive days of cure time is required before either the final lift is  
49 installed or vehicle traffic is allowed over the installation  
50

1 Loop sealant for use on concrete bridge decks and PCC pavement shall be one of  
2 the following:

- 3  
4 1. 3M Black 5000  
5 2. Gold Label Flex 1P  
6 3. QCM EAS-14  
7

8 Loop sealant installation shall conform to the manufacturer's recommendations.  
9

10 GMPPB.DT1

11 **(NWR September 16, 2002)**

12 **Pedestrian Push Buttons**

13 Section 9-29.19 is supplemented with the following:

14  
15 The assembly shall be constructed so that it will be impossible to receive an  
16 electrical shock under any weather conditions.  
17

18 GMPED.DT1

19 **Pedestrian Signals**

20 Section 9-29.20 is supplemented with the following:

21  
22 GMAUD.DT1

23 **(NWR April 16, 2001)**

24 **Audible Pedestrian Indicators**

25 Audible pedestrian indicators shall meet the requirements of the American Disability  
26 Act. Installation shall be done in conformance with procedures specified by the  
27 manufacturer and approved by the Engineer.  
28

29 Output shall be adjustable to provide a "Cuckoo" indication for north south  
30 movements or a "Peep-Peep" indication for east west movements. The indicators  
31 shall be self switching to one of two adjustable output levels depending on ambient  
32 noise conditions.  
33

34 Indicators shall be olive green.  
35

36 Indicators shall mount on top of pedestrian signals with a flex mount which can be  
37 used to aim the indicator. The mounting hardware shall incorporate an O ring and  
38 shall prevent entrance of moisture into the pedestrian signal.  
39

40 Indicators shall function when wired to the walk terminal and to the AC neutral  
41 terminal of the associated pedestrian signal.  
42

43 GMLED.DT1

44 **(NWR May 1, 2006)**

45 **LED Pedestrian Signal**

46 All pedestrian signal displays shall be the Light Emitting Diode (LED) type.  
47

48 GMPEDLED.DT1

49 **(NWR May 1, 2006)**

50 **LED Pedestrian Displays**

51 Section 9-29.20(1) is supplemented with the following:

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**LED Pedestrian Signal Display Modules**

Each LED pedestrian signal module shall be designed as retrofit replacements for optical units in a standard pedestrian signal housing and shall not require special tools for installation. The installation of an LED pedestrian module shall not require any modification to the housing. Each LED pedestrian module shall be a single, self-contained device, not requiring any on-site assembly for installation into any pedestrian signal housing. The power supply for the LED pedestrian module may be packaged as a separate module.

All pedestrian "HAND" modules shall be Portland Orange and shall conform to current ITE standards for size, chromaticity and intensity. LED pedestrian "HAND" modules shall be manufactured with a matrix of AlInGaP LED light sources. All pedestrian walking "MAN" modules shall be Lunar White and shall conform to current ITE standards for size, chromaticity and intensity. LED pedestrian walking "MAN" modules shall be manufactured with a matrix of InGaN LED light sources. The "HAND" and walking "MAN" message bearing surfaces shall be filled, not outline, symbols. The LED pedestrian modules shall be operationally compatible with controllers and conflict monitors on this project.

Each LED pedestrian module shall be protected against dust and moisture intrusion in accordance with the NEMA Moisture Resistant STD 250-1991 for Type 4 enclosures to protect all internal components. The assembly, manufacturing, and mounting of the LED pedestrian module shall be designed to assure all internal LED and electronic components are adequately supported to withstand mechanical shock and vibration from high winds and other sources. The manufacturer's name, trademark, serial number and other necessary identification shall be permanently marked on the backside of the LED pedestrian module. A label shall be provided on the LED housing and the Contractor shall mark the label with a permanent marker to note the installation date.

Each LED pedestrian module shall operate at  $60 \pm 3$  Hz. Nominal operating voltage for all measurements shall be  $120 \pm 3$  volts rms. The LED circuitry shall prevent flicker at less than 100 Hz over the voltage range specified above. Fluctuations in the line voltage specified above shall not affect luminous intensity by more than  $\pm 10\%$ . The signal module on-board circuitry shall include voltage surge protection to withstand high-repetition noise transients and low-repetition high-energy transients as stated in Section 2.1.6, NEMA Standard TS-2, 1992. The individual LED light sources shall be wired so that catastrophic failure of any one LED light source will result in the loss of not more than 20% of the signal module light sources. LED pedestrian signal modules shall provide a power factor of 0.90 or greater when operated at nominal operating voltage, and 77°C. Total harmonic distortion induced into an AC power line by an LED pedestrian module shall not exceed 20%. Each LED pedestrian module and associated onboard circuitry shall meet Federal Communications Commission (FCC) Title 47, SubPartB, Section 15 regulations concerning the emission of electrical noise. Two secured, color coded, 600V, 20AWG minimum, jacketed wires, conforming to the National

1 Electrical Code, rated for service at 221°C, shall be provided for electrical  
2 connection.

3  
4 GMSERV.DT1

5 **(NWR March 4, 2009)**

6 **Service Cabinets**

7 Section 9-29.24 is supplemented with the following:

8  
9 Service cabinets shall be fabricated from 0.125 inch sheet aluminum (5052 alloy)  
10 with mill finish. The aluminum shall not be anodized and the exterior shall not be  
11 painted.

12  
13 A spring-loaded construction core lock capable of accepting a Best 6-pin CX series  
14 core installed by others shall be installed on all doors accessing WSDOT  
15 equipment.

16  
17 Cabinet doors shall be four-hinged with a two-position door stop assembly and a  
18 three point latch.

19  
20 A three-position terminal block shall be installed between the main electrical service  
21 panel and the photocell assembly base.

22  
23 The cabinet bonding connection shall be a welded plate with stainless steel  
24 hardware, Belleville washers, cu/al lug, and antioxidant compound. The bolt shall  
25 be torqued to fully compress the Belleville washers.

26  
27 GMATT.DT1

28 **(NWR March 4, 2009)**

29 **Amplifier, Transformer, and Terminal Cabinets**

30 Section 9-29.25 is supplemented with the following:

31  
32 Nominal cabinet dimensions for Transformer 3.1 to 12.5 KVA shall be 20" (D) x 48"  
33 (H) x 24" (W).

34  
35 Cabinets shall be fabricated from 0.125-inch sheet aluminum (5052 alloy) with mill  
36 finish. Cabinets shall not be anodized and the exterior shall not be painted.

37  
38 Cabinet door hinges shall meet the requirements for the alternate hinge detailed on  
39 Standard Plan J-3b. Doors less than 3 feet in height shall have two hinges. Doors  
40 from 3 feet to 4 feet 8 inches in height shall have 3 hinges. Spacing of hinges for  
41 doors greater than 4 feet 8 inches in height shall not exceed 14 inches center to  
42 center.

43  
44 Three point latches are not required for terminal cabinets.

45  
46 GMCONST.DT1

47 **Construction Requirements**

48 Section 8-20.3 is supplemented with the following:

49

1 GCG.DT1  
2 **General**  
3 Section 8-20.3(1) is supplemented with the following:  
4  
5 FCORDER.DT1  
6 (\*\*\*\*\*)  
7 **Electrical Order of Work**  
8 \$\$1\$\$  
9  
10 GCENER.DT1  
11 (NWR May 15, 2000)  
12 Work shall be coordinated so that electrical equipment, with the exception of the  
13 service cabinet, is energized within 72 hours of installation.  
14  
15 GCTEMP.DT1  
16 (NWR June 20, 1995)  
17 Poles designated for removal shall not be removed prior to approval of the  
18 Engineer.  
19  
20 GCDISPLAY.DT1  
21 (NWR January 11, 2005)  
22 Signal displays shall be installed no more than 30 days prior to scheduled signal  
23 turn on or changeover.  
24  
25 GCCORE.DT1  
26 (NWR October 31, 2005)  
27 The Contractor shall coordinate installation of construction cores with Contracting  
28 Agency maintenance staff through the Engineer. The Contractor shall provide  
29 written notice to the Engineer, a minimum of seven working days in advance of  
30 proposed installation. The Contractor shall advise the Engineer in writing when  
31 construction cores are ready to be removed.  
32  
33 GCCREM.DT1  
34 (NWR May 15, 2000)  
35 **Removals**  
36 Removals associated with the electrical system shall not be stockpiled within the  
37 job site without the Engineer's approval.  
38  
39 FCCREM.DT1  
40 (NWR April 18, 1996)  
41 A portion of the existing electrical equipment to be removed shall remain the  
42 property of the Contracting Agency.  
43  
44 The following shall be disconnected, dismantled, and delivered to the Contracting  
45 Agency as specified in the subsection **Delivery of Removed Items**:  
46  
47 \*\*\*\$\$1\$\$\*\*\*  
48  
49 GCCREM2.DT1  
50 (NWR April 11, 2001)  
51 Remove all wires from salvaged light and signal standards.

1  
2 GCCONTR.DT1  
3 (NWR September 20, 1995)  
4 Controller cabinets shall not be removed until all associated electronic equipment is  
5 removed by Contracting Agency signals personnel. All other equipment shall be  
6 removed by the Contractor and delivered within 24 hours following removal to the  
7 Contracting Agency.  
8  
9 GCSPAN.DT1  
10 (NWR November 16, 1995)  
11 Span wire shall not be lowered or disconnected from strain poles until all  
12 associated signal heads and signs have been removed from the span.  
13  
14 GCSREM.DT1  
15 **(NWR August 5, 1996)**  
16 **Pole Shaft and Mast Arm Identification**  
17 All removed mast arms and pole shafts shall be identified by paper  
18 identification tags recording pole number, intersection location (such as SR  
19 XXX, Jct XXX), and mast arm length.  
20  
21 Four inch by six inch (minimum) tags shall be taped to corresponding pole  
22 shafts and mast arms. Information on the mast arm tag shall match the  
23 information on the corresponding pole shaft tag. Each tag shall be entirely  
24 covered with clear acetate tape. The tape shall be wrapped one full circle  
25 around the shaft or arm with a 1/2 inch minimum overlap at the ends and  
26 sides.  
27  
28 The Contractor shall bundle the complete signal standard assembly together. The  
29 assembly consists of pole shaft, mast arm, and connecting bolts. Connecting bolts  
30 shall be attached to the original mast arm base plate.  
31  
32 GCCPROP.DT1  
33 (NWR April 11, 2001)  
34 All removals associated with an electrical system, which are not designated to  
35 remain the property of the Contracting Agency, shall become the property of the  
36 Contractor and shall be removed from the project.  
37  
38 The Contractor shall:  
39  
40 Remove all wires for discontinued circuits from the conduit system.  
41  
42 Remove elbow sections of abandoned conduit entering junction boxes.  
43  
44 Abandoned conduit encountered during excavation shall be removed to the  
45 nearest outlets or as directed by the Engineer.  
46  
47 Remove foundations entirely, unless the Plans state otherwise.  
48  
49 Backfill voids created by removal of foundations and junction boxes.  
50 Backfilling and compaction shall be performed in accordance with Section 2-  
51 09.3(1)E.

1  
2 FCTREM.DT1  
3 (\*\*\*\*\*)  
4 **Relocation and Removal of Temporary Illumination**  
5 \$\$1\$\$  
6  
7 GCELEQ.DT1  
8 **(NWR February 22, 2005)**  
9 **Delivery of Removed Items**  
10 Removed electrical equipment which remains the property of the Contracting  
11 Agency shall be delivered to:  
12  
13 WSDOT Signal Shop  
14 3700 9th Ave. So.  
15 Seattle WA 98134  
16 Phone: (206) 442-2110  
17  
18 Five days written advance notice shall be delivered to both the Engineer and the  
19 Electronic Parts Specialist at the address listed above. Delivery shall occur during  
20 the hours of 8:00 a.m. to 2:00 p.m. Monday through Friday. Material will not be  
21 accepted without the required advance notice.  
22  
23 Equipment damaged during removal or delivery shall be repaired or replaced to the  
24 Engineer's satisfaction at no cost to the Contracting Agency.  
25  
26 The Contractor shall be responsible for unloading the equipment where directed by  
27 the Engineer at the delivery site.  
28  
29 GCSURF.DT1  
30 **(NWR May 15, 2000)**  
31 **Surface Mounted Appurtenances**  
32 Electrical appurtenances to be surface mounted on structures shall be mounted so  
33 that a minimum ¼ inch space is maintained between the appurtenance and  
34 structure.  
35  
36 GCCOND.DT1  
37 **(NWR August 10, 2009)**  
38 **Conduit**  
39 Section 8-20.3(5) is supplemented with the following:  
40  
41 Upon installation of wiring, all conduits entering pad mounted cabinets, all conduit  
42 entering ITS hubs, and all ITS conduit 2 inches in diameter or larger shall be sealed  
43 with an approved mechanical plug at both ends of the conduit run. Installation of  
44 mechanical plugs shall conform to the manufacturer's recommendations. Upon  
45 installation of wiring at other locations, conduit shall be sealed with duct seal. Upon  
46 installation of the pull string, spare conduit shall be plugged.  
47  
48 A pull string rated for 200 lbs. or greater shall be installed in all spare conduits.  
49  
50 Detectable underground warning tape shall be placed 12-inches above all innerduct  
51 installed in trenches.

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Location 14 AWG stranded orange USE insulated wire shall be placed in conjunction with all innerduct installed in trenches. The location wire shall be placed directly above the conduit containing innerduct in single conduit installations or between the conduits containing innerduct in multiple conduit installations.

Location wire routed into pull boxes or cable vaults shall be attached to the "C" channel or the cover hinge bracket with stainless steel bolts and straps. A 1-foot loop of locate wire shall be provided above the channel as shown in the Plans.

GCBORING.DT1

**(NWR October 16, 2006)**

**Boring**

In addition to the requirements for boring with casing, the Contractor shall submit to the Engineer for approval a pit plan and a proposed method of boring that includes, but is not limited to, the following:

- a. A pit plan depicting:
  - 1. Protection of traffic and pedestrians.
  - 2. The dimension of the pit.
  - 3. Shoring, bracing, struts, walers, or sheet pile
  - 4. Type of casing
  
- b. The proposed method of boring, including:
  - 1. The boring system
  - 2. The support system
  - 3. The support system under and at the bottom of the pit.

The shoring and boring pit plan shall be prepared by and bear the seal and signature of a Washington State licensed Professional Civil Engineer.

Installed casing pipe shall be free from grease, dirt, rust, moisture and any other deleterious contaminants.

Commercial concrete meeting the requirements of Section 6-02.3(2)B may be used to seal the casing.

GCJB.DT1

**(NWR October 16, 2006)**

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

Section 8-20.3(6) is supplemented with the following:

Unless otherwise noted in the Plans or approved by the Engineer, junction boxes, cable vaults and pull boxes shall not be placed within the traveled way or paved shoulders.

All junction boxes, cable vaults, and pull boxes placed within the traveled way or paved shoulders shall be heavy-duty.

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

When junction boxes, cable vaults and pull boxes are installed or adjusted prior to construction of finished grade, pre-molded joint filler for expansion joints may be placed around the junction boxes, cable vaults and pull boxes. The joint filler shall be removed prior to adjustment to finished grade.

Adjustments involving raising or lowering the junction boxes shall require conduit modification if the resultant clearance between top of conduit and the junction box lid becomes less than six inches or more than ten inches. Wiring shall be replaced if sufficient slack is not maintained.

The six-inch gravel pad required in Standard Plan J-11a shall be maintained. When existing junction boxes do not have this gravel pad, it shall be installed as part of the adjustment to finished grade.

Where conduit and junction boxes are placed in barrier, the prime Contractor shall coordinate the work of the Contractor constructing the barrier and the electrical Contractor so that each junction box placed in the barrier is placed in correct alignment with respect to the barrier, with the face of the box flush. The junction box shall be parallel to the top of the barrier within a 1-degree tolerance. If any point on the face of a junction box placed in barrier is recessed more than 1/8 inch from the surface of the barrier, the Contractor shall install a box extension per the Engineer's approval and grout around the extension or remove and replace the entire section of barrier.

Heavy-duty Type 4, 5 and 6 junction boxes, cable vaults and pull boxes shall be installed in accordance with the following:

1. Excavation and backfill shall be in accordance with Section 2-09. Excavation for junction boxes, cable vaults and pull boxes shall be sufficient to leave one foot in the clear between their outer surface and the earth bank.
2. Junction boxes, cable vaults and pull boxes shall be installed on a level 6-inch layer of crushed surfacing top course, in accordance with 9-03.9(3), placed on a compacted or undisturbed foundation. The crushed surfacing shall be compacted in accordance with Section 2-09.3(1)E.
3. After installation, the lid/cover shall be kept bolted down during periods when work is not actively in progress at the junction box, cable vault or pull box.
4. Before closing the lid/cover, the lid/cover and the frame/ring shall be thoroughly brushed and cleaned of all debris. There shall be absolutely no visible dirt, sand or other foreign matter between the bearing surfaces.

- 1                   5. When the lid/cover is closed for the final time, a liberal coating of anti-  
 2                   seize compound shall be applied to the bolts and nuts and the lid shall be  
 3                   securely tightened.  
 4  
 5                   6. Hinges on the Type 4, 5 and 6 junction boxes shall be located on the side  
 6                   of the box, which is nearest to adjacent shoulder. Hinges shall allow the lid  
 7                   to open 180 degrees.  
 8

9                   200308.GR8

10                  **Wiring**

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

12  
 13                  GCVCABLE.DT1

14                   **(NWR May 1, 2006)**

15                   **Video Detection Cable**

16                   Coaxial cable or combination (composite/Siamese) cable with 600V insulation  
 17                   rating for video detection may be installed in the same raceway with 480 volt  
 18                   illumination wiring.  
 19

20                  GCLABEL.DT1

21                   (NWR April 14, 2003)

22                   At each junction box, all illumination wires, power supply wires, and communication  
 23                   cable shall be labeled with a PVC marking sleeve. For illumination and power  
 24                   supply circuits the sleeve shall bear the circuit number. For communication cable  
 25                   the sleeve shall be marked "Comm."  
 26

27                  GCSPLICE.DT1

28                   (NWR March 13, 1995)

29                   All splices shall be made in the presence of the Engineer.  
 30

31                  GCTSPLICE.DT1

32                   **(NWR May 1, 2006)**

33                   **Illumination Circuit Splices**

34                   Temporary splices shall be the heat shrink type.  
 35

36                  20CHART.GR8

37                   **(March 13, 1995)**

38                   **Field Wiring Chart**

39                   501	AC+ Input	516-520 Railroad Pre-empt
40                   502	AC- Input	5A1-5D5 Emergency Pre-empt
41                   503-510	Control-Display	541-580 Coordination
42                   511-515	Sign Lights	581-599 Spare

43										
44	Movement Number	1	2	3	4	5	6	7	8	9
45										
46	Vehicle Head									
47	Red	611	621	631	641	651	661	671	681	691
48	Yellow	612	622	632	642	652	662	672	682	692
49	Green	613	623	633	643	653	663	673	683	693
50	Spare	614	624	634	644	654	664	674	684	694
51	Spare	615	625	635	645	655	665	675	685	695

1	AC-	616	626	636	646	656	666	676	686	696
2	Red Auxiliary	617	627	637	647	657	667	677	687	697
3	Yellow Auxiliary	618	628	638	648	658	668	678	688	698
4	Green Auxiliary	619	629	639	649	659	669	679	689	699
5	Pedestrian Heads & Dets.									
6	Hand	711	721	731	741	751	761	771	781	791
7	Man	712	722	732	742	752	762	772	782	792
8	AC-	713	723	733	743	753	763	773	783	793
9	Detection	714	724	734	744	754	764	774	784	794
10	Common-Detection	715	725	735	745	755	765	775	785	795
11	Spare	716	726	736	746	756	766	776	786	796
12	Spare	717	727	737	747	757	767	777	787	797
13	Spare	718	728	738	748	758	768	778	788	798
14	Spare	719	729	739	749	759	769	779	789	799
15	Detection									
16	AC+	811	821	831	841	851	861	871	881	891
17	AC-	812	822	832	842	852	862	872	882	892
18	Common-Detection	813	823	833	843	853	863	873	883	893
19	Detection A	814	824	834	844	854	864	874	884	894
20	Detection B	815	825	835	845	855	865	875	885	895
21	Loop 1 Out	816	826	836	846	856	866	876	886	896
22	Loop 1 In	817	827	837	847	857	867	877	887	897
23	Loop 2 Out	818	828	838	848	858	868	878	888	898
24	Loop 2 In	819	829	839	849	859	869	879	889	899
25	Supplemental Detection									
26	Loop 3 Out	911	921	931	941	951	961	971	981	991
27	Loop 3 In	912	922	932	942	952	962	972	982	992
28	Loop 4 Out	913	923	933	943	953	963	973	983	993
29	Loop 4 In	914	924	934	944	954	964	974	984	994
30	Loop 5 Out	915	925	935	945	955	965	975	985	995
31	Loop 5 In	916	926	936	946	956	966	976	986	996
32	Loop 6 Out	917	927	937	947	957	967	977	987	997
33	Loop 6 In	918	928	938	948	958	968	978	988	998
34	Spare	919	929	939	949	959	969	979	989	999

35  
36 FCCINS.DT1

37 (\*\*\*\*\*)

38 **Communication Cable Installation**

39 \$\$1\$\$

40

41 GCBOND.DT1

42 **(NWR August 21, 2006)**

43 **Bonding, Grounding**

44 Section 8-20.3(9) is supplemented with the following:

45

46 Where shown in the Plans or where designated by the Engineer, the metal frame  
47 and lid of existing junction boxes shall be grounded to the existing equipment  
48 grounding system. The existing equipment grounding system shall be derived from  
49 the service serving the raceway system of which the existing junction box is a part.

50

1 FCSEV.DT1  
2 **(NWR March 4, 2009)**  
3 **Services, Transformer, Intelligent Transportation System Cabinet**  
4 Section 8-20.3(10) is supplemented with the following:  
5

6 A green construction core shall be installed for each cabinet core lock. Upon  
7 contract completion, two master keys for each cabinet shall be delivered to the  
8 Engineer.  
9

10 GCFT.DT1  
11 **(NWR October 16, 2006)**  
12 **Testing**  
13 Section 8-20.3(11) is supplemented with the following:  
14

15 See Section 1-07.23 and the subsection **Signal Turn-On** of the associated Special  
16 Provision.  
17

18 Prior to scheduling a turn-on date, the Contractor shall provide verification to the  
19 Engineer that:  
20

- 21 a. Tests 1, 2, and 3 as specified in this section have been completed;
- 22
- 23 b. All other tests specified in Section 8-20.3(14)D have been completed.  
24

25 GCCTEST.DT1  
26 **(NWR August 5, 1996)**  
27 **Communication Cable Acceptance Testing**  
28 Communications cable acceptance testing shall be performed for each pair of  
29 conductors. Acceptance testing shall commence only after all communication cable  
30 is installed, and all splices have been completed, with the exception of the splices  
31 connecting the new cable to existing cable. If any test fails, repairs shall be made  
32 by the Contractor and the entire test series shall be repeated.  
33

34 Three tests shall be performed on each cable installation. All tests shall be  
35 conducted in the presence of the Engineer. The Contractor shall provide the  
36 necessary test equipment, perform the tests, and document the results. When the  
37 tests are completed, whether successful or not, the test result documentation shall  
38 be provided to the Engineer. All tests shall be conducted on all pairs in the  
39 communication cable to each cable drop point. Seven calendar days notice shall  
40 be given by the Contractor prior to performing any of the tests.  
41

42 For each arterial all testing shall be conducted from the same cable drop point.  
43

44 **Continuity Test:**

45 The continuity test shall be made on each conductor as well as the cable  
46 shield. Each conductor and/or shield shall show a resistance of not more than  
47 20 ohms per 1,000 feet of conductor. The resistance of each conductor shall  
48 be recorded.  
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**Insulation Test:**

The insulation test shall be measured on each insulated conductor with all other conductors in the cable (including cable shield) grounded. The measurement shall be made with a DC potential of not less than 60% and not more than 90% of the insulation rating for 1 minute. Insulation resistance shall exceed 5,000 megohm-miles. The insulation resistance of each conductor shall be recorded.

**Frequency Response and Noise Test:**

The frequency response and noise tests shall be performed on each pair of conductors. All tests shall be made using transmission test instruments designed especially for use on data circuits. Two such instruments are required; one for use at the designated testing location and the other for use at each cable drop location.

The test sets shall be subject to approval by the Engineer prior to the start of the tests.

The first test shall measure frequency response from the test location to each cable drop. A tone of 0 dBm shall be applied to the transmitting end and the signal level shall be measured at the receiving end. The cable pair being tested shall be isolated from ground and terminated in 600 ohms at both test locations. A 10,000 ohm resistor shall terminate the same pair at all other cable drop locations. The test shall be performed at frequencies of 300, 500, 700, 1,004, 1,500, 2,300 and 3,000 Hz. The received tone shall be:

Greater than minus 16 dBm at 1,004 Hz.

2 dB gain to 8 dB loss with respect to the level at 1,004 Hz over the frequency range of 500 to 2,500 Hz.

2 dB gain to 12 dB loss with respect to the level at 1,004 Hz over the frequency ranges of 300 to 500 Hz and 2,500 to 3,000 Hz.

The second test shall measure circuit or background noise. The cable pair being tested shall be terminated the same as in the previous test. A C-message filter in the test set shall restrict the spectrum to the range normally used for voice-grade data circuits. The noise level shall be at least 13 dB below the lowest signal level measured in the first test.

All test data shall be recorded in an approved format. Cables which fail the tests shall be repaired or replaced as directed by the Engineer.

GCILLUM.DT1  
**(NWR May 1, 2006)**  
**Illumination Systems**  
**Light Standards**

Section 8-20.3(13)A is supplemented with the following:

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When slip bases are installed, the conduit, anchor bolts, and other obstructions shall terminate at a height below the elevation of the top of the bottom slip plate.

GCHMLFND.DT1

**(NWR May 1, 2006)**  
**High Mast Light Standards**

Anchor bolts for HML standards shall be held in place during pouring of the foundation with template(s) as shown on the plan details. The top ends of anchor bolts shall be wrapped with two layers of 2-inch corrosion resistant tape, using a 1/2 lap wrap, below the leveling nut to a depth of six inches and no further below the top of the foundation.

A 1/2 inch diameter drain tube shall be placed in the grout pad.

High mast light standards shall not be erected until the foundations have set at least 14 days and the concrete has attained 80 percent of design strength.

The Contractor shall provide the following:

1. Written notice of the proposed date for field-testing the high mast lowering devices.
2. A manufacturer's approved inspection, maintenance, and operations video for the HML standard and lowering system.
3. Five service manuals with complete discussions on all moving parts, trouble shooting lists, maintenance procedures, parts list, stock numbers, diagrams, schematics, exploded views. The manuals shall be comprehensive enough to enable complete in-house servicing.

Installation and adjustment of the lowering device assembly shall be done in strict conformance with procedures specified by the manufacturer and approved by the Engineer. Installation and tension adjustment of hoist cables shall be done in the presence of a Contractor provided representative of the Manufacturer who is knowledgeable of the proper installation procedures for the equipment. Tension adjustment of the hoist cables shall be made with the ultimate load on the luminaire ring. Raise and lower the ring one complete cycle before and after each tension adjustment of the hoist cables. After all final adjustments have been completed, raise and lower the ring satisfactorily a minimum of two successive complete cycles in the presence of the Engineer.

Upon successful completion of lowering device testing and demonstration, the Contractor shall deliver the remote control portable power unit to:

WSDOT SIGNAL SHOP  
3700 9th Ave S  
Seattle, WA 98134  
Telephone: (206) 442-2110

Five days written advance notice shall be delivered to both the Engineer and the Electronic Parts Specialist at the address listed above. Delivery shall occur

1 between the hours of 8:00 a.m. to 2:00 p.m. Monday through Friday. Material  
2 will not be accepted without the required advance notice.  
3  
4 Equipment damaged during delivery shall be repaired or replaced to the  
5 Engineer's satisfaction, at no cost to the Contracting Agency.  
6  
7 The Contractor shall be responsible for unloading the equipment where  
8 directed by the Engineer at the delivery site.  
9  
10 FCFD.DT1  
11 (\*\*\*\*\*)  
12 **Foundation for Decorative Lighting Standard:**  
13 \$\$1\$\$  
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15 GCSIGSYS.DT1  
16 **Signal Systems**  
17  
18 GCVIDEO.DT1  
19 Section 8-20.3(14) is supplemented with the following:  
20  
21 GCVTEMP.DT1  
22 **(NWR August 10, 2009)**  
23 **Temporary Video Detection System**  
24 Temporary video detection systems shall be completely installed and made  
25 operational prior to any associated induction loop being disabled.  
26  
27 GCVTRAIN.DT1  
28 **(NWR August 10, 2009)**  
29 **Video Detection Equipment Training**  
30 The Contractor shall provide a minimum of eight hours of video detection  
31 equipment training for Contracting Agency personnel. The Contractor shall provide  
32 for the video equipment manufacturer or their duly authorized representative to  
33 conduct the training. The Contractor shall notify the Project Engineer seven days in  
34 advance of the training session. All pertinent documentation including, but not  
35 limited to maintenance and operation manuals and wiring diagrams shall be made  
36 available for use in this training session.  
37  
38 200314A.DT1  
39 **Signal Controllers**  
40 Section 8-20.3(14)A is supplemented with the following:  
41  
42 FCCTL.DT1  
43 (NWR March 13, 1995)  
44 \*\*\* \$\$1\$\$ \*\*\* will be delivered to the job site by the Contracting Agency.  
45  
46 200314A1.GR8  
47 **(March 13, 1995)**  
48 **Testing**  
49 All signal control equipment shall be tested at the Washington State  
50 Department of Transportation Materials Laboratory located in Tumwater,

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Washington, prior to final delivery. The tests shall check the operation of each individual component as well as the overall operation of the system.

The Contractor shall designate a qualified representative for these tests. Notification of this representative shall be submitted for approval, in writing, to the State Materials Laboratory, 14 calendar days prior to any equipment deliveries. The Engineer shall also receive a copy of this notification, which includes the representative's name, address, and telephone number. All communications and actions regarding testing of all equipment submitted to the State Materials Laboratory shall be made through this representative. These communications and actions shall include, but not be limited to, the following:

All notifications of failure or rejection, demonstration of the equipment, and the return of rejected equipment.

The State Materials Laboratory testing process will consist of the following four separate stages:

- a. Delivery and Assembly
- b. Demonstration and Documentation
- c. Performance Test
- d. Operational Test

Testing will follow in the correct order with no time gaps between stages unless mutually agreed upon by the Contractor and State Materials Laboratory.

**Stage 1 Delivery Assembly**

All components for the complete traffic control systems, including the necessary test equipment, shall be assembled and ready for demonstration within ten working days of delivery to the Materials Laboratory. The systems shall simulate the operations as installed in the field.

Equipment and prerequisites necessary to complete this stage shall include:

- a. Detection Simulator:  
The detection simulator shall provide at least one detector per phase and variable traffic volumes. One simulator shall be required for every two controllers tested.
- b. Communications Network:  
Locations, specified for coordinating communications equipment and cable, shall be completely wired to provide an operational communications system between all local and master controllers.

The Contractor shall provide labor, equipment, and materials necessary to assemble all control equipment complete and ready for demonstration. Materials and equipment used for this stage that are not required for field installation shall remain the property of the Contractor. Failure to

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complete this stage within ten working days will result in rejection of the entire system.

**Stage 2 Demonstration and Documentation**

This stage shall be completed within seven working days following the completion of Stage 1. Failure to do so shall result in rejection of the entire shipment.

All documentation shall be furnished with the control equipment prior to the start of testing. If corrections to any document are deemed necessary by the State, the Contractor shall submit this updated version prior to the final approval by the State Materials Laboratory. The documents to be supplied shall consist of or provide the following:

- a. A Complete accounting of all the control and test equipment required.
- b. A complete set of documents which shall include:
  - 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. Reproducible mylar wiring diagrams and two blue-tone prints for each controller and cabinet supplied. The sheet size shall be 24 inches by 36 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. One set of operations and maintenance manuals per cabinet; at least four but no more than ten. Five sets of software listings and flow charts.
  - 6. Complete operations and maintenance manuals for all auxiliary equipment. One set per cabinet.
- c. A description of the functions and the capabilities of individual components and of the overall control system.
- d. A presentation on how to operate the system.

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- e. A complete and thorough demonstration to show that all components of the control system are in good condition and operating properly, and proof that the controller and cabinet are functioning correctly.
- f. Detailed instructions for installing and operating the controller(s), including explanations on the use of all features of the controller(s).
- g. The operational and maintenance manuals for each traffic signal controller supplied including as a minimum, but not to be limited to the following:
  - 1. Detailed instructions for maintaining all hardware components, controller, and auxiliary equipment.
  - 2. A complete parts list detailing all manufacturer's identification codes.
  - 3. Detailed wiring diagrams and schematics indicating voltage levels and pictorial description, part name, and location for all hardware components, controller, and auxiliary equipment.

The demonstration shall include the following:

- a. Phasing per plans and all phase timing.
- b. Detection including any special detector functions.
- c. Conflict Monitor and Load Switches.
- d. Special Coordination including communication equipment.

This demonstration shall be performed by the Contractor in the presence of State Materials personnel. The Contractor shall supply any item not accounted for within five working days of the accounting. Controllers and cabinets that remain incomplete five working days after notification shall be rejected and returned freight collect to the Contractor.

**Stage 3 Unit Performance Test**

A minimum of ten working days shall be allowed for one or two cabinet assemblies and five working days for each additional assembly.

The unit performance test will be conducted by State Personnel to determine if each and every controller cabinet assembly complies with NEMA Environmental Standards as stated in NEMA publication No. TS 1-1976, Part 2.

Any unit submitted, whose failure has been corrected, shall be retested from the beginning of this stage.

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**Stage 4 Operational Test**

All control and auxiliary equipment shall operate without failure for a minimum of ten consecutive days. If an isolated controller is specified, it shall operate as an isolated controller. If a coordinated system is specified, it shall operate as a total coordinated system with the master and all local controllers operating in all coordinated modes.

If any failure occurs during this stage, all equipment for this stage shall be restarted following completion of repairs.

**Equipment Failure Or Rejection**

Equipment failures shall be defined as set forth in NEMA Publication No. TS 1-1976. Failure of load switches, detector amplifiers, and conflict monitors shall not result in rejection of the controller or cabinet. However, the Contractor shall stock, as replacements, approximately 30 percent more than the total for these three items. All excess material shall remain the property of the Contractor following completion of all tests.

If a failure occurs during Stages 3 or 4, repairs shall be made and completed within ten working days following notification of the malfunction. The Contractor shall have the option of making onsite repairs or repair them at a site selected by the Contractor. Failure to complete repairs within the allotted time shall result in rejection of the controller or cabinet assembly under test.

A total of two failures will be allowed from the start of Stage 3 to the end of Stage 4. If three failures occur during this time period, the equipment will be rejected. New equipment of different serial numbers submitted as replacement shall be received by the Materials Laboratory for testing under Stage 3 within ten working days following notification of rejection. Failure to meet this requirement within the allotted time will result in rejection of the entire system. Software errors will be considered as failures and, if not corrected within ten working days, the entire system will be subject to rejection. Following rejection of any equipment, the Contractor shall be responsible for all costs incurred. This shall include but not be limited to all shipping costs.

When the traffic control program is supplied by the State, the Contractor shall prove that any failures are, in fact, caused by that program and not the hardware.

All component or system failures, except load switches and detector amplifiers, shall be documented. This documentation shall be submitted prior to commencing the test or stage in which the failure was found and shall provide the following information:

- a. A detailed description of the failure.
- b. The steps undertaken to correct the failure.
- c. A list of parts that were replaced, if any.

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Upon completion of the tests, the equipment will be visually inspected. If material changes are observed which adversely affect the life of the equipment, the cause and conditions shall be noted. The Contractor will immediately be given notice to correct these conditions. If not repaired within ten working days of notification, the equipment will be subject to rejection. A final accounting shall be made of all equipment prior to approval.

All failed or rejected equipment shall be removed from the Materials Laboratory within three working days following notification; otherwise, the failed or rejected equipment will be returned, freight collect, to the Contractor.

Following final approval by the State Materials Laboratory, all equipment shall be removed from the State Materials Laboratory and delivered to sites as designated elsewhere in this contract.

**Guarantees**

The supplier shall furnish to the State any guarantee or warranty furnished as a normal trade practice in connection with any equipment supplied for this contract.

GCTRN.DT1

**(NWR March 13, 1995)  
Controller Equipment Training**

The Contractor shall provide a minimum of eight hours training for Contracting Agency personnel. Qualified personnel, mutually agreed upon by the Contracting Agency and Contractor, shall conduct the training. All sessions shall be conducted during Stages 2, 3, and 4 as described under **Testing** in this Special Provision. The Contractor shall notify the Project Engineer, who in turn shall notify the Regional Traffic Engineer, seven days in advance of the training session. All documentation (maintenance manuals, wiring diagrams, etc.) shall be made available for use in this training session.

This training shall include, but not be limited to, the following:

1. Operations: (approximately four hours in length)
  - a. Equipment Energization Procedures
  - b. Utilization of Operator Controls
  - c. Input Procedures
2. Maintenance: (approximately four hours in length)
  - a. Hardware Maintenance
  - b. System Trouble Shooting
  - c. Detection of Abnormal Conditions
  - d. Emergency Operating Procedures

All participants are assumed to have a basic working knowledge of electronics.

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Training sessions shall emphasize hands-on training.

No compensation shall be made to the Contractor if the "Controller Equipment Training" bid item is cancelled prior to the end of the procurement period, in accordance with Section 1-09.5.

GCSH.DT1

**(NWR May 1, 2006)**

**Signal Heads**

In Section 8-20.3(14)B the first paragraph is revised to read as follows:

Signal heads shall not be installed at any intersection until all other signal equipment is installed and the controller is in place, inspected, and ready for operation at that intersection, unless ordered by the Engineer. If the Engineer orders advance installation, the signal heads shall be covered to clearly indicate the signal is not in operation.

The signal head covering material shall be of sufficient size to entirely cover the display. The covering shall extend over all edges of the signal housing and shall be securely fastened at the back.

GC3MHEAD.DT1

**(NWR April 3, 1993)**

**Optically Programmed Signal Head:**

The visibility zone of the optically programmed signal heads shall be set as directed by the Engineer.

GCLOOP.DT1

**(NWR February 22, 2005)**

**Induction Loop Vehicle Detectors**

In Section 8-20.3(14)C, Items 2 and 11 and the last two sentences of Item 4 are deleted.

8200314C.DT1

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

GCRLOOP.DT1

**(NWR October 16, 2006)**

**Round Loops**

Round loops shall be constructed in accordance with the following requirements:

1. Loop conductor and lead in cable shall conform to these Special Provisions.
2. Round sawcuts shall be six feet in diameter and shall be constructed using equipment designed for cutting round loops. The equipment shall use a concave, diamond-segmented blade. The sawcuts shall be normal to the pavement surface and shall be a minimum of 0.25 inches wide. The sawcut depth shall be a minimum of 2 5/8 inches

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and a maximum of three inches measured at any point along the perimeter, except on bridge decks. Other methods of constructing the round sawcut, such as anchoring a router or flat blade saw, will not be allowed.

3. The bottom of the sawcut shall be smooth. No edges created by differences in sawcut depths will be allowed.
4. All sawcut corners shall be rounded to a minimum 1.5 inch radius.
5. All sawcuts shall be cleaned with a 1000 psi high pressure washer as certified by the manufacturer's label on the machine or as measured by an in line pressure gauge. Wash water and slurry shall be vacuumed out and the sawcut shall be blown dry with compressed air. Disposal of the wash water and slurry shall comply with the requirements of Section 1-07.5(3) and the Special Provision **LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC**.
6. Loops shall be installed after all grinding and prior to paving the final lift of asphalt.
7. The conductor shall be installed one turn on top of the previous turn. All turns shall be installed in a clockwise direction. The conductors shall be secured to prevent floating with 2-inch lengths of high temperature foam backer rod sized for a snug fit. The backer rod shall be spaced at 2-foot intervals around the perimeter of the sawcut and at corners.
8. Installation of the sealant shall completely encapsulate the loop conductors. A minimum of one inch of sealant shall be provided between the top of the conductors and the top of the sawcut. The top of the sealant shall be flush to 1/8 inch below the top of the sawcut.
9. Use of kerosene solvent is prohibited.

GCPFLOOP.DT1

**(NWR October 16, 2006)**

**Preformed Loops**

Where indicated in the Plans, detector loops shall be preformed.

Preformed detector loops and homeruns located in bridge roadway slabs shall be supported at a depth of 1 to 1-1/2 inches below the finished grade and one inch minimum above the top layer of steel reinforcing bars. Preformed detector loops and homeruns shall be supported by metal or plastic chair supports conforming to Section 6-02.3(24)C. The loops shall be supported every 12 inches at a minimum. Loops and homeruns shall be tie wrapped and anchored so that they remain at a depth 1 to 1-1/2 inches below the finished grade and one inch minimum above the top layer of steel reinforcing bars.

Preformed detector loops and homeruns located in cement concrete pavement, outside of bridge roadway slabs, shall be supported at a depth of

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four to six inches below the finished grade with plastic chair supports meeting the requirements of Section 6-02.3(24)C. The loops shall be supported every 12 inches at a minimum. Loops and homeruns shall be tie wrapped and anchored with epoxy coated rebar stakes so that they remain at a depth four to six inches below the finished grade. Epoxy coated rebar stakes shall be driven a minimum of four inches into the subgrade.

Preformed detector loops and homeruns located in hot mix asphalt shall be installed after all grinding and prior to paving the final lift of asphalt.

1. Round sawcuts shall be six feet in diameter and shall be constructed using equipment designed for cutting round loops. The equipment shall use a concave, diamond-segmented blade. The sawcut shall be normal to the pavement surface and shall be a minimum of 0.1 inches wider than the preformed detector loop. The sawcut depth shall be a minimum of one inch and a maximum of two inches measured at any point along the perimeter, except on bridge decks. Other methods of constructing the round sawcut, such as anchoring a router or flat blade saw, will not be allowed.
2. The bottom of the sawcut shall be smooth. No edges created by differences in sawcut depths will be allowed.
3. All sawcut corners shall be rounded to a minimum 1.5 inch radius.
4. All sawcuts shall be cleaned with a 1000 psi high pressure washer as certified by the manufacturer's label on the machine or as measured by an in line pressure gauge. Wash water and slurry shall be vacuumed out and the sawcut shall be blown dry with compressed air. Disposal of the wash water and slurry shall comply with the requirements of Section 1-07.5(3) and the Special Provision **LEGAL RELATIONS AND RESPONSIBILITIES TO THE PUBLIC**.
5. The preformed detector loops shall be secured to prevent floating with 2-inch lengths of high temperature foam backer rod sized for a snug fit. The backer rod shall be spaced at 2-foot intervals around the perimeter of the sawcut and at corners.
6. Installation of the sealant shall completely encapsulate the preformed detector loops. A minimum of 1/2 inch of sealant shall be provided between the top of the preformed detector loop and the top of the sawcut. The top of the sealant shall be flush to 1/8 inch below the top of the sawcut.
7. Use of kerosene solvent is prohibited.

The loop manufacturer shall mark the wire ends clearly with start and finish.

A minimum of six inches of hose assembly and two feet of slack homerun wire with the hose removed shall be coiled in the junction box.

1 Each successive preformed detector loop shall be installed with the homeruns  
2 twisted in alternating directions.

3  
4 GCEXLP.DT1

5 (NWR October 5, 2009)  
6 **Existing Traffic Loops**

7 The Contractor shall notify the Area Traffic Engineer through the Engineer a  
8 minimum of five working days in advance of pavement removal or grinding in  
9 areas with existing loops.

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11 If the Engineer suspects that damage to any loop, not identified in the Plans as  
12 being replaced, may have resulted from Contractor's operations or is not  
13 operating adequately, the Engineer may order the Contractor to perform the  
14 field tests specified in Section 8 20.3(14)D. The test results shall be recorded  
15 and submitted to the Engineer. Loops that fail any of these tests shall be  
16 replaced.

17  
18 Loops that fail the tests, as described above, and are replaced shall be  
19 installed in accordance with current WSDOT design standards and Standard  
20 Plans, as determined by the Engineer.

21  
22 If traffic signal loops that fail the tests, as described above, are not replaced  
23 and operational within 48 hours, the Contractor shall install and maintain  
24 interim video detection until the replacement loops are operational. The type  
25 of interim video detection furnished shall be approved by the Engineer prior to  
26 installation.

27  
28 GCILLCT.DT1

29 **Test for Induction Loops and Lead-in Cable**

30 Section 8-20.3(14)D, Test A and Test D are revised as follows:

31  
32 (NWR October 5, 2009)

33 Test A – The DC resistance between the 2 lead-in cable wires, including the  
34 loop, shall be measured by a volt ohmmeter. The resistance shall not exceed  
35 5-ohms or lower the Q of the circuit below 5 where Q is equal to the “Inductive  
36 Impedance @ 50 kHz” divided by “Resistance”.

37  
38 Test D - An inductance test shall be made to determine the inductance level of  
39 each inductance loop. The Contractor shall record the inductance level of  
40 each inductance loop installed on the project and shall furnish the findings to  
41 the Engineer. An induction level, as measured from the controller cabinet,  
42 below 50-microhenries is considered a failure.

43  
44 GCLOOPT.DT1

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

46  
47 GCPRET.DT1

48 (NWR October 5, 2009)

49 Where preformed loops are installed under cement concrete pavement, testing  
50 of the induction loop and lead-in cable shall be done immediately prior to

1 laying the concrete. Tests A, C and D shall be repeated after the placement of  
2 the cement concrete pavement.

3  
4 GCEXCABLE.DT1

5 (NWR October 5, 2009)

6 **Existing Lead-in Cable Test**

7 When new Induction loops are scheduled to be installed and spliced to an  
8 existing two-conductor shielded detector lead-in cable, the Contractor shall  
9 perform the following:

- 10
- 11 1. Disconnect the existing detector lead-in cable in the controller cabinet  
12 and at the loop splice.
- 13 2. Megger test both detector lead-in cable conductors. A resistance  
14 reading of less than 100-megohms is considered a failure.
- 15 3. Detector lead-in cables that fail the test shall be replaced and then  
16 retested.
- 17 4. After final testing of the detector lead-in cable, the loop installation  
18 shall be completed and the loop system tested according to Tests A,  
19 C and D.
- 20 5. Connect the detector lead-in cables in the controller cabinet.

21  
22 GCEXLOOP.DT1

23 (NWR October 5, 2009)

24 **Existing Loop Test**

25 When two-conductor shielded detector lead-in cable is scheduled to be  
26 installed and spliced to an existing loop, the Contractor shall perform the  
27 following:

- 28
- 29 1. Disconnect the existing loop from the detector lead-in splice.
- 30 2. Megger test the existing loop wire. A resistance reading of less than  
31 100-megohms is considered a failure.
- 32 3. Loops that fail the test shall be replaced and then retested.
- 33 4. After the final testing of the loops, the detector lead-in cable  
34 installation shall be completed and the loop system tested according  
35 to Tests A, C and D.

36  
37 GEMES.DT1

38 **Measurement**

39 Section 8-20.4 is supplemented with the following:

40  
41 GEMESA.DT1

42 (NWR August 10, 2009)

43 When the following is shown as lump sum in the Plans or in the Proposal, no specific  
44 unit of measurement will apply, but measurement will be for the sum total of all items for  
45 a complete system to be furnished and installed.

46  
47 GEMES1.DT1

48 (NWR August 10, 2009)

49 Traffic Signal and Illumination System

50

1 GEMES2.DT1  
2 (NWR August 10, 2009)  
3 Temporary Traffic Signal System  
4  
5 GEMES3.DT1  
6 (NWR August 10, 2009)  
7 Temporary Illumination System  
8  
9 GEMES4.DT1  
10 (NWR August 10, 2009)  
11 Temporary Traffic Signal and Illumination System  
12  
13 GEMES5.DT1  
14 (NWR August 10, 2009)  
15 Temporary Video Detection System  
16  
17 GEMES6.DT1  
18 (NWR August 10, 2009)  
19 Traffic Signal Interconnect System  
20  
21 GEMES7.DT1  
22 (NWR August 10, 2009)  
23 Electrical System Modifications  
24  
25 GEMESB.DT1  
26 (NWR August 10, 2009)  
27 Boring steel casing pipe will be measured by the linear foot for the actual length of the  
28 boring tunnel.  
29  
30 GEMESC.DT1  
31 (NWR August 10, 2009)  
32 Loop replacements will be measured per each complete installation.  
33  
34 GEMESD.DT1  
35 (NWR August 10, 2009)  
36 Grounding existing junction box will be measured per each junction box properly  
37 grounded.  
38  
39 GEPAY.DT1  
40 **Payment**  
41 Section 8-20.5 is supplemented with the following:  
42  
43 GEPAYA.DT1  
44 (NWR August 10, 2009)  
45 The lump sum Contract price for each of the following items shall be full pay for the  
46 construction of the complete electrical system, modifying existing systems, or both,  
47 including sign lighting systems, as described below and as shown in the Plans and  
48 herein specified including excavation, backfilling concrete foundations, conduit, wiring,  
49 restoring facilities destroyed or damaged during construction, salvaging existing  
50 materials, and for making all required tests. All additional materials and labor, not

1 shown in the Plans or called for herein and which are required to complete the electrical  
2 systems, shall be included in the lump sum Contract price.  
3  
4 GEPAY1.DT1  
5 (NWR August 10, 2009)  
6 "Traffic Signal and Illumination System \_\_\_\_", lump sum.  
7  
8 GEPAY2.DT1  
9 (NWR August 10, 2009)  
10 "Temporary Traffic Signal System \_\_\_\_", lump sum.  
11  
12 GEPAY3.DT1  
13 (NWR August 10, 2009)  
14 "Temporary Illumination System \_\_\_\_", lump sum.  
15  
16 GEPAY4.DT1  
17 (NWR August 10, 2009)  
18 "Temporary Traffic Signal and Illumination System \_\_\_\_", lump sum.  
19  
20 GEPAY5.DT1  
21 (NWR August 10, 2009)  
22 "Temporary Video Detection System\_\_", lump sum.  
23  
24 GEPAY6.DT1  
25 (NWR August 10, 2009)  
26 "Traffic Signal Interconnect System\_\_", lump sum.  
27  
28 GEPAY7.DT1  
29 (NWR August 10, 2009)  
30 "Electrical System Modifications\_\_", lump sum.  
31  
32 GEPAY8.DT1  
33 (NWR August 10, 2009)  
34 All costs for installing conduit and junction boxes containing both signal wiring and  
35 signal interconnect shall be included in the lump sum contract prices for the associated  
36 traffic signal system bid item.  
37  
38 GEPAY9.DT1  
39 (NWR August 10, 2009)  
40 All costs associated with the removal of a temporary traffic signal system, temporary  
41 illumination system, temporary traffic and illumination system or a temporary video  
42 detection system shall be included in the lump sum contract price for the associated bid  
43 item.  
44  
45 GEPAY10.DT1  
46 (NWR October 5, 2009)  
47 "Loop Replacement Type \_\_\_\_", per each  
48 All costs associated with the replacement of traffic loops identified in the contract Plans  
49 as replacement loops, and the associated lead in conduit, along with the testing of the  
50 replacement loops, shall be included in the unit contract price per each for "Loop  
51 Replacement Type \_\_\_\_",

1  
2 All pavement repair, sidewalk repair and sidewalk panel replacement costs associated  
3 with the replacement of traffic loops and conduit lead-ins shall be included in the unit  
4 contract price per each for "Loop Replacement Type\_\_".  
5  
6 When traffic loops are replaced as described under **Existing Traffic Loops**, all costs for  
7 replacement, along with testing of the new loops, shall be included in the unit contract  
8 price per each for "Loop Replacement Type \_\_\_\_".  
9  
10 When existing traffic loops are tested under Existing Traffic Loops, all costs for testing  
11 shall be paid in accordance with Section 1-04.4  
12  
13 When video detection is installed under Existing Traffic Loops, all costs associated with  
14 the video detection installation shall be paid in accordance with Section 1-04.4.  
15  
16 GEPAY11.DT1  
17 (NWR October 5, 2009)  
18 All costs for testing the existing detection loop, as described under **Existing Loop Test**,  
19 shall be included in the contract bid item associated with the detection lead-in cable  
20 installation.  
21  
22 All costs for replacing the existing detection loop, as described under **Existing Loop**  
23 **Test**, shall be in accordance with Section 1-04.4.  
24  
25 GEPAY12.DT1  
26 (NWR October 5, 2009)  
27 All costs for testing the existing detection lead-in cable, as described under **Existing**  
28 **Lead-in Cable Test**, shall be included in the contract bid item associated with the traffic  
29 loop installation.  
30  
31 All costs for replacing the existing detection lead-in cable, as described under **Existing**  
32 **Lead-n Cable Test**, shall be in accordance with Section 1-04.4.  
33  
34 GEPAY13.DT1  
35 (NWR August 10, 2009)  
36 All costs for testing preformed detector loop systems, before and after the cement  
37 concrete has been placed, shall be included in the contract bid item associated with the  
38 preformed detection loop installation.  
39  
40 GEPAY14.DT1  
41 (NWR August 10, 2009)  
42 "Grounding Existing Junction Box", per each  
43 The unit contract price per each for "Grounding Existing Junction Box" shall be full pay  
44 for the work as specified.  
45  
46 GEPAY15.DT1  
47 (NWR August 10, 2009)  
48 All costs for adjustment of new junction boxes, both to the final grade and any grade  
49 adjustments required for the various construction stages proposed in the Contract, or for  
50 alternative stages proposed by the Contractor, shall be included in the lump sum  
51 contract price for the associated electrical system.

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GEPAY16.DT1

(NWR August 10, 2009)

All costs for conduit, junction boxes, and associated hardware and fittings installed on or within a structural item (wall, bridge, or barrier) shall be included in the respective lump sum bid item for work on the associated electrical or conduit system.

GEPAY17.DT1

(NWR March 13, 1995)

The construction signs used during signal turn-on will be paid as part of "Construction Signs Class A".

GEPAYB.DT1

The paragraph following the bid item "Conduit Pipe \_\_\_In. Diam." is supplemented with the following:

(NWR August 10, 2009)

The unit contract price per linear foot for "Conduit Pipe \_\_\_\_\_ In. Diam." shall include the backfilling of trenches and pits

GEPAYC.DT1

The bid item "Casing" and the reference to the bid item in the paragraph following it are revised to read:

(NWR August 10, 2009)

"Boring Steel Casing Pipe \_\_\_\_ inch Diam.", per linear foot.

GEPAYD.DT1

The paragraph following the bid item "Directional Boring" is supplemented with the following:

(NWR August 10, 2009)

The unit contract price per linear foot for "Directional Boring" shall be full pay for the directional boring regardless of the number of conduits installed in the boring tunnel.