

8-18.5 Payment

(*****)

Supplement this Section with the following:

“Mailbox Support, Type _____,” per each.

No separate measurement will be made for providing temporary mailbox or removal of the existing mailboxes.

“Relocate Mailbox,” per each.

“Relocate Mailbox” shall include removal of the existing stand and mailbox and installation of the existing mailbox on new mailbox support, type as specified. “Relocate Mailbox” shall also include any coordination with the homeowner.

8-20 ILLUMINATION, TRAFFIC SIGNAL SYSTEMS AND ELECTRICAL

8-20.1 Description

This section is deleted in its entirety and replaced with the following:

This work shall consist of furnishing, installing and field testing all materials and equipment necessary to complete in place, fully functional system(s) of any or all of the following, types including modifications to an existing system all in accordance with approved methods, the Plans, the Special Provisions and these Specifications:

1. Traffic Signal System

2. Illumination System

Unless otherwise noted, the location of signals, controllers, standards, and appurtenances shown in the Plans are approximate; and the exact location will be established by the Engineer in the field.

Work for each body of work includes:

Traffic Signal System

The work involves constructing a new traffic signal system at the Des Moines Memorial Drive/South 200th Street intersection in the City of SeaTac and removal of an existing traffic signal system at the same intersection. The work shall be closely coordinated with major intersection improvements to be constructed in conjunction with this project.

The work consists of removing concrete foundation, timber strain poles, controller cabinet, electrical service cabinet, vehicle and pedestrian signal heads, pedestrian push button assemblies, vehicle preemption detectors, conduit, conduit risers, conduit bodies, junction boxes, conductors and signal-mounted traffic signing; adapting existing signal systems to accommodate various channelization phases as work progresses; and furnishing and installing concrete foundations, signal standards, controller, controller cabinet, auxiliary equipment, uninterruptible power supply (UPS) cabinet, vehicle and pedestrian signal heads, APS pedestrian push

button assemblies, emergency vehicle preemption detectors, temporary video vehicle detection system, permanent video detection system, conduit, junction boxes, conductors, signal-mounted traffic signing; trench, backfill and compaction; temporary traffic control; testing; and all other work necessary to provide a complete and operational traffic signal system as intended by the Plans and these Special Provisions.

Illumination System

The work involves constructing a new illumination system at the Des Moines Memorial Drive/South 200th Street intersection in the City of SeaTac. The system will address illumination for the intersection area as well as the south, north and east legs of the intersection. The work shall be closely coordinated with major intersection improvements to be constructed in conjunction with this project.

The work consists of furnishing and installing concrete foundations, decorative light standards, slip bases, LED cobra head luminaires, LED decorative luminaires, photocell, electrical service cabinet, ground rods, fuses, splices, conduit, junction boxes, conductors; trench, backfill and compaction; temporary traffic control; testing; and all other work necessary to provide a complete and operational illumination system as intended by the Plans and these Special Provisions.

Utility Undergrounding

This work shall also consist of trenching, shoring, substructure excavation, installation of utility supplied conduit, vaults, and handholes and structures, and backfilling trenches and structures for undergrounding of overhead utilities and also installation of new underground utilities including Puget Sound Energy (PSE), CenturyLink, and Comcast, and furnishing and installing City spare conduit, and wastehaul excess material. The work shall also consist of trenching, installation of Contractor furnished and utility furnished conduit and structures, backfilling trenches for undergrounding of overhead services on private property and wastehaul of excess material. The work includes confirming the location of existing septic drainfields with the property owner prior to excavation and protection of said drainfields.

Coordination with the utility companies and private property owners that have services to be converted to underground is also included in this work.

8-20.2 Materials

(*****)

The first paragraph of this Section is supplemented with the following:

Material to be furnished by the Contractor (Utility Undergrounding)

The Contractor shall furnish, provide and pay for all materials (except Utility Company furnished), labor, tools, equipment, transportation, and other facilities necessary for the execution and completion of the work in accordance with these specifications and as shown on the contract drawings.

Crushed surfacing base course per Section 9-03.9(3).

Sand pipe zone bedding shall be fine aggregate, Class 2 per Section 9-03.1(2)B.

Identification Tape

Identification tape for telecommunications conduit runs shall be polyethylene, 5-mil tape, 1/2 mil aluminum center core. Six-inch wide, orange in color, with non-ferrous metal conduction sandwiched in the tape for detection purposes imprinted with black lettering "CAUTION – COMMUNICATION LINE BELOW." Contractor shall provide identification tape.

Tape for electrical installations shall be red in color imprinted with black lettering "CAUTION – ELECTRIC LINE BELOW."

Material to be furnished by Utility Companies (Utility Undergrounding)

The Utility Companies will furnish and install all equipment including but not limited to, pedestals, switches, transformers, cables, cable terminations and equipment at the switches, transformers and junction boxes, and make all connections. Conduit, conduit fittings, conduit jacks and adhesive to connect conduits, and vaults for Puget Sound Energy, Century Link and Comcast facilities shall be furnished only by the Utility.

8-20.3 Construction Requirements

(*****)

This Section is supplemented with the following:

Dewatering shall be per Section 7-08.

Utility Undergrounding

The Contractor shall be required to perform or provide the following specific items:

- A. At least 25 business days prior to the scheduled commencement of the Utility Undergrounding work, the Contractor shall give written notice to PSE, Comcast, CenturyLink and the Contracting Agency.
- B. The Contractor shall schedule and lead a Utility Undergrounding preconstruction meeting a minimum of 15 business days prior to commencing the Utility Undergrounding work. Attendees will be PSE, Comcast, CenturyLink, and Contracting Agency representatives. The purpose of the meeting is to review project design, coordination requirements, work sequencing and related premobilization requirements.
- C. Provide a secure staging and storage area(s) for conduits, vaults and pedestals provided by PSE, Comcast, and CenturyLink. The Contractor shall be responsible for the security and condition of these materials until they are installed and accepted by the City or returned to PSE, Comcast, or CenturyLink's custody. All Utility provided materials required for the installation of conduit, vaults and pedestals will be delivered in one effort to the Contractor's designated staging area in one effort. Material delivery will not be broken up into multiple efforts or phases.

- 1 D. Facilitate weekly (or as otherwise agreed by the Contracting Agency) construction
2 coordination meetings to include all relevant parties participating in the Utility
3 Undergrounding including PSE and its contractor(s), Comcast and its contractor(s).
4 CenturyLink and its contractors, other utilities and the Engineer.
5
6 E. Coordinate with PSE, Comcast, and CenturyLink the delivery of utility-provided
7 conduit, vaults and pedestals. Utilities will need a minimum notice of 15 business
8 days to make delivery to storage area.
9
10 F. Provide labor and equipment for the off-loading of PSE, Comcast and CenturyLink
11 conduits, vaults and pedestal materials delivered to the job site.
12
13 G. Provide written notice to customers within the Utility Undergrounding area in advance
14 of Utility Undergrounding work starting. The notice will include contact information for
15 both the PSE, Comcast, CenturyLink and the Contracting Agency, the expected
16 Undergrounding Utility project schedule, anticipation of service interruptions and work
17 required to be performed by customers. A copy of the notice shall be provided to the
18 Engineer.
19
20 H. Provide all surveying for equipment placement, locations, and establish all grade
21 elevations (conduits, vaults and pedestals) for the Utility Undergrounding work.
22
23 I. Coordinate with private property owners the location of existing underground
24 improvements, trenching, excavation and restoration activity on private property.
25
26 J. Excavate and backfill for utility trench lines, and utility structure installation both within
27 the right-of-way and on private property. This includes trenching, backfill, and
28 restoration for cut-over and transfer of existing underground system and service lines
29 from the existing overhead distribution system to the new underground distribution
30 system.
31
32 K. Trench Excavation Safety Systems/Shoring for utility trenches and utility structures.
33
34 L. Install all conduit and conduit fittings, handholes, vaults, and pedestals furnished by
35 Century Link within the right-of-way. Furnish and install all conduit and conduit
36 fittings on private property for CenturyLink services.
37
38 M. Install all conduit, conduit fittings, and vaults furnished by Comcast within the right-of-
39 way and on private property.
40
41 N. Install all conduit, conduit fittings, handholes, and vaults furnished by Puget Sound
42 Energy within the right-of-way. Furnish and install conduit for electrical services on
43 private property.
44
45 O. Furnish and install new rigid conduit and new weatherhead for PSE services on
46 private properties and on poles as detailed in the Plans.
47
48 P. Furnish and install City spare conduit within the right-of-way.
49
50 Q. Testing of all conduit by mandrel to proof conduits surety. "Proofing" as used herein
51 is defined as verification using a mandrel that the duct and vault system is free and

clear of damage, installed to the proper grade and at the proper location and contains a pulling line.

R. Clearing, grubbing, and cleanup for underground utilities.

S. Traffic control for Utility Undergrounding work.

T. Temporary erosion control for Utility Undergrounding work.

U. Coordinate with Comcast. Install and cap conduit sweeps 6-inches above finished grade at Comcast pedestal locations. Comcast to furnish and install pedestals. Comcast to furnish and install cable and make service connections.

V. Coordinate with CenturyLink. CenturyLink to furnish and install cable and make service connections.

W. Coordinate with PSE. PSE to furnish and install wire and make the service connection.

X. Coordinate with PSE, Comcast and CenturyLink for wreck out of old poles and installation of new poles. Existing poles shall be removed after undergrounding is complete and all properties are served by the new system. Relocation of high voltage transmission will occur after undergrounding system is complete."

Work to be performed by Utility Companies

The Utility Companies will furnish and install all equipment including but not limited to, Comcast pedestals, switches, transformers, cables, cable terminations and equipment at the switches, transformers and junction boxes, and make all connections.

Unless otherwise noted, the location of proposed transformers, junction boxes, vaults, pedestals, utility poles and risers indicated on the Plans are approximate. The exact location will be established by the utility companies in the field. The Contractor shall coordinate with the utility companies. The exact location for the appurtenances shall be staked to include offsets and elevations as per the approve planset as provided by the utility to the Contracting Agency.

The layout of the joint utility trench and vaults shall be adjusted as necessary to avoid conflicts with the utilities, both existing and to be constructed under this Contract. It shall be the Contractor's responsibility to construct the joint utility trench so that it will not require adjustment or replacements for other items of Work. The Contractor is also alerted that all improvements for the Utility Undergrounding must remain within the City right of way or easements which are shown on the Plans. All adjustments to the layout shown must be reviewed and approved by the Engineer. Individual service connections are not required to be within easements.

The Contractor shall install conduit with proper sweeps into structures and around obstructions, and at proper elevation into structures. The Contractor shall maintain proper depth and separation between utilities.

1 Installation of franchise utility conduits and structures shall be per the requirements of the
2 franchise utilities. The Contractor shall perform all franchise utility work under the
3 supervision and inspection of the franchise utility representative. The Appendix contains
4 construction standards and general requirements for the franchise work, to which the
5 Contractor shall comply.

6
7 The Contractor shall complete rough grading prior to excavation of any utility trenches in
8 order to establish proper depths and finish grades for structures.

9 *Coordination with Utility Companies*

10
11 The high voltage transmission mains along Des Moines Memorial Drive will remain
12 overhead, but will be relocated to new poles. The existing low voltage overhead power
13 and communication will be converted to underground as detailed in the utility plans in the
14 Appendix. The existing overhead system must remain in service until the new
15 underground system is installed, accepted and conversion is complete.

16
17 Utility companies will jointly occupy the trench in most areas. It shall be the Contractor's
18 responsibility to notify those companies sufficiently in advance of construction to allow
19 them to schedule their inspection activities to coincide with work by the Contractor. The
20 Contractor shall not backfill the trench until all utility facilities have been installed.

21
22 It shall be the Contractor's responsibility to maintain communication with the Utility
23 Companies to coordinate construction of the underground utility systems. The Contractor
24 will be required to schedule the work accordingly and shall keep the Utility Companies'
25 engineers informed of such schedules.

26
27 PSE, CenturyLink and Comcast, or their contractors, will be provided a 120-calendar day
28 window beginning when the conduit and vault systems are 100 percent complete and
29 accepted by the Contracting Agency; and ending when the systems are energized,
30 conversion complete, and existing overhead systems are removed. During this period,
31 the Contractor must accommodate the utility company work, including traffic control and
32 space requirements necessary to perform their work. The Contractor is responsible for
33 planning and coordinating this utility work into their project schedule. The Contractor
34 shall notify the utility companies 45 calendar days and 14 calendar days prior to the start
35 of the 120-day window. The 120-calendar day window is included in the allotted working
36 day for the contract; unworkable days will not be allowed due to this accommodation of
37 the utility companies or their contractors within this 120-calendar day window except as
38 provided in Section 1-08.1(1). The Contractor shall notify PSE a minimum of 10 weeks in
39 advance in order to have the high voltage transmission main relocated.

40 *Excavation for Precast Concrete/Fiberglass Structures*

41 42 Description

43
44 The provisions of this section cover the removal or excavation of all materials of whatever
45 nature, necessary for the placement of the pre-cast concrete structures.

46
47 This section also contains the provisions, which cover the construction of all shoring, the
48 pumping which may be necessary for the execution of the work, and the placement and
49 compaction of all necessary backfill to the original ground elevation.

1
2 Construction Details
3

4 All precast concrete structures shall be placed on bedding of 6 inches of crushed
5 surfacing base course on undisturbed soil. Excavations for Comcast vaults and
6 CenturyLink handholes (vaults) shall be 2 feet beyond the sides of the vault. Excavations
7 for Puget Sound Energy vaults shall be per the details on the PSE Plans. Excavations
8 shall be backfilled with crushed surfacing base course. Care should be exercised when
9 backfilling to place backfill around and under the ribs on structures. Large rocks or other
10 obstructions in the bottom of the excavation, which may cause damage to the structures,
11 shall be removed. Contractor shall coordinate and schedule work accordingly. After the
12 new underground system is installed and energized, additional excavation may be
13 necessary. Contractor shall provide excavation within 48 hours (working days) upon
14 notice by utility company.
15

16 Disposal of Excavated Materials
17

18 Excess material obtained from structure excavation shall be removed from the
19 construction area and disposed of by the Contractor.

20 *Trench Excavation and/or Backfill*
21

22 Description
23

24 The provisions of this section cover the removal or excavation of all materials, of
25 whatever nature necessary, for the placement of electrical and telecommunications
26 conduits, which also includes sweeps and pole risers. This section also contains the
27 provisions which govern the construction of all shoring, the pump (pumping which may be
28 necessary for the execution of the work) and placement and compaction of all necessary
29 backfill to the original ground elevation.
30

31 It is the intent that the primary and secondary electrical conduit, telecommunication
32 conduit, City spare conduit and illumination conduits, etc., be placed in a common trench,
33 insofar as practicable. Trench widths shall not be less than as shown on the contract
34 drawings, and not wider than practicable for installation of the cable and conduit. Trench
35 depths shall be such as to provide the maximum depth from the top of the cable or
36 conduit to the surface of the placement or ground as shown on the Contract Drawings.
37 Trench shall be constructed so that the various utilities can transition in and out of the
38 trench in an orderly fashion without altering duct bank alignments of other existing or new
39 utilities shown on the Plans. Separation of crossing utilities sharing a common utility
40 trench is 8 inches. No additional compensation will be made for any widening or
41 deepening of the trench. The Contractor shall note that roadway grading and other
42 improvements will require cuts and/or fills over and adjacent to utility trenching and
43 crossings.
44

45 The bottom of all trenches shall be smooth, uniform, free of all loose rock, stone, other
46 sharp objects, and foreign material. Hand fill where large rocks are encountered and as
47 directed by the engineer.
48

49 The sand pipe zone bedding and initial trench backfill over conduits shall be placed with
50 due care to prevent damage, as indicated on the Plans.

Where directed by the engineer, trenches having abrasive bottom characteristics or where conduits are racked into a multilevel duct bank, the contractor shall place a sand cushion below the duct bank and sand cover above the duct bank.

Backfilling shall follow as closely after the trenching, cable laying, conduit installation, and bedding as permissible. Care shall be taken during all phases of the work so as not to knock rocks and other debris into the trench and thus contaminating the bedding.

All excess and/or unsuitable excavated material from all trenches shall be loaded and removed from the site without contaminating existing finished subgrade material at the Contractor's expense. Upon completion of the trenching, backfilling, and compacting, the area shall be cleaned up and restored to the neat lines and grades existing prior to commencing construction or as otherwise specified in the Contract Documents.

Backfill Material

Trench backfill material, above the sand pipe zone bedding, shall be crushed surfacing base course where trench is within road or sidewalk. If the trench is outside the road or sidewalk the trench may be backfilled with suitable native material as defined in Section 9-03.15. Backfill shall be as indicated on the Plans.

Compaction

The backfill shall be compacted by a method approved by the Engineer and meeting the provisions of Section 7-08.3(3) of the Standard Specifications.

Precast and Fiberglass Utility Structures

Description

The utility companies shall furnish all precast concrete and/or fiberglass utility structures, as shown and detailed on the Plans. The Contractor shall install the precast concrete and fiberglass utility structures, as indicated on the Plans and specified herein.

*Note: **Extreme caution should be used in the vicinity of energized equipment.** PSE line personnel must always be present when trenching in the vicinity of energized equipment, and only PSE line personnel shall install duct into energized transformers, switches, vaults, cabinets or any other surface mounted installation. All such activities shall be coordinated in advance with PSE.*

8-20.3(1) General

The following is added at the end of this section:

Contracting Agency Owned Equipment: A portion of the temporary or existing electrical equipment to be removed shall remain the property of the Contracting Agency. The following shall be disconnected, dismantled, and delivered to the Contracting Agency as specified in subsection **"Delivery of Removed Items"**:

Controller Cabinet and all Internal Components

Vehicle Signal Heads

Pedestrian Signal Heads

Pedestrian Push Buttons

Opticom Emergency Pre-emption Detectors

Contractor Owned Removals: All removals associated with the non-utility owned electrical system, which are not designated to remain the property of the Contracting Agency, shall become the property of the Contractor and shall be removed from the project. The Contractor shall:

Remove all wires for discontinued circuits from the conduit system. Where conduit is to remain, pull in tracer pull tape.

Remove elbow sections of abandoned conduit entering junction boxes.

Abandoned conduit encountered during excavation shall be removed to the nearest outlets or CDF the run as directed by the Engineer.

Remove foundations entirely, unless the Plans state otherwise.

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

Energized Equipment: Work shall be coordinated so that electrical equipment, with the exception of the service cabinet, is energized within 72 hours of installation.

Construction Core Installation: The Contractor shall coordinate installation of construction cores with Contracting Agency maintenance staff through the Engineer. The Contractor shall provide written notice to the Engineer, a minimum of seven working days in advance of proposed installation. The Contractor shall advise the Engineer in writing when construction cores are ready to be removed.

Wire Removal: Remove all wires from salvaged light and signal standards.

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

Spanwire Removal: Span wire shall not be lowered or disconnected from strain poles until all associated signal heads, opticoms and signs have been removed from the span.

Electrical Equipment Removals: Removals associated with the electrical system shall not be stockpiled within the job site without the Engineer's approval.

Delivery of Removed Items: Removed electrical equipment which remains the property of the Contracting Agency shall be delivered to:

King County Signal Shop

155 Monroe Ave NE, Building B

Renton, WA 98058

Attention: Signal Maintenance Supervisor

Telephone: (206) 423-0996 or (206) 296-8153 or (206) 296-8100

Five days written advance written notice shall be delivered to both the Engineer and the King County Signal Shop. Delivery shall occur between the hours of 7:30 AM and 2:30 PM Monday through Friday. Material will not be accepted without the required advance notice.

Equipment damaged during removal or delivery shall be repaired or replaced to the Engineer's satisfaction at no cost to the Contracting Agency.

The Contractor shall be responsible for unloading the equipment where directed by the Engineer at the delivery site.

Pole Removal: Poles designated for removal shall not be removed prior to approval of the Engineer.

8-20.3(5) Conduit

8-20.3(5)A General

This section is deleted in its entirety and replaced with the following:

Installation of conduit shall conform to appropriate articles of the Code and these Specifications.

The ends of all conduits shall be well reamed to remove burrs and rough edges. Field cuts shall be made square and true.

When conduit or casing is to be placed under pavement it shall be placed prior to the placement of a subbase, base, surfacing, and pavement.

Existing conduit in place scheduled to receive new conductors shall have any existing conductors removed and a cleaning mandrel sized for the conduit shall be pulled through.

The size of conduit used shall be as shown in the Plans. Conduits smaller than 1-inch electrical trade size shall not be used unless otherwise specified, except that grounding conductors at service points may be enclosed in 1/2 -inch diameter conduit.

Conduit between light standards, PPB, PS, or Type 1 poles and the nearest junction box shall be the diameter specified in the Plans. Larger size conduit is not allowed at these locations. At other locations, it shall be the option of the Contractor, at no expense to the Contracting Agency, to use larger size conduit if desired, and where larger size conduit is used, it shall be for the entire length of the run from outlet to outlet. Reducing couplings will not be permitted.

All new conduit, inner-duct and outer-duct shall be blown clean with compressed air. Then in the presence of the Engineer, an 80 percent sizing mandrel, correctly sized for the raceway, shall be pulled through to ensure that the raceway has not been deformed. Immediately after the sizing mandrel has been pulled through, install an equipment grounding conductor if applicable (see Section 8-20.3(9)), any new or existing wire or cable as specified in the Plans and a 400-pound minimum tensile strength tracer pull tape. In nonmetallic conduit less than 2-inch nominal diameter, tracer pull tapes shall not be less than 1/4-inch. In nonmetallic conduit of 2-inch nominal diameter or larger, tracer pull tapes for wire installation shall not be less than 1/2-inch diameter or width.

The tracer pull tape shall be attached to duct plugs or caps at both ends of the conduit. All conduit scheduled for future use shall originate in a foundation or junction box as detailed in the Plans and terminate in a junction box. All equipment grounding conductors, and the bonding conductor for metallic conduits shall be bonded in all junction boxes in accordance with Section 8-20.3(9).

Conduit ends shall be capped (do not glue non-metallic caps). Metallic conduit ends shall be threaded and capped with standard threaded conduit caps until wiring is started. When conduit caps are removed, the threaded ends shall be provided with approved conduit bushings or end bells (do not glue in place) for nonmetallic conduit.

Conduit stubs from controller cabinet foundations shall extend to the nearest junction box in that system.

8.20.3(5)B Conduit Type

This section is deleted in its entirety and replaced with the following:

Conduit shall be rigid polyvinyl chloride (PVC), high density polyethylene (HDPE), rigid galvanized steel, galvanized steel, or flexible metal depending on the application.

Rigid galvanized steel conduit shall be installed at the following locations:

1. Within railroad right-of-way.
2. All pole risers, except as otherwise required by owning utilities.
3. All bends with radius less than 3 feet on runs over 180 feet in length. Runs embedded within reinforced concrete structures are exempted.
4. All other locations noted in the Contract.
5. All runs externally attached to structures.
6. All runs within slip form structures.

Galvanized steel conduit, Schedule 80 polyvinyl chloride (PVC) or Schedule 80 high density polyethylene (HPDE) conduit shall be installed at the following locations:

1. All roadbed crossings.
2. All conduit entering foundations.
3. All runs installed at traffic signal locations, except inner-duct, and all other locations noted in the Plans.
4. All other locations noted in the Contract.

Schedule 40 PVC or HPDE conduit may be installed at the following locations:

1. As inner-duct
2. Couplings in cabinet foundations. The stub-outs above the couplings shall be PVC end bell bushings. The Schedule 40 section of PVC between the coupling and end bell bushings shall be installed without glue.
3. All other locations noted in the Plans.

Conduit runs, without inner-duct, installed using the directional boring method, that enter the traveled way or shoulders shall be Schedule 80 high-density polyethylene (HDPE) Schedule 80 PVC with mechanical couplings, or rigid galvanized steel.

At all other locations, conduit shall be PVC or rigid galvanized steel and the same type of conduit shall be used for the entire length of the run, from outlet to outlet. Standard PVC conduit shall be connected with medium-grade gray solvent applied per manufacturer's recommendations.

When PVC conduit is installed by a method other than directional boring, conduit shall be Schedule 40, with the exception that PVC conduit within the traveled way or shoulders and service lateral runs shall be Schedule 80.

8-20.3(5)B1 Rigid Metal Conduit

This section is removed in its entirety and replaced with the following:

Slip joints or running threads will not be permitted for coupling metallic conduit; however, running threads will be permitted in traffic signal head spiders and rigid galvanized steel outer-ducts. When installing rigid galvanized steel conduit and a standard coupling cannot be used, an approved three-piece coupling shall be used. Conduit fittings and couplings for steel conduit shall be cleaned and then painted with one coat of paint conforming to Section 9-08.1(2)B. The paint shall have a minimum wet film thickness of 3 mils and cover the entire coupling or fitting. The threads on all metallic conduit shall be rust-free, clean and painted with a good quality colloidal copper suspended in a petroleum vehicle before couplings are made. All couplings shall be tightened so that a good electrical connection will be made throughout the entire length of the conduit run. If the conduit has been moved after assembly, it shall be given a final tightening from the ends prior to backfilling.

Galvanized rigid steel conduit ends shall be terminated with grounded end bushings. Galvanized rigid steel conduit entering cable vaults shall extend 2 inches for the installation of grounded end bushing and bonding.

Galvanized rigid steel conduit entering concrete shall be wrapped in 2-inch-wide pipe wrap tape with a minimum 1-inch overlap for 12 inches on each side of the concrete face. Pipe wrap tape shall be installed per the manufacturer's recommendations.

Metallic conduit bends, shall have a radius consistent with the requirements of Article 344.24 and other articles of the Code. Where factory bends are not used, conduit shall be bent, using an approved conduit bending tool employing correctly sized dies, without crimping or flattening, using the longest radius practicable.

Where coating on galvanized conduit has been injured in handling or installing, such injured places shall be thoroughly painted with galvanizing repair paint, Formula A-9-73.

Metallic conduit stubs, caps, and exposed threads shall be painted with galvanizing repair paint Formula A-9-73.

8-20.3(5)B2 Non-Metallic Conduit

When nonmetallic conduit is installed, care shall be used in excavating, installing and backfilling, so that no rocks, wood or other foreign material will be left in a position to cause possible damage.

1 Nonmetallic conduit entering cable vaults and pull boxes shall terminate flush with the inside
2 walls of the structure. All conduit ends shall be terminated with termination kits.

3 Nonmetallic and nonmetallic conduit installation shall include equipment grounding conductor
4 and shall conform to requirements noted in the WSDOT Standard Plans.

5 When HDPE conduit is used for directional boring, it shall be continuous, with no joints for
6 the full length of the bore. The conduit run shall be extended to the associated outlets with
7 the same schedule HDPE or PVC conduit. Entry into associated junction box outlets shall be
8 with the same schedule PVC conduit and elbows. The same requirements apply for
9 extension of an existing HDPE conduit crossing.

10 PVC conduit and elbows shall be connected to HDPE conduit with an approved mechanical
11 coupling. The connection shall have a minimum pullout strength of 700 pounds. Prior to
12 installation of a mechanical coupling, the HDPE conduit shall first be prepared with a clean,
13 straightedge. A water-based pulling lubricant may be applied to the threaded end of the
14 mechanical coupling before installation. Solvent cement or epoxy shall not be used on the
15 threaded joint when connecting the HDPE conduit to the mechanical coupling. The
16 mechanical coupling shall be rotated until the HDPE conduit seats approximately 3/4 of the
17 distance into the threaded coupling depth.

18 For PVC installation through a directional bore, the PVC shall be in rigid sections assembled
19 to form a watertight bell and spigot-type mechanical joint with a solid retaining ring around
20 the entire circumference of the conduit installed per the manufacturer's recommendations.
21 The conduit run shall be extended beyond the length of the bore, to the associated outlets
22 with the same mechanical coupled PVC or with standard PVC conduit of the same schedule.
23 The same requirements apply for extension of an existing PVC conduit roadway crossing.

24 Nonmetallic conduit bends, where allowed, shall conform to Article 352.24 of the Code.
25 Eighteen-inch radius elbows shall be used for PVC conduit of 2-inch nominal diameter or
26 less. Standard sweep elbows shall be used for PVC conduit with greater than 2-inch nominal
27 diameter unless otherwise specified in the Plans. In nonmetallic conduit less than 2-inch
28 nominal diameter, tracer pull tapes for wire installation shall not be less than 1/4-inch. In
29 nonmetallic conduit of 2-inch nominal diameter or larger, tracer pull tapes for wire installation
30 shall not be less than 1/2-inch diameter or width.

31 Non-metallic conduit shall be assembled using the solvent cement specified in
32 Section 9-29.1.

33 **8-20.3(5)C Conduit Size**

34 **8-20.3(5)D Conduit Placement**

35 This section is removed in its entirety and replaced with the following:

36 Conduit shall be laid so that the top of the conduit is a minimum depth of:

- 37 1. 24 inches below the bottom of the curb in sidewalk areas.
- 38 2. 24 inches below the top of the roadway
- 39 3. 48 inches below the bottom of ties under railroad tracks unless otherwise specified by
40 the Rail Road Company.
- 41 4. 24 inches below the finish grade in all other areas.

Conduit entering through the bottom of a junction box shall be located near the end walls to leave the major portion of the box clear. At all outlets, conduit shall enter and exit the junction box, pull box or cable vault in the direction of the pull/run, terminating 6 to 8 inches below the junction box lid and within 3 inches of the box wall nearest its entry location.

Conduit runs shown in the Plans are for bidding purposes only and may be changed, with approval of the Engineer, to avoid underground obstructions.

Conduit shall be placed under existing pavement by approved directional boring, jacking or drilling methods, at locations approved by the Engineer. The pavement shall not be disturbed unless allowed in the Plans, or with the approval of the Engineer in the event that obstructions or impenetrable soils are encountered.

Conduit terminating in foundations shall extend a maximum of 2 inches above the foundation vertically including grounded end bushing or end bell.

Suitable marker stakes shall be set at the ends of conduits, which are buried so that they can be easily located.

Fittings shall be installed in accordance with current electrical codes, allowing freedom to install the electrical control wires without construction of the raceway. When conduit fittings are required per the Plans or as directed by the Engineer, the Contractor shall furnish all necessary covers and gaskets.

8-20.3(5)E Method of Conduit Installation

8-20.3(5)E4 Directional Boring:

This section is deleted in its entirety and replaced with the following:

General: The Contractor shall provide all materials, equipment and labor necessary to install the conduit using Horizontal Directional Boring (HDB) as shown on the Plans. Where new conduit installation is shown on the Plans, it shall be the option of the Contractor, at no expense to the Contracting Agency, to use horizontal directional boring method as an alternative to trenching. Directional boring for electrical installations shall be supervised by a licensed electrical contractor in accordance with Section 8-20.1(1).

Prior to Commencing Drilling Operation: Prerequisites for HDB for Contractor are minimum of two (2) years' experience installing conduit using HDB for both driller and locator. The Contractor shall provide details of similar contract experience successfully completed or in progress within the last three (3) years. This shall include at least three (3) projects of similar difficulty and magnitude to this project.

The Contractor shall provide Engineer with a drilling plan and data that shall include, at a minimum:

1. Equipment – The Contractor shall be responsible for selecting the equipment used during the drilling operation. The acceptance of the equipment by the Engineer in no way relieves the Contractor of the responsibility for difficulty or inability to successfully complete drilling and pullback operations or for damages of any nature that might occur as a result of the equipment used or of meeting the requirements of the contract documents, plans or specifications for this project.

1 The Contractor's drilling equipment shall be equipped with an electrical strike system.
2 The strike system shall be capable of indicating an electric strike by sensing both
3 current and voltage. The strike system shall be equipped with warning strobes on
4 both the drill frame and the power unit.

- 5 2. Methods and Work Plan – Include the anticipated location of all equipment on the
6 project site including slurry containment pit, cuttings settlement pit, and layout
7 requirements prior to pull back. Supply full details of the procedures and resources
8 that will be employed to carry out the work including method and sequence of drilling
9 operations, conduit and duct assembly and installation, and emergency procedures.
10 For drilling operations, include the number and size of construction crews, hours to be
11 worked, pilot hole drilling procedure, reaming procedure, method of monitoring the
12 drilling head, method of verifying conduit and duct location for As-Built drawings and
13 the schedule for completing major activities. Data to be provided regarding conduit
14 and duct assembly and installation shall include the number and size of the
15 construction crew, assembly procedure, joining procedure for conduit and ducts, and
16 the installation/pullback procedure. Provide emergency procedures for dealing with
17 blow holes or breakouts of drilling fluids and other types of problems that may be
18 experienced during the work.

19 The Contractor shall be responsible for obtaining, transporting and storing water
20 associated with the conduit installation by HDB. The Contractor shall obtain any
21 agreements or permits.

- 22 3. Company and Personnel – Names and resumes for all key personnel to be employed
23 in the execution of this Work including supervisory and operation personnel. At a
24 minimum this shall include the project engineer, drill operator, construction
25 superintendent and/or foreman surveyor. Provide qualification documents for all
26 subcontractors including those supplying drilling assemblies, drilling fluids, guidance
27 instrumentation, reaming equipment and cutters, slurry mixing tanks, and cuttings
28 separation equipment.

- 29 4. Composition of the drilling fluid medium.

- 30 5. Location of disposal site and method of removing slurry and cuttings material.

- 31 6. A Plan showing protection of traffic and pedestrians. The Contractor shall provide and
32 maintain a safety fence around all work and equipment areas.

- 33 7. The dimension of the pit.

- 34 8. Provide shoring plan.

35 Environmental Requirements: Waste cuttings and drilling mud shall be dewatered and
36 dried by Contractor to the extent necessary for disposal in offsite landfills.

37 "Blow holes" or "breakouts" of drilling fluid to the surface must be cleaned up immediately
38 and the surface area washed and returned to original condition. All drilling fluids, spoils
39 and separated material will be disposed of in compliance of local environmental
40 regulations. If the amount of surface returns exceeds that which can be contained and
41 collected using small sumps, drilling operations shall be discontinued until surface return
42 volumes can be brought under control. Equipment and materials for cleanup and
43 contingencies must be provided by Contractor and stored on site.

1 Execution: The Contractor shall install steel casings as specified and shown in the Plans.
2 Where boring with casing is called for, the casing shall be placed using an auger inside
3 the casing to remove the soil as the casing is jacked forward. The auger head shall
4 proceed no more than 4 inches ahead of the pipe being jacked. Boring operations shall
5 be conducted to prevent caving ahead of the pipe. Installed casing pipe shall be free
6 from grease, rock, dirt, rust, moisture and any other deleterious contaminants.

7 The space between the conduit and the casing shall be plugged with sand bags and a
8 grout seal 12-inch thick at each end of the casing. Casings abandoned due to an
9 encountered obstruction shall be grout sealed in the same manner. Grout shall conform
10 to Section 9-20.3(4).

11 In lieu of sandbags and grout, unopened sacks of prepackaged concrete may be used to
12 seal the casing.

13 Material shall not be removed from the boring pit by washing or sluicing.

14 All joints shall be welded by a Washington State certified welder. Welding shall conform
15 to AWS D 1.1-80 Structural Welding Code, Section 3, Workmanship.

16 Where directional boring is called for, conduit shall be installed using a surface-launched,
17 steerable drilling tool. Drilling shall be accomplished using a high-pressure fluid jet tool
18 head. The drilling fluid shall be used to maintain the stability of the tunnel, reduce drag
19 on the conduit, and provide backfill between the conduit and tunnel. A guidance system
20 that measures the depth, lateral position, and roll shall be used to guide the tool head
21 when creating the pilot hole. Once the pilot hole is established, a reamer and swivel shall
22 be used to install the conduit. Reaming diameter shall not exceed 1.5 times the diameter
23 of the conduit being installed. Conduit that is being pulled into the tunnel shall be
24 installed in such a manner that the conduit is not damaged during installation. The
25 pullback force on the conduit shall be controlled to prevent damage to the conduit. A
26 vacuum spoils extraction system shall be used to remove any excess spoils generated
27 during the installation. Excess drilling fluid and spoils shall be disposed of. The method
28 and location used for disposal of excess drilling fluid and spoils shall be subject to the
29 Engineer's approval. Drilling fluid returns (caused by fracturing of formations) at locations
30 other than the entry and exit points shall be minimized. Any drilling fluid that surfaces
31 through fracturing shall be cleaned up immediately. Mobile spoils-removal equipment
32 capable of quickly removing spoils from entry and direction pits and areas with returns
33 caused by fracturing shall be used as necessary during the drilling operations.

34 Bore pits shall be backfilled and compacted in accordance with Section 2-09.3(1) E.
35 Directional boring; and jacking or drilling pits shall be kept 2 feet from the edge of any
36 type of pavement wherever possible. Excessive use of water that might undermine the
37 pavement or soften the subgrade will not be permitted.

38 When approved by the Engineer, small test holes may be cut in the pavement to locate
39 obstructions. When the Contractor encounters obstructions or is unable to install conduit
40 because of soil conditions, as determined by the Engineer, additional work to place the
41 conduit will be paid in accordance with Section 1-04.4.

42 The Contractor shall maintain and submit a complete set of project records. The entire
43 length of the horizontal directional bore shall have a recorded profile based on a down
44 hole survey or a walkover location system. Maintain a daily activity log during horizontal
45 directional boring operations. A copy of the log shall be submitted to the Engineer for

record purposes on a daily basis. These documents shall include but not be limited to the following:

1. Start and finish time of each section of drill pipe for pilot hole drilling and reaming.
2. For pilot hole drilling, provide drill bit location at least every 30 feet along the drill path. The Contractor shall mark the As-Built drawings on a daily basis with drilling progress, complete with calculated x, y, z positions.
3. General description of ground conditions encountered along the drill path.
4. Details and perceived reasons for delays greater than one hour other than normal breaks and shift changes.
5. Details of any unusual conditions or events.

8-20.3(6) Junction Boxes, Cable Vaults, and Pull Boxes

This section is deleted in its entirety and replaced with the following:

Standard junction boxes, pull boxes and cable vaults shall be installed at the locations shown in the Plans. All junction boxes, cable vaults, and pull boxes shall be located outside the traveled way. All junction boxes, cable vaults, and pull boxes located in paved shoulders shall be heavy-duty. The Contractor may install, at no expense to the Contracting Agency, such additional boxes as may be desired to facilitate the work. Junction box installation shall conform to details in the WSDOT Standard Plans.

All junction box lids and frames shall be grounded by means of a minimum No. 8 AWG braided tinned copper bonding jumper bolted to the lid with countersunk stainless steel bolts that will allow the removal of the junction box lid without breaking the ground.

Cable vaults and pull boxes shall be installed in accordance with the following:

1. Excavation shall be performed in accordance with Section 2-09.
2. Cable vaults and pull boxes shall be installed on 6 inches of crushed surfacing top course, per Standard Plan J-40.10-04 and J-40.30-04 and section 9-03.9(3), placed on a compacted or undisturbed level foundation. If a cable vault or pull box is installed outside a paved area, an asphalt pad a minimum of 6-inches wide shall be constructed surrounding the junction box.
3. All openings around conduits shall be sealed and filled with grout to prevent water and debris from entering the vaults or pull boxes. The grout shall meet the specifications of the cable vault and pull box manufacturers.
4. Backfilling around the work shall not be allowed until the concrete or mortar has set.
5. Pull boxes shall be installed in accordance with Plans and details.
6. Pull boxes shall be configured such that the tensile and bending limitations of the fiber optic cable are not compromised. Pull boxes shall be configured to mechanically protect the fiber optic cable against installation force as well as inert forces after cable pulling operations.
7. Upon acceptance of work, cable vaults, and pull boxes shall be free of debris and ready for cable installation. All grounding requirements shall be met prior to cable installation.

- 1 8. Where installed near steel casings, the pull boxes and cable vaults shall be offset 3
2 feet, minimum from the centerline of the casing. Factory bends shall be used to route
3 the conduits to the cable vault or pull box.
- 4 9. Lids shall be spot-welded where noted in the Plans or as directed by the Engineer.
- 5 Heavy-duty Type 4, 5 and 6 junction boxes, cable vaults, and pull boxes shall be installed
6 in accordance with the following:
 - 7 1. Excavation for junction boxes, cable vaults and pull boxes shall be sufficient to leave
8 one foot in the clear between the outer surface and the earth bank.
 - 9 2. Junction boxes, cable vaults and pull boxes shall be installed on a level 6-inch layer
10 of crushed surfacing top course, in accordance with 9-03.9(3), placed on a
11 compacted or undisturbed foundation. The crushed surfacing top course shall be
12 compacted in accordance with section 2-09.3(1)E.
 - 13 3. After installation, the lid/cover shall be kept bolted down during periods when work is
14 not actively in progress at the junction box, cable vault or pull box.
 - 15 4. Before closing the lid/cover, the lid/cover and the frame/ring shall be thoroughly
16 brushed and cleaned of all debris. There shall be absolutely no visible dirt, sand, or
17 other foreign matter between the bearing surfaces.
 - 18 5. When the lid/cover is closed for the final time, a liberal coating of anti-seize
19 compound shall be applied to the bolts and nuts and the lid shall be securely
20 tightened.
 - 21 6. Hinges on Type 4, 5 and 6 junction boxes shall be located on the side of the box,
22 which is nearest to adjacent shoulder. Hinges shall allow the lid to open 180 degrees
23 and remain within right-of-way.
 - 24 7. Lids shall be spot-welded where noted in the Plans or as directed by the Engineer.
- 25 Adjustments involving raising or lowering the junction boxes shall require conduit
26 modification if the resultant clearance between the top of the conduit and the junction box
27 lid becomes less than 6 inches or more than 10 inches in accordance with WSDOT
28 Standard Plans J-40.10-04, J-40.20-03, and J-40.30-04. Wiring shall not be pulled into
29 any conduit until all associated junction boxes have been adjusted to, or installed in, their
30 final grade and location, unless installation is necessary to maintain system operation. If
31 wire is installed for this reason, sufficient slack shall be left to allow for future adjustment.
32 Cable vaults and pull boxes shall be adjusted to final grade using risers or rings
33 manufactured by the cable vault and pull box manufacturer. Cable vaults and pull boxes
34 with traffic bearing lids shall be raised to final grade using ring risers to raise the cover
35 only.
- 36 All voids resulting from the adjustment shall be backfilled with materials matching
37 adjacent surfacing material and compacted in accordance with Section 2-09.3(1)E.
- 38 Damage to the junction boxes, pull boxes, cable vaults and the associated conduit
39 system, or wiring resulting from the Contractor's operations, shall be repaired to the
40 Engineer's satisfaction at no additional cost to the Contracting Agency.

Both existing and new junction boxes, pull boxes, and cable vaults shall be adjusted to be flush with the finished grade as well as with the grade during the various construction stages proposed in the contract.

Prior to installing new cables or reinstalling existing cables into new or existing cable vaults, pull boxes or junction boxes, the cable vault, pull box or junction box shall be cleaned of all dirt and debris.

Standard Duty pull boxes, cable vaults, and concrete junction boxes installed in sidewalks, walkways, and shared-use paths shall have slip-resistant surfaces and be flush with the surface grade of the sidewalk, walkway, or shared-use path. The boxes, vaults, and junction boxes shall not be placed in curb ramps, curb ramp landings, or the gutter areas associated with the curb ramps. Standard Duty nonconcrete junction boxes shall not be installed in sidewalks, walkways, or shared-use paths.

Lids for junction boxes, pull boxes and cable vaults slated for reuse in the Plans shall be replaced if the skid-resistant coating shows any sign of flaking or peeling.

8-20.3(8) Wiring

The third paragraph of this section is deleted and replaced with the following:

All splices in underground illumination circuits, induction loop circuits, and magnetometer circuits shall be installed in junction boxes. The only splice allowed in induction loop circuits and magnetometer circuits shall be the splice connecting the induction loop lead-in conductors or magnetometer lead-in conductors to the shielded home run cable. Loop wires shall be spliced to lead-in cable at the loop junction box with an approved mastic tape, 3-M 06147 or equal. The mastic pad shall be a minimum of 5 inches long. The mastic splice shall be centered on the wire at the splice point, folded up around the sides, and jointed at the top. The mastic pad ends shall be visible and fully sealed to the conductor insulation. The ends of the lead-in cable shall have the sheathing removed 8 inches and shall be dressed external to the splice. All connections with #10 and smaller wire shall use copper crimped connectors installed with a positive action (ratchet) tool. The non-insulated die shall be an indent type and insulated die shall be of a smooth shape capable of crimping pre-insulated terminals and connectors. The tool shall be compound lever type with a ratchet mechanism to ensure positive closure for full crimping cycle. The tool shall be field adjustable to proper calibration with common tools and materials. All connectors shall be wrapped with two layers of electrical tape. All epoxy splice kits shall be physically separated from other splices and wiring within the junction box to avoid damage from heat during the casting process.

The following the added at the end of this section:

At each junction box, all illumination wires, power supply wires, and communication cable shall be labeled with a PVC marking sleeve. For illumination and power supply circuits the sleeve shall bear the circuit number. For communications cable the sleeve shall be marked "comm".

All splices shall be made in the presence of the Engineer or Signal Technician.

Temporary splices shall be heat shrink type.

8-20.3(8)A Field Wiring Chart (NEW SECTION)

(IMSA Standards)

501	AC+ Input	508	AC+ Detectors
502	AC-	509	AC+ 12 Volts
503	AC+ Lights	510	Remote-Flash
504	AC+ Lights	511	Remote-All Red
505	AC+ Lights	512-520	Special
506	AC+ Control	551-562	Interconnect
507	AC+ Crosswalk	593-598	Railroad Preemption

	Phases	1	2	3	4	5	6	7	8	A	B	C	D
Vehicle Heads	Red	611	621	631	641	651	661	671	681	6A1	6B1	6C1	6D1
	Orange	612	622	632	642	652	662	672	682	6A2	6B2	6C2	6D2
	Green	613	623	633	643	653	663	673	683	6A3	6B3	6C3	6D3
	Black	614	624	634	644	654	664	674	684	6A4	6B4	6C4	6D4
	White	616	626	636	646	656	666	676	686	6A6	6B	6C6	6D6
Pedestrian Heads	Red	711	721	731	741	751	761	771	781				
	Green	712	722	732	742	752	762	772	782				
	White	716	726	736	746	756	766	776	786				
	Orange	714	724	734	744	754	764	774	784				
	Black	715	725	735	745	755	765	775	785				
Vehicle Detection	Loop 1	811	821	831	841	851	861	871	881	8A1	8B1	8C1	8D1
	Loop 1	812	822	832	842	852	862	872	882	8A2	8B2	8C2	8D2
	Loop 2	813	823	833	843	853	863	873	883	8A3	8B3	8C3	8D3
	Loop 2	814	824	834	844	854	864	874	884	8A4	8B4	8C4	8D4
	Loop 3	815	825	835	845	855	865	875	885	8A5	8B5	8C5	8D5
	Loop 3	816	826	836	846	856	866	876	886	8A6	8B6	8C6	8D6
	Loop 4	817	827	837	847	857	867	877	887	8A7	8B7	8C7	8D7
	Loop 4	818	828	838	848	858	868	878	888	8A8	8B8	8C8	8D8
Vehicle Detectors / Count Loops	Loop 1	911	921	931	941	951	961	971	981	9A1	9B1	9C1	9D1
	Loop 1	912	922	932	942	952	962	972	982	9A2	9B2	9C2	9D2
	Loop 2	913	923	933	943	953	963	973	983	9A3	9B3	9C3	9D3
	Loop 2	914	924	934	944	954	964	974	984	9A4	9B4	9C4	9D4
	Loop 3	915	925	935	945	955	965	975	985	9A5	9B5	9C5	9D5
	Loop 3	916	926	936	946	956	966	976	986	9A6	9B6	9C6	9D6
	Loop 4	917	927	937	947	957	967	977	987	9A7	9B7	9C7	9D7
	Loop 4	918	928	938	948	958	968	978	988	9A8	9B8	9C8	9D8

8-20.3(9) Bonding, Grounding

The first paragraph of this section is deleted and replaced with the following:

All metallic appurtenances containing electrical conductors (luminaires, light standards, cabinets, metallic conduit, non-metallic conduit, etc.) shall be made mechanically and electrically secure to form a continuous system that shall be effectively grounded. Where metallic conduit systems are employed, the conduit system constitutes the equipment grounding conductor. Where non-metallic conduit is installed, the installation shall include an equipment ground conductor, in addition to the conductors noted in the contract. Except as noted below for sign lighting fixtures, bonding. Bonding jumpers and equipment grounding conductors shall be installed in accordance with Section 9-29.3 and sized per NEC 250-122. The equipment ground conductor between the isolation switch

and the sign lighter fixtures may be No. 14 AWG stranded copper conductor. Where parallel circuits are enclosed in a common conduit, the equipment grounding conductor shall be sized by the largest overcurrent device serving any circuit contained within the conduit.

The following is added at the end of this section:

Where conductors are adjusted in size to compensate for voltage drop, equipment grounding conductors shall be adjusted proportionately according to circular mil area in compliance with NEC 250-122(b).

The grounding electrode system shall consist of a ground ring and shall be 25 ohms or less impedance. The ground ring shall be placed in contact with the earth at a depth of 2.5 feet or more and consist of bare copper conductor not smaller than No. 2. The grounding electrode system shall be tested with a ground rod tester in the presence of the County Signal Technician prior to activating the service.

8-20.3(10) Services, Transformer, Intelligent Transportation System Cabinet

The following is added at the end of this section:

Service type shall be county standard ES-2EU or ES-1 cabinets, unless otherwise approved by the Engineer. The Contractor shall request the State Department of Labor and Industries (L&I) to perform required inspections for service approval. The request by the Contractor to L&I shall be sent by certified mail with a copy forwarded to the County. The Contractor shall notify the Engineer when the service is approved by L&I and ready for connection.

8-20.3(11) Testing

The fourth paragraph of this section is deleted and replaced with the following:

When the project includes a traffic signal system, the Contractor shall conduct tests noted in Section 8-20.3(14)D. The Contractor shall provide the Engineer a minimum of five days advance written notice of the proposed traffic signal turn-on date and time. The Contractor shall be present during the turn-on with adequate equipment to repair any deficiencies in operation. The traffic signal turn-on procedure shall not begin until all required channelization, pavement markings, illumination, signs, and sign lights are substantially complete and operational unless otherwise allowed by the Project Engineer. The Contractor shall provide traffic control to stop all traffic from entering the intersection. The Contracting Agency Traffic Signal Technician will program the controller and enter the timing data, and then turn the traffic signal system to its flash mode to verify proper flash indications. The Contractor shall then conduct functional tests to demonstrate that each part of the traffic signal system, illumination system, or other electrical system functions as specified. These demonstrations shall be conducted in the presence of a Traffic Signal Technician. The Contracting Agency Traffic Signal Technician shall then turn the traffic signal to stop and go operation for no less than one full cycle. Based on the results of the turn-on, the Contracting Agency Electronics Technician will either turn on the traffic signal to normal stop and go operation or to turn off the signal. If turned off, the Contractor shall cover all signal displays. Signal display covers shall be re-usable yellow bags or Caltrans-approved re-usable yellow cloth type covering the whole signal head, unless otherwise approved by the Engineer.

1 **8-20.3(13)C Luminaires**

2 The following is added at the end of this section:

3 All luminaires shall be light-emitting-diode type meeting Section 9-29.10.

4 **8-20.3(13)A Light Standards**

5 The following is added at the end of this section:

6 Decorative light standards shall meet the requirements as stated in the latest version of
7 AASHTO and shall be able to withstand winds of 80 mph with a gust factor of 1.3. All
8 decorative light standards shall have slip bases per WSDOT Standard Plans J-28 series.
9 Hand holes shall be oriented as shown on the Plans. Fabrication of pole length shall be
10 within a 6-inch tolerance.

11 **8-20.3(14)B Signal Heads**

12 The following is added at the end of this section:

13 Signal heads shall be installed with 5-inch flat-black aluminum back plates. A two-inch
14 wide reflective tape shall be applied around the outside perimeter of the back plate. Prior
15 to applying the tape, the back plate shall be cleaned, degreased with isopropyl alcohol
16 and dried thoroughly.

17 **8-20.3(14)C Induction Loop Vehicle Detectors**

18 **Existing Traffic Loops**

19 The Contractor shall notify the Engineer a minimum of five working days in advance of
20 pavement removal or grinding in areas with existing loops.

21 If the Engineer suspects that damage to any loop, not identified in the Plans as being
22 replaced, may have resulted from Contractor's operations or is not operating adequately,
23 the Engineer may order the Contractor to perform the field tests specified in Section 8-
24 20.3(14)D. The test results shall be recorded and submitted to the Engineer. Loops that
25 fail any tests shall be replaced.

26 Loops that fail the tests, as described above, and are replaced shall be installed in
27 accordance with current County design standards and Standard Plans, as determined by
28 the Engineer.

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

33 **8-20.3(14)D Test for Induction Loops and Lead-In Cable**

34 This section is deleted in its entirety and replaced with the following:

35 All tests shall be performed by the Contractor in the presence of the Traffic Signal
36 Technician for each loop or the tests will be conducted by County personnel at the
37 request of the Contractor. The tests shall be performed at the amplifier location after
38 complete installation of the loop. All costs associated with testing shall be included in the
39 unit contract prices of the respective bid items.

Test A — The DC resistance between the two lead-in cable wires will be measured by a volt ohm meter. The resistance shall not exceed 5 ohms measured at the loop ends in the junction box.

Test B — A megohm meter test at 500 volts DC shall be made between the lead-in cable shield and grounding, prior to connection to grounding. The resistance shall equal or exceed 200 megohms.

Test C — A megger test shall be made between the loop circuit and grounding. The resistance shall equal or exceed 200 megohms.

Test D — An inductance test to determine the inductance level of each inductance loop. The Contractor shall record the inductance level of each inductance loop installed on the project and shall furnish the findings to the Engineer. The inductance level shall equal or exceed 90 micro-henries.

If any of the installations fails to pass all tests, the loop installation or lead-in cable shall be repaired and replaced and then retested.

8-20.3(14)F Temporary Video Detection System (NEW SECTION)

Prior to commencing Work around existing vehicle inductance loops, the Contractor shall provide a fully operational temporary video detection system at the intersection noted in the Plans. The temporary video detection system shall be completely installed and made fully-operational prior to any associated induction loop being disabled. The County will operate and the Contractor shall maintain the video detection system throughout construction until the permanent video detection system is operational at the changeover. The Contractor shall provide adequate cable for each detection camera to allow relocation of cameras as construction conditions (lane shifts, traffic control, etc) change.

The video detection system shall consist of the following:

- Video cameras, including camera enclosure, filter, sunshield and connector kit
- Camera mount assemblies, including extensions and mast arms as specified in the Plans.
- Video image processors
- 9-inch LED OR LCD video monitor, including cable
- Programming devices and/or software
- Camera lens(es) and lens adjustment module
- Surge Suppressor
- Coaxial and power cables
- All other equipment necessary for a fully operational video detection system.

Cameras shall be mounted at a sufficient height to prevent occlusion from cross traffic and obstruction by overhead cables. The Contractor shall provide and install the camera mounts and cable per the Plans. King County will install the cameras and controller cabinet video camera equipment, and program the cameras to provide detection. The Contractor shall notify the Engineer 48 hours in advance of changes that will require King County staff to reprogram cameras.

1 All video detection system equipment shall become the property of the Contractor upon
2 completion of the contract work. The Contractor shall be responsible for any damage to the
3 video detection equipment.

4 **8-20.4 Measurement**

5 (*****)

6 The following is added as the first paragraph in this section:

7 When shown as lump sum in the Plans or in the Proposal as Illumination System,
8 Complete or Traffic Signal System, Complete no specific unit of measurement will apply,
9 but measurement will be for the sum total of all complete items for a complete system to
10 be furnished and installed.

11 Measurement of Furnish and Install ____ Inch Diam., Sch. ____, PVC Conduit w/Fittings
12 will be per linear foot of conduit installed to include sweeps.

13
14 Measurement of Joint Utility Trench shall be per cubic yard.

15
16 Measurement of Install ____ Conduit w/Fittings will be per linear foot of utility-furnished
17 conduit.

18
19 Measurement of Install ____ Vault will be per each of utility-furnished vault installed.

20
21 Measurement of Locate Septic Drainfield will be per each drainfield located.

22 23 **8-20.5 Payment**

24 (*****)

25 This section is deleted in its entirety and replaced with the following:

26 Payment will be made for each of the following bid items that are included in the
27 Proposal:

28 "Illumination System, Complete", lump sum.

29 The lump sum Contract price for "Illumination System, Complete" shall be full pay for the
30 construction of the complete electrical system as shown in the Plans and herein specified
31 including: furnishing and installing concrete foundations, decorative light standards, slip
32 bases, LED cobra head luminaires, LED decorative luminaires, photocell, electrical
33 service cabinet, ground rods, fuses, splices, all illumination conduit, junction boxes,
34 conductors; trench, backfill and compaction; temporary traffic control; excavation,
35 backfilling, waste/haul; restoring facilities destroyed or damaged during construction;
36 additional costs due to procurement suspensions, and for making all required tests. All
37 additional materials and labor, not shown in the Plans or called for herein and which are
38 required to complete the illumination system, shall be included in the lump sum Contract
39 price.

40 "Traffic Signal System, Complete", lump sum.

41 The lump sum Contract price for "Traffic Signal System, Complete" shall be full pay for
42 the construction of the complete electrical system, modifying or removing existing
43 system, or both, as shown in the Plans and herein specified including: adapting existing

1 signal systems to accommodate various channelization phases as work progresses;
2 furnishing and installing concrete foundations, signal standards, controller, controller
3 cabinet, auxiliary equipment, uninterruptible power supply (UPS) cabinet, vehicle and
4 pedestrian signal heads, APS pedestrian push button assemblies, emergency vehicle
5 preemption detectors, temporary video vehicle detection system, permanent video
6 detection system, conduit, junction boxes, all signal conduit, conductors, signal-mounted
7 traffic signing; trench, backfill and compaction; temporary traffic control; excavation,
8 backfilling, wastehaul; restoring facilities destroyed or damaged during construction;
9 salvaging existing materials; additional costs due to procurement suspensions,
10 coordinate with PSE for electrical service and meter, and for making all required tests. All
11 additional materials and labor, not shown in the Plans or called for herein and which are
12 required to complete the traffic signal system, shall be included in the lump sum Contract
13 price.

14 "Joint Utility Trench Excavation," per cubic yard.

15 The unit contract price per cubic yard for "Joint Utility Trench Excavation" shall be full
16 compensation for all labor, materials, tools, and equipment necessary or incidental to
17 construct joint utility trench and crossings as indicated on the Plans and specified herein.
18 This work includes, but is not limited to, excavation, bedding, backfilling with Contracting
19 Agency approved suitable native material, compaction, wastehaul, dewatering, draining,
20 regrading, maintaining drainage channels, identification tape, cleanup, trenching for
21 Comcast pedestals, and coordination with PSE, Comcast and CenturyLink necessary to
22 complete the trenching. This work also includes any temporary fenced storage area for
23 utility provided conduit and vaults.

24 "Furnish and Install ____ Conduit, ____ Inch Diam., PVC Sch. ____, (w/Fittings)," per
25 linear foot.

26
27 The unit contract price per linear foot for "Furnish and Install ____ Conduit, ____ Inch
28 Diam., PVC Sch. ____, (w/Fittings)" shall be full compensation for all costs to furnish,
29 install and proof the Contractor provided conduit to include sweeps, sand bedding,
30 temporary plugs, fittings, sweeps, mule tape, identification tape, and coordination with the
31 City.

32
33 "Install ____ Conduit, ____ In. Diam. (w/Fittings)," per linear foot.

34
35 The unit contract price per linear foot for "Install ____ Conduit, ____ In. Diam.
36 (w/Fittings)" shall be full compensation for all costs to coordinate with the utilities for the
37 utility provided conduit and fittings, and to install the conduit, spacers and sweeps, sand
38 bedding, proof the conduit, install temporary plugs, fittings, mule tape, identification tape
39 and coordinate with PSE, Comcast and CenturyLink.

40
41 "Install ____ Vault, Type ____, " per each.

42
43 The unit contract price per each for "Install ____ Vault, Type ____" shall be full
44 compensation to coordinate with the utility companies for the utility provided vault,
45 excavate, wastehaul excess material, furnish and install vault foundation, install utility
46 supplied vault, furnish and install backfill and provide temporary and final vault, handhole,
47 manhole, adjustments and to coordinate the work with PSE, Comcast and CenturyLink.
48