Active Traffic Management System Design Build Project

Chapter 2

Technical Requirements

Washington State Department of Transportation

I-5 Et Al.
Active Traffic Management System Design Build

Request for Proposal

April 6, 2009

Washington State Department of Transportation

WASHINGTON JOBS NOW

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2.1 GENERAL INFORMATION

2.1.1 GENERAL

Design-Build Flexibility – WSDOT intends to allow the Design-Builder flexibility in design and construction by accommodating the processes, procedures, and innovative techniques that are preferred by the Design-Builder, as long as they are consistent with the Basic Configuration, site conditions, good engineering practices, WSDOT standard practices, and the standards, guidelines, and procedures identified in the Contract.

Other Agencies – The Design-Builder shall promptly notify WSDOT of any public and private agency requirements that it discovers. The Design-Builder and WSDOT shall coordinate all negotiations with the appropriate agencies.

2.1.1.1 SCOPE

The Design-Builder shall conduct all Work necessary to deliver or construct the Project, unless the Work is specified to be performed by WSDOT or by others. Quality Control and Quality Assurance processes shall apply to all aspects of the Work, including but not limited to, design, construction, environmental compliance, maintenance of traffic, public involvement, utilities, and control of materials. These processes shall be outlined in the Quality Management Plan.

2.1.1.2 DEFINITIONS

The following capitalized terms shall have the following meanings:

Appendix (Appendices) – Where referred to in the RFP (without other reference), the term Appendix (Appendices) refers to the documents listed in Appendix A1.

Project – I-5 Et Al. Active Traffic Management System Design Build

Review and Comment – The process for reviewing and commenting on the Design-Builder's submittals in accordance with the Design-Builder's responsibility for Work. See Section 1-07 of the General Provisions.

WSDOT I-5 ATM Gantry Project – I-5 ATM Gantry project will build typical WSDOT signbridges along the I-5 corridor for the eventual use by this Project. The project is scheduled to begin in spring of 2009, and be completed by January of 2010. Each gantry will be turned over to this Project as it is completed.

WSDOT I-90/SR 520 ATM Gantry Project – The I-90 and SR 520 ATM Gantry project will build typical and modified-design WSDOT signbridges along the I-90 and SR 520 corridors for the eventual use by this Project. The project is schedule to begin in summer of 2009, and be completed in winter of 2010. Each gantry will be turned over to this Project as it is completed.

2.1.1.3 UNITS OF MEASUREMENT

The Project shall be designed, constructed, and documented in English units of measure.

2.1.1.4 PURPOSE

The purpose of the Project is to provide safety improvements and congestion relief along I-5, SR 520, and I-90. The Project will reduce secondary collisions and their severity by reducing speeds in successive steps prior to congestion or an incident.

2.1.1.5 PROJECT DESCRIPTION

The Project will design, manufacture, procure, test, commission, and integrate Active Traffic Management (ATM) Dynamic Message Signs (DMS). The DMS signs include, but are not limited to, the following:

- Variable Message Signs (VMS) – Typical WSDOT VMS signs, but without cat-walk. Mounted on ATM gantries and existing overpass structures.
- Side-mount Dynamic Message Signs (SDMS) – Full-color, full-matrix signs, mounted on the sides of ATM gantries, on existing structures, and ground-mounted.
- Lane Control Signs (LCS) – Limited function color full-matrix signs, mounted over each lane on gantries and overpass and bridge structures.

The Project will construct ITS improvements to support the DMS equipment. The ITS improvements include, but are not limited to, the following:

- Installation of fiber optic main distribution cables.
- Construction of new Closed Circuit Television (CCTV) camera installations and replacement CCTV cameras at existing installations.
- Placement of VMS, overhead and ground-mounted SDMS, and LCS.
- Placement of radar detectors and new and replacement loop detectors.
- All cabinets, controllers, transformers, software, junction boxes, and any ancillary equipment required to create a functioning ITS.

Other Project elements include, but are not limited to, the following:

- Delineating wetlands outside of previously-delineated areas.
- Designing and constructing electrical services, power supply systems and modifying existing power supply systems as necessary to support the new ITS infrastructure.

2.1.1.6 PROJECT GOALS

For Project Goals, refer to the Contract and Instructions to Proposers.

2.1.1.7 COORDINATION WITH OTHER PROJECTS

The Design-Builder shall coordinate the Work for the Project with others, with other WSDOT projects, and in accordance with the General Provisions. The following projects could occur within the immediate vicinity of, or at the same time as, the Project:

- WSDOT Boeing Access Road to I-90 I/C Sign Bridges.
- WSDOT I-90 and SR 520 Lake Washington Congestion Management Sign Bridges.
- I-405, NE 8th St to SR 520 Braided Ramps- Interchange Improvements.
- WSDOT I-5 Pavement Repair, Boeing Access Road to King/Snohomish County Line.
- WSDOT I-5 South Seattle Vicinity Seismic Retrofit, I-90 to SR 900 Vicinity.
- WSDOT I-405 Stage 2 Widening, I-5 to SR 169.
- WSDOT Alaska Way Viaduct and Seawall Replacement, North End Battery Street Tunnel Upgrades.

- WSDOT SR 519, South Seattle Intermodal Access, Royal Brougham
- City of Seattle South Spokane Street Viaduct Widening and Fourth Avenue South Off-Ramp.
- WSDOT I-90 Homer Hadley Bridge Repair, Expansion Joint Replacement.
- Sound Transit I-5 Undercrossing Project, Olive Way and Pike-Pine Reversible Ramp Closures.
- WSDOT I-5 Ramp Overlay, South 272nd Street to Southcenter Parkway.
- WSDOT I-5 Seismic Retrofit, Central King to South Snohomish Bridges.
- I-90 Two-Way Transit Dowel Bar (Stimulus Version).
- I-90 Two-Way Transit Stage 2.
- Other Projects in the Vicinity.

In that event of competing Maintenance of Traffic Plans or closures that cannot be resolved, the issue shall be elevated to the Resident Engineer for a decision about which project will take precedence. No time or schedule claims shall be allowed as a result of the decision of the Resident Engineer.

2.1.1.8 INTENTIONALLY OMITTED

2.1.2 COMMUNICATIONS

2.1.2.1 PUBLIC INFORMATION

The Design-Builder shall establish and implement a Public Information Plan, which shall describe the proposed methodology for maintaining a consistent level of communication with the public, elected officials, emergency services, community leaders, and the news media. This Plan shall encourage broad public awareness and understanding of the Project. Refer to Section 2.9 for additional requirements.

2.1.2.2 MEETINGS AND COORDINATION

2.1.2.2.1 All Meetings

The Design-Builder shall develop all meeting agendas and provide all meeting facilities. Agendas shall be sent to invitees no less that 1 day prior to meetings.

The Design-Builder shall record minutes of each meeting and distribute copies to WSDOT attendees within 7 Calendar Days of the meeting for review and comment. WSDOT will return comments to the Design-Builder within 7 Calendar Days of receipt of meeting minutes, and the Design-Builder shall finalize minutes within 7 Calendar Days of receiving WSDOT comments.

2.1.2.2.2 Task Force Meetings

The Design-Builder is encouraged to maintain close communication with WSDOT throughout the design and construction of the Project. It is anticipated that this close communication will expedite Project reviews; facilitate the incorporation of innovative project solutions; and facilitate Final Acceptance of the Project.

On previous projects, WSDOT has found task force meetings between the Design-Builder and WSDOT to be an effective method of communication. Task force meetings are particularly effective when they are established for each design discipline; when they commence prior to starting design; and when they continue at regular intervals throughout the design. Task force meetings are required for specific disciplines as noted in these Technical Requirements. Should the Design-Builder choose to hold task force meetings for other disciplines, WSDOT will be available on a weekly basis to attend them.

2.1.2.2.3 Environmental Meetings

2.1.2.2.3.1 *Weekly Environmental Coordination Meetings*

The Design-Builder's Environmental Compliance Manager (ECM) shall organize and implement bi-weekly meetings during design and construction to ensure that the Project design meets the Project environmental commitments, and to identify which construction elements such as locations, work activities, weather conditions, and times of day present the greatest risk to the environment. In addition, the ECM shall review Best Management Practices at these meetings, to avoid and minimize risk. WSDOT shall be invited to attend these meetings. The ECM shall use the commitments database (see Section 2.8) and the construction schedules to identify environmental commitments pertaining to upcoming work activities.

2.1.2.2.3.2 *Intentionally Omitted*

2.1.2.2.4 Orientation Meetings

Prior to commencement of construction, an orientation meeting shall be held between the Design-Builder and WSDOT to address documentation requirements. The Design-Builder shall be responsible for obtaining, maintaining, and reviewing all documents and records required in the Contract for compliance with the Contract requirements.

2.1.2.2.5 Notification

When the Contract requires that a notification be sent to WSDOT, the Design-Builder shall send an email to the WSDOT Engineer.

2.1.2.2.5.1 *Pre-Contract Meeting*

As soon as practicable, but not more than 30 Calendar Days after award of the Contract, the Design-Builder shall schedule a pre-contract meeting with the WSDOT Engineer to discuss the Project, and to exchange information as described in Section 1-2.1C of the WSDOT *Construction Manual* (M41-01) (Appendix D2).

The Design-Builder shall organize and participate in an environmental pre-construction meeting with WSDOT and the regulatory agencies prior to construction. During the meeting, the Design-Builder shall discuss its Environmental Compliance Plan, including its environmental training program, to demonstrate how the Design-Builder shall meet permit conditions and fulfill environmental commitments. The Design-Builder shall supply and discuss its construction schedule and identify the early construction elements.

Additional topics relevant to the design phase, as identified by the Design-Builder, shall also be discussed at this meeting.

2.1.2.3 SUBCONTRACTS

2.1.2.3.1 General

The Design-Builder shall incorporate the provisions specified in Section 1-08 of the General Provisions into each subcontract.

2.1.2.3.2 Communication

The Design-Builder shall require all subcontractors, suppliers, and other individuals or entities performing or furnishing any of the Work to formally communicate with WSDOT through the Design-Builder only.

2.1.2.3.3 Coordination

The Design-Builder shall accept sole responsibility for scheduling and coordinating the Work of subcontractors, suppliers, and other individuals or entities performing or furnishing any of the Work under direct or indirect contract with the Design-Builder.

2.1.2.4 CONSTRUCTION OFFICE

The Design-Builder shall provide and maintain all office and other building space, including office space for WSDOT, and all facilities, equipment, and vehicles necessary to construct the Project and to meet the requirements of the Contract. Sufficient space shall be provided in the Design-Builder's construction office for simultaneous occupancy by both construction and design personnel.

On previous projects, WSDOT has found that co-locating the Design-Builder with WSDOT is an effective method of facilitating and expediting communication. The Design-Builder is encouraged to co-locate its staff with certain WSDOT staff into a single Project office. The Design-Builder shall coordinate with WSDOT prior to securing any data or phone connection for a co-located office.

2.1.2.4.1 WSDOT Facilities

The Design-Builder shall provide an office with space for WSDOT. Each office space shall be at least 100 square feet, wired for 1 personal computer (unless otherwise specified) on the WSDOT network, and wired for 1 telephone. The Design-Builder shall provide the following office and storage spaces for WSDOT:

- 1 full-time closed-door office space.
- 3 full-time office spaces.
- 1 network room meeting the requirements of this Section.
- 3 "drop-in" office spaces.
- Access to conference rooms.
- EITHER 7 parking spaces OR, if the office is located in downtown Seattle or downtown Bellevue, access to an paid parking garage or lot with parking fees reimbursed for all meeting attendees not scheduled to work in the office on a daily basis.

- Sufficient storage capacity for hard copy files; at a minimum, two 8.5-inch by 11-inch, four-drawer locking file cabinets, and one 11-inch by 17-inch locking file cabinet.

2.1.2.4.2 Location

The Design-Builder's construction office for the Project and the office space for WSDOT shall be located within 10 miles of the Bellevue Construction Office (3241 - 118th Ave SE, Bellevue, WA 98005-4138), and south of SR 520. The office shall be within 1/2 mile of a bus stop with routes that serve downtown Seattle and downtown Bellevue.

2.1.2.4.2.1 *General Requirements*

In addition to the requirements described above, the office space for WSDOT that is provided by the Design-Builder shall include the following:

- 1 desk, chair, 2-drawer locking filing cabinet, bookcase, and telephone in each office space.
- Copying with color capability, scanning to file with color capability, fax equipment, and telephone lines to support each.
- 1 touch-tone speaker telephone for each office space with a status indicator and access to all outside lines and conference call systems. Each telephone shall be connected to a phone service with voice mail for each extension.
- WSDOT will pay all long distance charges for WSDOT phones after installation.
- Meeting facilities for all Project-related meetings. In the event the requirements for any meeting exceed the space available, the Design-Builder shall provide meeting space at a suitable alternate location. The alternate location shall be located within 10 miles of the Project Office.
- At least 2 exits from each building or trailer.
- A secure door lock plus a deadbolt lock on each entrance.
- Men's and women's restrooms.
- Trash and paper recycle containers.
- Daily janitorial service (except holidays) including trash and paper recycle pickup.
- Maintained exterior office space areas, including access to parking areas and snow removal.
- Overhead lighting that meets the requirements of the United States Occupational Safety and Health Administration, and building and electrical codes for office space, which shall include a minimum circuit capacity of 20 amperes, and at least 2 duplex receptacles for each office space.
- Heating, ventilation, air conditioning, and cooling systems capable of maintaining temperatures between 65° and 75° F in all spaces, including the network room, throughout the year.
- Access requirements that meet the Americans with Disabilities Act.
- An office space that meets all local building code requirements.

The Design-Builder shall maintain all office space for WSDOT from 21 Calendar Days after Notice to Proceed, until at least Physical Completion of the Project, unless otherwise agreed to by WSDOT in writing.

Except for the Design-Builder's construction office and the office space for WSDOT, the Design-Builder shall remove all facilities and perform any required site restoration Work related to facilities provided by the Design-Builder, prior to Physical Completion.

The Design-Builder shall remove all facilities and perform any required site restoration Work related to the Design-Builder's construction office and the office space for WSDOT within 100 Calendar Days after Physical Completion.

2.1.2.4.3 Intentionally Omitted

2.1.3 PROJECT DOCUMENTATION

2.1.3.1 GENERAL

The Design-Builder shall accept sole responsibility for the documentation of all Work activities.

The Design-Builder shall maintain in good order, in a secure and protected place at the Project Site, 1 record copy of all drawings, specifications, addenda, written amendments, change orders, change directives, field orders, and written interpretations and clarifications required for the Work. The Design-Builder shall annotate the record documents to show changes made during construction. The Design-Builder shall make these record documents, together with all approved samples and approved shop drawings, available to WSDOT for reference.

2.1.3.1.1 Format

The Design-Builder shall maintain all files indicated in this Section in electronic media and hard copies.

2.1.3.1.2 Communications Distribution

At a minimum, the Design-Builder shall prepare and circulate to WSDOT and meeting attendees, hard copies and electronic files of all correspondence, minutes of meetings, and other documents developed as a result of any and all communications with the following:

- WSDOT.
- Utility owners.
- Communities.
- Agencies.
- The general public.

The Design-Builder shall accept sole responsibility for ensuring that all communications are distributed to the appropriate parties.

2.1.3.1.3 Electronic Files

2.1.3.1.3.1 *Backups*

The Design-Builder shall backup all electronic files that have been revised every Calendar Day; backup all electronic files every week; and store all backup media in a secure off-site area in accordance with this Section.

2.1.3.1.3.2 *Data Backup and Recovery*

The Design-Builder shall develop and implement data security and a backup and recovery plan for Project information maintained by the Design-Builder.

2.1.3.2 DESIGN DOCUMENTATION

2.1.3.2.1 Communication and Submittal Documentation

Throughout the course of the Project, the Design-Builder shall maintain in the Design-Builder's construction office and make available for WSDOT review, at a minimum, 1 complete set of the following documents:

- Contract.
- Calculations.
- Reports.
- Studies and investigations.
- Preliminary Design Submittal and Final Design Submittal documents.
- Released For Construction (RFC) Documents and revised RFC Documents.
- Communications.
- Minutes of meetings.
- Review comments and responses.
- Permits and other environmental agreements.
- Easement agreements.

2.1.3.3 CONSTRUCTION DOCUMENTATION

2.1.3.3.1 Communication and Submittal Documentation

Throughout the course of the Project, the Design-Builder shall maintain in the Design-Builder's construction office and make available for WSDOT review, at a minimum, 1 complete set of orderly hard copy files that include the following documents:

- Subcontracts.
- Change orders.
- Shop drawings.
- Pay invoices.

- Field directive changes.
- Claims.
- Calculations.
- Reports.
- Tests.

Throughout the course of the Project, the Design-Builder shall maintain in the Design-Builder's construction office and make available for WSDOT review, at a minimum, 2 complete sets of orderly hard copy files that include the RFC Documents.

2.1.3.4 DOCUMENT CONTROL REQUIREMENTS

2.1.3.4.1 General

Document control is an integral part of WSDOT's proactive project management process for all WSDOT projects. The Design-Builder shall use an electronic Document Control System (DCS) to track and manage all Project documentation. The DCS shall ensure that all incoming and outgoing Project documentation is electronically and physically accounted for and filed.

WSDOT uses Primavera Expedition for document control processes and procedures. The Design-Builder shall work with WSDOT to ensure that the WSDOT and Design-Builder systems and processes are compatible. The Design-Builder's DCS shall be subject to WSDOT Review and Comment.

The Design-Builder shall establish and maintain a collaborative Web site DCS, accessible to both the Design-Builder and to WSDOT from the construction office and remote locations, to exchange, organize, list, store, record, and track correspondence, drawings, technical reports, specifications, submittals, calculations, control of materials, Inspector Daily Reports, meeting minutes, administrative, and other Project documents. The Design-Builder shall also establish document routing, filing, control, and retrieval methods that are compatible with WSDOT's DCS. Document control, storage, and retrieval methods shall include the use of both hard copies and electronic records. The Design-Builder's DCS shall manage all of the documents. The Design-Builder's DCS shall be established and operational prior to the first design submittal to WSDOT, and no later than 30 Calendar Days after Notice to Proceed.

The Design-Builder shall provide training and system support to all WSDOT employees and WSDOT representatives who require access to the collaborative Web site DCS, including all reviewers of Project documents. If applicable, the Design-Builder shall provide all licenses for WSDOT use.

2.1.3.4.2 File Format

Graphics shall be submitted in TIF, GIF, JPG, or PDF file formats (compressed image formats only). These formats are intended for photos, conceptual sketches, and other uses.

Data files contained in a database or a spreadsheet shall be in one of the following formats:

- Microsoft Access.
- Microsoft SQL.
- Microsoft Excel.

All links between non-graphical data and graphic elements; relationships between database tables; and report formats shall be maintained. All database tables shall conform to the structure and file naming guidance provided by WSDOT. The Design-Builder shall provide the database file in the preferred file format as directed by the WSDOT Engineer.

Any documents such as reports, photographs, and manuals that use a variety of software packages and file formats shall be submitted as PDFs in addition to being submitted in the base file format.

2.1.3.4.3 Submittals

2.1.3.4.3.1 *Work Plan*

The Design-Builder shall submit a Document Control Work Plan within 30 Calendar Days of Notice to Proceed or prior to the first design submittal, whichever occurs first. This Plan shall include the following:

- File structure and numbering.
- Flow charts depicting the routing and processing of documents.
- Persons involved and their responsibilities.
- The handling and filing of hard copy documents.
- Incorporation of electronic documents into the system.
- DCS backup and recovery.
- Submittal log in DCS.

2.1.3.4.3.2 *Format*

All documents sent to WSDOT shall contain the following information at the top or on the first page of the document being sent:

- WSDOT project name and contract number.
- Document type, such as Letter, Letter of Transmittal, Deliverable, and Submittal.
- Document number, unique for the type of document. If any revisions are made to the original document, the same unique number shall be used with a revision number added.

At a minimum, all submittals shall include 1 hard copy and 1 electronic copy. Unless otherwise specified, the Design-Builder shall send the original hard copy as well as a PDF of the document. WSDOT may also require the Design-Builder to send the file in other formats as requested by the WSDOT Engineer.

2.1.3.4.3.3 *Project Completion*

Prior to Physical Completion of the Project, the Design-Builder shall deliver to WSDOT a full and complete backup of the DCS. This backup shall include all documents in electronic format. The Design-Builder shall also deliver a copy of the DCS software in the version that the electronic documents and databases were created in.

The Design-Builder shall provide a final file structure and index for the electronic archived documents. Written instructions and procedures for use of the Design-Builder's software pertaining to the archived documents shall also be provided.

2.1.4 SOFTWARE

2.1.4.1 GENERAL

The Design-Builder shall acquire, use, and maintain all software for the Project.

Version – The Design-Builder shall use the current version of the specified software in effect as of Notice to Proceed, unless otherwise specified in this Section.

Updates – The Design-Builder shall update software programs throughout the Contract within six months of release of a software update, or earlier, if mutually agreed upon with WSDOT. WSDOT will similarly update its software.

File Server – The Design-Builder shall store all data files for the software programs on, or have them accessible through, the Design-Builder's central file server.

2.1.4.1.1 Required Project Software

The Design-Builder shall submit all design documentation, whether it is in process, final, or as-built, to WSDOT as hard copies and electronic files on CDROMs. CDROMs shall be labeled using permanent marker. The Design-Builder shall not use tape to label CDROMs.

In addition to any other software specified in the Contract, the Design-Builder shall use the following software programs:

2.1.4.1.1.1 *Roadway*

InRoads (by Bentley) – Same version WSDOT is using at Notice to Proceed.

2.1.4.1.1.2 *Structures*

Refer to Section 2.13 for load rating software format.

2.1.4.1.1.3 *Illumination and Intelligent Transportation System*

Refer to Sections 2.16 and 2.18.

2.1.4.1.1.4 *Signing and Maintenance of Traffic*

Refer to Sections 2.19 and 2.22.

2.1.4.1.1.5 *Intentionally Omitted*

2.1.4.1.1.6 *CADD Files*

MicroStation (by Bentley) – Same version WSDOT is using at Notice to Proceed.

2.1.4.1.1.7 *Word Processing and Spreadsheets*

The Design-Builder shall use the following software:

- Microsoft Word for word processing.
- Microsoft Excel for spreadsheets.
- Microsoft Access for databases.

End of Section

2.2 MANDATORY STANDARDS

Certain sections of this RFP list mandatory manuals and/or publications that the Design-Builder shall use for the design and construction described in those sections. The Design-Builder shall use the current mandatory manuals and/or publications as of the RFP issue date (April 6, 2009).

If there are updates to the mandatory manuals and/or publications between the RFP issue date and 14 Calendar Days prior to the Proposal Due Date, WSDOT may issue Addenda to the RFP to account for those updates.

If there are updates to the mandatory manuals and/or publications after 14 Calendar Days prior to the Proposal Due Date, or at any time during the time of the Contract, that will affect the design criteria or construction requirements, Section 1-04 of the General Provisions will be enforced.

End of Section

2.3 STATE TAXES

State Department of Revenue Rule 170 (WAC 458-20-170) and its related rules shall apply to all Work.

End of Section

2.5 SURVEYS AND MAPPING

2.5.1 GENERAL

The Design-Builder shall conduct all Work necessary to complete the land surveying and survey mapping for the Project. This Work includes, but is not limited to, survey control data, secondary horizontal and vertical control surveys, topographic surveys, Right-of-Way surveys, bridge surveys, utility surveys, design surveys, construction surveys, as-built surveys, records of surveys, and all other land surveying services necessary to complete the Project.

2.5.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

The meaning of words and terms used in this Section and not otherwise defined in the Contract shall be as listed in the current edition of *Definitions of Surveying and Associated Terms,* published by the American Congress on Surveying and Mapping, and the American Society of Civil Engineers.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Highway Surveying Manual* (M22-97) (Appendix D26).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D11).
- WSDOT *Standard Plans* (M21-01) (Appendix D15).

2.5.2.1 REFERENCE DOCUMENTS

WSDOT will provide mapping for the Project from several sources. Ground survey files cover the areas around each new sign gantry. Basemap files developed from aerial photogrammetry cover most of the project area outside of the gantry areas. Finally, CADD baseline and InRoads alignment files provide baseline information for all 3 corridors. A list of the pertinent files and file descriptions can be found in Appendix R2.

Existing primary control monumentation established by WSDOT, and primary and secondary control monuments established for WSDOT by others are for informational purposes only. Existing WSDOT geodetic primary survey monumentation can be found at the following Web site:

www.wsdot.wa.gov/monument.

2.5.3 PERFORMANCE REQUIREMENTS

2.5.3.1 GENERAL

The Design-Builder is solely responsible for the accuracy of content and completeness of all survey information used in the design and construction of the Project.

The Design-Builder shall verify and confirm the location, accuracy, and datum of all survey data and survey information, regardless of the source. The Design-Builder shall document its verification of all of the data in accordance with the Quality Management Plan (QMP) requirements in Section 2.28. WSDOT does not warrant the accuracy of the survey information provided in the RFP except as described in this Section. Any discrepancies between the survey data and the survey information provided by WSDOT shall be brought to WSDOT's attention for resolution. The Design-Builder is solely responsible for the accuracy of all survey information provided in this RFP.

Horizontal control is based on the North American Datum of 1983, adjusted in 1991. Vertical control is based on North American Vertical Datum of 1988 (NAVD 88) and as specified as < 0.005M (± linear uncertainty).

All field survey work, design, and construction shall be done in Project ground datum. The conversion to Project datum shall be completed according to the WSDOT *Highway Surveying Manual*. Any conversion from Metric to English shall use the U.S. Survey foot definition: 1 meter = 39.37 inches exactly.

2.5.3.2 SURVEY MANAGER

The Design-Builder shall designate a Survey Manager for the Project. The Survey Manager shall be registered as a Professional Land Surveyor in the State of Washington. All survey work shall be prepared by, or under the direct supervision of the Survey Manager. The Survey Manager shall be the single point of contact for all survey activities.

2.5.4 DESIGN REQUIREMENTS

2.5.4.1 GENERAL

The Design-Builder shall prepare field survey Work, which is suitable for preparation of design documents and Released For Construction Documents, and which meets the technical requirements of WSDOT and the Washington State Board of Registration for Engineers and Land Surveyors.

The Design-Builder shall obtain any permits that may be required prior to beginning field Work (see the WSDOT *Design Manual*, Chapter 1450 for Permits). Preparation of surveys shall conform to requirements referenced in the WSDOT *Highway Surveying Manual,* including but not limited to, procedures, record-keeping requirements, equipment use, and safety precautions.

2.5.5 CONSTRUCTION REQUIREMENTS

2.5.5.1 GENERAL

The Design-Builder shall maintain detailed survey records, including a description of the Work performed on each shift, and the methods and control points used. The records shall include adequate detail to allow the survey to be reproduced, graphic notes depicting control points used and relationship to other control points or reference points, description,

coordinates, and location description. Bench marks and temporary bench marks shall also have graphic notes depicting description, elevation, coordinates, and location description. A data collector printout of the day's activities shall not be considered an acceptable record. When requested, the Survey Manager shall provide a copy of each day's record to WSDOT within 5 Calendar Days after the end of the shift.

Survey work by the Design-Builder shall include, but is not limited to, the following:

- Verifying survey data furnished by WSDOT.
- Expanding into secondary control by adding stakes and hubs, as well as additional permanent survey control needed for the Project.
- Providing descriptions of permanent secondary control to WSDOT.

All permanent secondary control points shall be shown on a Report of Survey Mark form, similar to WSDOT's form, and shall be tied to the Right-of-Way centerline alignment labeled on a Post Construction Record of Survey. Permanent secondary control points shall be established in accordance with the WSDOT *Highway Surveying Manual*.

For all types of construction, including but not limited to, walls, grading, signing and Intelligent Transportation Systems (ITS), the Design-Builder shall provide staking and layout as necessary to adequately locate, construct, and check the specific construction activity.

Upon request, the Design-Builder shall provide WSDOT with copies of all calculations and staking data prior to staking.

2.5.5.2 INTENTIONALLY OMITTED

2.5.6 SUBMITTALS

2.5.6.1 SURVEY RECORDS AND SUBMITTALS

The Design-Builder shall deliver a hard copy and an electronic file of the survey records to WSDOT within 30 Calendar Days of Substantial Completion, unless an earlier delivery is requested by WSDOT. The electronic file shall be in InRoads and MicroStation Version 8 expanded level format.

The Design-Builder shall prepare and submit calculations to WSDOT within 14 Calendar Days after Notice to Proceed for concurrence of Project datum to be used.

2.5.6.2 TRAFFIC CONTROL PLAN SUBMITTAL

The Design-Builder shall prepare a Maintenance of Traffic Plan whenever a survey crew, or a survey crew's vehicle, will be working within any roadway clear zone. Submittal, review, and approval of the Maintenance of Traffic Plan shall be in accordance with Section 2.22.

2.5.6.3 INTENTIONALLY OMITTED

2.5.6.4 AS-BUILTS

The Design-Builder shall produce reports documenting the location of the as-built features. These reports shall include descriptive statements for the survey methods used to determine the as-built location of the feature being surveyed. Where WSDOT has provided data to the Design-Builder in x, y, z coordinate format, the Design-Builder shall

provide WSDOT with data in x, y, z coordinate format. Where WSDOT has provided data to the Design-Builder in x, y coordinate format only, or z coordinate format only, the Design-Builder shall provide WSDOT with data in x, y coordinate format only, or z coordinate format only.

All x, y, and z coordinates shall be in State Plane.

The Design-Builder shall provide WSDOT with an as-built survey base map file in State Plane, InRoads, and MicroStation Version 8 expanded level format.

The Design-Builder shall deliver all as-built survey files to WSDOT within 30 Calendar Days of Substantial Completion of the Project.

2.5.6.5 POST CONSTRUCTION RECORD OF SURVEY

The Design-Builder shall provide WSDOT with a hard copy and an electronic file of the Post Construction Record of Survey. A draft copy shall be submitted to the WSDOT Engineer for review prior to recording with the county where the survey was performed. A mylar hard copy that includes the county's recording numbers, and an electronic file shall be delivered at the time of Substantial Completion, unless an earlier delivery is requested by WSDOT. The electronic format shall be compatible with WSDOT's format. The Post Construction Record of Survey shall include, but is not limited to, the following:

- All permanent secondary and tertiary horizontal and vertical control points established by the Design-Builder shall be defined by State Plane Coordinates (x, y and z) and by station, and offset to the Right-of-Way centerline alignment. All permanent control points shall be accompanied by a Report of Survey Mark.
- All monuments, remaining undisturbed and set during this Contract, defined by station and offset to the Right-of-Way centerline alignment.

End of Section

2.6 GEOTECHNICAL DESIGN

2.6.1 GENERAL

The Design-Builder shall conduct all Work necessary to complete the geotechnical investigation and design for the Project. Elements of the Work shall include, but are not limited to, the following:

- The Design-Builder shall evaluate the requirements of the Work, and perform necessary geotechnical explorations, geotechnical analyses, and laboratory testing. The Design-Builder shall provide geotechnical designs and construction support in accordance with this Section.

2.6.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Geotechnical Design Manual* (M46-03) (GDM) (Appendix D5).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Highway Runoff Manual* (M31-16) (Appendix D6).
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D12).
- WSDOT *Materials Manual* (M46-01) (Appendix D9).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Standard Plans* (M21-01) (Appendix D15).
- AASHTO *Manual on Subsurface Investigations*, 1st Edition, 1988.
- AASHTO *LRFD Bridge Design Specifications*, Customary US Units, 4th Edition, 2007 with 2008 Interim Revisions.
- AASHTO *Standard Specifications for Transportation Materials and Methods of Sampling and Testing*, 28th Edition and Provisional Standards, 2008.
- AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals,* 5th Edition, 2009.

2.6.2.1 DESIGN-BUILD MODIFICATIONS TO THE WSDOT GEOTECHNICAL DESIGN MANUAL (GDM)

The GDM was created as an internal design document to be used by the WSDOT foundation engineers and engineering geologists. It was also created as an external design document to be used by consultants and Design-Builders performing geotechnical design on WSDOT projects. The GDM is a mandatory design document to be used on all

WSDOT projects. For purposes of design-build projects, when the manual refers to an activity that "shall" be done or that "is" done, the Design-Builder shall assume those activities are mandatory. All references to the Bridge and Structures Office (BO), Geotechnical Division (GD), Structural Designer (ST), Structural Engineer, Project Designer, Geotechnical Engineer, and Geotechnical Designer (GT) shall mean the Design-Builder.

No changes have been made to provisions in the GDM that do not apply to design-build contracts, (e.g., descriptions of WSDOT divisions and their duties, descriptions of legal authority, or descriptions of internal WSDOT procedures or policies); however, in some cases it may not be clear whether rights or responsibilities in the GDM are applicable to the Design-Builder. If it is unclear whether specific provisions in the GDM are applicable to the Design-Builder, the Design-Builder shall raise the issue with WSDOT and WSDOT shall make that determination at its sole discretion. WSDOT has identified the following provisions of the GDM that are not applicable to design-build contracts:

- Section 1.2.2.
- Section 1.3.
- Section 1.6.
- Chapter 20.
- Chapter 21.
- Chapter 22.

2.6.2.2 HISTORICAL AND RECENT GEOTECHNICAL DATA

No historical records for previous geotechnical studies and related Work along the Project alignment are provided as part of this RFP.

2.6.3 PERFORMANCE REQUIREMENTS

2.6.3.1 PERSONNEL REQUIREMENTS

The Design-Builder shall provide a Geotechnical Engineer with a minimum of 7 years of experience in geotechnical design and construction support of retaining walls and intelligent transportation system (ITS) pole foundations, and other highway-related elements. The Geotechnical Engineer shall have at least 2 years of experience working in Washington State, and shall be familiar with the AASHTO *LRFD Bridge Design Specifications*. The Geotechnical Engineer shall be a Professional Engineer, licensed under Title 18 RCW, and shall be responsible for the geotechnical design elements of the Project.

2.6.3.2 SUBSURFACE INVESTIGATION PLAN (SIP)

The Design-Builder shall create a Subsurface Investigation Plan (SIP). Explorations as determined necessary by the Design-Builder and to meet mandatory standards shall occur along the alignment of planned retaining walls, and at ITS poles.

The investigation shall be conducted in accordance with the GDM. The Design-Builder shall determine the specific locations, frequency, and scope of the SIP.

The investigation shall be conducted in accordance with all environmental permits. The Design-Builder shall refer to Section 2.8 for acquiring environmental permits or

modifications to existing permits needed to complete the SIP. The permit application process may be time-consuming, and the Design-Builder shall adjust the SIP schedule for any time delays due to the application process.

The SIP shall be submitted to WSDOT for Review and Comment prior to commencement of any earthwork or excavation. This submittal shall include the number and depths of the proposed borings/cone penetration tests and other field investigations, and the proposed sampling and testing necessary to meet the minimum requirements of the Project. The submittal shall also include a Maintenance of Traffic Plan in accordance with Section 2.22 for investigations that are on or adjacent to, active freeway or city streets. The Design-Builder shall secure an access permit from the appropriate agency, if required.

Soil properties shall be determined in accordance with the GDM. Field tests shall be conducted in accordance with appropriate AASHTO and WSDOT standards.

Following completion of exploratory Work, all boring locations shall be surveyed. The survey shall determine station and offset, elevation, and State Plane coordinates, which shall be included on the boring logs. Following drilling and laboratory Work, the Design-Builder shall retain all samples until Final Acceptance, and shall provide such samples to WSDOT, if requested, before Final Acceptance.

2.6.3.3 LABORATORY TESTING REQUIREMENTS

Laboratory testing of soil and groundwater samples shall be conducted in accordance with the GDM and applicable WSDOT and AASHTO testing procedures. Laboratories conducting geotechnical testing shall be either AASHTO-accredited for the testing being performed, or fulfill the requirements of AASHTO R18 for qualifying testers and calibrating/verifying of testing equipment for those tests being performed. All test results shall be included in the Design-Builder's Geotechnical Report.

2.6.3.4 INTENTIONALLY OMITTED

2.6.3.5 BOREHOLE SITE CLEANUP

Backfilling of borings, test pits, CPT holes, and abandonment of piezometers and inclinometers shall be performed in accordance with the provisions of applicable local, State, or Federal laws and regulations. Borings shall be abandoned in accordance with Washington State Department of Ecology regulations.

The Design-Builder shall backfill all test holes drilled by the Design-Builder in a manner that ensures against subsequent settlement of the backfill and holes that could be hazardous to persons, animals, or equipment. Upon completion of the field investigation Work, the Design-Builder shall remove all surplus material, temporary structures, and debris resulting from the Work performed on land and in water.

2.6.3.6 FIELD LOGS

The field logs shall be prepared in accordance with the requirements of the GDM. Logs of all field explorations shall be included in the Design-Builder’s Geotechnical Report.

2.6.3.7 GEOTECHNICAL ANALYSIS

The Design-Builder shall perform geotechnical engineering and geologic analyses in accordance with the Mandatory Standards. The geotechnical engineering and analyses shall be based on the findings from subsurface investigations and laboratory testing

programs; the results of engineering analyses, including information provided in the GBR; and additional geotechnical studies included in Appendices G1 and G2.

2.6.3.8 GEOTECHNICAL REPORT

The Design-Builder shall prepare a Geotechnical Report in accordance with the GDM that summarizes the results of the field testing; all instrumentation data; laboratory investigation programs; engineering studies; and geotechnical design recommendations, including those provided in the technical memoranda.

2.6.4 DESIGN CRITERIA

The Design-Builder shall perform appropriate design and construction of the Project elements as specified in the GDM and the BDM.

2.6.4.1 INTENTIONALLY OMITTED

2.6.4.2 WALL DESIGN

All retaining walls and wall foundations shall be designed using the LRFD specifications described in the GDM, the BDM, the AASHTO *LRFD Bridge Design Specifications*, and the AASHTO *Guide Specifications for LRFD Seismic Bridge Design*, except for soil nail walls and Structural Earth (SE) walls. Soil nail walls shall be designed using the Service Load Design (SLD) method as required in the GDM. SE walls shall be designed using either the SLD method or the LRFD method as required in the GDM.

The Design-Builder shall meet the bridges and structures requirements described in Section 2.13.

2.6.4.3 FOUNDATION DESIGN FOR SIGNS AND ITS

All standard foundations for new ITS poles shall be evaluated in accordance with the GDM. The standard ITS foundation designs provided in the WSDOT Northwest Region *ITS Details* (Appendix I2) shall be used if the minimum applicable soil and slope conditions are present at the site. If soil/rock or ground conditions are marginal, or if nonstandard loadings are present at the site, detailed analyses shall be conducted. Design of these foundation elements shall be performed in accordance with the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*.

2.6.5 CONSTRUCTION CRITERIA

2.6.5.1 PERFORMANCE CRITERIA

Criteria for allowable settlement and horizontal deformation of retaining structures are provided in the GDM and the BDM.

2.6.5.2 INTENTIONALLY OMITTED

2.6.6 SUBMITTALS

2.6.6.1 GENERAL

All submittals shall be submitted in draft form to WSDOT for Review and Comment. Comments submitted by WSDOT shall be addressed by the Design-Builder to the satisfaction of WSDOT.

All geotechnical calculations using commercial spreadsheets or math software shall be checked with hand calculations to verify logic, look-ups, formulae, and calculations. Certified geotechnical software shall not require this validation. The spreadsheets and/or math software for performing bearing calculations, pile or shaft capacity calculations, settlement, permeability, Standard Penetration Test corrections, liquefaction calculations, or other calculations developed by the Design-Builder shall be submitted in a Calculations Verification Submittal (CVS). Example problems shall be developed by the Design-Builder and the solutions from the spreadsheets and/or math software used to solve the problems shall be validated with hand calculations. All formulae used shall be documented with references (data sources).

The CVS shall be developed during design, and shall be submitted to WSDOT for Review and Comment prior to use on the Project. Multiple CVS submittals shall be permitted, but each one shall be submitted to WSDOT for Review and Comment prior to use on the Project. The Design-Builder shall provide documentation to WSDOT showing that the formulae in the approved spreadsheets and math software cannot be modified or changed without prior Review and Comment from WSDOT. Any modification to the logic, look-ups, formulae, and calculations of an approved program shall be resubmitted to WSDOT for Review and Comment. Final versions of the technical memoranda and the Design-Builder's Geotechnical Report (final report after addressing comments) shall include the stamp of a Professional Engineer, licensed under Title 18 RCW.

2.6.6.2 DESIGN

Project submittals include, but are not limited to, the following:

- Subsurface Investigation Plan.
- Technical Memoranda.
- Geotechnical Report.
- Calculations Verification Submittal.
- Pre-Condition Survey.

End of Section

2.7 PAVEMENT

2.7.1 GENERAL

The Design-Builder shall perform all Work necessary to construct the pavement sections for all roadways and driveways, in accordance with the requirements of this Section. The term pavement, or pavement section, shall be defined as the entire pavement structural section, including but not limited to, Hot Mix Asphalt (HMA), Portland Cement Concrete Pavement (PCCP), base, and sub-base material.

Elements of Work shall include, but are not limited to, the following:

- Construction of new pullout areas for ITS/electrical pole and cabinet locations, as defined in Sections 2.16 and 2.18.

2.7.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for pavement construction. They are listed in a hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Materials Manual* (M46-01) (Appendix D9).
- WSDOT *Pavement Guide*, Volume 1 Pavement Policy (Appendix D22).
- WSDOT *Pavement Surface Condition Rating Manual* (Appendix D10).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- FHWA *Guidelines for the Design of Subsurface Drainage Systems for Highway Structural Sections*, 1972 (RD-72-30).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Standard Plans* (M21-01) (Appendix D15).
- AASHTO *A Policy on Geometric Design of Highways and Streets*, 5th Edition, 2004.
- AASHTO *LRFD Bridge Design Specifications*, Customary U.S. Units, 4th Edition, 2007 with 2008 Interim Revisions.
- AASHTO *Standard Specifications for Highway Bridges*, 17th Edition, 2002.
- WSDOT *Qualified Product List* (M46-02) (QPL) (Appendix D12).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D11).

2.7.3 PERFORMANCE REQUIREMENTS

2.7.3.1 INTENTIONALLY OMITTED

2.7.3.2 INTENTIONALLY OMITTED

2.7.3.3 INTENTIONALLY OMITTED

2.7.3.4 INTENTIONALLY OMITTED

2.7.3.5 INTENTIONALLY OMITTED

2.7.3.6 INTENTIONALLY OMITTED

2.7.3.7 INTENTIONALLY OMITTED

2.7.3.8 MISCELLANEOUS PAVEMENT

Any pavement outside of the shoulder shall be considered miscellaneous pavement. All miscellaneous pavement sections on I-5, I-90, and SR 520 shall match the adjacent shoulder, unless otherwise noted in these Technical Requirements.

2.7.4 DESIGN REQUIREMENTS

2.7.4.1 WIDENING OF EXISTING PAVEMENT

Widening of existing shoulders shall match the adjacent shoulder, unless otherwise noted in these Technical Requirements.

2.7.5 CONSTRUCTION REQUIREMENTS

Pavement construction shall be in accordance with the Standard Specifications.

2.7.5.1 PAVEMENT MATERIALS

The pavement materials shall be in accordance with the Standard Specifications.

2.7.5.2 INTENTIONALLY OMITTED

2.7.5.3 INTENTIONALLY OMITTED

2.7.5.4 INTENTIONALLY OMITTED

2.7.5.5 ACCEPTANCE SAMPLING AND TESTING

2.7.5.5.1 HMA Mixture

All acceptance testing for Asphalt Treated Base and HMA aggregate, mixture, in-place density, cyclic density, longitudinal joint density, and coring as required will be performed by WSDOT or its representatives.

Section 5-04.3(8)A of the Standard Specifications:

The first paragraph of Item 5 is revised to read as follows:

WSDOT will furnish the Design-Builder with a copy of the results of all acceptance testing performed in the field within either 24 hours of sampling or 4 hours after the beginning of the next paving shift, whichever is later. WSDOT will also provide the Composite Pay Factor (CPF) of the completed sublots after 3 sublots have been produced. The CPF will be provided by the midpoint of the next paving shift after sampling results are completed.

The first sentence in the second paragraph of Item 5 is revised to read as follows:

Sublot sample test results (gradation, asphalt binder content, VMA and Va) may be challenged by the Design-Builder.

The third paragraph of Item 5 is revised to read as follows:

The results of the challenge sample will be compared to the original results of the acceptance sample test and evaluated according to the following criteria:

Deviation	
U.S. No. 4 sieve and larger	Percent passing ±4.0
U.S. No. 8 sieve	Percent passing ±2.0
U.S. No. 200 sieve	Percent passing ±0.4
Asphalt binder	Percent binder content ±0.3
VMA	Percent VMA ±1.5
Va	Percent Va ±0.7

The last sentence of Item 7 is revised to read as follows:

The calculation of the CPF in a test section with a mix design that did not verify will include gradation, asphalt binder content, voids in mineral aggregate (VMA) and % air voids (Va).

Low cyclic density areas will be evaluated by WSDOT in accordance with Section 5-04.3(10)B of the Standard Specifications. The price adjustment will be calculated as 15% of the unit price included in Table 5 of Section 1-06 of the General Provisions, for the quantity of HMA represented by that lot. The credit for the price adjustment shall be made under the item “Cyclic Density Price Adjustment”.

WSDOT will evaluate the HMA wearing surface for low density at the longitudinal joint. Low density is defined as less than 90 % of the reference maximum density. If 1 density reading, at either longitudinal joint, is below 90% of the reference maximum density, a $200 per lot price adjustment will be assessed for that lot. The credit for the price adjustment shall be made under the item “Non-Specification Material Compaction Price Adjustment”.

2.7.5.5.2 PCCP

Payments to the Design-Builder will be adjusted based on the actual thickness of PCCP in accordance with Section 5-05.5(1) of the Standard Specifications as modified herein. All costs to measure pavement thicknesses as specified will be the responsibility of the Design-Builder.

The exact location and number of thickness measurements within each primary unit, both longitudinally and transversely, will be determined by the WSDOT Engineer. The exact location and number of thickness measurements shall be adjusted when requested by the WSDOT Engineer.

The Design-Builder Construction Quality Assurance Manager shall determine the volume of PCCP as follows:

- The width measurement shall be the width of the pavement shown on the typical cross-section in the Plans, additional widening where called for, or as otherwise specified in writing by the WSDOT Engineer.
- The length shall be measured horizontally along the center of each roadway or ramp.
- The depth shall be determined from the reference cores. The depth utilized to calculate the volume shall not exceed the plan depth plus 0.04 feet, or the plan depth minus 0.05 feet.
- The Design-Builder shall determine the difference between the plan depth, and the actual depth.
- The adjusted volume of the pavement section represented by the reference core shall equal the measured length times the width, times the difference between the plan depth and the actual depth.

Where the actual depth exceeds the plan depth, the adjusted volume for PCCP will be paid based on the unit price included in Table 5 of Section 1-06 of the General Provisions. Payment will be made under the item "Non-Specification Material Price Adjustment".

PCCP thickness deficiencies shall be evaluated in accordance with Section 5-05.5(1)A of the Standard Specifications by the Design-Builders Construction Quality Assurance Manager. The thickness deficiency adjustment shall be calculated in accordance with Section 5-05.5(1)A of the Standard Specifications, based on the unit price included in Table 5 of Section 1-06 of the General Provisions. The credit for the thickness deficiency adjustment will be made under the item "Non-Specification Material Price Adjustment".

2.7.6 SUBMITTALS

2.7.6.1 HMA MIX DESIGN

The Design-Builder shall submit a copy of the completed HMA mix design to WSDOT in accordance with Section 2.25.

2.7.6.2 INTENTIONALLY OMITTED

2.7.6.3 CONTAINMENT, COLLECTION, AND DISPOSAL PLAN

A Containment, Collection, and Disposal Plan shall be prepared in accordance with this Section and Section 2.8.

End of Section

2.8 ENVIRONMENTAL

2.8.1 GENERAL

2.8.1.1 SCOPE

The Design-Builder shall conduct all Work necessary to deliver the Project while protecting and enhancing the environment. Elements of the Work shall include, but are not limited to, the following:

- Determining the extent of sensitive areas affected by construction within the Project Area outside the areas previously surveyed by WSDOT.
- Avoiding impacts to the community and to environmental, historic, archaeological, and cultural resources beyond those already approved by the regulatory agencies. If impacts are unavoidable, the Design-Builder shall make every effort to minimize the unavoidable impacts. New, unavoidable impacts shall be mitigated.
- Fostering good relationships with Federal, State, and local agencies; tribes; and local stakeholders by ensuring that the commitments WSDOT has made are reflected in the Project's final design and are fulfilled during construction. The Design-Builder shall accomplish this by meeting or exceeding all environmental requirements and commitments listed in the Contract, permits, environmental documents, and regulatory agency Concurrence Letters.
- Complying with all Federal, State, and local laws, regulations, and ordinances (collectively referred to in this Section as "regulations") and not receiving any penalties or warnings from resource agencies for permit violations.

2.8.1.2 WSDOT INTENTIONS

The design-build process is an effective way to deliver transportation projects to the tax payers on time and within budget, while protecting and enhancing the environment. WSDOT recognizes that the design-build process is a different way of doing business, and has therefore been working with Federal, State, and local agencies; tribes; and local stakeholders to address their concerns. A number of strategies have been developed in a document titled *Environmental Strategies for Design-Build Projects* (Appendix E8), and incorporated into this Section to address those concerns and to protect the environment throughout the life of the Project. The Design-Builder shall implement these strategies by designing and constructing the Project in accordance with current environmental regulations, as well as with the requirements set forth in this Section.

2.8.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete all design and construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the requirements of an environmental document, programmatic agreement, or permit issued for the Project, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them. If a requirement or permit condition is unclear or ambiguous, the Design-Builder shall

obtain clarification from the WSDOT Engineer prior to proceeding with design or construction.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Standard Plans* (M21-01) (Appendix D15).
- WSDOT *Environmental Procedures Manual* (M31-11) (Appendix D4).
- WSDOT *Environmental Compliance Assurance Procedure* (Appendix E5).
- WSDOT *Highway Runoff Manual* (M31-16) (Appendix D6).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).

2.8.2.1 ENVIRONMENTAL DOCUMENTS AND PERMITS

The Design-Builder shall implement the commitments included in this Section. A list of the permits that will be obtained and additional permits required for the Project is provided in this Section. Copies of the available permits have been included in Appendix P. Copies of permits not yet available will be provided as they are received. The principal environmental documents for the Project, all which are incorporated into this RFP as Appendices E and W are listed in Appendix A1.

2.8.2.2 INTERDEPARTMENTAL AGREEMENTS AND MEMORANDA

WSDOT has entered into several interagency agreements with Federal and State agencies and local jurisdictions that provide guidance and clarification for meeting regulatory requirements. The Design-Builder shall comply with the Implementing Agreements and Instructional Letters included in Appendix E, and identified in Appendix A1.

2.8.3 PERFORMANCE REQUIREMENTS

2.8.3.1 DESIGN INNOVATION AND TECHNOLOGY

WSDOT recognizes that innovation during the early design stages of a project may alter the number of permits, permit modifications, approvals, effects, and mitigation measures required to construct the Project.

WSDOT has made a number of commitments for the Project. These commitments avoid and minimize Project-related impacts. The Design-Builder shall ensure these commitments are reflected in the design submittals and the Released For Construction (RFC) Documents.

2.8.3.2 ENVIRONMENTAL COMPLIANCE PLAN (ECP)

2.8.3.2.1 Documentation and Approval

The Design-Builder shall prepare and implement an Environmental Compliance Plan (ECP) that identifies roles and responsibilities of key personnel, procedures for environmental compliance, procedures to identify and correct non-compliance events, and procedures for emergency response. WSDOT's goal is to ensure environmental compliance with no permit violations.

In order to facilitate preliminary field investigation in support of design and early construction, WSDOT will accept an Interim Environmental Compliance Plan (IECP) specific to the proposed early construction work. The IECP shall include all applicable information for construction in the locations where early work will occur. The information provided in the IECP shall be incorporated into the Draft and Final ECP when submitted to WSDOT in accordance with this Section. To fulfill the ECP requirements for proposed early work, the Design-Builder shall submit an IECP that includes a Temporary Erosion and Sediment Control (TESC) Plan, a Spill Prevention, Control, and Countermeasures (SPCC) Plan, a Fugitive Dust Control Plan, an Unanticipated Discovery Plan, a Roadside Work Plan, a Concrete Containment and Disposal Plan (CCDP) and any reference documents to WSDOT for review and approval prior to early construction.

WSDOT will require a minimum of 14 working days each review of these documents. The Design-Builder shall submit a schedule to WSDOT with the dates that these documents will be available for review and provide at least 1 week notice if the dates in the schedule change.

The Design-Builder shall provide WSDOT with a complete Draft ECP prior to or with the Preliminary Design Submittal. The Environmental Compliance Manager (ECM) shall be responsible for submitting the Draft ECP. WSDOT will review the Draft ECP in accordance with Section 2.28. The Design-Builder shall provide WSDOT with the Final ECP 30 Calendar Days prior to the commencement of any construction activities not otherwise identified within the IECP, so that WSDOT can ensure its comments were addressed and incorporated prior to sharing the Final ECP with the regulatory agencies. The Design-Builder shall stamp the ECP "Released For Construction" prior to the Environmental Pre-Construction Meeting (see Section 2.1). The ECP shall be consistent with all other requirements of the Quality Management Plan (QMP).

The ECP shall consist of two parts:

- Part I: Environmental Personnel, Communications, and Training
- Part II: Environmental Plans and Strategies

The Final ECP shall be stored in a format easily accessible by WSDOT and the regulatory agencies. A hard copy of the ECP shall be maintained by the ECM at the Design-Builder's construction office or on site at the Project.

2.8.3.2.2 Environmental Personnel, Communications, and Training (Part I)

2.8.3.2.2.1 *Personnel: Environmental Compliance Manager (ECM)*

2.8.3.2.2.1.1 *Roles and Responsibilities*

The ECM shall be responsible for overall environmental compliance for the Project, and shall function as principal technical advisor and coordinator for environmental issues. The ECP shall identify all critical roles, responsibilities, and authorities of the ECM. The ECP shall identify the roles and responsibilities of other staff, and their roles in assuring environmental compliance. The ECP shall identify how the ECM will interact with WSDOT's Environmental Compliance Assurance Inspector (ECAI), as WSDOT's ECAI will be performing compliance audits and will be working closely with the ECM.

The ECM shall be on site for the duration of the Project. If the Design-Builder replaces the ECM, the Design-Builder shall provide an equally or more qualified replacement, contingent upon WSDOT's approval. If during the course of the Contract, WSDOT finds

that the ECM is not ensuring implementation of the ECP, then WSDOT may require replacement of the ECM in accordance with Section 1-05 of the General Provisions.

The ECM must have at least 5 years of experience managing environmental design and construction compliance issues on projects. At least 3 of those 5 years must be specific to linear transportation projects. An ECM with at least 2 years of experience managing permitting and environmental compliance issues in the Pacific Northwest region is preferred. The ECM must have knowledge of the environmental regulations and permits relevant to the Project. The ECM is required to be certified through the WSDOT Construction Site and Erosion and Sediment Control Certification Course, or equivalent course. The Design-Builder shall provide a copy of the course certificate or other material verifying completion of the certification course within 30 days of Notice to Proceed.

The ECM shall also be responsible for the following:

- Integrating with the design team during plan preparation and advising how to avoid and minimize adverse effects to the natural environment and communities.
- Reviewing engineering plans to ensure the Project's design reflects environmental commitments and requirements
- Ensuring and providing documentation that the Work complies with all environmental commitments agreed to in the environmental documents, permits, agreements, and approvals of the Project.
- Acting as a liaison to WSDOT, the design team, and the construction personnel (e.g., submitting reports, discussing changes to the Project, communicating compliance issues).
- Maintaining the authority and means to bring the Project into compliance and/or stop Work if the Project is in violation of an environmental regulation or commitment.
- Identifying wetland and sensitive environmental areas.
- Identifying when non-compliance is occurring or has occurred.
- Preparing and implementing a water quality monitoring plan to ensure erosion/sedimentation and spill control devices and Best Management Practices are effective and maintained.
- Conducting field inspections to ensure that environmental compliance measures and Best Management Practices are meeting environmental requirements.

2.8.3.2.2.2 *Environmental Communications Protocol*

As part of the ECP, the ECM shall develop, document, and implement an Environmental Communications Protocol. The Environmental Communications Protocol shall describe the process to be used for non-compliance reporting; procedures for internal and external communications; and communications with WSDOT. When developing the Environmental Communications Protocol, the Design-Builder shall ensure the procedures are consistent with the WSDOT *Environmental Compliance Assurance Procedure*.

The Environmental Communications Protocol shall include organizational charts that identify the Design-Builder's ECM and other personnel who will be assisting the ECM to ensure compliance with all permit conditions, performance standards, and environmental

commitments. It shall discuss the personnel's roles and communication procedures that will be used for the internal and external communications, and communications with WSDOT.

2.8.3.2.2.2.1 *Internal Communications*

For internal communications procedures, the Design-Builder shall:

- Describe the Design-Builder's organizational hierarchy and identify compliance roles and internal reporting responsibilities.
- Include a clear discussion regarding which key personnel, in addition to the ECM, have the authority to stop work on the Project to prevent a violation from occurring.
- Describe the process for identifying and reacting to non-compliance events.

2.8.3.2.2.2.2 *External Communications*

For external communications procedures, the Design-Builder shall:

- Describe a procedure that defines how all external communications received by the Design-Builder will be documented and handled, including how WSDOT will be involved. External communications may originate from tribes, local jurisdictions, regulatory agencies, and the public. Issues may range from public noise complaints to violation notices from regulatory agencies. Where appropriate, this communication procedure shall be consistent with the WSDOT *Environmental Compliance Assurance Procedure*, and all permit conditions, performance standards, environmental commitments, and regulations described in Appendix E5. WSDOT will remain the main point of contact (unless the Design-Builder is otherwise directed by WSDOT) for coordination with tribes, local jurisdictions, the public, and regulatory agencies; and will be responsible for external notifications and reporting non-compliance events, spills, or discoveries of historic, archeological, or cultural resources to the relevant agencies.

2.8.3.2.2.2.3 *WSDOT Communications*

For communications with WSDOT, the Design-Builder shall:

- Describe interactions between the Design-Builder and WSDOT in regard to reporting non-compliance issues.
- Identify all applicable WSDOT personnel that would be contacted in the event of a spill, inadvertent discovery, or non-compliance event. The Design-Builder shall ensure the procedure is consistent with the WSDOT *Environmental Compliance Assurance Procedure* and all permit conditions (Appendix P).
- Describe the Design-Builder's communication process and key personnel who would be responsible for recognizing when a design change and/or alternative construction technique may require a permit modification or new approval. This section shall describe the Design-Builder's strategy for managing design changes that may require permit modifications or additional approvals.

2.8.3.2.2.3 ***Environmental Protection Training***

The Design-Builder shall develop and implement an environmental protection training program for the Design-Builder's design and construction staff, quality assurance

personnel, subcontractors, and vendors. The Design-Builder shall be responsible for these personnel should their work practices lead to a negative effect on the environment, or result in a non-compliance event or permit violation. Therefore, the Design-Builder's training program shall orient employees and subcontractors to the following activities prior to the start of construction:

- Permit conditions, performance standards, environmental commitments, and environmental regulations related to the Project.
- The overall importance of environmental issues.
- The specific environmental sensitivities of the Project.
- Erosion and sediment control procedures and certification.
- Environmental compliance monitoring and reporting procedures.
- Management of known or suspected contamination.
- Unanticipated historic or archaeological discoveries.
- Emergency response procedures.

The Design-Builder's ECM shall notify the WSDOT Engineer of environmental training sessions and invite WSDOT to participate.

WSDOT will work with the Design-Builder to provide "Just-in-Time" training to ensure water quality is monitored in accordance with the WSDOT *Highway Runoff Manual* protocols, Project-specific permit conditions, performance standards, and environmental commitments. This training will include a field visit prior to construction to establish monitoring sites and to review monitoring and reporting procedures.

2.8.3.2.3 Environmental Plans and Strategies (Part II)

2.8.3.2.3.1 *Temporary Erosion and Sediment Control (TESC) Plan*

The Design-Builder shall prepare and implement a TESC Plan that will describe measures to minimize erosion during construction activities. The Design-Builder shall identify a certified TESC Lead who shall develop, implement, and update the TESC Plan.

The TESC Plan (narrative and plan sheets) shall be prepared and implemented in accordance with Section 2.14, Chapter 6 of the WSDOT *Highway Runoff Manual,* and Division 8 of the Standard Specifications. The TESC Plan shall address off-site stormwater in accordance with the Special Provisions. The Design-Builder's TESC Plan shall accommodate all Project-specific permit conditions, performance standards, environmental commitments, and the requirements of Section 2.29. The Design-Builder shall develop and implement a Project-specific Water Quality Monitoring Plan as part of the TESC Plan. The Water Quality Monitoring Plan shall address the minimum requirements identified in Chapter 6 of the WSDOT *Highway Runoff Manual* and the permit conditions described in Appendix P. The Plan shall be submitted to WSDOT for review and approval.

The Design-Builder shall submit a TESC Plan that addresses early construction elements as a part of the Preliminary Design Submittal prior to the start of construction. Updated TESC Plans, including narrative and plan sheets, shall be submitted as part of the Final Design Submittal described in Section 2.28. Construction shall not proceed on any

element of Work until the relevant TESC Plans, including narratives, is stamped "Released For Construction" as described in Section 2.28.

2.8.3.2.3.1.1 *High Visibility Construction Fencing (HVF) Requirements*

Within the Project limits (including staging areas, borrow sources, and other sites developed or used to support the construction of the Project), the Design-Builder shall determine the locations of all environmentally sensitive areas and the buffers of environmentally sensitive areas not already shown in Appendix E or W. These areas shall be fenced with High Visibility Construction Fencing (HVF) prior to commencing construction activities. Areas to be fenced shall include equipment staging, materials storage, and parking of workers' vehicles.

- If the Project will be constructed in stages, the HVF and other markings described below must be completely installed before construction on that stage can begin.
- All field staff shall be trained to recognize HVF; understand its purpose; and properly install the fence in the appropriate locations.
- HVF shall be maintained until all Work is completed for each stage of the Project.
- All clearing limits, stockpile sites, staging areas, and trees to be preserved shall be clearly marked prior to commencing construction activities for a particular stage of the Project.
- All clearing limits, stockpile sites, staging areas, and tree preservation markings shall be maintained until all Work is completed for each stage of the Project.
- No equipment will enter, operate, be stored, or be parked within any sensitive area.
- Where HVF is not appropriate (such as over water), the environmentally sensitive areas will be clearly marked by other means in order to ensure that these areas are protected.

HVF shall be comprised of UV stabilized orange or yellow high-density polyethylene material with open mesh. The HVF shall be installed in accordance with the manufacturer's recommendations and the Standard Specifications. The HVF shall be at least 4 feet in height, and shall not be fastened to trees.

Installation of HVF is identified as a Hold Point in accordance with Section 2.28. Throughout the life of the Project, the Design-Builder shall preserve and protect the sensitive area, acting immediately to repair or restore any HVF that has been damaged or removed.

2.8.3.2.3.1.2 *Best Management Practices (BMP)*

The Design-Builder shall select, install, monitor, and maintain all erosion and sediment control BMPs in accordance with the requirements described in the WSDOT *Highway Runoff Manual*. The Design-Builder shall not use experimental BMPs unless they have been approved by WSDOT prior to their use (e.g., chemically enhanced sand filtration systems). Monitoring activities and inspection protocols shall be described in the Design-Builder's Environmental Compliance Monitoring and Reporting Plan. Failure to install and repair TESC Plan measures may result in liquidated damages (see Section 1-08 of the General Provisions).

The Design-Builder shall remove all temporary BMPs from the Right-of-Way, in accordance with Section 8-01 of the Standard Specifications and the Project-specific

permit requirements. Any temporary BMPs that are not removed from the Right-of-Way within the time frames designated in the permits will be removed by WSDOT. All costs associated with WSDOT's removal will be deducted from any payments due or coming due to the Design-Builder.

2.8.3.2.3.2 *Spill Prevention, Control, and Countermeasures (SPCC) Plan*

The Design-Builder shall prepare a project-specific SPCC Plan that will be used for the duration of the Project. The Design-Builder shall submit the Plan to the WSDOT Engineer as part of the ECP in accordance with the requirements described in this Section. No on-site construction activities may commence until WSDOT accepts an SPCC Plan for the Project.

The term "hazardous materials," as used in these Technical Requirements, is defined in Chapter 447 of the WSDOT *Environmental Procedures Manual*. Occupational safety and health requirements that may pertain to SPCC Plan implementation are contained in but not limited to WAC 296-824 and WAC 296-843.

Implementation Requirements

The SPCC Plan shall be updated by the Design-Builder throughout Project construction so that the written Plan reflects actual site conditions and practices. The Design-Builder shall update the SPCC Plan in accordance with National Pollution Discharge Elimination System (NPDES) permit requirements and maintain a copy of the updated SPCC Plan on the Project site. All Project employees shall be trained in spill prevention and containment, and shall know where the SPCC Plan and spill response kits are located and have immediate access to them.

If hazardous materials are encountered or spilled during construction, the Design-Builder shall do everything possible to control and contain the material until appropriate measures can be taken. The Design-Builder shall supply and maintain spill response kits of appropriate size within close proximity to hazardous materials and equipment.

The Design-Builder shall implement the spill prevention measures identified in the SPCC Plan before performing any of the following:

- Placing materials or equipment in staging or storage areas.
- Refueling, washing, or maintaining equipment.
- Stockpiling contaminated materials.

The permits include a number of conditions regarding concrete work that shall be addressed in the SPCC Plan.

Stormwater or dewatering water that has come into contact with concrete rubble, pours, and grindings, or cement-treated soils, shall be managed in accordance with the Standard Specifications as modified by this RFP. Furthermore, the Design-Builder shall submit a Containment, Collection, and Disposal Plan (CCDP) to WSDOT for approval prior to beginning any concrete or grinding work. The CCDP shall be prepared in accordance with the Standard Specifications and the Amendments to the Standard Specifications.

SPCC Plan Element Requirements

The SPCC Plan shall set forth the following information in the following order:

1. Responsible Personnel

Identify the name(s), title(s), and contact information for the personnel responsible for implementing and updating the plan, including all spill responders.

2. Spill Reporting

List the names and telephone numbers of the Federal, State, and local agencies the Design-Builder shall notify in the event of a spill.

3. Project and Site Information

Describe the following items:

A. The Project Work.
B. The site location and boundaries.
C. The drainage pathways from the site.
D. Nearby waterways and sensitive areas and their distances from the site.

4. Potential Spill Sources

Describe each of the following for all potentially hazardous materials brought or generated on site (including materials used for equipment operation, refueling, maintenance, or cleaning):

A. Name of material and its intended use.
B. Estimated maximum amount on site at any one time.
C. Location(s) (including any equipment used below the ordinary high water line) where the material will be staged, used, and stored and the distance(s) from nearby waterways and sensitive areas.
D. Decontamination location and procedure for equipment that comes into contact with the material.
E. Disposal procedures.

5. Pre-Existing Contamination

Describe any pre-existing contamination and contaminant sources (such as buried pipes or tanks) in the Project Area that are described in the Contract documents. Identify equipment and work practices that will be used to prevent the release of contamination.

6. Spill Prevention and Response Training

Describe how and when all personnel (including refueling contractors and Subcontractors) will be trained in spill prevention, containment and response in accordance with the Plan. Describe how and when all spill responders will be trained in accordance with WAC 296-824.

7. Spill Prevention

Describe the following items:

A. Spill response kit contents and location(s).
B. Security measures for potential spill sources.
C. Secondary containment practices and structures for hazardous materials.
D. Methods used to prevent stormwater from contacting hazardous materials.
E. Site inspection procedures and frequency.
F. Equipment and structure maintenance practices.

G. Daily inspection and cleanup procedures that ensure all equipment used below the ordinary high water line is free of all external petroleum based products.

H. Refueling procedures for equipment that cannot be moved from below the ordinary high water line.

8. Spill Response

Outline the response procedures the Design-Builder will follow for each scenario listed below. Include a description of the actions the Design-Builder shall take and the specific, on-site, spill response equipment that shall be used to assess the spill, secure the area, contain and eliminate the spill source, and clean up and dispose of spilled and contaminated material.

A. A spill of each type of hazardous material at each location identified in item 4, above.

B. Stormwater that has come into contact with hazardous materials.

C. A release or spill of any pre-existing contamination and contaminant source described in item 5, above.

D. A release or spill of any unknown pre-existing contamination and contaminant sources (such as buried pipes or tanks) encountered during Project Work.

E. A spill occurring during Work with equipment used below the ordinary high water line.

If the Design-Builder will use a Subcontractor for spill response, provide contact information for the Subcontractor under item 1 above,, identify when the Subcontractor will be used, and describe actions the Design-Builder shall take while waiting for the Subcontractor to respond.

9. Project Site Map

Provide a map showing the following items:

A. Site location and boundaries.

B. Site access roads.

C. Drainage pathways from the site.

D. Nearby waterways and sensitive areas.

E. Hazardous materials, equipment, and decontamination areas identified in item 4, above.

F. Pre-existing contamination or contaminant sources described in item 5, above.

G. Spill prevention and response equipment described in items 7 and 8, above.

10. Spill Report Forms

Provide a copy of the spill report form(s) that the Design-Builder will use in the event of a release or spill.

2.8.3.2.3.3 *Fugitive Dust Control Plan*

Fugitive dust shall be controlled by the Design-Builder in accordance with the *Memorandum of Agreement between WSDOT and Puget Sound Clean Air Agency Regarding Control of Fugitive Dust from Construction Projects* (Appendix E4) and Project-specific commitments. The Design-Builder shall prepare and implement a Fugitive Dust Control Plan to reduce short-term construction impacts to air quality, and submit it to

WSDOT for review and approval as part of the ECP. The Design-Builder shall ensure that all air quality and fugitive dust requirements in the permits are incorporated into the Fugitive Dust Control Plan to control particulate matter.

2.8.3.2.4 Environmental Compliance, Monitoring, and Reporting

The Design-Builder, through rigorous monitoring and inspections, shall ensure that all regulations, approvals, and environmental performance specifications are being fulfilled. At a minimum, the Design-Builder's process for monitoring environmental compliance and reporting shall address the following areas.

2.8.3.2.4.1 *Temporary Erosion and Sediment Control (TESC)*

The Design-Builder shall inspect all on-site erosion and sediment control BMPs at least once every 7 Calendar Days and within 24 hours of runoff events in which stormwater discharges from the site. Division 8 of the Standard Specifications includes additional inspection and reporting requirements that the Design-Builder shall adhere to during construction. The Design-Builder shall correct damaged or inadequate TESC BMPs immediately, and a WSDOT Erosion and Sediment Control Inspection Form (Appendix E9) shall be completed for each inspection in accordance with Section 8-01 of the Standard Specifications and NPDES permit requirements. A Site Log Book shall be maintained in accordance with the NPDES permit requirements. The Design-Builder shall review the TESC Plan for compliance with permit conditions, and make appropriate revisions within 7 Calendar Days of the inspection.

2.8.3.2.4.2 *Water Quality Monitoring*

Water quality monitoring shall be performed in accordance with the Water Quality Monitoring Plan. Monitoring protocols and reporting frequencies for in-water Work shall be consistent with those listed in the WSDOT *Highway Runoff Manual,* and must adhere to all permit conditions, performance standards, and environmental commitments listed in Appendices C, E, O, and P.

The Design-Builder shall sample for pH in accordance with NPDES permit requirements and the Amendments to the Standard Specifications.

2.8.3.2.4.3 *Post-Construction Monitoring*

Within seven Calendar Days of Substantial Completion of each corridor, the ECM shall conduct final monitoring inspections to assess and document compliance with permitting requirements. Inspections should address the successes, failures, and remedial actions for site restoration and compensatory mitigation sites.

2.8.3.2.4.3.1 *Environmental Commitment Close-Out Report*

The Design-Builder shall prepare an Environmental Commitment Close-Out Report to summarize overall compliance with permit conditions, performance standards, and environmental commitments. At a minimum, the Design-Builder's Environmental Commitment Close-Out Report shall include the following:

- Fulfillment descriptions completed for all permit conditions, performance standards, and environmental commitments;
- Commitments the Design-Builder was unable to fulfill, and why;

- Significant compliance deficiencies or incidents that may have occurred during the life of the Project and the corrective actions taken; and
- Future requirements for maintaining permanent BMPs, such as cleaning detention ponds.

The Environmental Commitment Close-Out Report shall be completed within 21 Calendar Days of Substantial Completion. The Design-Builder may submit the Environmental Commitment Close-Out Report in stages as discrete elements of Work are completed (e.g., at completion of wetland and stream mitigation sites).

2.8.4 DESIGN AND CONSTRUCTION REQUIREMENTS (ENVIRONMENTAL COMMITMENTS)

WSDOT made commitments in the National Environmental Policy Act (NEPA)/State Environmental Policy Act (SEPA) environmental documents, permits, and Endangered Species Act (ESA) concurrence documents which contain a number of specific design and construction criteria.

A list of the permits that will be obtained and additional permits required for the Project is provided in this Section. Copies of the available permits have been included in Appendix P. Copies of permits not yet available will be provided as they are received. The Design-Builder shall fulfill and report monthly on the implementation of these commitments.

2.8.4.1 NEPA/SEPA DOCUMENTATION

Two (2) NEPA Documented Categorical Exclusions (DCEs) have been prepared by WSDOT to address the scope, impacts, and mitigation for the Project (Appendix E1). In addition, two separate SEPA Categorical Exemptions have been prepared by WSDOT (Appendix E1). If the design of the Project is altered by the Design-Builder in such a way that causes new or additional impacts to the environment and/or surrounding communities, revised or supplemental NEPA/SEPA documentation may be required. If required, the Design-Builder shall be responsible for preparing any additional environmental documentation. In addition, the Design-Builder shall pay all costs and accept all responsibility for any schedule delays associated with securing the additional environmental approvals.

If required, the environmental reevaluation shall follow the WSDOT *Environmental Procedures Manual* and 23 CFR 771. WSDOT will coordinate with all previously-involved agencies as part of any reevaluation process. Final determination regarding the necessity of environmental reevaluations shall be made by WSDOT and the Federal Highway Administration (FHWA).

All environmental reevaluations shall be subject to written approval by WSDOT and FHWA.

2.8.4.2 PERMITS AND APPROVALS

2.8.4.2.1 Permit Acquisition

WSDOT will obtain the following permits and approvals:

- Coastal Zone Management Act Consistency Determination – Ecology (Appendix P2).
- Shoreline Exemption – City of Seattle (Appendix P3).

- Hydraulic Permit Approval – Washington Department of Fish and Wildlife.
- Section 402 NPDES General Permit for Construction Activities – Washington State Department of Ecology (Ecology). Appendix P1 includes the general permit language while P4 includes the Project-specific permit application.

The Design-Builder shall acquire the following permits and approvals, if necessary, and comply with all associated environmental requirements. Other permits may be required.

- Noise Variance – City of Bellevue, City of Clyde Hill, City of Hunts Point, City of Kirkland, City of Medina, City of Mercer Island, City of Seattle, City of Tukwila and City of Yarrow Point;

The Design-Builder shall provide information to WSDOT that will help in the acquisition of the following permits and approvals, if necessary. The Design Builder shall comply with all associated environmental requirements.

- Section 404 Permit – U.S Army Corps of Engineers, if necessary;
- Administrative Order for Chemical Treatment (if necessary) – Ecology.*

*Note: The use of chemical treatment BMPs, including enhanced sand filtration, requires an Administrative Order for Chemical Treatment from Ecology. The Design-Builder shall coordinate with WSDOT for review prior to submitting the plan to Ecology for approval. It is recommended that the Design-Builder allow a minimum of 30 Calendar Days for the approval process.

2.8.4.2.2 Permit Compliance, Modifications, and Additional Approvals

The Design-Builder shall follow the requirements of all commitments referenced in this Section, and any other permits that are obtained for the Project. The Design-Builder shall provide WSDOT with timely notice of its intent to propose an alternative construction method or a design change that is inconsistent with a particular environmental requirement or commitment. WSDOT will work with the Design-Builder and will bring final detailed proposals provided by the Design-Builder to the regulatory agencies to obtain permits and to initiate ESA consultation as required. The Design-Builder shall be responsible for preparing any additional environmental documentation needed to secure the additional environmental approvals required for implementation of the Design-Builder's alternative proposals.

The Design-Builder shall pay all costs and accept responsibility for any schedule delays resulting from a proposed alternative construction method or design change, including, but not limited to, implementation of an approved ATC. Such costs and schedule delays may result from changes in impacts to the environmental resources addressed in Section 2.8.4.3. In addition to the direct costs associated with preparing documentation for and securing additional environmental approvals, the Design-Builder shall be responsible for costs including, but not limited to, WSDOT labor and materials expenses incurred in gaining environmental approvals. The Design-Builder shall also be responsible for additional mitigation costs such as site acquisition, design, and construction should this be required as a result of increased impacts.

If requested, the Design-Builder's ECM shall attend environmental coordination meetings between WSDOT and the regulatory agencies. Meetings may occur more frequently during final design stages and prior to initial construction activities.

2.8.4.3 OTHER AGREEMENTS AND COMMITMENTS

The environmental documents in the Appendices contain commitments for the completion of the Work. The Design-Builder shall ensure that these commitments are adhered to and implemented.

2.8.4.3.1 Wetlands

Appendix W1d contains wetland delineation files for portions of the SR 520 corridor between I-5 and Lake Washington. A report detailing wetland delineations, characterizations, ratings, and functional assessments for portions of the SR 520 corridor between Lake Washington and I-405 is forthcoming.

Appendix W1c includes the I-405 NE 8th Street to SR 520 Braided Ramps *Ecosystems Discipline Report*. This report covers wetlands in the interchange of I-405 with SR 520.

Appendix W1b includes the *112th to I-90 Wetland Biology Report.* This document provides information about wetlands in the interchange of I-405 and I-90.

Appendix W1a includes the *Wetland Biology Report* from the I-5, I-90 and SR 900 Single Column Seismic Retrofit project. This document provides information on wetland delineations, characterizations, ratings, and functional assessments for small portions of the Project Area.

The Design-Builder shall install High Visibility Fence (HVF) around wetlands. The Design-Builder shall conduct an independent wetland verification, and shall delineate all wetlands and wetland buffers within the Project area to be impacted by construction activity outside of the areas covered in Appendix W1 prior to the installation of HVF to confirm that all wetlands have been identified. The Design-Builder shall submit a Wetland Verification Confirmation and Delineation Memorandum to WSDOT stating its concurrence with the previously-identified wetland boundaries, and its delineation of any new wetlands and wetland buffers, if any. The memorandum shall show the boundaries of any new wetlands or wetland buffers delineated, as well as the methods used to delineate. If the Design-Builder disagrees with WSDOT's findings regarding the areas covered in Appendix W1, the letter shall identify the location of the new wetlands and/or the existing wetland boundary in question.

2.8.4.3.2 Wetlands Impacts

If the Design-Builder proposes changes within the project footprint the Design-Builder shall conduct field investigations to assess impacts to known wetlands and to determine if previously unidentified wetlands are present. If known or previously unidentified wetlands are present and would be impacted by the proposed change, the Design-Builder shall provide WSDOT with information necessary to obtain a permit about impacts to the known or previously unidentified wetlands. The Design-Builder shall not impact these wetlands without written authorization from WSDOT. The Design-Builder shall strive to include all additional impacts to wetlands and their associated buffers in a single submittal.

2.8.4.3.3 Mitigation for Wetlands Impacts

If the Design-Builder determines that construction of the Project will result in unavoidable impacts to wetlands, the Design-Builder shall provide WSDOT with all information necessary to obtain required permits. The Design-Builder shall not impact these wetlands without written authorization from WSDOT. The Design-Builder shall strive to include all impacts to wetlands and their associated buffers in a single submittal.

The Design-Builder shall also be responsible for additional mitigation costs such as site acquisition, design, and construction should this be required as a result of impacts.

2.8.4.3.4 Streams

No streams within the Project Area have been identified or located by WSDOT. The Design-Builder shall conduct field investigations to identify the boundary of streams or their associated buffers not previously identified, and to assess impacts to streams or their associated buffers within the Project Area. If any streams or stream buffers will be impacted, the Design-Builder shall notify WSDOT and shall provide WSDOT with all information necessary to obtain required permits. The Design-Builder shall install HVF to protect all streams and stream buffers. The Design-Builder shall not impact any streams without written authorization from WSDOT. The Design-Builder shall strive to include all impacts to streams and their associated buffers in a single submittal.

2.8.4.3.5 Intentionally Omitted

2.8.4.3.6 Intentionally Omitted

2.8.4.3.7 Jurisdictional Features

The Design-Builder shall install HVF around jurisdictional ditches identified through the wetland delineation process. The Design-Builder shall conduct an independent jurisdictional ditch verification and shall delineate all jurisdictional ditches within the Project area to be impacted by construction activity outside of the areas covered in Appendix W1 prior to the installation of HVF to confirm that all jurisdictional ditches have been identified. As part of the Wetland Verification Confirmation and Delineation Memorandum, the Design-Builder shall submit a letter to WSDOT stating its concurrence with the previously-identified jurisdictional ditches, and its delineation of any new jurisdictional ditches, if any. The memorandum shall show the boundaries of any new jurisdictional ditches delineated, as well as the methods used to delineate. If the Design-Builder disagrees with WSDOT's findings regarding the areas covered in Appendix W1, the letter shall identify the location of the new jurisdictional ditches and/or the existing jurisdictional ditches in question.

2.8.4.3.8 Construction Noise

The Design-Builder shall implement mitigation measures for temporary noise impacts associated with construction activities in accordance with the noise variances. The Design-Builder shall obtain a noise variance from the local jurisdiction, as required, and shall comply with all conditions within the variance.

The Design-Builder should be aware that the process to obtain noise variances can be lengthy, and should plan to submit the noise variance applications as soon as practicable. WSDOT will be available as a resource if the Design-Builder requests assistance during the variance approval process.

2.8.4.3.9 Threatened and Endangered Species

Two Endangered Species Act (ESA) No Effect letters were issued and are included as Appendix E2.

If the Design-Builder modifies design or construction activities beyond those agreed to in the No Effect Letters, ESA consultation may have to be initiated. If this occurs, the

Design-Builder shall work through WSDOT to provide the necessary information required for ESA consultation. If ESA consultation needs to be reinitiated due to changes made by the Design-Builder to the Basic Configuration (Appendix M1), all cost and schedule impacts shall be the Design-Builder's responsibility.

2.8.4.3.10 Hazardous Materials

No known or suspected contamination has been identified within the Right-of-Way. Known or suspected contamination shall be addressed in the RFC Documents.

Prior to construction, the Design-Builder shall have performed a thorough hazardous materials survey. The Design-Builder shall inspect, remove, and dispose of all hazardous materials identified in the survey. This effort will not be considered a Differing Site Condition (DSC) in accordance with Section 1-04 of the General Provisions.

If the Design-Builder encounters an unknown Underground Storage Tank (UST) within the Right-of-Way, the Design-Builder shall decommission and remove the UST. This effort will be considered a DSC in accordance with Section 1-04 of the General Provisions. If a UST is encountered, WSDOT and the Design-Builder shall follow all applicable rules and regulations associated with UST removal activities.

The Design-Builder shall dispose of construction waste material such as concrete or other harmful materials at approved sites in accordance with Sections 2-01, 2-02, and 2-03 of the Standard Specifications, and as supplemented by the Special Provisions.

The Design-Builder shall meet all regulatory conditions imposed at contaminated properties (e.g., Consent Decree) associated with construction. These conditions could include ensuring that the surrounding properties and population are not exposed to the contaminants on the site. The Design-Builder shall ensure that the site is properly contained during construction so that contaminants do not migrate off-site, and so that the health and safety of all on site personnel are protected during Work at the site. The Design-Builder shall prepare a SPCC Plan that provides specific guidance for managing contaminated media that may be encountered within the Right-of-Way.

If unknown contamination is discovered during construction, the Design-Builder shall notify WSDOT immediately and shall follow the SPCC Plan as well as all appropriate regulations.

2.8.4.3.10.1 *Worker and Public Health and Safety*

The Design-Builder shall comply with the following regulations and agreements:

- State Dangerous Waste Regulations (Chapter 173-303 WAC).
- State Underground Storage Tank Regulations (Chapter 173-360 WAC).
- State Health and Safety Asbestos Regulations (Chapter 49.26 RCW).
- Safety Standards for Construction Work (Chapter 296-155 WAC).
- Washington Industrial Safety and Health Act (Chapter 49.17 RCW).
- National Emission Standards for Hazardous Air Pollutants (NESHAP) (Code of Federal Regulations, Title 40, Volume 5, Parts 61 to 71).
- General Occupational Health Standards (Chapter 296-62 WAC).

- Implementing Agreement Between Ecology and WSDOT Concerning Hazardous Waste Management.

2.8.4.3.11 Historic, Archaeological, and Cultural Preservation

WSDOT has determined that this Project is exempt from Section 106 of the National Historic Preservation Act of 1966, as described in two exemption memos (Appendix E3). Known historic, archaeological, or cultural sites that have been identified within the Right-of-Way are described in these memos.

The Project-specific Unanticipated Discovery Plan is shown in Appendix E10. The Unanticipated Discovery Plan shall be adopted and revised by the Design-Builder, as necessary. The Unanticipated Discovery Plan shall be submitted to WSDOT for Review and Comment as part of the Design-Builder's ECP, prior to the start of construction.

Any historic, archaeological, or cultural objects encountered by the Design-Builder shall not be further disturbed in accordance with Section 1-07 of the General Provisions and the Unanticipated Discovery Plan.

If the Design-Builder elects to propose a design change that would impact areas not analyzed in the Section 106 memo a subsurface investigation and consultation with the Department of Archaeology and Historic Preservation and affected and interested tribes may be necessary. WSDOT reserves the right to take up to 30 Calendar Days to provide concurrence for the proposed design change. WSDOT will use this time to coordinate with outside agencies, tribes, and other entities, and/or to complete field investigations.

2.8.5 SUBMITTALS

The Design-Builder shall submit the following documents to WSDOT as required by this RFP and the permits obtained for the Project. The submittals shall include, but are not limited to, the following:

- Interim Environmental Compliance Plan (IECP).
- Environmental Compliance Plan (ECP).
- Hazardous Material Survey.
- Noise Variance Applications.
- Environmental Commitments Close-Out Reports.
- Various Construction Monitoring Reports as required in the permits.
- Wetland Verification Confirmation and Delineation Memo.

End of Section

2.9 PUBLIC INFORMATION

2.9.1 GENERAL

Everyone working on a WSDOT project, whether a contractor, consultant or a WSDOT employee, is expected to meet or exceed the agency's communications standards as outlined in the most current WSDOT *Communications Manual*. WSDOT contractors need to understand the importance of sharing honest, open, consistent, clear, concise, and timely information with WSDOT and partnering agency staff. In turn, WSDOT will share Project information with employees, elected officials, community leaders, businesses, citizens and taxpayers, others in the transportation community, the press, and other media. WSDOT and the Design-Builder shall develop and maintain a consistent level of public communication, while encouraging broad public awareness and understanding of the Project.

Contractors and subcontractors play a key role in supporting WSDOT by maintaining internal and external communications, while encouraging broad public awareness and an understanding of the Project. The Design-Builder shall promote WSDOT's 3 key elements: Project delivery, accountability, and communications. The Design-Builder shall also strive to educate and promote understanding about how the Project fits in with WSDOT's Moving Washington Plan and other statewide initiatives. WSDOT and the Design-Builder shall develop and maintain a consistent level of internal and external communication, and keep the public informed about the Project. All communication shall be coordinated with WSDOT.

The Design-Builder shall work with WSDOT to achieve the following public information and community relations goals:

- Support the successful delivery of the Project.
- Provide information to individuals and entities directly affected by construction in as proactive, responsive, and complete manner as possible.
- Assure that any potential disproportionately high and/or adverse impacts on minority and/or low-income populations are identified and addressed; and continue to communicate with social service agencies.
- Educate the public about the benefits and improvements associated with the Project, such as reducing and managing collisions.
- Reinforce positive WSDOT relationships with partner agencies, individuals, and community groups.
- Increase the public's understanding of ATM concepts and technology.
- Educate public on the Project's vital importance to improving safety and mobility on I-5.
- Promptly respond to questions and concerns from individuals and entities affected by the Project, including constructing the ATM signs and how they will work.

2.9.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any

ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall immediately notify WSDOT so that WSDOT may resolve them.

- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Communications Manual and Appendix* (Appendices D20 and D21).
- ATM Communications Plan (Appendix Y1).

2.9.3 PERFORMANCE REQUIREMENTS

2.9.3.1 JOINT COMMUNICATIONS EFFORT

Development and dissemination of public information for the Project requires the integration of resources and labor between WSDOT and the Design-Builder. Joint communications will educate and inform the public, establish expectations, and play a significant role in delivering a successful Project.

WSDOT and the Design-Builder shall coordinate construction closures and communications with other projects being constructed along and near the project corridors, and within the region. They must also maintain ongoing communication with the local jurisdictions within the Project Area regarding upcoming construction activities and planned closures.

2.9.3.2 PUBLIC INVOLVEMENT PLAN (PIP)

Using the ATM Communications Plan as a guide, the Design-Builder shall submit a Draft Public Involvement Plan (PIP) in accordance with this Section, within 30 Calendar Days after Notice to Proceed. The Final PIP will be agreed to during a communications task force meeting held within 30 Calendar Days of submittal of the Draft PIP. The task force shall include the Design-Builder's Project Manager and public information representatives; and WSDOT Project personnel and communications staff. The communications planning workshop shall clarify and document those roles.

The Final PIP shall be the framework for disseminating information and responding to public inquiries, comments, and requests. It should include all publics that will be affected by the Project, such as local neighborhoods, community, business groups, local jurisdictions, transit providers, and emergency services, and outline a plan to coordinate with these entities. As the Project progresses, the PIP may need to be updated. The Design-Builder should regularly review the PIP and update as needed.

The Final PIP shall also include performance-monitoring processes and tools to be used by WSDOT to assess the progress and measure the success of the Design-Builder's overall communications efforts.

2.9.3.3 COMMUNICATIONS PLANNING AND NO SURPRISES WORKSHOP

The Design-Builder shall provide space, assist in set up and require construction field and office staff to attend and participate in a WSDOT-hosted No Surprises Construction Kick-Off Workshop within 30 Calendar Days after Notice to Proceed. The Design-Builder shall participate in the meeting and additional WSDOT-hosted No Surprises meetings if determined necessary by WSDOT.

This meeting shall be facilitated by WSDOT and shall discuss WSDOT's "No Surprises" philosophy, weekly construction updates, long-range communications planning, internal

communications, emergency protocols and contacts, opening events, open houses, graphics, Project access, and other issues.

The Design-Builder shall assist with organizing and implementing the workshop, which shall include the participation of the Design-Builder's Project Manager, relevant field and office staff; stakeholders, and WSDOT project personnel and communications staff.

2.9.4 WSDOT'S COMMUNICATIONS RESPONSIBILITIES

WSDOT will retain primary responsibility for the following communications tasks:

- Creating and maintaining the ATM Communications Plan.
- Maintaining a Project Web page.
- Developing Project-related collateral materials.
- Response to public comments regarding the Project and concept.
- Communications related to items such as transit, bicycles, and pedestrians.
- Communications regarding environmental issues, such as noise, and their mitigation.
- Media relations activities.
- Conducting major Project-related events, such as ground-breaking and ribbon-cutting.
- Contacting elected officials.
- Conducting Project-related events, such as open houses and public meetings.
- Monitoring Project communications to meet WSDOT standards for form, graphic design, content, and messaging.

2.9.5 DESIGN-BUILDER'S ROLE IN PUBLIC INFORMATION EFFORTS

The Design-Builder shall identify and implement ways of informing the public, individual property owners, and broader communities about design and construction activities that directly affect them. These communities may also include local businesses, neighborhoods, transit providers, and emergency services about construction activities. Such information shall be clear, consistent, and comprehensive, and shall meet WSDOT graphic and writing standards and be subject to ongoing review by WSDOT before distribution. Examples are flyers for night noise, disruption of utility services, pedestrian access, bike access, and transit disruptions.

The Design-Builder shall also:

- Create a Public Involvement Plan (PIP).
- Shoot video and photos for posting on Web pages.
- Create a crisis communication plan.
- Create and distribute an emergency contact list.
- Provide monthly progress reports.
- Create and maintain a database to track public correspondence that enables a query search based on date of inquiry, topic, and name.
- Participate in meetings.

- Provide regular updates regarding construction activities and schedule on a minimum weekly basis or more often if plans change.
- Distribute updates on construction activities using a variety of tools.
- Ensure ample notification to the public regarding construction activities affecting them. A few examples include drivers, pedestrians, business, residents, handicapped, and bicyclists.
- Provide construction schedules on a weekly basis.
- Provide support for WSDOT communications to successfully complete the following tasks:
    - Maintaining a Project Web page.
    - Developing Project-related collateral materials.
    - Response to public comments regarding the Project and concept.
    - Communications related to items, such as transit, bicycles. and pedestrians.
    - Communications regarding environmental issues, such as noise and their mitigation.
    - Conducting major Project-related events, such as ground-breaking and ribbon-cutting.
    - Conducting Project-related events, such as open houses and public meetings.
    - Monitoring Project communications to meet WSDOT standards for form, graphic design, content, and messaging.

2.9.5.1 PUBLIC INFORMATION STAFF

The Design-Builder shall provide a Public Information Specialist and additional staff as needed to support the Project, and will be responsible for identifying public information issues related to the Design-Builder's Work, and for formulating and implementing strategies to address those issues. Prior to implementing these strategies, the Public Information Specialist shall consult with WSDOT.

The Design-Builder shall work in partnership with the communications staff member to make sure that WSDOT's public information and communications goals and objectives are met.

The Design-Builder shall provide unrestricted site access for photographs, video shoots, and media interviews as directed by WSDOT.

The Public Information Specialist shall be available to visit the Project office on a weekly basis for meetings and to enter information into the Project database; and be readily available by telephone during all other business hours with immediate computer and e-mail access. During critical construction activities and emergencies, the Public Information Specialist shall be available as necessary outside of regular business hours.

The Public Information Specialist shall have professional experience in communications for large public infrastructure projects, including, but not limited to, the following:

- Strong writing skills, including writing for the public, news media, and internet. Knowledge of WSDOT's Reader-Friendly Toolkit, "plain talk" communications, and media relations protocols is preferred.

- Providing and presenting information to the public, news reporters, community groups, and others.
- Developing, implementing, and measuring the results of strategic communication plans and strategic messaging.
- Developing and producing maps, charts, graphs, diagrams, and other visual images, preferably using InDesign, Adobe Freehand, Adobe Photoshop, and WSDOT design templates to meet WSDOT graphics standards.
- Developing and implementing public involvement and community relations programs.
- Taking photographs and video.

The Public Information Specialist shall have full access to all of the Design-Builder's Project details that may be relevant to the public, public agencies, emergency service providers, businesses, media, and other interested parties. The Public Information Specialist shall share information with WSDOT continually throughout the Project.

The Design-Builder shall provide WSDOT with a prioritized after-hours call list within 30 Calendar Days after Notice to Proceed. The call list shall include the contact information for the Design-Builder's public information staff, including home and mobile phone numbers, and e-mail addresses. The call list shall be updated monthly with any information that has changed.

2.9.6 DESIGN-BUILDER PUBLIC INFORMATION SPECIFICATIONS

2.9.6.1 MEETINGS

The Public Information Specialist shall work closely with WSDOT communications staff to maintain regular coordination and communication with WSDOT on all public information goals and activities.

At WSDOT's request, the Public Information Specialist shall participate in weekly region-wide conference call meetings when planning and implementing critical construction activities.

The Design-Builder shall be available to participate in community meetings or any other event that will enhance public outreach for the project.

2.9.6.2 MONTHLY PROGRESS REPORTS

The Design-Builder shall provide a brief Monthly Progress Report to WSDOT. The Report shall summarize progress made the previous month and include photos of the previous month's construction activities. The Design-Builder shall submit the Report by e-mail the first Monday of the month to the designated WSDOT Public Information Lead for the Project

2.9.6.3 CONSTRUCTION INFORMATION DISSEMINATION

The Design-Builder shall coordinate with WSDOT to collect, write, and disseminate design and construction information to the WSDOT Web site, Project page, WSDOT's e-mail updates, WSDOT's 511 Condition Acquisition and Reporting System, Highway Advisory Radio (HAR), Variable Message Signs (VMS) and any other appropriate outreach tools. The Design-Builder shall collect and maintain a current schedule of planned and current construction activities, such as location, estimated duration of activity,

type of work being performed, effects (e.g., noise, lane closures, narrowed lanes, commercial vehicle restrictions), and planned construction detours.

2.9.6.3.1 Construction Schedule

One (1) month prior to commencement of construction in any area of the Project, the Design-Builder shall notify WSDOT and the public of construction schedules. The Design-Builder shall provide construction updates to WSDOT on a weekly basis by 5:00 p.m. Wednesday. The Design-Builder shall deliver additional updates if construction and traffic impacts change, or if WSDOT requests additional updates. These updates shall include the upcoming week's planned closures, detours, Project status, and other information relevant to the public. The Design-Builder shall enter upcoming closure information into WSDOT's construction update report template on a weekly basis and submit for WSDOT review, comment, and dissemination. The Design-Builder shall immediately notify WSDOT of any changes to the planned closures.

2.9.6.4 CRISIS COMMUNICATIONS PLAN

The Design-Builder shall include a Crisis Communications Plan (emergency response protocol) for responding to emergencies and incidents during the Project in its Draft PIP. The Design-Builder shall coordinate this approach with the Design-Builder's overall Traffic Management Plan and Traffic Incident Management Plan (see Section 2.22). The Design-Builder's Crisis Communications Plan shall address the following:

- Communications approaches to emergencies, such as fire, gas line strikes, injured employees, auto accidents in a Work zone, and environmental spills.
- An outline of staff designated to respond to the emergency, including their role and their contact information.
- The cause of specific disruptions, such as construction-related disruptions and weather;
- Actions that could be taken to mitigate the crisis.
- Procedures for notifying WSDOT, the public, and the Design-Builder.
- Any corrective procedures that will be put in place as a result of the crisis.
- Procedures for referring victims of auto damage due to construction to WSDOT's risk management department.

In the event of a crisis, the Design-Builder shall summarize the emergency protocol used in an emergency incident report, and submit that report to WSDOT within 3 Calendar Days of the crisis.

Within 30 Calendar Days of Contract execution, the Design-Builder' Project Manager, Workzone Traffic Engineering Manager, and Public Information Specialist, along with other staff deemed necessary by the Design-Builder, shall participate in a crisis communication "No Surprises" workshop provided by WSDOT to discuss protocols and potential emergency situations. Staff from jurisdictions affected by the Project or from other related projects may attend. The same Design-Build staff shall be required to participate in follow-up workshops held annually, and following any crisis situations.

2.9.6.4.1 Dissemination of Emergency Information

As part of the Crisis Communications Plan, the Design-Builder shall establish and manage an emergency response call list. All appropriate personnel shall be included on the call list

for immediate response in the event of an emergency. The call list shall be divided into areas of expertise, so the proper people are contacted for specific emergency situations.

The following WSDOT personnel shall be included on the call list for notification of all emergencies:

- Project Engineer.
- Public Information staff.
- Traffic Safety Management Center.
- Maintenance.

The following Design-Builder personnel shall be included on the call list for notification of all emergencies:

- Project Manager.
- Work Zone Traffic Engineering Manager.
- Public Information Specialist.

The personnel on the call list shall be included in the PIP. In addition, the Design-Builder shall provide a trained spokesperson as needed during emergencies, and shall provide prompt information and assistance as requested by WSDOT during an emergency.

2.9.6.5 COORDINATION WITH TRAFFIC MANAGEMENT PLAN

The Design-Builder's Public Information Specialist shall coordinate with Project staff to communicate construction traffic information to the public and other affected parties. In addition, the Design-Builder shall be responsible for coordinating traffic communications with neighboring construction projects, as part of an established coordinated communications plan. Refer to Section 2.22 for additional traffic coordination requirements.

2.9.6.5.1 Intentionally Omitted

2.9.6.5.2 Traffic Conditions

The Design-Builder shall inform the WSDOT Traffic Systems Management Center and WSDOT Project personnel of any unusual traffic conditions, such as road obstructions, within 15 minutes of detection.

2.9.6.5.3 Commercial Vehicle Access and Restriction Information

Fourteen (14) Calendar Days prior to any activity taking place that may restrict or impede the movement of commercial vehicles due to reduced lane widths, reduced height clearances, or lower weight limits, the Design-Builder shall provide WSDOT with a description of the event, the start date of the event, and the end date of the event.

2.9.6.5.4 Emergency Vehicle Access

The Design-Builder shall develop a protocol for communicating information to the emergency service providers regarding access to the Project Area for emergency vehicles. This protocol shall be included in the PIP.

2.9.6.5.5 Bicycle, Pedestrian, and Handicapped Mobility Access

The Design-Builder shall clearly define and communicate to WSDOT access routes for bicycles, pedestrians, and handicapped persons, including alternate routes and detours.

2.9.7 METHODS AND TOOLS FOR DISSEMINATION OF INFORMATION

2.9.7.1 HIGHWAY ADVISORY RADIO (HAR)

The Design-Builder shall provide timely and accurate information daily or as requested by WSDOT for HAR messages. The Design-Builder shall prepare draft messages for advance notice of traffic restrictions due to planned construction activities, for WSDOT to record. The messages will be reviewed and approved by WSDOT prior to the HAR broadcasts.

2.9.7.2 VARIABLE MESSAGE SIGNS (VMS)

The Design-Builder shall prepare draft messages for advance notice of traffic restrictions due to planned construction activities. The messages will be reviewed and approved by WSDOT prior to posting on VMS.

2.9.7.3 INTENTIONALLY OMITTED

2.9.7.4 TELEPHONE HOTLINE

The Design-Builder shall establish and manage a telephone hotline for the Project. The Design-Builder shall provide material for daily recorded updates of current construction impacts, traffic impacts, and Project progress. The Design-Builder shall respond to any inquiries from the hotline within 24 hours. The Design-Builder shall ensure that all staff responding to inquiries are trained, friendly, responsive, and informed about construction and traffic impacts.

The Design-Builder shall be responsible for compiling and summarizing questions and comments referred by WSDOT, from the general public. This includes tracking responses to callers, analyzing and reporting trends, and providing a weekly status report file to WSDOT.

2.9.7.5 PROJECT WEB PAGE

The Design-Builder shall submit information regarding construction effects and project updates for the Project Web page and other WSDOT Web pages. The Design-Builder shall provide information on lane closures, detour routes, re-channelization plans, road condition information, and other construction-related issues relevant to the public. The information, including graphics and photos, shall be updated on a bi-weekly basis.

2.9.7.6 COLLATERAL MATERIALS

In addition to the dissemination of construction information discussed in this Section, the Design-Builder shall copy and disseminate written materials produced by WSDOT on specific construction issues, which may include, but are not limited to, schedule, noise, and lights. Materials shall be made available to the public as requested through U.S. mail, e-mail, and at individual and group meetings. WSDOT and the Design-Builder shall determine when materials shall be distributed to businesses and neighborhoods and the size of the distribution area.

2.9.7.7 CORRESPONDENCE AND E-MAIL

The Design-Builder will forward e-mail, letters, and other forms of correspondence from the public regarding design and construction issues to WSDOT for response. The Design-Builder shall provide WSDOT with any assistance or information required to draft a response.

The Design-Builder shall furnish written documentation of other Project-related correspondence to WSDOT within 1 week of the communication. Project-related correspondence shall include communications with the public, businesses, community groups, and government entities affected by the Project, and other communications required in this RFP.

2.9.7.8 OPEN HOUSES, SPECIAL EVENTS, PUBLIC MEETINGS, AND SPEAKING ENGAGEMENTS

The Design-Builder shall convene 1 public open house per year to inform the public of the Project's status, and to answer questions related to the Project. The first open house shall be scheduled to occur prior to the start of construction activities.

The Design-Builder shall assist with outreach to community groups, including but not limited to, the Cities of Seattle, Bellevue and Mercer Island; neighborhoods;, businesses; truckers; shippers; transit agencies; and employee transportation coordinators. The Design-Builder shall be available to attend public and community meetings or to make presentations at WSDOT's request. The Design-Builder shall attend at least 6 public or community meetings per year for the duration of the Contract.

2.9.7.9 PHOTOGRAPHS AND VIDEO

The Design-Builder shall document construction, public outreach, and other Project-related events by producing 24 photographs per month during the duration of the Contract. The documentation shall be used for public communications, media relations, and WSDOT archival purposes. All photographs produced by the Design-Builder's staff for public dissemination shall comply with WSDOT's standards as defined in the WSDOT Communications Manual, and are the shared property of the Design-Builder and WSDOT. The Design-Builder shall comply with the following standards:

- Produce and distribute photos as requested by WSDOT.
- Track and file photos using a WSDOT-approved documentation system.
- Provide or obtain accompanying information, such as use permissions and publication rights, for photographs and videos.

2.9.7.10 EVENTS

The Design-Builder shall coordinate, communicate, and provide a plan to minimize construction effects on public events held by public and private entities as well as other construction in the area. The Design-Builder shall develop and maintain a list of public events. Examples of public events include, but are not limited to: Mariners baseball games and events; Seahawks games and events; conference center events; boat shows; home shows; RV shows; concerts; campaigns; fun runs; festivals; parades and other large scale events; July 4th festivities; and holiday festivities. The Design-Builder shall notify WSDOT of planned events that may be affected by construction 14 Calendar Days before the event takes place, and submit weekly updates to the special events listing.

2.9.7.11 MEDIA RELATIONS

Although media relations are the responsibility of WSDOT, the Design-Builder shall participate in media interviews or other media information support activities at WSDOT's request. When participating in media inquiries and interviews, the Design-Builder shall provide information that complies with WSDOT messaging and other standards, including requirements for advance Project information, Project progress and accountability, and timely response to media inquiries.

The Design-Builder shall coordinate all media requests with WSDOT prior to interviews. WSDOT will be the media spokesperson. The Design-Builder shall provide WSDOT with information and access to key Project staff for press interviews, as requested.

At WSDOT's request, the Design-Builder shall conduct tours of the Project site for media, local, or State government officials, or WSDOT management. The Design-Builder shall provide information and materials that meet local broadcast and print media requirements and deadlines. All information released to the news media must be reviewed and approved by WSDOT prior to release.

2.9.7.12 UTILITY SHUT-OFFS

The Design-Builder shall conduct regular communication with residents and businesses affected by utility shut-offs, to mitigate the impacts of utility disruptions. The Design-Builder shall contact all affected residents and businesses 48 hours in advance of a utility shut-off, and shall maintain a record of each notification. Notices shall indicate the purpose and expected duration of the outage, and provide information indicating how those affected by the outage can contact the Design-Builder. Such notices may also be provided by WSDOT.

In the event of an emergency involving a utility shutoff, the Design-Builder shall notify the utility owner in accordance with utility company standards and local emergency services.

2.9.7.13 CONSTRUCTION TRAFFIC MITIGATION

The Design-Builder shall collaborate with WSDOT at the request of WSDOT on opportunities to work with transportation coordinators, transit agencies, local chambers of commerce, sports teams, retail centers, businesses, communities, and others to encourage more efficient use of highways and roadways. The Design-Builder shall work with WSDOT to keep these entities informed of construction activities. The Design-Builder shall participate in meetings with the WSDOT as requested.

2.9.8 INTENTIONALLY OMITTED

2.9.9 QUALITY ASSURANCE AND QUALITY CONTROL

The Design-Builder shall maintain a high level of quality control for all public information tools and materials. The Design-Builder shall be bound by the provisions of the Quality Management Plan for all public information. The PIP shall outline a process for managing review and resolution of comments for all communications materials, both within the Design-Builder's team and with WSDOT. WSDOT shall provide the Design-Builder with periodic feedback and suggestions for improvement.

2.9.10 SUBMITTALS

Project submittals include, but are not limited to, the following:

- Project Contact Call List – Submitted within 30 Calendar Days of Contract execution.
- Monthly Progress Reports – Format to be established within 30 Calendar Days of Contract execution, with reporting beginning immediately thereafter.
- Draft and Final PIPs.
- Construction information.
- Emergency response protocol.
- Telephone hotline information.
- Photos.

End of Section

2.10 UTILITIES AND RELOCATION AGREEMENTS

2.10.1 GENERAL

The Design-Builder shall carry out all Work in the vicinity of Utilities carefully and skillfully, and shall support, secure, and exercise care with respect to Utilities to avoid damaging them.

The Design-Builder shall ensure continuity of all existing Utility services to all users, except when a Utility Owner determines that temporary interruption is necessary and acceptable.

The Design-Builder shall comply with all Applicable Laws relating to grading or excavation in the area of underground Utilities. Before starting construction that may affect any Utility in a particular area (whether underground or overhead), the Design-Builder shall notify the affected Utility Owners in writing at least 30 Calendar Days prior to commencement of the Work. The Design-Builder shall contact the One-Call Locate Center (1-800-424-5555) prior to performing any excavation. The Design-Builder shall maintain all appropriate clearances from active power lines in accordance with WAC 296-155-428.

If any Utilities are damaged by the Design-Builder's activities, the Design-Builder shall immediately notify the affected Utility Owner, the One-Call Locate Center, and WSDOT. The Design-Builder shall pay for all costs associated with damage caused by the Design-Builder, including Utility down-time; all reconstruction; all remediation of hazards; litigation; loss of product; and Utility start-up and delay costs. At the Utility Owner's request, the Design-Builder shall repair the damage, or the Utility Owner may choose to repair the damage at the Design-Builder's expense. All repairs by the Design-Builder shall be performed to the reasonable satisfaction of the Utility Owner. The Design-Builder shall pay any reimbursement due to the Utility Owner because of any damage caused by the Design-Builder within 30 Calendar Days after receipt of the Utility Owner's invoice.

2.10.2 INTENTIONALLY OMITTED

2.10.3 ACCESS TO EXISTING UTILITIES

Any authorized agent of WSDOT, a Utility Owner, or a Utility Owner's representative may enter the Right of Way to inspect, repair, maintain, rearrange, alter, or connect Utility facilities and equipment. The Design-Builder shall cooperate with such efforts and shall avoid creating delays or hindrances to the performance of such work. If the Design-Builder determines, or a Utility Owner requests, that a Utility Owner must be on site to protect its facility, the Design-Builder shall provide at least seven Calendar Days advance notice to the Utility Owner.

2.10.4 IDENTIFICATION OF UTILITIES

2.10.4.1 INFORMATION SUPPLIED BY WSDOT

WSDOT has not performed an exhaustive investigation of existing Utilities located within the Right of Way. Utility investigation was performed as part of the WSDOT Boeing Access Road to I-90 I/C Sign Bridges project and the WSDOT I-90 and SR 520 Lake Washington Congestion Management Sign Bridges Project, the results of which are included in Appendix U3. A list of existing electrical services within the Project Area,

along with photos of each, can be found in Appendix U5. Service agreements for existing services can be found in Appendix U4.

2.10.4.2 DESIGN-BUILDER'S INVESTIGATIONS

The Design-Builder shall be solely responsible for verifying, at its expense, the exact horizontal and vertical location, size, type, and all other relevant characteristics of all Utilities located within the Right of Way or otherwise potentially impacted by the Project (including any Utilities located on private property). Such actions shall include making diligent inquiry at the offices of the Utility Owners, consulting public records, and conducting field studies, as appropriate. The Design-Builder shall consider the possibility that the information provided by Utility Owners may be inaccurate and incomplete.

2.10.5 COORDINATION, AND CORRESPONDENCE

2.10.5.1 COORDINATION RESPONSIBILITIES

The Design-Builder shall be responsible for coordination with all Utility Owners with Utilities located within the Project limits. Such responsibilities shall include obtaining information from and providing information to the Utility Owners; coordination and scheduling of inspections, approvals, and acceptances; and coordination and scheduling of construction Work. The Design-Builder shall keep Utility Owners informed of the Design-Builder's construction schedules. The Design-Builder shall cooperate with the Utility The Design-Builder shall act diligently in maintaining a positive relationship with the Utility Owners.

2.10.5.2 CONTACT INFORMATION

The Design-Builder shall obtain Utility Owner contact information, and shall maintain current contacts for all Utilities affected by the Project.

End of Section

2.11 ROADWAY DESIGN

2.11.1 GENERAL

The Design-Builder shall conduct all Work necessary to complete the roadway design and grading elements for the Project.

The Design-Builder shall construct maintenance pullouts at new Intelligent Transportation System (ITS) pole and VMS installations as described below. The Design-Builder shall protect new ITS installations as required by the *WSDOT Design Manual*.

2.11.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Standard Plans* (M21-01) (Appendix D15).
- WSDOT *Plans Preparation Manual* (M22-31) (Appendix D11).
- WSDOT *Local Agency Guidelines* (M36-63) (LAG) (Appendix D7).
- AASHTO *A Policy on Geometric Design of Highway and Streets*, 5th Edition, 2004.
- AASHTO *Guide for High-Occupancy (HOV) Facilities*, 3rd Edition, 2004.
- AASHTO *Roadside Design Guide*, 3rd Edition, 2002, and 2006 Chapter 6 Update.
- ADA Accessibility Guideline (ADAAG), US Access Board.
- AASHTO *Guide for the Development of Bicycle Facilities*, 3rd Edition, 1999.
- AASHTO *Guide for the Planning, Design, and Operation of Pedestrian Facilities*, 1st Edition, 2004.
- Otak *Pedestrian Facilities Guidebook: Incorporating Pedestrians into Washington's Transportation System*, 1997.
- *Manual on Uniform Traffic Control Devices – Washington State Modifications* (M24-01) (MUTCD) (Appendix D23).
- FHWA *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD), 2003.
- FHWA *Flexibility in Highway Design*, 1997.

2.11.3 INTENTIONALLY OMITTED

2.11.4 DESIGN REQUIREMENTS

2.11.4.1 MANDATORY DESIGN CRITERIA

In widening areas, superelevation transitions shall match the existing superelevation rates and lengths.

2.11.4.2 INTENTIONALLY OMITTED

2.11.4.3 INTENTIONALLY OMITTED

2.11.4.4 ROADSIDE BARRIER SELECTION

Pre-cast and cast-in-place concrete barrier incorporated into the Project shall be single-slope-concrete barrier, in accordance with the Standard Plans.

All guardrail shall be Beam Guardrail Type 31 or Beam Guardrail Type 31 NB.

2.11.4.5 INTENTIONALLY OMITTED

2.11.4.6 FENCING

Fall protection fencing shall be provided in accordance with the WSDOT *Design Manual*.

2.11.4.7 SIDE-SLOPES

Side slopes shall be in accordance with the Mandatory Standards. For locations where steeper slopes are necessary due to Right-of-Way constraints, environmental constraints, or other constraints, the Design-Builder shall amend the design documentation with a design deviation in accordance with Section 2.12.

Side slopes shall be summarized in a side slope table on the construction drawings, and shall identify the baseline, station range, and side slope applied.

2.11.4.8 MAINTENANCE ACCESS

Maintenance access roads and road approaches to the access roads shall be designed according to the WSDOT *Design Manual*.

Access requirements for facilities constructed on the Project are addressed in the applicable sections of these Technical Requirements.

At CCTV and Non-Intrusive Data Collection pole locations and Variable Message Sign installations described in Section 2.18, the Design-Builder shall design and construct shoulder widening or off-shoulder access to accommodate a maintenance vehicle with outriggers extended (12 feet wide by 45 feet long). The shoulder widening or off-shoulder access shall provide a minimum 2-foot clear zone from the edge of the nearest travel lane to the edge of the vehicle and outriggers. The parking surface outside of the roadway shoulder shall be pervious pavement, and shall not have a slope greater than 6 % in any direction. The Design-Builder shall design and construct a 3-foot level work zone clear of obstacles on all sides of the ITS cabinet installations and poles.

2.11.5 CONSTRUCTION REQUIREMENTS

2.11.5.1 DISPOSAL OF SURPLUS MATERIAL

Section 2-03.3(7)C of the Standard Specifications is supplemented with the following:

- All surplus excavation or other materials shall be disposed of outside the Project limits or reused in a manner that does not impact sensitive resources such as wellhead protection zones, surface water bodies, parks, and child-use areas. Disposing of soils of any kind directly to a topsoil manufacturer is prohibited.

Additionally, surplus material or other material shall not be disposed of or reused in any areas determined by WSDOT to be Environmentally Sensitive Areas.

2.11.6 SUBMITTALS

2.11.6.1 INTENTIONALLY OMITTED

2.11.6.2 ROADSIDE BARRIER TECHNICAL MEMORANDUM

For all proposed roadside barrier, the Design-Builder shall prepare and submit a technical memorandum providing justification for need or removal of the roadside barrier. The technical memorandum shall include the following:

- Description of the roadside hazard including dimensions, station, off-set, narrative description, and photo documentation.
- Barrier length of need calculation.
- Plan layout of barrier including beginning and ending stations, off-set, terminal type, and barrier type.
- Narrative documenting justification for the need or removal of roadside barrier, and the terminal type selection.

2.11.6.3 INTENTIONALLY OMITTED

2.11.6.4 CLEAR ZONE INVENTORY

A Clear Zone Inventory for new ITS installation locations shall be completed prior to the start of construction and updated to reflect all changes from the Project.

End of Section

2.12 PROJECT DOCUMENTATION

2.12.1 GENERAL

The Design-Builder shall conduct all Work necessary to complete the required documentation for the design and construction of the Project, and to obtain WSDOT acceptance of the final Project documentation.

2.12.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Design Manual* Supplement, *Engineering for Intelligent Transportation Systems* (Appendix D27).
- WSDOT *Bridge Design Manual* (M23-50) (BDM) (Appendix D1).
- WSDOT *Highway Runoff Manual* (M31-16) (Appendix D6).
- WSDOT *Environmental Procedures Manual* (M31-11) (Appendix D4).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D11).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Standard Plans* (M21-01) (Appendix D15).
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D12).

2.12.3 PERFORMANCE REQUIREMENTS

All documentation for the Project shall be submitted for review in accordance with the Quality Management Plan (QMP) (see Section 2.28).

2.12.4 DESIGN REQUIREMENTS

2.12.4.1 DESIGN DOCUMENTATION PACKAGE (DDP)

Design Approval for the Project is being completed; when complete, a copy will be included in Appendix O4. A DDP was completed for the related WSDOT Boeing Access Road to I-90 I/C Sign Bridges project, a copy of which is included in Appendix O3. Once available, the DDP for the WSDOT I-90 and SR 520 Lake Washington Congestion Management Sign Bridges project will also be added to Appendix O3.

The Design-Builder shall complete the Project Development Approval Package prior to Physical completion of the Project. The Design-Builder shall include the Design Criteria

worksheet and a Design Variances Inventory in the Project Development Approval Package. The Design-Builder shall provide WSDOT with updates to the DDP as they are made. The completed DDP must be approved by WSDOT before Final Acceptance.

2.12.4.2 SYSTEMS ENGINEERING PROCESS

The Design-Builder shall ensure that the design of the Project conforms to the Systems Engineering Process, as described in WSDOT *Design Manual* Supplement, *Engineering for Intelligent Transportation Systems* (Appendix D27). The Design-Builder shall document conformance with the Systems Engineering Process in a System Engineering Technical Memorandum, which shall be delivered prior to Substantial Completion.

2.12.4.3 TECHNICAL MEMORANDA

The Design-Builder shall provide technical memoranda that document decisions made during completion of the design regarding components not included in the Mandatory Standards. Technical memoranda shall be dated, indicate the Project title, and include the name of the person who wrote the memoranda. The technical memoranda shall follow the following format:

- Section 1 - Subject or purpose.
- Section 2 - Background or existing conditions.
- Section 3 - Discussion of alternatives.
- Section 4 – Recommendations.
- Section 5 – Conclusions.

2.12.4.4 CALCULATIONS

All calculations shall be prepared and checked in accordance with the QMP. The calculations shall be available for WSDOT Review and Comment.

2.12.4.5 DESIGN DEVIATIONS

No design deviations have been pre-approved for the Project. The Design-Builder shall conduct all Work necessary to prepare and submit design deviations for the Project, should they prove necessary. All deviations prepared by the Design-Builder shall be prepared by, or under the direct supervision of, a Professional Engineer licensed under Title 18 RCW. The cover of each design deviation shall carry the Professional Engineer's stamp.

2.12.4.5.1 Pre-approved Deviations

No deviations have been pre-approved for the Project.

2.12.4.5.2 Design Deviations

The Design-Builder shall prepare and obtain WSDOT approval, and FHWA approval as required, for all design deviations incorporated into the Project within the Project limits. Although design deviations may be requested, the Design-Builder is advised that there is no assurance they will be approved.

If the Design-Builder identifies any design deviations, the Design-Builder shall prepare documentation for the design deviations that conforms to the WSDOT *Design Manual*. The Design-Builder shall submit this documentation to WSDOT for review and approval.

WSDOT will coordinate review of the design deviations with FHWA as required. The Design-Builder shall not incorporate any design deviations into the Project without receiving WSDOT approval, and FHWA approval as required.

Design deviations approved shall be addressed in accordance with Section 1-04 of the General Provisions.

2.12.4.6 FINAL DESIGN DOCUMENTS

Prior to Physical Completion or termination of the Contract, the Design-Builder shall collect and submit all design documents prepared in the performance of the Contract. The Final Design Documents shall include, but are not limited to, the following:

- Design Documentation Package and Project File.
  - Design calculations and documentation.
  - Reports and technical memoranda.
  - Deviations.
  - Project Development Approval Package.
- Updated electronic Microstation and Inroads files, including all Released For Construction (RFC) sheets, reference files and base mapping (topography).

The Design-Builder shall ensure that the Final Design Documents reflect the actual condition of the constructed Work, to the same degree of detail as the RFC documents.

The Final Design Documents shall include all changes and corrections to the documents that depict the final completed component, with relevant data shown (including copies of calculations not previously submitted with shop drawings or with the Final Design Submittal).

WSDOT will review the submittal and advise the Design-Builder of its acceptance of the Final Design Documents or will provide comments detailing issues to be resolved. The Design-Builder shall address all comments in a manner consistent with the agreed-to comment resolution process, and then resubmit the Final Design Documents to WSDOT for acceptance.

2.12.5 CONSTRUCTION REQUIREMENTS

The Design-Builder shall conduct all Work necessary to provide temporary and permanent final records for the Project in accordance with the WSDOT *Construction Manual* and these Technical Requirements.

2.12.5.1 AS-BUILT PLANS, AMENDMENTS TO THE STANDARD SPECIFICATIONS, AND TECHNICAL SPECIFICATIONS

Prior to Physical Completion of the Project, the Design-Builder shall update and re-release all RFC and design documents affected by changes made during construction. The electronic Microstation and Inroads files shall be updated to show the as-constructed conditions, incorporating all revisions made during construction. The drawings shall be arranged in sequential order as defined in the WSDOT *Plans Preparation Manual*. The Design-Builder shall make all electronic Microstation and Inroads files consistent with the software and drawing conformance requirements of the Technical Requirements, and shall

submit 2 hard copies and 1 complete electronic copy of the updated Microstation and Inroads files on CDROM.

All revisions to the RFC Documents shall be performed by, or under the direct supervision of, the Engineer of Record (EOR) for the documents. Each reissued sheet of the revised RFC plans, and the cover of each of the reissued revised RFC Technical Specifications, shall include the Professional Engineer's stamp.

Calculations for design revisions made during construction shall be available for WSDOT Review and Comment prior to implementation of the revisions during construction. Calculations for design revisions made during construction shall be incorporated into the design calculation file when construction is completed.

As a record of how the Project was actually constructed, As-Built Plans shall reflect the same degree of detail as the RFC Documents. Underground features shall be documented showing the location and elevation. The Design-Builder shall also provide reproducible originals of the shop drawings for pre-stressed structural elements and all structural steel components.

The Design-Builder shall submit the As-Built Plans as a complete package in sequence, in accordance with standard WSDOT numbering and naming conventions as defined in the WSDOT *Plans Preparation Manual*. The As-Built Plans shall include the following:

- A cover sheet for the Work, which shall include the following:
  - A written certification by the EOR that the As-Built Plans accurately and completely reflect all changes and corrections made during construction.
  - The EOR's stamp.
  - An accompanying index and instructions.

Each sheet of the As-Built Plans shall be stamped or clearly marked "AS-BUILT".

MOT Plans are exempt from the as-built requirements.

2.12.5.2 FINAL RECORDS

The Design-Builder shall submit the following final records prior to Completion or termination of the Contract:

- Final Record Book No. 1:
  - This book of documents shall be bound in a semi-rigid, water resistant cover. Each page shall be numbered consecutively. The following documents shall be included, and the order in which they are to be arranged is described below. No other material shall be included in this book.
    1) Index Sheet - Containing the detailed index for Final Record Book No.1 and the listing of the other final records contained in each book.
    2) The Design-Builder Personnel List - Containing the name and classification of managers, supervisors, foremen, testers, engineers, and any other Design-Builder personnel who were responsible for signing documents or forms or were responsible for decision-making on the Project. Each person shall sign his or her

identifying initials after his or her name on this list in the same manner as it appears in other Project documents.

3) Final Contract Voucher Certification, Form 134-146 - Including the Design-Builder's authorized signature and the WSDOT Regional authorized signature.

4) Contract Estimate Payment Totals Report - To be provided by WSDOT.

5) Affidavit of Wages Paid, State L & I Form F700-007-000 - The original or copy of the approved affidavits.

6) List of Category A and Category B Change Orders - Showing the change order numbers, a brief description of each, and the change order cost.

7) Record of Construction Materials - Tabulating the source of the construction materials. See Section 2.25 for additional information.

8) A list of all Field Design Changes.

- Project Diaries, Daily Reports, and the Design-Builder's Daily Reports of Traffic Control:
  - The Construction Project Diaries and the Daily Reports shall be organized in chronological order and bound in books similar to Final Record Book No. 1. The pages of these books do not require numbering; however, the books themselves shall be numbered consecutively starting with Final Record Book No. 2. The Design-Builder's Daily Reports of Traffic Control shall be bound in the same manner and the books numbered consecutively after the diaries/daily reports books.
- Materials Certification:
  - See Section 2.25 for additional information on Materials Certification.
- As-Built Plans:
  - As Built Plans shall be full size, 22 inches by 34 inches, blackline prints. Each plan sheet shall have lettering or a stamp identifying it as As-Built Plans.
- The Design-Builder Construction Survey:
  - Copies of all survey calculations and survey notes, including grade books and cross-section notes shall be kept and turned over to WSDOT with the final records.
- Temporary Final Records:
  - Temporary final records are comprised of all relevant records not included in the final records. Copies of these records must be submitted to the WSDOT Engineer to be retained for a 5-year period following acceptance of the Project as required by RCW 40.14. The Design-Builder shall submit these to the WSDOT Engineer with the final records. Examples of these records include but are not limited to the following:

1) Material acceptance test reports.

2) Concrete pour records.
3) Source of materials documentation.
4) Prints of shop drawings.
5) Copies of certified payrolls (for Federally-funded projects only).
6) Horizontal and vertical alignment data.

Refer to Section 10-3.1B of the WSDOT *Construction Manual* for additional requirements.

2.12.6 SUBMITTALS

2.12.6.1 DESIGN DOCUMENT SUBMITTALS

The design document submittals shall include the following:

- Systems Engineering Technical Memorandum.
- Amended Design Documentation Package and Project File.
  - Design calculations and documentation.
  - Reports and technical memoranda.
  - Deviations.
  - Project Development Approval Package.
- Updated electronic Microstation and Inroads files, including all RFC sheets, reference files, and base mapping (topography).

2.12.6.2 CONSTRUCTION SUBMITTALS

The construction submittals shall include, but are not limited to, the following:

- As-Built Plans and specifications.
- Final records.

End of Section

2.13 BRIDGES AND STRUCTURES

2.13.1 GENERAL

The Design-Builder shall conduct all Work necessary to mount items to existing bridges and structures for the Project. Elements of Work shall include, but are not limited to, the following:

- Mount Dynamic Message Signs (DMS) to existing signbridges and overpass structures as show in the Conceptual Plans (Appendix M1).
- Mount signs to the westbound I-90 arch structure east of the Mount Baker Tunnel, as shown in the Conceptual Plans (Appendix M1).
- Affix conduit to the outside of existing structures to accommodate power and communications conductors to DMS signs.

Information about existing signbridges and structures relevant to the Project are located in the Conceptual Plans (Appendix M1). Appendix M2 shows conceptual plans for signbridges on I-90 and SR 520, which the Design-Builder shall use to mount equipment as shown in Appendix M1. These plans will be finalized by WSDOT and put to ad on May 11, 2009. Structural plans for signbridges on I-5 are available in the WSDOT Boeing Access Road to I-90 I/C Sign Bridges contract at http://www.bxwa.com/bxwa_toc/pub/wsdot/253_boeing_access_road_to_i_90_97364/info.php. The plans referenced in this Section are not guaranteed to be dimensionally accurate or complete. The Design-Builder shall field-measure existing dimensions as required.

2.13.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Bridge Design Manual* (M23-50) (BDM) (Appendix D1).
- WSDOT *Geotechnical Design Manual* (M46-03) (GDM) (Appendix D5).
- *"I-90 Architectural Design Standards"*, December, 1986 (Appendix L1).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D8).
- AASHTO *Guide Specifications for LRFD Seismic Bridge Design*, 1st Edition, 2009.
- AASHTO *LRFD Bridge Design Specifications*, Customary U.S. Units, 4th Edition, 2007 with 2008 Interim Revisions.
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D11).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).

- AASHTO *LRFD Bridge Construction Specifications*, 2nd Edition with 2006, 2007, 2008, and 2009 Interim Revisions.
- WSDOT *Materials Manual* (M46-01) (Appendix D9).
- WSDOT *Standard Plans* (M21-01) (Appendix D15).
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D12).
- AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, 5th Edition, 2009.
- AASHTO *Guide Specifications for Structural Design of Sound Barriers*, 1989 with 1992 and 2002 Interims.
- AASHTO/AWS D1.5M/D1.5: 2008 Bridge Welding Code, with 2009 AASHTO Interim.
- AASHTO *Manual for Bridge Evaluation*, 1st Edition, 2008.
- AASHTO *Standard Specifications for Highway Bridges*, 17th Edition, 2002.
- FHWA *Publication No. FHWA-HRT-06-032; Seismic Retrofitting Manual for Highway Structures: Part 1-Bridges*, January 2006.

2.13.2.1 MODIFICATIONS TO THE WSDOT BRIDGE DESIGN MANUAL (BDM)

The WSDOT Design Memoranda (Appendix B2) shall apply to the Project, except that the references to the Project advertisement dates shall not apply.

The BDM, as modified by the WSDOT Design Memoranda, shall be further modified for Design-Build as follows:

- Rights and Responsibilities - The following clarifies which rights and responsibilities discussed in the BDM are applicable to the Design-Builder:
  - The Design-Builder shall complete all analyses, evaluations, load ratings, plans, and specifications discussed in the BDM.
  - All such analyses, evaluations, load ratings, plans, and specifications are subject to Review and Comment by WSDOT.
  - All references to WSDOT sections, offices, and engineers shall mean WSDOT.
- The Design-Builder shall obtain WSDOT's approval for all proposed deviations from the provisions of the BDM.
- The Design-Builder shall follow the guidelines established by Section 1-03.5 of the General Provisions for resolution of perceived ambiguities in or disputes regarding the interpretation of specific provisions of the BDM.

2.13.3 PERFORMANCE REQUIREMENTS

2.13.3.1 GENERAL

A minimum vertical clearance of 16.5 feet shall be maintained over all roadways at all times during and after construction, with the exception of existing structures having a vertical clearance less than 16.5 feet. For these structures, the minimum vertical clearance shall not reduce the existing clearance.

The bottom of DMS signs shall not project below the bottom of overpass structures to which they are affixed.

2.13.3.2 MEETINGS

It is recommended that the Design-Builder work with WSDOT to establish a Structures Design Team to oversee and provide input on structure-related design and construction issues. It is recommended that the Design-Builder schedule and chair the meetings during the design and construction stages until Substantial Completion. The Design Builder shall prepare the agenda, meeting minutes, exhibits, and design plans necessary for each meeting (see Section 2.1). Meetings may include representatives from WSDOT and other representatives as requested by WSDOT.

2.13.4 DESIGN CRITERIA

2.13.4.1 PERSONNEL REQUIREMENTS

The Design-Builder shall provide a Structural Lead Engineer with a minimum of 15 years of experience in the design and construction of bridges, retaining walls, and other highway-related structures. The Structural Lead Engineer shall be a Structural Engineer licensed under Title 18 RCW, and shall be in responsible charge of the structural design elements of the Project.

2.13.4.2 DESIGN CRITERIA

All existing structural elements whose load-carrying capacity are altered by the Work shall be analyzed and designed using the BDM.

2.13.4.2.1 Intentionally Omitted

2.13.4.2.2 Intentionally Omitted

2.13.4.2.3 Intentionally Omitted

2.13.4.2.4 Retaining Wall Design Criteria

Reinforced elements in Structural Earth (SE) walls supporting other structures shall be designed for a 100-year service life.

Fall protection, such as safety cable railing, shall be provided at the top of all retaining walls and retaining wall terraces greater than 10 feet in height. Fall protection shall have a minimum height of 42 inches above the top of the retaining walls and retaining wall terraces.

The Design-Builder shall evaluate potential impacts to utilities crossing under proposed walls, and incorporate appropriate mitigation measures to avoid conflicts and detrimental effects including, but not limited to, settlement and surcharge loading.

Refer to Sections 2.6 and 2.10 for additional design criteria.

2.13.4.2.5 Temporary Retaining Wall Design Criteria

"Temporary retaining wall" refers to any wall or portion of wall that will not remain upon completion of the Contract.

Structural components of temporary retaining walls may be reused as part of permanent retaining wall systems, provided all of the structural support elements and materials of the temporary retaining walls meet the requirements for permanent walls. The Design-Builder may use timber piles as foundations for temporary retaining walls where allowed by the Project's permits. The Design-Builder shall be responsible for maintenance of temporary wall structures.

Temporary retaining walls may be abandoned and left in place by the Design-Builder, on the condition that the temporary walls are no longer required for ground support, or permanent retaining walls are constructed to replace them. Temporary retaining walls left in place shall be removed to a point 2 feet below finished ground, adjacent ground, pavement section, or natural stream bottom. Temporary retaining walls constructed of treated timber shall be removed entirely.

2.13.4.2.6 Intentionally Omitted

2.13.4.2.7 Intentionally Omitted

2.13.4.2.8 Intentionally Omitted

2.13.4.2.9 Intentionally Omitted

2.13.4.2.10 Intentionally Omitted

2.13.4.2.11 Intentionally Omitted

2.13.4.2.12 Intentionally Omitted

2.13.4.2.13 Intentionally Omitted

2.13.4.2.14 Intentionally Omitted

2.13.4.2.15 Intentionally Omitted

2.13.4.2.16 Slope Protection

Slope protection shall reduce or eliminate the need for maintenance, and lessen or eliminate negative visual impacts associated with soil erosion, weed growth, trash accumulation, and vandalism.

2.13.4.2.17 Intentionally Omitted

2.13.4.2.18 Sign Structures, Closed Circuit Television (CCTV) Camera and Non-Intrusive Detection Structures,

Where DMS are mounted on bridges, the mounting elements shall be designed for the loads from the DMS. The Design-Builder shall design retaining walls and foundations to account for the placement of any Intelligent Transportation System (ITS) facility supports.

Refer to Sections 2.18 and 2.19 for additional requirements.

2.13.4.2.18.1 *Dynamic Message Signs (DMS)*

The Design-Builder shall furnish and install all DMS. The Design-Builder shall design and construct all associated sign housings and sign mounting beams and brackets to install DMS.

The DMS housing structural framing, face covering, and mounting members shall be designed to withstand a wind velocity of 100 mph with a 30% gust factor, and shall otherwise comply with the latest requirements of AASHTO Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals.

Prior to fabrication, the Design-Builder shall prepare and submit detailed structural design calculations and plans for the DMS mounting brackets to WSDOT for Review and Comment. A Structural Engineer licensed under Title 18 RCW shall design the DMS mounting brackets.

2.13.4.2.18.2 *Closed Circuit Television (CCTV) and Non-Intrusive Detection*

The analysis and design of CCTV camera and non-intrusive detection support structures shall conform to the following criteria:

- Basic wind speed of 90 mph shall be used in computing design wind pressure using Equation 3-1 of the AASHTO *LRFD Bridge Design Specifications*.
- Pole deflection shall not exceed 0.7 inch in 30 mph wind or 1.4 inches in 70 mph wind.
- The Design Life and Recurrence Interval shall be as follows:
  - 50 years for CCTV camera support structures exceeding 50 feet in height.
  - 25 years for CCTV camera support structures less than 50 feet in height.
- Fatigue Design shall conform to Section 11 of the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals* using Fatigue Category III.

2.13.5 CONSTRUCTION CRITERIA

Cranes, drill rigs, and other construction equipment exceeding the legal load shall not be operated on structures without WSDOT's written approval, as specified in Section 1-07 of the General Provisions.

2.13.6 SUBMITTALS

2.13.6.1 DESIGN SUBMITTALS

2.13.6.1.1 Plans

The Design-Builder shall submit Released For Construction Documents on WSDOT standard sheets for modifications and/or attachments to bridges; retaining walls, including temporary retaining walls; and other minor structures.

All final design documents shall include the stamp of a Professional Engineer licensed under Title 18 RCW.

Refer to Section 2.28 for additional requirements.

2.13.6.1.2 Calculations

The Design-Builder shall provide complete sets of calculations to support all structural designs described in this Section. Complete sets of calculations shall be included with each design review submittal (including temporary structures, falsework, and other temporary works).

All final design calculations shall include the stamp of a Professional Engineer licensed under Title 18 RCW.

The sets of calculations shall include the following:

- Index Sheets - These shall include numbered calculation sheets and an index by subject with the corresponding sheet numbers. The name of the Project, Structure Number, designer/checker initials, date (month, day, and year), and supervisor's initials shall be listed.
- Design Calculations - These shall include design criteria; loadings; structural analysis; 1 set of moment and shear diagrams; and pertinent computer input and output data (reduced to a 8.5-inch by 11-inch sheet size).

Refer to Sections 2.12 and 2.28 for additional requirements.

2.13.6.2 SHOP DRAWING SUBMITTAL

The Design-Builder shall submit shop drawings for all mounting systems to be attached to existing structures, including mounting systems for conduit, according to Section 2.28, to WSDOT for Review and Comment. The following information shall be included in the shop drawings, if applicable:

- Size of member and fasteners.
- Length dimensions.
- Finish such as galvanizing, anodizing, and painting.
- Weld size and type and welding procedures, if required.
- Fabrication-reaming, drilling, and assembly procedures.

End of Section

2.16 ELECTRICAL

2.16.1 GENERAL

The Design-Builder shall perform all Work necessary to meet the requirements for temporary lighting and electrical systems for the Project and all other requirements of this RFP.

Refer to Section 2.22 for additional temporary lighting requirements.

2.16.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Standard Plans* (M21-01) (Appendix D15).
- WSDOT *Traffic Manual* (M51-02) (Appendix D17).
- WSDOT *Materials Manual* (M46-01) (Appendix D9).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- *I-90 Architectural Standards,* December, 1986 (Appendix L1).
- WSDOT *Northwest Region Current Practices in Electrical Design* (Appendix T5).
- WSDOT *Northwest Region Illumination and Signal Details* (Appendix T3).
- WSDOT *Northwest Region Power Supply for Transportation Applications* (Appendix T6).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D11).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D8).
- WSDOT *Bridge Design Manual* (M23-50) (BDM) (Appendix D1).
- National Fire Protection Association, *National Electric Code* (NFPA, NEC), 2008.
- AASHTO *A Policy on Geometric Design of Highways and Streets*, 5th Edition, 2004.
- AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, 5th Edition, 2009.
- AASHTO *Roadside Design Guide*, 3rd Edition, 2002, and 2006 Chapter 6 Update.
- EIA *Electronic Industries Alliance Standards and Technical Publications*.
- IESNA *Recommended Practice for Roadway Lighting*, 2000 (ANSI/IES RP-8-00).

- IESNA *Recommended Practice for Tunnel Lighting*, 2005 (IES-RP-22-05).
- IESNA *Lighting Handbook*, 9th Edition, 2000.
- AASHTO *Roadway Lighting Design Guide*, 2005.
- ITE *Traffic Control Devices Handbook*, 2001.
- FHWA *Traffic Control Systems Handbook*, 2005.
- ITE *Traffic Engineering Handbook*, 6th Edition, 2009.

2.16.3 PERFORMANCE REQUIREMENTS

2.16.3.1 SOFTWARE

The Design-Builder shall use AGI32 Lighting Design Software available from Lighting Analysts, Inc., Littleton, Colorado, (303) 972-8852. The software shall use data files in Illuminating Engineering Society (IES) standard format for the luminaires. Lighting analysis shall be submitted to WSDOT on hard copy; and AGI32 files shall be submitted to WSDOT on CDROM.

2.16.3.2 MEETINGS

Refer to Section 2.18 for required meetings.

2.16.3.3 UTILITY LOCATES

Prior to installing any element of the temporary illumination or electrical system, the Design-Builder shall contact the One-Call number (1-800-424-5555) for utility locations. The Design-Builder shall be responsible for coordination with the utility owners and reconciliation of any utility conflicts in accordance with Section 1-07 of the Standard Specifications and Section 2.10.

In addition, the Design-Builder shall be responsible for responding to the One-Call number requests as the owner (see Section 2.10). When requested, the Design-Builder shall mark all conduit and utilities installed as part of the Project. WSDOT will locate and mark existing utilities remaining undisturbed that are owned by WSDOT.

2.16.3.4 ELECTRICAL SERVICE AGREEMENTS

WSDOT will obtain all Service Agreements from the electric power company. The WSDOT shall pay all costs charged by the electric power company for the Service Agreement and for the power company's costs associated with upgrading its facilities to meet the requirements of the Service Agreement. WSDOT will pay the monthly electric bills starting on the day Work begins for the existing services, and for the services installed under the Contract until Physical Completion.

The Design-Builder shall coordinate with WSDOT and submit a Service Agreement Request for all new and modified services required for the Project. The Service Agreement Request shall include the information listed in the Service Agreement Request Checklist (Appendix U2) and the following:

- Location of existing or new service submitted in plan sheet format.
- Load calculations showing design and future loads in Kilo-Volt-Amps (KVA) and voltage required.

- Request for modifications to existing services showing existing load, new load, and ultimate load.
- Name of the utility and the service agreement number (for existing services).

The Design-Builder shall submit the Service Agreement Request a minimum of 60 Calendar Days in advance of when the Service Agreement is needed. WSDOT will begin procurement of the Service Agreement after the Service Agreement Request is accepted and determined complete by WSDOT. If changes to the Service Agreement are required by the Design-Builder, the Design-Builder shall pay all costs associated with the Service Agreement revisions. Further, the 60 Calendar Day advance notice will begin when the revision to the Service Agreement Request is accepted and determined complete by WSDOT. A power connection may take longer to establish than the Service Agreement execution, depending on the workload of the utility company.

If the Design-Builder proposes to remove an existing service, the Design-Builder shall notify WSDOT in writing at least 14 Calendar Days prior to the proposed removal, so that the service account can be cancelled. The written notification shall contain the Service Agreement number, location, and electrical load in KVA.

2.16.3.5 WSDOT ELECTRICAL INSPECTOR

Refer to Section 2.18.

2.16.4 DESIGN REQUIREMENTS

2.16.4.1 FIELD-REVIEW AND AS-BUILT VERIFICATION

The Design-Builder shall coordinate with WSDOT personnel in obtaining as-built documentation for existing illumination, signal and electrical systems impacted by construction activity. The Design-Builder shall make all necessary efforts required to field verify the as-built information and to identify and document all existing WSDOT electrical equipment impacted by construction that is not otherwise documented by as-builts.

2.16.4.2 ILLUMINATION

The Design-Builder shall provide temporary illumination when required in accordance with light levels and uniformity ratios provided in the WSDOT *Design Manual* and as required by Section 2.22.

2.16.4.2.1 Lighting Design Requirements

The Design-Builder shall provide temporary illumination at all locations identified in Section 840.05 of the WSDOT *Design Manual*, Section 2.22 and as specified in these Technical Requirements. On interchanges and ramp terminals, the Design-Builder shall use the Light Levels and Uniformity Ratios presented in the WSDOT *Design Manual,* including the appropriate area classification.

The allowable line loss for illumination circuits shall be a maximum of five percent.

2.16.4.2.1.1 Photometric Analysis

Where illumination is required, the Design-Builder shall complete a Photometric Analysis that includes the following:

- Lighting intensities (foot candles) and uniformity (average/minimum); light pole locations and heights; luminaire types; wattage and brightness; and quantities of each.
- Lighting calculations that account for the anticipated loss of light due to Lamp Lumen Depreciation and Lamp Dirt Depreciation shall be 0.62.
- Consideration of roadway safety; ease and cost of maintenance; consistency with adjacent roadway lighting designs; annual energy costs; provision for future lighting needs; and local planning policies.
- Lighting contours for nighttime illumination shall show the distances from the light source at lighting levels 1.0, 0.5, and 0.2 foot-candle. Lighting contours of 0.1 and 0.05 foot-candle shall be provided for permanent surfaces adjacent to sensitive areas such as streams and rivers. Topographic plan features shall be shown at least 150 feet beyond the illumination contours.
- Lighting calculation grid spacing shall be 5 feet by 5 feet.
- Veiling luminance calculations.

A surface shall be created for each lighting design area which matches the roadway contours.

2.16.4.2.1.2 Spillover Light

When adjacent to non-commercial areas, the maximum spillover light allowed shall be 0.2 foot-candles at ground level at the edge of the Right of Way, unless otherwise noted. The Design-Builder shall install flat lens medium cut-off fixtures to limit spillover light outside of the Right of Way. The Design-Builder may use shielding to limit spillover light. Temporary lighting shall minimize spillover light shining on the main and side channels of streams and rivers to no more than 0.05 foot candles.

2.16.4.2.2 Light Standards

See Section 2.22 for requirements related to Temporary Light Standards.

2.16.4.3 ELECTRICAL SERVICE

Within limited access, the Design-Builder shall coordinate with WSDOT and submit the necessary design information for new and modified electrical services as required by Section 2.16.3.

Underground service laterals (conduit and conductors) shall be provided by the Design-Builder between the utility power source and the service cabinet. Power feed conductors, from the utility transformer to the service cabinet, shall be isolated from other circuits by using a separate conduit. Junction boxes in this conduit run are not allowed. Service connections shall meet utility company requirements. The Design-Builder shall coordinate placement of electrical services so that circuits from the service do not overlap or cross paths with circuits from other services.

Sizes of service breakers shall be in accordance with the National Electrical Code. Branch breakers shall be at least 140 percent of the computed illumination circuit load. The breaker size shall not exceed the ampacity of the smallest conductor it protects. The size of the main breakers shall exceed the sum total of 140 percent of all of the computed

illumination loads, and 125 percent of all other loads on the service. The service busswork capacity shall meet or exceed the size of the main breaker.

The maximum size for Illumination circuit branch breakers is 50 amps. The minimum main breaker size shall be 200 amps.

The service lateral conductors shall be sized to serve the full load of the electrical bus work. Lead in conductors for transformers, services, panels, and cabinets shall be sized to the capacity of the main breaker or size of the device. Rating of lighting contactors shall equal or exceed the branch breaker rating for the circuit they switch.

In addition to the breakers required to satisfy the power requirements of this RFP, the Design-Builder shall provide a minimum of two spare 30 amp branch breakers in each new service cabinet.

Electrical services shall provide sufficient access for WSDOT, shall comply with the requirements of the serving utility, and shall not be installed in ditches or on slopes steeper than 4:1.

A new electrical service is required if the Design-Builder requires a disconnect and reconnect of power from the serving utility to an existing service cabinet, except if the existing service meets Electrical Utility Service Equipment Requirements Committee requirements and WSDOT requirements. Wire sizes for transformers shall be designed to the load rate of the transformers. Step up transformers shall not be permitted between electrical services and maximum and continuous loads.

2.16.4.4 CONDUIT SYSTEM

The Design-Builder shall not sawcut or open trench across mainline or ramps under any circumstances.

The Design-Builder shall not sawcut or open trench the following on roadways outside of limited access Right of Way:

- Cement concrete pavement;
- Any pavement after the final lift of Hot Mix Asphalt or Portland Cement Concrete Pavement is placed; or
- Existing pavement to remain.

When the conditions described above are encountered, the Design-Builder shall install conduit using jacking, drilling, or boring methods. The Design-Builder shall install new conduit for the illumination system with the following exceptions:

- Conduit under pavement may remain, provided the conduit is free of debris, in good repair, and proofed and cleaned in accordance with Section 8.20 of the Standard Specifications.

All conduit shall have a minimum clearance of 3 feet from guardrail posts.

The minimum size conduit for illumination systems is a 2-inch diameter, except for the conduit from the first junction box to an underdeck luminaire, which may have a 3/4-inch diameter. Smaller diameter conduit may be used from the junction box to any standard luminaire. A one-inch size conduit shall be used between light standards with slip bases and the adjacent junction box.

The Design-Builder shall install a spare 2-inch conduit associated with every conduit crossing under pavement or through structures, including walls. The Design-Builder shall install a spare 2-inch conduit between each service cabinet and the first junction box.

In new conduits, conductors shall occupy a maximum of 26 percent of the cross-section of the conduit. In existing conduits, conductor fill shall meet NEC requirements for conduit with three or more conductors, and shall occupy a maximum of 40 percent of the conduit's cross-sectional area.

The Design-Builder shall install two 2-inch conduit/junction box systems (embedded in concrete) in each of the following:

- Bridge rail;
- Median cast in place barrier; and
- Roadside cast in place barrier.

The conduit/junction box installations shall be constructed in accordance with Section 2.13 and the WSDOT *Northwest Region Illumination and Signal Details*. All conduit installed in concrete structures shall be fitted with appropriate deflection and/or expansion fittings.

2.16.4.5 JUNCTION BOXES, CABLE VAULTS AND PULL BOXES

Where possible, junction boxes shall not be located within paved areas. Any junction boxes located within paved areas shall be Heavy Duty Type 4, 5, or 6. The Design-Builder shall consult with WSDOT when considering installation of heavy duty junction boxes. No junction boxes shall be placed in the traveled way.

Junction boxes located outside of paved areas shall be Type 1, 2, or 8. Refer to the Standard Plans and details in the WSDOT *Northwest Region Illumination and Signal Details*.

Junction boxes shall be installed at all cabinets and where a conduit system requires a major change in direction. The maximum spacing for junction boxes in traffic barrier, retaining wall, or structures shall be 180 feet within each raceway system, and 240 feet in all other areas.

2.16.5 CONSTRUCTION REQUIREMENTS

2.16.5.1 TEMPORARY ILLUMINATION

Refer to Section 2.22.

2.16.5.1.1 Light Standards

The Design-Builder shall provide light standards according to the Standard Specifications. Section 8-20.3(13)A of the Standard Specifications is supplemented with the following:

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.

2.16.5.2 SERVICE CABINETS

The Design-Builder shall provide service cabinets according to the Standard Specifications. Section 9-29.24 of the Standard Specifications is supplemented with the following:

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

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

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

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

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

Steel conduit penetrating the cabinet shall have a grounding bushing and shall be bonded to the system ground.

2.16.5.3 CONDUIT SYSTEM

Refer to Section 2.18.

2.16.5.4 BORING

Refer to Section 2.18.

2.16.5.5 JUNCTION BOXES, CABLE VAULTS AND PULL BOXES

Refer to Section 2.18.

2.16.5.6 WIRING

The Design-Builder shall provide wiring system according to the Standard Specifications. Section 8-20.3(8) of the Standard Specifications is supplemented with the following:

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.

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

2.16.5.6.1 Illumination circuit splices

Temporary splices shall be the heat shrink type.

2.16.5.7 BONDING, GROUNDING

The Design-Builder shall ground and bond equipment according to the Standard Specifications. Section 8-20.3(9) of the Standard Specifications is supplemented with the following:

Where existing ITS conduits are utilized, an equipment-grounding conductor shall be installed except for conduits with innerduct.

In addition to the conductors called for in the contract, all ITS conduits without innerduct shall be installed with an equipment-grounding conductor and bonding jumpers sized per NEC 250-122, with the exception that the minimum size shall be 8 AWG.

All new and existing junction boxes, cable vaults and pull boxes that an equipment-grounding conductor is pulled to shall be bonded in accordance with Section 8-20.3(9).

Location wires shall not be connected to the equipment-grounding system. See "Location Wire and Warning Tape" portions of this Section for attachment of location wires.

Supplemental grounding shall be provided at signal standards for ramp meters and steel sign posts for advance warning signs. Foundations for these standards shall be installed with a bare 4 AWG copper wire, which is connected to the reinforcing cage with an approved acorn clamp or exothermic weld and routed to connect to the pole at the grounding lug.

2.16.5.8 AMPLIFIER, TRANSFORMER AND TERMINAL CABINETS

The Design-Builder shall provide amplifiers, transformers, and terminal cabinets according to the Standard Specifications. Section 9-29.25 of the Standard Specifications is supplemented with the following:

Nominal cabinet dimensions for Transformer 3.1 to 12.5 KVA shall be 20 inches (D) x 48 inches (H) x 24 inches (W). The transformer cabinet for the new camera site on the I-90 bridge at approximate LR LINE Sta 133 may be smaller, and shall be designed to mount to the camera pole or parapet. All other transformer cabinets shall be pad-mount installations.

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

Cabinet door hinges shall meet the requirements for the alternate hinge detailed on Standard Plan J-3b. Doors less than 3 feet in height shall have 2 hinges. Doors from 3 feet to 4 feet 8 inches in height shall have 3 hinges. Spacing of hinges for doors greater than 4 feet 8 inches in height shall not exceed 14 inches center to center.

Three point latches are not required for terminal cabinets.

A green construction core shall be installed at each core lock. Upon contract completion, 2 master keys for each cabinet shall be delivered to the Engineer.

2.16.5.9 SALVAGE

Refer to Section 2.18.

2.16.6 SUBMITTALS

The Design-Builder shall provide all documents and information required for the Design Documentation Package in accordance with Section 2.12.

The Design-Builder shall submit Preliminary Electrical Plans for Review and Comment, and prepare Final Electrical Plans prior to issuance of the Released For Construction Plans. All submittals shall follow the requirements of Section 2.28 and the Quality Management Plan approved by WSDOT.

2.16.6.1 PRELIMINARY DESIGN SUBMITTAL

2.16.6.1.1 Photometric Analysis

Photometric analysis shall be performed for all required temporary illumination areas as described in Section 840.05 of WSDOT *Design Manual* and in Section 2.22 of this RFP. The analysis shall identify the mounting height, light standard height, offset, spacing, and lighting fixture data. Photometric data files in IES standard format for the luminaires shall be submitted to WSDOT for Review and Comment. The Design-Builder shall provide the following analysis data for the design areas as required by Section 840.05 of the WSDOT *Design Manual*:

- Minimum light level;
- Minimum average light level;
- Uniformity ratio (ave./min.); and
- Maximum veiling luminance ratio.

The Design-Builder shall submit a graphical report showing all design areas with calculation points. The report shall be legible and to scale, and shall list all photometric files, luminaire definitions, and their characteristics. The Design-Builder shall also submit a rendering for each lighting area requiring 3D lighting analysis.

The Design-Builder shall submit an electronic copy of the Photometric Analysis (in AGI format) to WSDOT with the Preliminary Design Submittal for Review and Comment.

2.16.6.1.2 Plans

Temporary Illumination Plans shall be submitted as required in Section 2.22.

Electrical Plans shall be prepared in accordance with the Illumination sections of the WSDOT *Northwest Region Current Practices in Electrical Design*; the Photometric Analysis; and the WSDOT *Plans Preparation Manual*. The Plans shall include, but are not limited to, the following items:

- Existing channelization;
- Location of, conduit and junction boxes required for the installation;
- Identification of proposed service cabinets and existing service cabinets to remain.

The Design-Builder shall submit the Electrical Plans to WSDOT for Review and Comment.

The Design-Builder shall also submit back-up data as described in the Illumination sections of the WSDOT *Northwest Region Current Practices in Electrical Design*.

2.16.6.2 FINAL DESIGN SUBMITTAL

Electrical Final Design Submittal shall be complete, and shall include all of the items from the Preliminary Electrical Design Submittal, in addition to the following:

- Existing Utilities;
- Existing channelization;
- Conduit and conductor schedule showing new wire and existing wire to remain;
- Details and notes specifying how the proposed electrical system is tied into the existing electrical system;

- Transformer schedules;
- Sub-panel schedules;
- Service cabinet types, as required, including photocells, breaker schedules, and wiring diagrams;
- Wiring diagram for each circuit;
- Complete construction notes;
- All wire, cable, and terminators that are needed for the complete operation of the electrical system;
- Details for non-standard design elements;
- All references to the Standard Plans and electrical details; and
- Structural calculations, if required.

Refer to Sections 2.12 and 2.28 for submittal and review requirements.

The Design-Builder shall also submit backup as described in the Illumination sections of the WSDOT *Northwest Region Current Practices in Electrical Design*.

2.16.6.3 RELEASED FOR CONSTRUCTION ELECTRICAL PLANS

Refer to Sections 2.12 and 2.28 for submittal and review requirements.

2.16.6.4 SHOP DRAWINGS

Shop drawings and product data shall include the following:

- Wiring diagrams;
- Electrical panels;
- Splice enclosures;
- Conduit;
- Concrete for foundations;
- Junction boxes; and
- Wiring.

End of Section

2.18 INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

2.18.1 GENERAL

The Design-Builder shall conduct all Work necessary to meet the requirements for Intelligent Transportation Systems (ITS) in accordance with this RFP, and shall keep the existing ITS functioning throughout construction of the Project. This Section discusses ITS standards and publications, performance requirements, design and construction criteria, maintenance during construction, and submittal requirements.

The Design-Builder shall maintain electrical power to all ITS devices during construction. The Design-Builder shall maintain communications between all ITS devices and the Traffic Management Center (TMC) during construction.

The Design-Builder shall design, furnish, and install complete ITS including, but not limited to, the following elements, subject to specific requirements in this Section:

- Fiber-optic mainline and mainline distribution cables.
- Twisted Pair cables (as necessary).
- A minimum of 31 new Closed Circuit Television (CCTV) camera installations.
- A minimum of 18 replacement Closed Circuit Television (CCTV) cameras.
- A minimum of 25 Variable Message Signs (VMS).
- A minimum of 47 signbridge-mounted Side-mount Dynamic Message Signs (SDMS).
- A minimum of 7 ground-mounted SDMS.
- A minimum of 217 Lane Control Signs (LCS).
- A minimum of 11 Wavetronix Radar Detector units.
- A minimum of 66 induction loop detectors.
- All cabinets, controllers, transformers, software, junction boxes, and any ancillary equipment required to create a functioning ITS.
- System and equipment testing as required
- Foundations, property restoration, and incidental Work.

In addition, the Design-Builder shall perform the following:

- Replacement of a minimum of 46 existing induction loop detectors.
- Removal of a minimum of 15 existing ground-mounted VSL signs and control equipment.
- Removal of a minimum of 2 existing tunnel (TNL) signs and control equipment.

Additional related electrical elements, such as electrical services, are covered in Section 2.16. Additional related signing elements, such as removal and placement of static signing, are covered in Section 2.19.

2.18.1.1 MAINTENANCE REQUIREMENTS

Except where noted, all ITS devices shall be designed and constructed so that they are accessible and maintainable using current maintenance methods and materials.

Refer to Section 2.11 for additional requirements related to development of maintenance access.

2.18.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any ambiguities and/or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Standard Plans* (M21-01) (Appendix D15).
- WSDOT *Traffic Manual* (M51-02) (Appendix D17).
- *MUTCD – Washington State Modifications* (M24-01) (MUTCD) (Appendix D23).
- WSDOT *Materials Manual* (M46-01) (Appendix D9).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- *"I-90 Architectural Design Standards"*, December, 1986 (Appendix L1).
- WSDOT *Northwest Region Illumination and Signal Details* (Appendix T3).
- WSDOT *Northwest Region ITS Design Guide Supplement* (Appendix I4).
- WSDOT *Northwest Region ITS Design Guide* (Appendix I1).
- WSDOT *Northwest Region ITS Details* (Appendix I2).
- WSDOT *ITS Device Naming Scheme* (Appendix I3).
- NTCIP 1203 – *Object Definitions for Dynamic Message Signs (DMS)* – Version 02, 2007.
- NTCIP 1201 – *Global Object (GO) Definitions* - Version 03, 2007.
- NTCIP 2202, *Internet (TCP/IP and UDP/IP) Transport Profile*.
- NTCIP 2104, *Ethernet Subnetwork Profile*.
- NTCIP 2201, *NTCIP TP-Null Transport Profile Null (TP-NULL)*.
- NEMA Standards Publication TS 4, *Hardware Standards for Dynamic Message Signs (DMS), with NTCIP Requirements*, 2005.
- ICC *Supplement to the International Code*, 2007.
- ICC *International Building Code* (IBC), 2009.

- National Fire Protection Association *National Electrical Code* (NFPA, NEC), 2008.
- AASHTO *A Policy on Geometric Design of Highways and Streets*, 5th Edition, 2004.
- AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals*, 5th Edition, 2009.
- FHWA *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD), 2003.
- AASHTO *Roadside Design Guide*, 3rd Edition, 2002, and 2006 Chapter 6 Update.
- US DOT National ITS Architecture.
- EIA/TIA *Fiber Optic Test Procedure* (FOTP) *Standards*.
- USDA *United States Department of Agriculture Rural Utilities Service* (RUS) *Specifications and Drawings*.

2.18.3 PERFORMANCE REQUIREMENTS

2.18.3.1 ITS DESIGN PROGRESS MEETINGS

2.18.3.1.1 ATM DMS Sign Design

WSDOT envisions a collaborative approach to the process of ATM DMS sign design. The Design-Builder shall fully participate in this collaborative process by providing the ingenuity and industry knowledge needed to develop the design.

The Design-Builder shall be aware of WSDOT's anticipated active level of involvement in the sign design process.

The Design-Builder shall foster a collaborative, cooperative design process whereby WSDOT's comments, concerns, and input are acknowledged and responded to in a mutually agreed fashion.

2.18.3.1.1.1 ATM Sign Design Workshop

The Design-Builder shall conduct one 4-hour sign design workshop with WSDOT.

At a minimum, the list of attendees shall include representatives of the following groups within WSDOT:

- Advanced Traffic Management Design-Build Project Staff
- Urban Corridors Office
- NW Region Traffic Operations, including Software Design
- NW Region Traffic Design
- NW Region ITS
- Signals Maintenance

At the design workshop, the Design-Builder and WSDOT shall discuss how each sign's functional requirements were addressed in the design submitted with the Design-Builder's proposal. Further discussion will pertain to WSDOT's desired refinements to the Design-Builder's proposed design, which will remain within the functional requirements.

At the discretion of the Design-Builder, separate workshop sessions may be conducted in parallel, such as separate sessions for signs, controllers, mountings, etc. Such workshops shall not be held concurrently as WSDOT staff may have overlapping responsibilities.

The outcome of the design workshop shall be a set of fully functional signs, controllers and brackets that capture the design consensus reached at the workshops, the number and delivery method of which are defined in Section 2.18.3.2.4.5.1.

2.18.3.1.2 ITS Design and Construction Progress Meetings

The Design-Builder shall schedule and chair Traffic Task Force meetings twice each month from Contract execution to Project completion The Traffic Task Force will provide input on the design and construction of traffic-related design issues including, but not limited to, signing, electrical, and Intelligent Transportation Systems (ITS). The Design-Builder shall prepare the agenda, meeting minutes, exhibits, and design plans necessary for each meeting (see Section 2.1). Meetings shall include representatives from WSDOT and other representatives as requested by WSDOT.

2.18.3.2 ITS TESTING

The Design-Builder shall follow all testing requirements in accordance with this Section, Section 2.25 and Section 2.28.

The Design-Builder shall coordinate ITS testing with the WSDOT Engineer and with the Signal Branch Office. Prior to any testing, the Design-Builder shall provide 30 Calendar Days notice to the WSDOT Engineer and to the Signal Branch Office. The WSDOT Signal Branch Office may be contacted at the following address:

3700 - 9th Avenue South
Seattle, Washington 98134
Telephone: (206) 442-2110

The Design-Builder shall have current training and certification on all testing equipment used. The Design-Builder shall provide documentary evidence that the instruments used for testing have been calibrated in accordance with the instrument manufacturer's specifications within the last 12 months. The Design-Builder shall have all testing equipment calibrated annually for the duration of the Contract. Measurements recorded during the tests shall be supplied to WSDOT.

The Design-Builder shall have in its possession a certification of test device calibration in accordance with the American National Standards Institute (ANSI) guidelines. The testing device shall measure electrical and insulation characteristics of power and signal control cables, and calibration documentation of optical cable test equipment. ANSI guidelines call for annual calibration of test equipment.

Depending on the construction schedule, highway ITS components may be installed, made operational, and relocated at a later time. Highway ITS components shall undergo all series of tests when relocated.

The Design-Builder shall provide a schedule for all testing so that WSDOT may observe the testing. Times and locations for all tests shall be provided to WSDOT a minimum of 7 Calendar Days in advance of any test.

The Design-Builder shall develop all ITS testing procedures and pass/fail requirements, other than those detailed in these Technical Requirements. Testing procedures and

requirements must be accepted by WSDOT prior to any testing. WSDOT may observe any tests and will audit test results.

2.18.3.2.1 Testing of Existing Equipment

Prior to the performance of any Work the Design-Builder may request a meeting at each site where the Design-Builder will perform Work with WSDOT and the agency with current maintenance responsibility, in order to determine that all existing equipment is in proper working order. At the time of this meeting all loops, cabling, connectors, and cabinet operations may be tested by the Design-Builder. The Design-Builder shall be responsible for requesting, coordinating, and conducting the on-site meeting, and for providing all labor, materials, test equipment, and test documentation. All testing shall be non-destructive. If the Design-Builder begins Work at a Project site without arranging this pre-testing, WSDOT will assume that all cabinet components and operations were in proper working order prior to the performance of any Work, and the Design-Builder shall be responsible for ensuring that all cabinet components and operations are in proper working order during and upon the completion of the Work. If no pre-testing is completed, any equipment that is not functioning upon the completion of the Work will be assumed to have been in proper working order as of the date of Notice to Proceed, and shall be replaced at the Design-Builder's expense.

2.18.3.2.2 Detection Testing

2.18.3.2.2.1 Detector Controller and Cabinet Assembly Acceptance Testing

The Design Builder shall deliver loop detector and non-intrusive detector controller and cabinet assemblies for testing according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

Each controller and cabinet assembly shall undergo shop testing prior to final acceptance. The Design-Builder shall deliver the equipment to the WSDOT Northwest Region Signal Maintenance Office in Seattle, Washington, for testing. These tests shall check the operation of each individual component as well as the component's ability to operate within the overall system. Shop testing shall consist of two separate stages:

- Stage 1: Notification, Delivery, and Assembly
- Stage 2: Hardware and Systems Tests

2.18.3.2.2.1.1 Stage 1 Testing – Notification, Delivery, and Assembly

The following documents shall be submitted to the Engineer along with a copy to the Northwest Region Signal Maintenance Office, not less than 10 working days before any equipment is delivered to the Signal Shop for testing:

(1) Design-Builder's representative for tests: name, title, address, and telephone number.

(2) Inventory of items to be delivered including:

(a) The quantity of each item to be delivered.

(b) The number of maintenance and operations manuals to be delivered.

(c) The number of cabinet prints, equipment schematics, equipment manuals, et al., to be delivered.

(d) The contract number the equipment is being tested for.

(3) Certificate confirming that the Type 170 Traffic Signal Control Hardware Specification FHWA IP-79-16, as currently amended, has been met, if applicable. The certificate shall indicate type and modes of equipment tested, date and place of test, and name of party responsible for conducting the test. The certificate shall include the serial number of the detector unit and the controller.

(4) Scheduled delivery date of equipment to the Shop.

Delivery

Delivery shall be made to the Northwest Region Signal Maintenance Office located at:

3700 9th Ave. S.
Seattle, WA 98134
Attention: Jeri Rahm
(206) 442-2110

Delivery will be accepted only if all required equipment and materials described in the notification are on hand, between the hours of 8:00 a.m. to 2:00 p.m. Monday through Friday.

The Design-Builder shall be responsible for unloading all equipment and materials.

Assembly

All equipment to be tested shall be completely assembled by the Design-Builder in preparation for Stage 2 testing.

2.18.3.2.2.1.2 Stage 2 Testing – Hardware and Systems Testing

The Design-Builder shall allow 25 Calendar Days for acceptance testing of two controller and cabinet assemblies with 2 additional Calendar days for each additional controller and cabinet.

The tests will verify whether or not the equipment supplied meets the environmental and operating standards in this Section provides the functions and operations required in this Section. A sample checklist of the type to be used during testing is shown in Appendix T18.

Only two failures in each controller assembly will be allowed. A third failure will result in rejection of the assembly.

A malfunctioning load switch and/or detection amplifier will not be considered a failure. However, the Design-Builder shall provide replacement units.

The Design-Builder will be notified of all rejections. The Design-Builder shall remove all equipment that is rejected from the Shop within 7 Calendar Days following receipt of the rejection notice. If not removed accordingly, the Shop will forward the equipment to the Design-Builder, freight collect.

Stage 2 testing may extend beyond the allowed test period if:

1. A controller and cabinet assembly fails within the last 7 Calendar Days of Stage 2.
2. A controller and cabinet assembly that replaces a rejected assembly is submitted for testing.

In order to pass the Stage 2 test, the controller and cabinet assembly must have no failures during the last 7 Calendar Days of the test period.

The Shop will release no equipment unless all documents are current and correct. Should any document require revising or updating, the Design-Builder shall provide 2 copies of that document with the changes obviously marked. Changes on printed documents shall be marked in red. These documents include, but are not limited to, the following:

1. One electronic version of the wiring diagram of each controller and cabinet assembly supplied, on CD-ROM.
2. Two blue-tone wiring diagrams of each controller and cabinet assembly supplied.
3. Wiring diagrams for all auxiliary equipment furnished. One set per controller and cabinet assembly.
4. Controller and cabinet assembly operations and maintenance manuals. One (1) set per cabinet. The Design-Builder shall provide 2 extra sets over and above the total number required for all cabinets.
5. Auxiliary equipment operations and maintenance manuals. One set per cabinet.

All equipment shall be removed from the Shop within 7 working days following notice of final approval and acceptance. If not removed accordingly, the shop will forward the equipment to the Design-Builder freight collect. Accepted controllers shall remain in the shop until requested by the Contractor for the Turn-On Test.

2.18.3.2.2.1.3 Turn-On Test

Immediately following the field installation of the traffic data station controllers, the Design-Builder shall demonstrate that all functions of the controllers and cabinets operate as specified, specifically:

1. The ability of the cabinet to interface properly with field wiring and equipment. This shall include communicating with the central computer over the communication lines, and detecting vehicle presence and absence over all induction loops. The Design-Builder shall correct any interfacing problems resulting from this installation.
2. The ability of the controller to gather, store, and transmit field data to the central computer, including status of field equipment, as specified.
3. The ability of the controller to receive and process commands from the central computer.

The turn-on tests shall be conducted only during the time period between 9:00 a.m. and 2:30 p.m. The Design-Builder shall notify the Engineer 10 days in advance of the demonstration and perform the demonstration in the presence of the Engineer. TMC personnel will be on-site to help in transmitting commands from the central computer to the controller(s) at the Design-Builder's request.

2.18.3.2.2.1.4 Work Delays

The Design-Builder will not be granted an extension of time for delays caused by rejected equipment.

2.18.3.2.2.2 Performance Testing

The Design-Builder shall test and tune all detectors after installation.

2.18.3.2.2.2.1 Induction Loops and Lead-in Cable

Induction loops and lead-in cable shall be tested according to the Standard Specifications. Section 8-20.3(14)D of the Standard Specifications is supplemented with the following:

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

Test D - An inductance test shall be made 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. An induction level, as measured from the controller cabinet, below 50-microhenries is considered a failure.

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

2.18.3.2.2.2.2 Loop Accuracy

After all inductance testing is complete and all loops are connected to the cabinet in their final configuration, the Design-Builder shall tune, test, and document the performance of each of the loops.

Tuning Rack Mount Vehicle Detectors

The Design-Builder shall set all rack mount vehicle loops detectors sensitivity to 5. The frequency of each rack mount vehicle loop detector shall then be tuned so that no 2 adjacent loops are on the same frequency.

Checking for Accuracy

For each loop detector and non-intrusive vehicle detector installed, the Design-Builder shall compare and document the number of times the display panel in the cabinet detects a vehicle (called 'hits' from here on) to those that can be seen on the roadway in real-time.

The Design-Builder shall record how many cars drive over each loop, including physical loop detectors and non-intrusive 'virtual loops,' and how many times the display panel in the cabinet shows a 'hit' during a test period. This shall be done for a minimum of 20 vehicles on each loop. This test will confirm that all loops are connected to the proper place inside of the cabinet and that the loop is properly tuned. If the display panel 'hits' and the number of vehicles passing over a loop varies by more than 5% (1 car in 20) the loop shall be retuned and the test restarted.

2.18.3.2.2.2.3 Documentation

See Section 2.18.6.4.1 for documentation requirements.

2.18.3.2.3 CCTV

2.18.3.2.3.1 CCTV Controller and Cabinet Assembly Acceptance Testing

The Design Builder shall deliver CCTV controller and cabinet assemblies for testing according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following

Each controller and cabinet assembly shall undergo shop testing prior to final acceptance. The Design-Builder shall deliver the equipment to the WSDOT Northwest Region Signal Maintenance Office in Seattle, Washington, for testing. These tests shall check the operation of each individual component as well as the component's ability to operate within the overall system. Shop testing shall consist of two separate stages:

- Stage 1: Notification, Delivery, and Assembly
- Stage 2: Hardware and Systems Tests

2.18.3.2.3.1.1 Stage 1 Testing – Notification, Delivery, and Assembly

The following documents shall be submitted to the Engineer along with a copy to the Northwest Region Signal Maintenance Office, not less than 10 working days before any equipment is delivered to the Signal Shop for testing:

(1) Design-Builder's representative for tests: name, title, address, and telephone number.

(2) Inventory of items to be delivered including:

(e) The quantity of each item to be delivered.

(f) The number of maintenance and operations manuals to be delivered.

(g) The number of cabinet prints, equipment schematics, equipment manuals, et al., to be delivered.

(h) The contract number the equipment is being tested for.

(3) Scheduled delivery date of equipment to the Shop.

Delivery

Delivery shall be made to the Northwest Region Signal Maintenance Office located at:

3700 9th Ave. S.
Seattle, WA 98134
Attention: Jeri Rahm
(206) 442-2110

Delivery will be accepted only if all required equipment and materials described in the notification are on hand, between the hours of 8:00 a.m. to 2:00 p.m. Monday through Friday.

The Design-Builder shall be responsible for unloading all equipment and materials.

Assembly

All equipment to be tested shall be completely assembled by the Design-Builder in preparation for Stage 2 testing.

2.18.3.2.3.1.2 Stage 2 Testing – Hardware and Systems Testing

The Design-Builder shall allow 25 Calendar Days for acceptance testing of two controller and cabinet assemblies with 2 additional Calendar days for each additional controller and cabinet.

The tests will verify whether or not the equipment supplied meets the environmental and operating standards in this Section and provides the functions and operations required in

this Section. A sample checklist of the type to be used during testing is shown in Appendix T18.

Only two failures in each controller assembly will be allowed. A third failure will result in rejection of the assembly.

A malfunctioning load switch will not be considered a failure. However, the Design-Builder shall provide replacement units.

The Design-Builder will be notified of all rejections. The Design-Builder shall remove all equipment that is rejected from the Shop within 7 Calendar Days following receipt of the rejection notice. If not removed accordingly, the Shop will forward the equipment to the Design-Builder, freight collect.

Stage 2 testing may extend beyond the allowed test period if:

1. A controller and cabinet assembly fails within the last 7 Calendar Days of Stage 2.
2. A controller and cabinet assembly that replaces a rejected assembly is submitted for testing.

In order to pass the Stage 2 test, the controller and cabinet assembly must have no failures during the last 7 Calendar Days of the test period.

The Shop will release no equipment unless all documents are current and correct. Should any document require revising or updating, the Design-Builder shall provide 2 copies of that document with the changes obviously marked. Changes on printed documents shall be marked in red. These documents include, but are not limited to, the following:

1. One electronic version of the wiring diagram of each controller and cabinet assembly supplied, on CD-ROM.
2. Two blue-tone wiring diagrams of each controller and cabinet assembly supplied.
3. Wiring diagrams for all auxiliary equipment furnished. One set per controller and cabinet assembly.
4. Controller and cabinet assembly operations and maintenance manuals. One (1) set per cabinet. The Design-Builder shall provide 2 extra sets over and above the total number required for all cabinets.
5. Auxiliary equipment operations and maintenance manuals. One set per cabinet.

All equipment shall be removed from the Shop by the Design-Builder within 7 working days following notice of final approval and acceptance. If not removed accordingly, the shop will forward the equipment to the Design-Builder freight collect. Accepted controllers shall remain in the shop until requested by the Contractor no earlier than 2 days prior to installation.

2.18.3.2.3.1.3 Work Delays

The Design-Builder will not be granted an extension of time for delays caused by rejected equipment.

2.18.3.2.3.2 CCTV Camera and System Testing

CCTV cameras and the CCTV system shall be tested according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

The Design-Builder shall test the CCTV system using a Design-Builder-supplied NTSC-compatible video monitor and a Design-Builder-supplied camera control device. The control device may be an IBM-compatible laptop computer with a suitable EIA-422 converter running Vendor-supplied software. The control device and monitor shall remain the property of the Design-Builder. All test cables and connections shall be the responsibility of the Design-Builder.

During each testing phase, the Design-Builder shall repair, replace, or reconfigure each CCTV camera installation as necessary, at no additional cost to WSDOT.

2.18.3.2.3.2.1 Bench CCTV Test

Before each CCTV camera is installed the Design Builder shall perform a bench test according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

The Design-Builder shall perform a bench test on each camera, pan-and-tilt unit, and camera controller prior to installation. The bench test shall be performed at a location proposed by the Design-Builder and approved by the Engineer. The bench test shall consist of the following:

1. Display camera video on Design-Builder-provided monitor.
2. Program I.D. generator.
3. Pan and tilt camera.
4. Zoom and focus camera in both fast and slow modes.
5. Turn camera off and on.
6. Change iris between auto and manual.
7. Black and white modes.

2.18.3.2.3.2.2 Local CCTV Test

After each CCTV camera is installed the Design Builder shall perform a local CCTV test according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

At each camera control cabinet, the Design-Builder shall connect the video monitor to the coaxial video cable and connect the camera control device to the camera control cable. The Design-Builder shall demonstrate to the Engineer the following features of the camera installation:

1. Display camera video on the Design-Builder-provided monitor.
2. Program the I.D. Generator to display the State Route on line 1 and the location of the camera on line 2. The I.D. shall be shown on the upper left of the camera image.
3. Pan and tilt the camera.
4. Zoom and focus the camera in both fast and slow modes.
5. Turn the camera off and on.
6. Change the iris to auto and manual.
7. Black and white modes.

2.18.3.2.3.2.3 HUB CCTV Test

After each CCTV camera is installed the Design Builder shall perform a HUB CCTV test according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

At each hub the Design-Builder shall connect the camera control device to the EIA-232/422 converter. The video monitor shall be connected to the BNC port of the camera video receiver for the camera being tested. In the presence of the ITS Implementation Engineer, the Design-Builder shall demonstrate all of the features listed in Section 2.18.3.2.3.2.2: Local CCTV Test.

2.18.3.2.3.2.4 TMC CCTV Test

After each CCTV camera is installed the Design Builder shall perform a TMC CCTV test according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

At the Traffic Management Center, the Design-Builder shall witness the TMC CCTV Testing as performed by WSDOT. WSDOT will attempt to perform all of the Local CCTV Test features through an existing TMS control console at the TMC.

2.18.3.2.4 DMS Testing

The Design-Builder shall perform DMS testing according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

All dynamic message signs, DMS control software, DMS control equipment, and cabinets shall be inspected and tested by the Design-Builder prior to shipment from the factory and after installation in the field. These tests shall demonstrate that each component is fully functional and conforms to these Technical Requirements. At a minimum, the tests shall show that all pixels are operational and that the control software provides LED brightness, housing ventilation and message and beacon control. All components that fail a test shall be replaced and retested.

Documentation from factory testing shall be submitted as detailed in Section 2.18.6.4.3.

The Engineer reserves the right to perform any independent inspections or tests, which are deemed necessary to ensure that the DMS equipment and software complies with the requirements of this Section.

2.18.3.2.4.1 DMS Testing Plan

The Design-Builder shall submit a DMS Testing Plan prior to beginning work on the ITS. The DMS Testing Plan shall include the following:

- Mounting location for each DMS sign.
- Staging location(s) of each DMS sign.
- Method of transport between testing and installation locations.
- Specific schedule dates of all types of testing for each DMS sign.
- Tests to be performed.
- Equipment to be used for the testing.

- Calibration results of testing equipment.
- List of Project contacts (including phone numbers) for the Design-Builder and WSDOT staff.

An updated version of the DMS Testing Plan shall be submitted in Microsoft Word format with each final plan submittal that includes ITS Work. The DMS Testing Plan shall be updated as necessary with each change affecting testing equipment, personnel or staging.

Upon substantial completion, the Design-Builder shall submit the completed DMS Testing Plan as part of the DMS Testing Documentation. See Section 2.18.6.4.3 for documentation requirements.

2.18.3.2.4.2 DMS Controller and Cabinet Assembly Acceptance Testing

Each DMS sign and controller assembly shall undergo shop testing by WSDOT prior to final acceptance. The Design-Builder shall deliver the equipment to the WSDOT Signal Shop in Seattle, Washington, for testing. These tests shall check the operation of each individual component as well as the component's ability to operate within the overall system. Shop testing shall consist of three stages. Stages 2 and 3 will occur concurrently.

- Stage 1: Notification, Delivery, and Assembly
- Stage 2: Hardware, Systems and Controller Testing
- Stage 3: NTCIP Testing

2.18.3.2.4.2.1 Stage 1 Testing – Notification, Delivery, and Assembly

Notification

The following documents shall be submitted to the Engineer along with a copy to the Northwest Region Signal Shop, not less than 10 working days before any equipment is delivered to the Signal Shop for testing:

(1) Design-Builder's representative for tests: name, title, address, and telephone number.

(2) Inventory of items to be delivered including:

(i) The quantity of each item to be delivered.

(j) The number of maintenance and operations manuals to be delivered.

(k) The number of cabinet prints, equipment schematics, equipment manuals, et al., to be delivered.

(l) The contract number the equipment is being tested for.

(3) Scheduled delivery date of equipment to the Shop.

Delivery

Delivery shall be made to the Region Signal Maintenance Office located at:

3700 9th Ave. S.
Seattle, WA 98134
Attention: Jeri Rahm
(206) 442-2110

Delivery will be accepted only if all required equipment and materials described in the notification are on hand, between the hours of 8:00 a.m. to 2:00 p.m. Monday through Friday.

The Design-Builder shall be responsible for unloading all equipment and materials.

Assembly

All equipment to be tested shall be completely assembled by the Design-Builder in preparation for Stage 2 testing.

2.18.3.2.4.2.2 Stage 2 Testing – Hardware and Systems Testing

The Design-Builder shall allow 30 Calendar Days for each sign and controller assembly.

The tests will verify whether or not the equipment supplied meets the environmental and operating standards in this Section and provides the functions and operations required in this Section. A sample checklist of the type to be used during testing is shown in Appendix T17.

Only two failures in each controller assembly will be allowed. A third failure will result in rejection of the assembly.

A malfunctioning load switch will not be considered a failure. However, the Design-Builder shall provide replacement units.

The Design-Builder will be notified of all rejections. The Design-Builder shall remove all equipment that is rejected from the Shop within 7 Calendar Days following receipt of the rejection notice. If not removed accordingly, the Shop will forward the equipment to the Design-Builder, freight collect.

Stage 2 testing may extend beyond the allowed test period if:

1. A sign and controller assembly fails within the last 7 Calendar Days of Stage 2; or
2. A sign and controller assembly that replaces a rejected assembly is submitted for testing.

In order to pass the Stage 2 test, the sign and controller assembly must have no failures during the last 7 Calendar Days of the test period.

The Shop will release no equipment unless all documents are current and correct. Should any document require revising or updating, the Design-Builder shall provide 2 copies of that document with the changes obviously marked. Changes on printed documents shall be marked in red. These documents include, but are not limited to, the following:

1. One electronic version of the wiring diagram of each sign and controller assembly supplied, on CD-ROM.
2. Two blue-tone wiring diagrams of each sign and controller assembly supplied.
3. Wiring diagrams for all auxiliary equipment furnished. One set per sign and controller assembly.
4. Sign and controller assembly operations and maintenance manuals. Twelve (12) sets for each type of equipment.
5. Auxiliary equipment operations and maintenance manuals. Twelve (12) sets per each sign type.

2.18.3.2.4.2.3 Stage 2 Testing – Controller Testing

Controller testing will be primarily communications oriented. However, a hardware failure shall cause the controller being tested to fail the test. Each controller will be tested for communications compatibility with the central computer over a 24-hour test period. The test will be considered successful if communications with the central computer are maintained over the test period.

Communication Failure

Failure to properly communicate with the central computer on each transmission during the 24-hour period shall cause the unit to fail the test. The Design-Builder shall diagnose the problem and document the solution upon notice of a failure.

Failure of Equipment Provided by the Design-Builder

If the problem is related to equipment provided by the Design-Builder, the Design-Builder shall remove the failed unit from the TMC for repair or replacement. The repaired or replaced unit and its cabinet shall be delivered to the Shop for complete testing before re-testing at TMC.

2.18.3.2.4.2.4 Stage 3 Testing – NTCIP Testing

Each DMS sign controller will be tested by WSDOT using the NTCIP Exerciser in place of the Central Computer. The NTCIP test will use the circuit created to connect the sign controller to the central computer, the Ethernet network, and WSDOT's copy of the Exerciser. The Exerciser shall prove that DMS sign controller fully complies with the NTCIP requirements of this Section. The WSDOT Software Engineer shall decide any differences in the interpretation of NTCIP Standards. The Design-Builder shall be responsible for ensuring that the DMS equipment fully complies with NTCIP standards specified herein.

2.18.3.2.4.2.5 Work Delays

The Design-Builder will not be granted an extension of time for delays caused by rejected equipment.

2.18.3.2.4.2.6 Post-Testing Procedure

All equipment shall be removed from the Shop by the Design-Builder within 5 Working Days following notice of final approval and acceptance. If not removed accordingly, the shop will forward the equipment to the Design-Builder freight collect.

2.18.3.2.4.3 DMS Acceptance Testing

Each DMS sign and controller assembly shall be tested after installation in order to check the operation of the sign. A representative from the manufacturer shall be present during testing of the DMS. A DMS operation manual for each type of DMS shall be provided to WSDOT at the time of the test for use during the test.

During the 20-day test, the Design-Builder shall replace all failed sign components.

The Design-Builder shall verify remote control of the sign from the Traffic Management Center at 15700 Dayton Avenue North, Shoreline, Washington, before scheduling any testing. The Design-Builder shall demonstrate to the satisfaction of the Engineer that the sign, at a minimum can display diagnostic messages originating from the TMC control

consoles. Where beacons are installed, messages shall incorporate the use of the beacons. Testing shall not begin until the sign's basic features have been demonstrated to the satisfaction of the Engineer.

The test shall be conducted immediately following the complete installation of each new DMS. The Design-Builder shall demonstrate that all functions of the signs and local controllers are operational. This test shall be conducted in the presence of the Engineer.

Upon satisfaction of the Engineer that all functions of the system are operational, a 20-day test period of continuous operation shall begin. Test periods shall be shown in the Design-Builder's CPM schedule. The following shall be observed during the test period:

1. All equipment shall be in working order at the beginning of the test. Any adjustment or replacement of components shall be considered a malfunction and cause for termination of the test period.
2. The system shall operate for 20 consecutive days without malfunction.
3. The DMS shall be communicating with the central computer during the entire 20-day test. Any loss of communication between the DMS and the central computer shall be considered a malfunction.
4. Although it is not necessary for the Design-Builder to provide personnel to be in attendance during the 20-day testing period, upon being informed of a malfunction, the Design-Builder shall respond within 48 hours with a representative who is thoroughly familiar with the operation of all parts of the system.
5. Upon detection of a malfunction, the test and test time shall be stopped and the malfunction corrected. Test time will be reset and a new 20-day test period shall begin.

2.18.3.2.4.4 Active Traffic Management (ATM) System Testing

After Acceptance Testing, WSDOT will test the ATM software it has developed. Prior to ATM System Testing, all elements of the ITS, including, but not limited to, CCTV, DMS, detection, and communication cables and interfaces must be tested and accepted as described in this Section. ATM System testing will occur after Substantial Completion.

ATM System Testing will be phased by Corridor. Sixty (60) Calendar Days will be required for testing of the first Corridor to be tested, and 45 Calendar Days will be required for testing of the second and third Corridors to be tested. Testing periods by Corridor will take place consecutively. No overlap of testing on multiple Corridors will be allowed.

The Design-Builder shall respond to any WSDOT request for assistance during the ATM system testing period within 24 hours with a representative who is thoroughly familiar with the operation of all parts of the system, including NTCIP communications protocol implementation.

2.18.3.2.4.4.1 Equipment for ATM Software and Maintenance Testing

The Design-Builder shall supply one fully functional, installation-ready controller, sign, and sign mounting bracket for each type of DMS (LCS, SDMS, and VMS) to be used by WSDOT for ATM software and maintenance testing. Each piece of equipment shall be accompanied by 1 set of shop drawings. The DMS equipment shall be delivered within 14 Calendar Days of the conclusion of the design workshop described in Section 2.18.3.1.1.1. The equipment shall be delivered to the WSDOT Northwest Region Signal and ITS Maintenance Superintendent at the following address:

3700 - 9th Avenue South
Seattle, Washington 98134
Telephone: (206) 442-2110

The equipment described in this Section shall remain the property of WSDOT once delivered. If any design or component changes whatsoever are made to any piece of equipment for any reason after delivery and before Substantial Completion, each piece of original equipment shall be supplemented with an entirely new modified version, along with shop drawing, within 3 Calendar Days of the design or component change.

2.18.3.2.5 Twisted Pair (TWP) Cable Testing

The Design-Builder shall perform a Field Acceptance Test on the installed cable. Each pair shall be tested for frequency attenuation between the communication hub and each ITS device. WSDOT will provide a witness during the tests and the test results shall be documented in accordance with Section 2.18.6.4.5.1.

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

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

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

The Design-Builder shall ensure that all individual wires in all TWP cables have been terminated consistent with the wire insulation color to termination pin requirements set forth in this Section.

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

Testing shall be documented in accordance with Section 2.18.6.4.5.1.

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

- DC Resistance - The resistance of any conductor in any cable shall not exceed 20 ohms per 1000 feet.
- DC Resistance Unbalance - The resistance unbalance between the two conductors of any pair shall not exceed 5%.
- Ambient Noise Measurements - The Contractor shall measure the ambient noise level in dBm0 to determine the level of noise on each cable being tested. The distant end of the pair being tested should be terminated with a 600-ohm resistor. At the near end, an HP-3551 or equivalent transmission measuring set should be configured for conducting

a noise reading test. Cable pairs being sampled shall provide an ambient noise figure of 30 Dbm0 (-60 dBm) or better. The Contractor shall record all readings.

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

Within 30 days of submitting the test results in accordance with Section 2.18.6.4.5.1, the Design-Builder, in the presence of the Engineer, shall re-test a minimum of 5% of the previously tested locations to validate the test results. A 5% sample will be selected randomly from the terminal device locations.

2.18.3.2.6 Fiber-Optic Cable Testing

The Design-Builder shall perform fiber-optic cable testing according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

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

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

All testing values shall be in metric.

The Design-Builder shall take corrective actions on portions of the fiber installation determined to be out of compliance.

Within 30 days of submitting the test results referred to in Section 2.18.6.4.5.2, the Design-Builder, in the presence of the Engineer, shall retest a minimum of 5% of the previously tested locations to validate the test results. A 5% sample will be selected randomly from the terminal device locations.

2.18.3.2.6.1 Fiber-Optic Splicing and Testing Plan

The Design-Builder shall submit a Fiber Optic Splicing and Testing Plan prior to beginning work on the ITS. The Fiber Optic Splicing and Testing Plan shall include the following:

- Location of all proposed fiber-optic splices, including what is being spliced.
- Location of all temporary fiber-optic splices.
- Schedule date of splices and testing.
- Tests to be performed.
- Equipment to be used for the testing.
- Calibration results of testing equipment.
- List of Project contacts (including phone numbers) for the Design-Builder and WSDOT staff.

An updated version of the Fiber Optic Splicing and Testing Plan shall be submitted in Microsoft Word format with each final plan submittal that includes ITS Work. The Fiber

Optic Splicing and Testing Plan shall be updated as necessary with each design change affecting testing type and location.

Upon completion of the splicing and testing of ITS equipment, the Design-Builder shall submit the completed fiber-optic test plan as part of the fiber-optic testing documentation. See Section 2.18.6.4.5 for documentation requirements.

2.18.3.2.6.2 Power Meter Testing

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

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

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

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

2.18.3.2.6.3 Optical Time Domain Reflectometer (OTDR) Testing

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

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

Each new fiber shall be tested in both directions at the 1310 and 1550 nanometer wavelengths. Existing fibers that are spliced to or respliced as part of this contract shall also be tested in both directions and at both wavelengths.

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

1. Fiber/Strand #.
2. Fiber type (Singlemode or Multimode).
3. Cable and fiber IDs.
4. X-Y plot scaled for fiber length.

- The X-axis (Distance) shall be scaled such that the beginning of the trace starts with the OTDR/dead-zone interface. The end of the trace shall extend no more than 1 km beyond the end of the test span.
- The Y-axis (dB) shall be set to maximize the trace. The bottom of the Y scale shall begin above the noise floor and the top of the scale shall be no more than 5 dB higher than the largest event. No events or reflections shall be cut off.

5. Near end and far end test locations using device names.
6. Date, time, and operator.
7. Wavelength.
8. OTDR Settings.
   - Index of Refraction.
   - Averaging time (Minimum of 30 seconds).
   - Pulse Width (to provide a smooth trace, excluding events).
9. Table of Events that includes Event ID, Type, Location, Loss, and Reflection.
   - Events are defined as:
     1. Any reflectance event in excess of -60 dB.
     2. Any loss occurrence in excess of 0.05 dB.
     3. Any splice location regardless of loss.
     4. Beginning and end of span.
        - The beginning of the span shall be denoted by the "A-Marker." This marker shall be placed just to the left of the spike of the dead-zone box / fiber interface.
        - The end of the span shall be denoted by the "B-Marker." This marker shall be placed just to the left of the end-of-span reflection spike.

2.18.3.2.6.3.1 Fiber-Optic Performance Requirements

Splice Loss shall not exceed 0.20 dB in one direction, and the bidirectional average shall not exceed 0.15 dB.

Reflectance shall not exceed -55 dB.

2.18.3.3 COORDINATION WITH ADJOINING PROJECTS

The Design-Builder shall obtain the ITS design plans for any adjacent projects, and determine the coordination requirements for continuous functioning of the ITS equipment for the Project. The Design-Builder shall adjust the design and construction schedule accordingly to coordinate the installation of the required components, while continuously maintaining the ITS. Refer to Section 2.1.

2.18.3.4 MAINTENANCE AND OPERATION OF ITS COMPONENTS

2.18.3.4.1 Maintenance and Operation Plan

The Design-Builder shall submit to WSDOT a written plan for providing maintenance and operation of ITS components furnished and installed by the Design-Builder, a minimum of 21 Calendar Days prior to performing Work on any portion of the ITS.

The Design-Builder shall use every precaution to ensure that no contract work causes disruptions to the existing systems, except those disruptions that are planned and approved in advance, as defined herein.

Existing systems include, but are not limited to, the following:

A. All ITS field devices, such as ramp meter, data collection, and CCTV systems, within the project construction limits.

B. Fiber-optic and TWP data and video communication systems on I-5, SR 520, I-90, and I-405.

2.18.3.4.2 Continuous Function of Existing ITS

The Design-Builder shall ensure continuous functionality of the existing ITS system during construction.

Existing ITS elements, including, but not limited to, CCTV cameras, ramp meters, DMS, HAR, and data stations, shall remain operational during construction of the Project, except during the allowable working hours. Prior to the installation of new equipment, the Design-Builder shall provide temporary equipment for locations where the existing equipment will be removed, unless otherwise permitted in this RFP.

If continuous operations of the existing ITS system cannot be maintained during construction of new ITS elements, the Design-Builder shall provide a temporary ITS that provides for continuous operation of all existing ITS components during construction.

2.18.3.4.2.1 Disruption and Restoration

2.18.3.4.2.1.1 Planned Disruptions

Work required by this RFP may require disruptions to existing systems, circuits, and equipment. The Design-Builder shall schedule the work and predetermine the affected system(s), extent, start time, and duration of planned disruptions. Planned disruptions will only be allowed when a cutover from an existing system occurs, and shall be scheduled between the hours of 8:00 p.m. and 4:00 a.m. Failure of the Design-Builder to restore disrupted systems and equipment prior to 4:00 a.m. will constitute an unplanned disruption, and the "Restoration Procedure" below will apply.

2.18.3.4.2.1.2 Disruption Request

Twenty-one (21) Calendar Days prior to planned disruptions of any existing system, circuit, or equipment, the Design-Builder shall submit to the Engineer for approval a written Disruption Request. Each Disruption Request shall include the system(s) to be affected, the disruption start date and time, and the estimated duration required. The Design-Builder shall submit a separate, numbered Disruption Request for each planned disruption. Disruption Request approval or rejection will be returned to the Design-Builder in writing by the Engineer at least 7 Calendar Days prior to the proposed start of the

disruption. The Engineer may reject a requested time or duration and verbally recommend an alternate time or duration agreeable to both the Design-Builder and WSDOT.

2.18.3.4.2.1.3 Restoration Procedure

Any unplanned disruptions determined by the Engineer to be caused by the actions of the Design-Builder or the Design-Builder's representative(s) shall be corrected by the Design-Builder at no additional cost to WSDOT.

Upon the occurrence of an unplanned disruption and subsequent notification by the Engineer, the Design-Builder shall immediately stop all other ITS work in progress and shall expend all efforts to restore the disrupted system(s) or correct the problem causing the disruption. The Design-Builder will not be granted an extension of time for delays caused by the repair of disrupted systems. Unplanned disruptions shall result in the assessment of liquidated damages in accordance with Chapter 1 of this RFP**.**

2.18.3.4.2.2 Ramp Metering

When any in-place ramp meter is to be off line due to construction during any time in which the ramp meter is normally in operation as defined by WSDOT, the Design-Builder shall install a temporary ramp meter. Temporary ramp meters shall: be compatible with the existing system; communicate in real-time with the TSMC; and include all associated signing and pavement marking for ramp meter operations per the WSDOT *Northwest Region ITS Details*.

2.18.3.4.2.3 CCTV System

The freeway management system cameras are used to detect and verify incidents.

The existing cameras shall remain operational, or temporary cameras shall be installed when any existing camera is to be off line due to construction for greater than the allowable working hours on the ITS, as defined in Section 2.18.3.4.3. The temporary camera shall be installed and operational prior to taking the existing camera off line. Temporary cameras shall be compatible with the existing system; and shall have the same functionality and coverage as the existing system.

The Design-Builder shall maintain fiber-optic connections to all cameras during construction.

2.18.3.4.2.4 DMS

The DMS are used to inform drivers of incidents and give other information. Existing DMS shall remain operational at all times outside of the allowable working hours. New DMS that have been brought into operation shall be considered existing for the purposes of this Section, and shall remain operational at all times.

2.18.3.4.3 Allowable Working Hours on the ITS

All ITS devices, whether inside or outside of the Project limits, shall not be taken out of operation by the Design-Builder, and shall remain operational during all phases of construction.

Normal hours of operation of active ITS elements not in continuous operations, such as ramp meters, shall be defined by WSDOT.

The Design-Builder shall not work on active ITS elements within the Project limits except ITS hubs from 4:00 a.m. to 8:00 p.m. The Design-Builder may perform Work in ITS hubs at any time, provided that proper notice has been given and the ITS Implementation Engineer directly supervises the Work.

Unless otherwise specified in this RFP, the Design-Builder shall contact WSDOT a minimum of 7 Calendar Days prior to performing any Work on existing and active ITS devices and 30 Calendar Days in advance of performing any Work on any hub. The Design-Builder shall perform all Work in a manner ensuring the integrity and proper performance of all ITS components.

Liquidated damages will be assessed for unplanned ITS disruptions as provided in Chapter 1 of this RFP.

2.18.3.4.4 Maintenance and Operation of ITS Components

The Design-Builder shall provide maintenance of all new ITS components that the Design-Builder furnished and installed as part of the Project, until Physical Completion or unless otherwise noted.

Upon execution of the Contract, the Design-Builder shall be responsible for all highway ITS and communications components that the Design-Builder performs Work on or otherwise impacts, including those components already in place. The Design-Builder shall maintain the components through Physical Completion.

Maintenance and operation includes the response to faults. The three categories of faults -- urgent, priority, and minor -- are described as follows:

- Urgent – Any fault that causes a total failure, disruption, safety impact, or system wide disruption of the following equipment or services:
    - Communications links and equipment.
    - Detection failure.
    - Ramp metering facility or CCTV facility.

The response time for urgent faults of ITS components shall be less than 2 hours. The repair time for urgent faults of ITS components shall be less than 4 hours.

- Priority – Any fault that causes a failure or disruption of an operator workstation, local control unit for DMS, or the DMS itself. The response time shall be noon of the following day. The repair time shall be less than 4 hours.
- Minor – Any other fault. The response time shall be midnight (12:00 a.m.) of the next Calendar Day. The repair time shall be less than 4 hours.

The Design-Builder shall provide a plan for maintenance of new ITS components within the Project limits. The plan shall include, at a minimum, the following:

- Details of the proposed preventive maintenance program, including frequency, for each highway ITS component.
- A general description of the proposed emergency maintenance and operation response program, for each highway ITS component. This description shall include the categories of faults and how the faults will be detected.
- Maintenance and operation activities.

The Design-Builder shall replace, not repair, hardware or equipment if any of the following occurs:

- The Design-Builder has attempted to repair the hardware or equipment on at least one previous occasion and there has been a subsequent failure;
- The repair activities interfere with the movement of traffic; or
- WSDOT decides that replacement is necessary in the interest of public safety.

The Design-Builder shall maintain a log documenting maintenance activities and all repairs performed on ITS equipment. The maintenance log shall be made available to WSDOT upon request.

2.18.3.5 REMOVAL AND DELIVERY

2.18.3.5.1 Removal, Salvage, and Delivery of Existing ITS Equipment

The Design-Builder shall remove and deliver existing ITS equipment according to the Standard Specifications. Section 8-20.3(1) of the Standard Specifications is supplemented with the following:

The Design-Builder shall remove, salvage and deliver existing equipment, including, but not limited to, cabinets, poles, cameras, DMS, and associated equipment, and all other equipment requested by WSDOT to:

3700 9th Avenue South
Seattle WA 98134
Attention: Secretary Supervisor
(206) 442-2110
FAX: (206) 442-2147

Seven (7) days written advance notice shall be given to both the Engineer and the electrical parts specialist at the address listed above. Delivery shall occur between the hours of 8:00 a.m. and 1:00 p.m. Monday, Wednesday, and Friday. Material will not be accepted without the required advance notice. The Design-Builder shall provide all labor and equipment to transport, load, unload, and store the salvaged items.

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

to the WSDOT Northwest Region Signal and ITS Maintenance Superintendent at the following address:

3700 - 9th Avenue South
Seattle, Washington 98134
Telephone: (206) 442-2110

The Design-Builder shall give notice to the WSDOT Northwest Region Signal and ITS Maintenance Superintendent 7 Calendar Days prior to delivery.

2.18.3.5.2 Delivery of New ITS Equipment

Initial delivery and movement of components from one location to another during the course of the Work shall be the responsibility of the Design-Builder. The Design-Builder shall supply all equipment and personnel needed to load, transport, and unload all components required in this Section.

2.18.3.6 ITS TRAINING

The Design-Builder shall conduct ITS training according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

The Design-Builder shall provide 8 hours of training for each type of DMS sign for 5 Contracting Agency personnel taught by a manufacturer certified instructor. This shall include classroom instruction at a facility provided by WSDOT. Training shall focus on removal and replacement of sign components and manufacturer's standard troubleshooting procedures.

2.18.3.7 WSDOT PERSONNEL

The Design-Builder shall coordinate the Work with WSDOT personnel as required. The Design-Builder shall coordinate ITS Work with the following WSDOT staff:

2.18.3.7.1 WSDOT ITS Implementation Engineer

The WSDOT ITS Implementation Engineer will perform the following:

- Recommend acceptance of components and/or methods to WSDOT.
- Review the certification of test device calibration (to ANSI specified guidelines).
- Review and make recommendations for acceptance to WSDOT of the required documentation including specifications, shop drawings, and all measured and recorded values for the system and for each cabinet.
- Review cable vault, CCTV, cabinet, and communication hub locations once surveyed and staked in the field.
- Oversee connections to the existing ITS communication network.
- Review plans and component submittal packages and assist the design team.
- Make recommendations to WSDOT for the acceptance of ITS components based on the submittal and other documentation packages.

2.18.3.7.2 WSDOT Electrical Inspector

The Department of Labor and Industries has authority over all electrical installations within the State of Washington. WSDOT has been granted authority over all electrical installations within the rights-of-way of State highways, provided WSDOT maintains and enforces an equal, higher, or better standard of construction, materials, devices, appliances, and equipment than is required by State law. It is the role of the WSDOT Electrical Inspector to assure that all electrical installations meet the requirements of the National Electric Code, and all applicable State laws and provisions.

The WSDOT Electrical Inspector will perform the following:

- Act as a resource for the ITS design team.
- Assist with ITS plan reviews.
- Perform periodic inspections during construction.
- Witness required ITS field tests (as desired).
- Inspect and approve all electrical and ITS installations in accordance with this RFP.

WSDOT will designate a WSDOT Electrical Inspector. The Design-Builder shall contact WSDOT to arrange for electrical inspection.

2.18.3.7.3 WSDOT Software Engineer

The WSDOT Software Engineer will perform the following:

- Review results of third-party NTCIP tests.
- Verify the implementation of NTCIP v2 features.
- Verify that each DMS sign has the correct version of the manufacturer's software.
- Approve DMS signs at the conclusion of acceptance testing.
- Oversee WSDOT NTCIP compliance testing and work with the Design-Builder to correct non-compliance issues.

2.18.3.8 WARRANTY

Warranties for ITS shall be in accordance with Chapter 1 of this RFP.

2.18.3.8.1 General Warranty

The Design-Builder shall procure for the benefit of WSDOT a one (1) year (minimum) manufacturer's express Warranty for all components installed as part of this RFP and not otherwise specified in this Section or in RFP Chapter 1. See RFP Chapter 1 Section 1-05.16 for additional Warranty provisions.

The express Warranty shall be written by the manufacturer or authorized repair agent (warrantor) of the above listed components in favor of WSDOT (warrantee) as ultimate owner and user of the systems. The express warranty shall provide that: (1) The components are fit and sufficient for the purpose intended; (2) components are merchantable, of good quality and free from defects, whether patent or latent in material or workmanship under normal use and service; and (3) components conform to the standards required in the Contract between the Design-Builder and WSDOT. Any component that fails to comply with the express Warranty shall be replaced by the warrantor free of all charges, including return freight and shipping costs but shall not include any labor costs for removing and reinstalling the component(s).

The warrantee shall notify the warrantor, in writing, within a reasonable time after the discovery of any component failure, defect or damage covered by the express Warranty. Any replacement parts or components shall be new. If the warrantor fails to replace the component(s) within a reasonable time after receipt of notice, the warrantee shall have the right to replace, repair and otherwise remedy the failure, defect or damage at warrantor's expense.

Any Warranty work to the component(s) will have a one (1) year Warranty from the date the replaced component(s) is reinstalled into the system(s).

The express Warranty shall exclude coverage for damage or defects caused by abuse, insufficient maintenance, improper operation, modification, accidents, acts of God, or normal wear and tear from use.

The express Warranty shall further indicate that in the event any legal action or proceedings are instituted to enforce any right or obligation under the Warranty, the action

shall be initiated in the state of Washington and that all questions be resolved by the application of Washington State law.

The Design-Builder shall coordinate the Warranty period with the warrantor of the component(s) to begin upon acceptance of the system. Acceptance of the system is defined as starting on the Physical Completion date of the Contract, or if relief of responsibility is to be granted in accordance with Section 1-07.13(2), on the date the Engineer relieves the Design-Builder from responsibility for the completed system.

The Design-Builder shall provide the Engineer with a written copy of the express Warranty. Any other Warranty or guarantee applying to any component(s) listed above that is typically furnished as a customary trade practice in connection with the purchase of that component shall be provided. All Warranties shall be executed in writing for the benefit of WSDOT. Any Warranty document shall denote that the Warranty period begins upon acceptance of the system and not on product delivery.

The rights and remedies of WSDOT provided in this Warranty section are in addition to and do not limit any rights afforded to WSDOT by any other section of this RFP.

2.18.3.8.2 DMS Warranty

The Design-Builder shall procure for the benefit of WSDOT, a one (1) year (minimum) manufacturer's express Warranty for the major components of the DMS system, including LCS, SDMS and VMS, listed as follows:

- Sign Display
- DMS Sign Beacon
- Sign Housing
- Sign Mounting Hardware
- DMS Field Cabinet
- Control System
- Circuit Boards
- Display LEDs
- LED Modules
- LED output Control
- LED Intensity Control System
- LED Display Driver Circuit Boards
- Power Supplies
- Transient Current Protection
- DMS Sign Controller
- Sign Controller Software
- Control Software

The express Warranty shall be written by the manufacturer or authorized repair agent (warrantor) of the above components in favor of the WSODT (warrantee) as ultimate

owner and user of the DMS system. The express Warranty shall provide that: (1) The components are fit and sufficient for the purpose intended; (2) components are merchantable, of good quality and free from defects, whether patent or latent in material or workmanship under normal use and service; and (3) components conform to the standards required in the Chapter 1 of this RFP. Any component that fails to comply with the express Warranty shall be replaced on site with new parts by the warrantor free of all charges, including all labor costs incurred in removing defective components, installing new replacement parts, and restoring the system to full operation.

The warrantor shall provide software upgrades during the Warranty period at no cost to the warrantee.

The warrantee shall notify the warrantor in writing, within a reasonable time after the discovery of any component failure, defect or damage covered by the expressed Warranty. Within 2 days of the notification, the warrantor shall inspect the component(s) and commence the work required to restore the system to full operation. Warrantor shall make arrangements with the warrantee's representative listed below to provide on site access to the DMS system and any necessary traffic control.

Contact Information:
NWR Regional Signal Maintenance Superintendent
3700 Ninth Avenue South
Seattle, WA 98134
(206) 764-4065

If the warrantor fails to restore the system to full operation within the 5 days timeframe or within another timeframe mutually agreed to by the parties, the warrantee shall have the right to replace, repair or otherwise remedy the failure, defect or damage at warrantor expense. If requested by the warrantee, the warrantor shall provide the installation instructions required to correct any mechanical problems with the DMS system.

The warrantor shall indemnify and hold the warrantee, its agents, employees and officers harmless from and shall process and defend at its own expense all claims, suits or actions brought for damages or loss attributable to death, bodily injury and/or destruction of property, arising out of, in connection with or incident to the warrantor, its agents or employees own negligent acts or omissions while performing Warranty work or related services on the warrantee's right of way; provided, however, that if such claims are caused by or result from the concurrent negligence of (a) the warrantor and (b) the warrantee, this indemnity and defense provision shall be valid and enforceable only to the extent of the negligence or omissions of the warrantor and provided, further, that nothing herein shall require the warrantor to hold harmless or defend the warrantee from any claims arising from the sole negligence of the warrantee.

Any warrant work to the component(s) will have a one (1) year Warranty from the date the replaced component(s) is/are installed into the DMS system.

The express Warranty shall exclude coverage for damage or defects caused by abuse, insufficient maintenance, improper operation, modification, accidents, acts of God, or normal wear and tear from use.

The express Warranty shall further indicate that in the event any legal action or proceedings are instituted to enforce any right or obligations under the Warranty, the action shall be initiated in the state of Washington and that all questions be resolved by the application of Washington State law.

The Design-Builder shall coordinate the Warranty period with the warrantor of the components to begin upon acceptance of the DMS system. Acceptance of the system is defined as starting on the Physical Completion date of this RFP, or if relief of responsibility is to be granted in accordance with RFP Chapter 1 Section 1-07.13(2),on the date the Engineer relieves the Design-Builder from responsibility for the completed DMS system.

The Design-Builder shall provide the Engineer with a written copy of the express Warranty. Any other Warranty or guarantee applying to any component listed above that is typically furnished as a customary trade practice in connection with the purchase of that component shall be provided. All warranties shall be executed in writing for the benefit of WSODT. Any Warranty document shall denote that the Warranty period begins upon acceptance of the DMS system and not on product delivery.

The rights and remedies of WSDOT provided in this Warranty section are in addition to and do not limit any rights afforded to WSDOT by any other section of this RFP.

See RFP Chapter 1-05.16 for additional Warranty provisions.

2.18.4 DESIGN REQUIREMENTS

2.18.4.1 GENERAL REQUIREMENTS

The ITS shall provide for vehicle detection, fiber-optic communications, real-time National Television System Committee CCTV surveillance, data collection, DMS, and all associated traffic control devices.

The Design-Builder shall provide a complete, operational, and maintainable ITS and components. The ITS and its components shall be compatible with the existing system. The Design-Builder shall furnish all electrical power service and communications necessary for the ITS. The Design-Builder shall label all new and existing ITS devices using naming and numbering conventions in accordance with WSDOT *ITS Device Naming*. The Design-Builder shall provide an ITS that meets the following requirements:

- Expandability.
- Cabinet layouts in accordance with the WSDOT *Northwest Region ITS Design Guide Supplement* and the WSDOT *Northwest Region ITS Details*.
- Documentation reflecting the National ITS Architecture.
- Support for stand-alone operation of all field devices using backup software components.
- Protection from voltage surges and lightning.
- Weather-resistant components capable of operating in rain, snow, and wind conditions, and in temperature and humidity ranges encountered in the Project area.
- Hazard-free ITS components mounted along the side of the road outside of the clear zone, or in protected areas.
- If ITS components are mounted in the clear zone, they shall be constructed and protected in accordance with the AASHTO *Roadside Design Guide*.
- Field cabinets and devices with standard WSDOT locking devices.

The Design-Builder shall locate ITS cabinets so that:

- They are easily accessible to maintenance personnel from the roadway.
- WSDOT maintenance personnel may park a vehicle nearby without leaving State right-of-way.
- The safety of maintenance personnel accessing the cabinets is maximized.
- The need for future relocation is minimized.

All cabinets and electronic devices shall be provided with transient current protection.

The Design-Builder shall construct maintenance access for maintenance vehicles at the following approximate locations of ITS poles and VMS signs unless any of the following apply:

- The site is barrier or wall protected, such that alteration of the barrier or wall would be required to construct the pullout.
- The site will be re-configured in the future due to the WSDOT I-405, NE 8th St to SR 520 Braided Ramps- Interchange Improvements Project.
- Construction of the maintenance access will require revisions to landscaping.
- The roadway shoulder is substandard.

See Section 2.11 for additional requirements related to maintenance access.

2.18.4.1.1 Vehicle Detection

The Design-Builder shall provide permanent vehicle detection on the highway in between each set of two successive ATM sign installations, including installations mounted on signbridges and bridge structures. Ideally, each detection location will be halfway between two sets of ATM sign installations. The detection shall measure, at a minimum, vehicular volume, lane occupancy, and speed, and shall cover all mainline and auxiliary lanes.

The Design-Builder shall install new data stations at the following locations, at minimum, which may employ loop detectors or Non-Intrusive Vehicle Detectors. The Design-Builder may adjust these locations up to 50 feet in either direction. Further adjustments shall require the approval of the ITS Implementation Engineer.

- I-5 STA 1817+00
- I-5 STA 1868+50
- I-5 STA 1929+50
- I-5 STA 1957+75
- I-5 STA 1967+50
- I-5 STA 2030+00
- SR 520 STA A34+25
- SR 520 STA A76+00
- SR 520 STA A368+75
- I-90 LL LINE STA 343+50
- I-90 LR LINE SA 376+00

The Design-Builder shall install new loop detectors, lead-in cables, and ancillary items to provide for a functioning speed loop installation at approximately I-5 STA 2056+00, per the WSDOT *Northwest Region ITS Details*. The existing controller cabinet 005es16272 may be used.

The Design-Builder shall install new loop detectors, lead-in cables, and ancillary items to provide for a functioning speed loop installation at the following approximate locations of existing loops, at minimum, per the WSDOT *Northwest Region ITS Details*.

- I-5 STA 2699+50
- I-5 STA 1987+25
- I-5 STA 2055+00
- SR 520 BL LINE STA 2347+25
- SR 520 STA A44+50
- SR 520 WB STA B207+50
- SR 520 EB STA B207+50
- SR 520 WB A302+50
- SR 520 EB A304+75
- SR 520 WB A352+50
- SR 520 EB A352+75
- I-90 LL LINE STA 107+25
- I-90 LR LINE STA 108+00
- I-90 LR LINE STA 205+00
- I-90 LL LINE STA 202+25
- I-90 LR LINE STA 241+50
- I-90 LL LINE STA 256+50
- I-90 LR LINE STA 268+25
- I-90 LR LINE STA 295+25
- I-90 LR LINE STA 315+00
- I-90 LR LINE STA 334+00
- I-90 LR LINE STA 361+75
- I-90 LL LINE STA 494+75
- I-90 LR LINE STA 499+75

New loops shall be connected to the cabinet in the order provided to the Design Builder by the ITS Implementation Engineer. .The Design-Builder shall not exceed the maximum loop lead-in length of 500 feet without the approval of the WSDOT Engineer. The Design-Builder shall include a maximum of 32 detector inputs per cabinet.

Where existing loops will be reused and routed into a new data station or ramp meter cabinet, or where existing loops are repaired, the Design-Builder shall ensure that all loops are connected to a cabinet location. To achieve this, the Design-Builder shall comply with this RFP and the following requirements:

- No splices will be allowed in the loop lead-ins (2c(s) wires); if necessary, the Design-Builder shall replace the lead-in wires.
- The lead-in wires shall be contained within a continuous conduit/junction box run from the loop to the new cabinet.

All existing mainline loops within the project limits shall be tested in accordance with Section 2.18.3.2.6. Non-functional loops shall be replaced.

All loop lead-in wires shall be labeled.

Loop Detectors

The Design-Builder shall furnish and install R1, R2, and WR induction loop detectors in accordance with this RFP and the WSDOT *Northwest Region ITS Details*. WR loops shall be used on all lanes wider than 12 feet.

In cement concrete pavement, the Design-Builder shall locate detector loops in the center of the lane and at least 3 feet from transverse panel joints.

2.18.4.1.1.1 Non-Intrusive Vehicle Detection

The Design-Builder shall provide, install, and connect non-intrusive vehicle detector units in accordance with this RFP. At each location where a non-intrusive vehicle detector is installed, equipment provided shall include, but not be limited to, a new detector unit, detector control cable, non-intrusive data station cabinet or CCTV camera control cabinet and mounting pad, AC/DC adaptor, pole (unless mounted to an existing pole), pole foundation, and all other conduits, accessories and components to make the detector fully functioning and operable. The Design-Builder shall also furnish any equipment necessary to install the components, connections, and splices to create a fully functioning and operable system. Detector units and all related equipment shall be designed per the Standard Specifications and manufacturer recommendations.

The use of non-intrusive detection technologies may be considered for temporary data collection during construction with WSDOT approval.

2.18.4.2 JUNCTION BOXES

Junction boxes serve as collection points for conduits entering a cabinet or service.

The Design-Builder shall place junction boxes adjacent to all control cabinets, electrical service points, and detector stations. For each detector station, the Design-Builder shall provide two junction boxes for each direction of travel – one on the outside shoulder and one in the median.

On long conduit runs, the Design-Builder shall space junction boxes no farther apart than 240 feet.

When a junction box is abandoned, the Design-Builder shall remove the junction box in accordance with the Standard Specifications.

Prior to use, the Design-Builder shall clean and adjust to grade the existing junction boxes installed by others.

All metallic junction box lids shall be grounded, including any existing junction boxes that are to remain.

Junction boxes shall not be placed in the traveled roadway.

Junction boxes shall not be used for conduit runs containing fiber optic cable. Pull boxes or cable vaults shall be used for this application.

Any junction boxes located within paved areas shall be Heavy Duty Type 4, 5, or 6. The Design-Builder shall consult with WSDOT for locations where Heavy Duty junction boxes are proposed. Refer to the WSDOT *Northwest Region Illumination and Signal Details* for junction box details. Junction boxes located outside of paved areas shall be Type 1L, 2L, or 8.

2.18.4.3 CABLE VAULTS AND PULL BOXES

Cable vaults and pull boxes located on the mainline conduit system shall only contain mainline and distribution communication cables.

The Design-Builder shall install new cable vaults adjacent to all new cabinet foundations and adjacent to all cabinets with fiber being installed. The vaults are to be used for splicing distribution fiber and preterminated patch panels. Existing cable vaults may be utilized for this application if they are on the same side of the road as the cabinet and are within 75 feet of the cabinet.

Design-Builder shall include a drainage system, grounding provisions, cable and closure hanger bracket assembly, and a ground rod marker in the construction of all pull boxes and cable vaults.

Cable vaults and pull boxes shall be according to the *Standard Plans*.

2.18.4.4 CLOSED CIRCUIT TELEVISION (CCTV) SYSTEM

The Design-Builder shall provide a CCTV system according to the Standard Specifications. Section 8-2.1 of the Standard Specifications is supplemented with the following:

The Design-Builder shall furnish, install, and test all materials and equipment necessary to provide a complete and operable extension to the existing closed circuit television (CCTV) system.

The Design-Builder shall provide a CCTV system which meets all design requirements. At each location where a new CCTV camera is required, equipment provided shall include, but not be limited to, a new CCTV camera (top pole mount), camera control cabinet and mounting pad, video transmitter, video receiver, AC/DC adaptor, camera pole, foundation, and all other conduits, accessories and components to make the camera fully functioning and operable. The Design-Builder shall also furnish any equipment necessary to install the components, connections, and splices to create a fully functioning and operable system. CCTV cameras and all related equipment shall be designed per the WSDOT *Northwest Region ITS Details* (Appendix I2).

The Design-Builder shall ensure that all accessories and components are fully compatible with the existing ITS equipment.

CCTV cameras shall provide surveillance of every DMS sign, and every freeway, highway, and ramp segment. CCTV cameras at interchanges shall be located so as to

provide a view of the intersecting arterial and ramps. CCTV cameras shall also provide the following:

- Maximum visibility and coverage of ramp meter operations and ramp signal operations (including viewing of ramp meter signal indications).
- Maximum visibility and coverage of weaving and merging areas near ramps and interchanges.
- Verification of all DMS messages.
- All pavement surfaces shall be completely visible by CCTV cameras (no blind spots).
- Ability to provide suitable maintenance access for maintenance personnel based on the geometric layout of the area.
- Minimum obstructions to view caused by landscaping, trees, billboards, buildings, fixed freeway signs or topography.
- Suitable access to the proposed communication system.
- Power, communication, and underground utility considerations.

The Design-Builder shall consult with WSDOT on the placement of CCTV hardware. Camera views, accessibility, and maintainability are issues of concern. The Design-Builder shall inspect the camera view from a bucket truck and provide video and still images of that view to WSDOT for Review and Comment.

The proposed CCTV system shall not diminish the existing CCTV camera coverage of all roadways, including roadways outside of the Project limits.

The Design-Builder shall replace the existing CCTV cameras, camera cables, and all other accessories and components needed to make the new cameras fully-functioning and operable at all existing CCTV sites within the Project limits that currently have a camera model other than Cohu 3965. At a minimum, replacements shall be made at the following locations:

- CCTV I-5 STA 1850+00
- CCTV I-5 STA 1894+50
- CCTV I-5 STA 1929+50
- CCTV I-5 STA 1975+00
- CCTV SR 520 STA 2348+50
- CCTV SR 520 STA 207+00
- CCTV SR 520 STA 241+75
- CCTV SR 520 STA A266+00
- CCTV SR 520 STA 307+00
- CCTV SR 520 WB STA 393+00
- CCTV SR 520 EB STA 414+00
- CCTV I-90 LR LINE STA 24+75
- CCTV I-90 LL LINE STA 36+50

- CCTV I-90 LR LINE STA 50+00
- CCTV I-90 LL LINE STA 103+50
- CCTV I-90 LL LINE STA 252+75
- CCTV I-90 LL LINE STA 266+75
- CCTV I-90 LR LINE STA 277+75
- CCTV I-90 LR LINE STA 308+50
- CCTV I-90 LL LINE STA 375+75

Existing CCTV camera equipment removed within the Project limits, including, but not limited to, cameras, poles, cabinets, and associated hardware, shall be removed and salvaged to WSDOT, and replaced with new equipment if required.

The Design-Builder shall notify WSDOT when the installation of the CCTV hardware is complete.

2.18.4.4.1 CCTV Camera Pole

Refer to Section 2.13 and the WSDOT *Northwest Region ITS Details* for structural and foundation requirements.

The Design-Builder shall galvanize the CCTV camera poles on I-5 and SR 520 and I-90 in accordance with the Standard Specifications, and powder coat the CCTV camera poles on I-90 in accordance with the Standard Specifications and the I-90 Architectural Design standards (Appendix L1).

New camera poles shall be used for new camera installations or replacement cameras in new locations. Existing poles may be used where existing cameras are replaced in the same location.

2.18.4.4.1.1 Access to CCTV Camera Pole

Refer to Section 2.11 for maintenance access requirements.

2.18.4.4.2 CCTV Control Cabinet

The Design-Builder shall provide CCTV control cabinets ground-mounted on pads and shall provide all necessary tools and equipment to connect the cabinets to the cameras, electrical source, and communications system.

2.18.4.5 DYNAMIC MESSAGE SIGNS (DMS)

The Design-Builder shall provide DMS according to the Standard Specifications. Section 8-20.1 of the Standard Specifications is supplemented with the following:

The Design-Builder shall furnish, install and test all materials and equipment necessary to complete in place the dynamic message sign (DMS) system, and when required, the modification of such an existing system, including variable message signs (VMS), side-mount dynamic message signs (SDMS) and lane control signs (LCS).

The Design-Builder shall furnish and install DMS at the following locations, which are also shown in the Conceptual Plans (Appendix M1). The locations of structure-mounted DMS signs shall not vary from the locations given in the table below and shown in the conceptual plans.

RTE	Direction	MP	Structure Loc. No.	SIGNS		
				LCS	SDMS	VMS
I-5	NB	157.23	5-01	5	0	1
I-5	NB	157.94	5-02	5	2	0
I-5	NB	158.42	5-03	5	0	1
I-5	NB	158.95	5-04	5	2	0
I-5	NB	159.43	5-05	5	0	1
I-5	NB	160.08	5-06	5	2	0
I-5	NB	160.57	5-07	5	0	1
I-5	NB	161.08	5-08	5	2	0
I-5	NB	161.45	5-09	5	0	1
I-5	NB	162.02	5-10	5	2	0
I-5	NB	162.48	5-11	5	0	1
I-5	NB	162.94	5-12	4	2	0
I-5	NB	163.48	5-13	5	0	1
I-5	NB	163.93	5-14	5	2	0
I-5	NB	164.46	5-15	4	0	1
SR 520	EB	0.19	520-SS01	3	0	0
SR 520	EB	0.91	520-SS02	2	0	1
SR 520	WB	0.93	520-SS03	2	0	1
SR 520	EB	1.23	520-SS04	2	1	0
SR 520	WB	1.24	520-SS05	2	1	0
SR 520	EB	1.51	N/A	0	1	0
SR 520	EB, WB	4.00	520-06	4	2	0
SR 520	EB, WB	4.45	520-07	5	2	0
SR 520	EB, WB	4.93	520-08	5	2	0
SR 520	EB, WB	5.49	520-09	5	2	0
SR 520	EB, WB	6.08	520-10	5	2	0
SR 520	EB	6.53	520-11	4	2	0
SR 520	WB	6.83	520-12	3	0	1
SR 520	WB	7.32	520-13	4	2	0
SR 520	WB	7.81	520-14	3	0	1
I-90	EB	2.81	90-01	4	0	1
I-90	WB	3.22	90-02	5	0	1
I-90	EB	3.31	90-SS03	3	2	0
I-90	EB	4.36	90-SS06	3	2	0
I-90	WB	4.51	90-07	3	0	1
I-90	EB	5.88	90-SS09.5	0	0	1
I-90	WB	5.97	90-10	3	0	1
I-90	EB	6.04	90-SS11	3	0	0
I-90	EB	7.02	90-SS14	3	1	0
I-90	WB	7.03	90-SS15	3	0	1
I-90	EB	7.70	90-SS17	3	1	0
I-90	WB	7.73	90-SS16	4	2	0
I-90	WB	8.41	90-19	4	2	0

RTE	Direction	MP	Structure Loc. No.	SIGNS		
				LCS	SDMS	VMS
I-90	EB	8.43	90-20	3	2	1
I-90	EB	9.01	90-22	4	0	1
I-90	WB	9.03	90-21	6	2	0
I-90	EB	9.48	90-23	4	2	0
I-90	WB	9.49	90-24	3	0	1
I-90	WB	9.53	N/A	0	1	0
I-90	WB	9.97	90-25	4	2	0
I-90	EB	10.10	90-26	4	0	1
I-90	WB	10.51	90-27	6	0	1
I-90	EB	10.59	90-28	6	2	0
I-90	WB	11.18	90-29	5	0	1
I-90	EB	11.31	90-30	5	0	1
I-90	WB	11.73	90-31	4	0	1

The Design-Builder shall position all DMS signs to achieve the optimum sight line and maximum visibility for the vehicles approaching the sign. Each sign shall be legible by motorists from 1,000 feet away.

The Design-Builder shall mount the DMS to the support structure. The Design-Builder shall position the signs to allow motorists to view the signs, and take appropriate actions based on the sign messages; and to advise travelers of adverse road conditions. WSDOT TSMC personnel will remotely operate the messages on the signs.

The Design-Builder shall consider the half-power sign-viewing angle for the DMS location and install the DMS in accordance with manufacturer's recommendations and this Section.

Refer to Section 2.13 for additional DMS requirements related to structural mounting.

2.18.4.5.1 Lane Control Signs (LCS)

The Design-Builder shall mount each LCS above a lane in order to display speed and lane usage information to drivers. Signs shall appear centered over the lane to drivers in the lane.

2.18.4.5.1.1 Sign Housing

The nominal external dimensions of the LCS sign shall not exceed 6 feet square. The design dead load of the housing and contents shall not exceed 350 lbs.

LCS housing exterior sheet seams shall be continuously welded and waterproof. Maintenance access into the signs shall be provided.

LCS housings shall be constructed to present a clean, neat appearance, and the equipment located within shall be protected from rain, snow, dirt, and corrosion.

The front of the LED display matrix shall be completely covered with polycarbonate sheeting that is weather tight, ultraviolet (UV) light protected, non-glare, and which has a minimum thickness of 0.17 inch. To achieve maximum display contrast and legibility, the outside of the polycarbonate sign face shall be fully covered with a mask, which is formed from aluminum sheeting. The mask shall have a minimum thickness of 0.09 inch and shall contain a circular opening for each pixel. The openings shall not hinder the LED viewing

angle. All exposed metal on the LCS front face, which is visible to viewing motorists, shall be coated with black Kynar 500 resin or an equivalent oven-fired fluoropolymer-based coating having a minimum outdoor service life of 20 years. This shall include the aluminum face mask, the aluminum border outside the LED display matrix, and all the mounting and assembly hardware.

All LCS equipment, components, modular assemblies and other materials which are part of the LCS sign shall be removable, transportable, and capable of being installed as a single unit by a single technician utilizing a one-person aerial lift truck. LCS structural members are not included in this requirement. Sign housing shall include 2 lifting points.

Ribbon cable shall be protected at all points of physical contact to prevent cable insulation rub-through from road induced vibration in the sign framework.

The interior LCS environment shall be monitored by the sign controller. The sign housing shall be designed to maintain the internal LCS temperature at or below +140°F when the outdoor ambient temperature is at or below +115°F.

2.18.4.5.1.1.1 Internal Temperature Sensor

The LCS shall contain an internally mounted temperature sensors which the sign controller continuously monitors. The sign controller shall automatically shut down the LED display whenever the sensor indicates that LED board temperature has exceeded a user-programmable threshold. The sign controller shall automatically restart the LED display whenever the LED board temperature falls below a user-programmable threshold. Sensor temperatures and LCS shutdown/restart events shall be reportable to the DMS Central Software.

2.18.4.5.1.1.2 Sign Mounting Hardware

LCS sign mountings shall be easily movable to facilitate the horizontal realignment of the signs. Sign communication and power connectors shall attach and disconnect easily and quickly to minimize the time required to replace the sign with another of the same type. Signs shall be secured and impervious to tampering.

2.18.4.5.1.2 Ground Mounted Field Cabinet

LCS ground-mounted field cabinets shall meet all of the requirements in Section 2.18.5.11.3.

2.18.4.5.1.3 Control System

The Design-Builder shall provide LCS control systems according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

The Design-Builder shall provide the control system for each LCS. The LCS control system shall include all excavation, backfill, conduit, wiring, and all hardware associated with providing power and communication between the local control cabinet and the sign. Each VMS shall be fully compatible with and completely capable of being operated by WSDOT's computer system without requiring additional software or software modifications to be made to WSDOT's computer system.

LCS control cable shall be installed between each LCS ground control cabinet and each sign cabinet.

The Design-Builder shall furnish and install LCS control cable and all necessary cables and accessories in accordance with the manufacturer's specifications, to make the LCS operational.

The Design-Builder shall pull the LCS control cable between the ground control cabinet and the sign cabinet, and terminate it.

The Design-Builder shall provide 10 feet of coiled slack cable in the ground control cabinet, and 40 feet in the sign cabinet. If the sign cabinet does not contain space for coiled slack cable, it shall be coiled in the sign gantry or other nearby location.

2.18.4.5.1.3.1 Circuit Boards

The manufacturer's submittal shall include a schematic diagram for each type of circuit board used in the sign display and control system.

2.18.4.5.1.3.2 Display LEDs

LEDs used in the LCS display shall be from one LED manufacturer and of one part number.

The rated brightness per LED shall be a minimum of 3 candelas.

LEDs shall be pre-sorted by the LED manufacturer for luminous intensity and color. LEDs used shall be obtained from a one-bin luminous intensity sort. A bin is defined such that when all LEDs from a given bin are driven with an identical forward current, the dimmest LED shall emit no less than half the luminous intensity of the brightest LED in the bin.

The minimum half-power viewing angle shall be 30°. Half-power viewing angle is defined such that, at a given distance from the LED, luminous intensity measured at any point at an angle of 15° from the LEDs center axis shall be no less than one-half the luminous intensity measured directly on the LEDs center axis.

2.18.4.5.1.3.3 LED Modules

The LED Modules shall meet the following requirements:

- The failure of an LED string shall not cause a change in the forward current of any other LED string, nor shall it cause the failure of any other LED string. Similarly, the failure of any LED pixel shall not cause the failure of any other pixel in the LCS.
- An independent laboratory that utilizes equipment and procedures traceable to NIST standards shall certify LED pixel intensity. The independent laboratory's certification report shall be provided with the manufacturer's submittal. This report shall contain the laboratory name, address, and contact information. The report shall also contain a description of the test procedure and test equipment used, test personnel name(s), pixel intensity test results, date(s) the LCS manufacturer's LED pixel samples were tested, and the LCS manufacturer's name.
- Any variations in discrete LED color and intensity shall be thoroughly dispersed throughout the entire display, thereby creating a uniform visual appearance of both color and intensity.
- The sign controller shall be able to measure the forward current of each LED pixel and determine if the pixel is operating normally. This information shall be stored in a read-only NTCIP object.

2.18.4.5.1.3.4 LED Intensity Control System

The LCS shall be equipped with an LED intensity control system. The control shall support both manual and automatic control. The LCS controller shall contain a read-write NTCIP object that adjusts the maximum usable intensity threshold.

2.18.4.5.1.3.5 Display Driver Circuit Board

The LED display shall have a minimum refresh rate of 100 frames per second. The manufacturer's submittal shall provide calculations that prove that the display conforms to this requirement.

2.18.4.5.1.3.6 Power Supplies

Each LCS shall be equipped with a power supply. The LCS sign controller shall be capable of monitoring the operational status ("normal" or "failed") of each individual power supply.

A copy of the power supply manufacturer's data sheet and its UL product card shall be provided with the manufacturer's submittal.

2.18.4.5.1.3.7 Transient Current Protection

LCS and sign controller signal and power inputs shall be protected from electrical spikes and transients. Digital input and output lines from the VMS to the control equipment shall be protected.

2.18.4.5.1.4 Sign Control Software

LCS shall meet all of the requirements of Section 2.18.5.11.5. In addition, LCS shall meet the requirements below.

2.18.4.5.1.4.1 Font

1. Provide manufacturer's standard font set, including single and double stroke fonts.
2. The sign shall support all NTCIP 1203 v2 font objects.
3. The sign shall support all NTCIP 1203 v2 MULTI tags.
4. Display Requirements:
    a. Height: 9 inches and 18 inches.
    b. Characters per Line: 6.
    c. Number of Lines:
        - 2 Lines of 9 inch characters + 1 Line of 18 inch characters.
        - 4 Lines of 9 inch characters.

2.18.4.5.1.4.2 Pixels

1. Full Matrix: minimum 42 wide by 42 high.
2. Pitch: maximum 1.4 inches.
3. Color Display: Red, Green, Yellow, and White.

2.18.4.5.1.4.3 Characters

1. Characters to be provided shall be Hex 20 to 7E inclusive of the ASCII Character Set.

2.18.4.5.1.4.4 Message Set

WSDOT will supply the Design-Builder with a message set at the conclusion of the sign design workshop (see Section 2.18.3.1.1.1). The signs shall store this message set in permanent memory as required in Section 2.18.5.11.4.9

2.18.4.5.2 Side Mounted Dynamic Message Signs (SDMS)

SDMS will be mounted in various locations in order to display the speed limit and supplementary information to drivers.

2.18.4.5.2.1 Sign Housing

The nominal external dimensions of the SDMS sign shall not exceed 7 feet, 2 inches square. The dead load of the housing and contents shall not exceed 700 lbs.

SMDS housing exterior sheet seams shall be continuously welded and waterproof. Maintenance access into the signs shall be provided.

SDMS housings shall be constructed to present a clean, neat appearance, and the equipment located within shall be protected from rain, snow, dirt, and corrosion.

The front of the LED display matrix shall be completely covered with polycarbonate sheeting that is weather tight, ultraviolet (UV) light protected, non-glare, and which has a minimum thickness of 0.17 inch. To achieve maximum display contrast and legibility, the outside of the polycarbonate sign face shall be fully covered with a mask, which is formed from aluminum sheeting. The mask shall have a minimum thickness of 0.09 inch and shall contain a circular opening for each pixel. The openings shall not hinder the LED viewing angle. All exposed metal on the DMS front face, which is visible to viewing motorists, shall be coated with black Kynar 500 resin or an equivalent oven-fired fluoropolymer-based coating having a minimum outdoor service life of 20 years. This shall include the aluminum face mask, the aluminum border outside the LED display matrix, and all the mounting and assembly hardware.

All SDMS equipment, components, modular assemblies and other materials located within the SDMS housing shall be removable, transportable, and capable of being installed as a single unit by a single technician utilizing a one-person aerial lift truck. SDMS structural members are not included in this requirement.

Ribbon cable shall be protected at all points of physical contact to prevent cable insulation rub-through from road induced vibration in the sign framework.

The interior SDMS environment shall be monitored and controlled by the sign controller. Environmental control shall be designed to maintain the internal SDMS temperature at or below +140°F when the outdoor ambient temperature is at or below +115°F.

2.18.4.5.2.1.1 Sign Housing Environmental Control

The SDMS sign housing shall meet all of the environmental control requirements of Sections 2.18.5.11.1.3.1 through 2.18.5.11.1.3.4.

2.18.4.5.2.1.2 Sign Mounting Hardware

SDMS sign communication and power connectors shall attach and disconnect easily and quickly to minimize the time required to replace the sign with another of the same type. Signs shall be secured and impervious to tampering.

2.18.4.5.2.2 Ground Mounted Field Cabinet

SDMS ground-mounted field cabinets shall meet all of the requirements in Section 2.18.5.11.3.

2.18.4.5.2.3 Control System

The Design-Builder shall connect the two SDMSs at I-90 LR LINE Sta 57 to the existing tunnel safety system for the Mt. Baker Tunnel. The SDMSs must be installed such that they functionally replace the existing TNL signs that will be removed as part of this Contract.

The Design-Builder shall provide SDMS control systems according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

The Design-Builder shall provide the control system for each SDMS. The SDMS control system shall include all excavation, backfill, conduit, wiring, and all hardware associated with providing power and communication between the local control cabinet and the sign. Each SDMS shall be fully compatible with and completely capable of being operated by WSDOT's computer system without requiring additional software or software modifications to be made to WSDOT's computer system.

SDMS control cable shall be installed between each SDMS ground control cabinet and each sign cabinet.

The Design-Builder shall furnish and install SDMS control cable and all necessary cables and accessories in accordance with the manufacturer's specifications, to make the SDMS operational.

The Design-Builder shall pull the SDMS control cable between the ground control cabinet and the sign cabinet, and terminate it.

The Design-Builder shall provide 10 feet of coiled slack cable in the ground control cabinet, and 40 feet in the sign cabinet. If the sign cabinet does not contain space for coiled slack cable, it shall be coiled in the sign gantry or other nearby location.

2.18.4.5.2.3.1 Circuit Boards

The manufacturer's submittal shall include a schematic diagram for each type of circuit board used in the sign display and control system.

2.18.4.5.2.3.2 Display LEDs

LEDs used in the SDMS display shall be from one LED manufacturer and of one part number.

The rated brightness per LED shall be a minimum of 3 candelas.

LEDs shall be pre-sorted by the LED manufacturer for luminous intensity and color. LEDs used shall be obtained from a one-bin luminous intensity sort. A bin is defined such that

when all LEDs from a given bin are driven with an identical forward current, the dimmest LED shall emit no less than half the luminous intensity of the brightest LED in the bin.

The minimum half-power viewing angle shall be 30°. Half-power viewing angle is defined such that, at a given distance from the LED, luminous intensity measured at any point at an angle of 15° from the LEDs center axis shall be no less than one-half the luminous intensity measured directly on the LEDs center axis.

2.18.4.5.2.3.3 LED Modules

The LED Modules shall meet the following requirements:

- The failure of an LED string shall not cause a change in the forward current of any other LED string, nor shall it cause the failure of any other LED string. Similarly, the failure of any LED pixel shall not cause the failure of any other pixel in the SDMS.
- An independent laboratory that utilizes equipment and procedures traceable to NIST standards shall certify LED pixel intensity. The independent laboratory's certification report shall be provided with the manufacturer's submittal. This report shall contain the laboratory name, address, and contact information. The report shall also contain a description of the test procedure and test equipment used, test personnel name(s), pixel intensity test results, date(s) the SDMS manufacturer's LED pixel samples were tested, and the SMDS manufacturer's name.
- Any variations in discrete LED color and intensity shall be thoroughly dispersed throughout the entire display, thereby creating a uniform visual appearance of both color and intensity.
- The sign controller shall be able determine if the pixel is operating normally. This information shall be stored in a read-only NTCIP object.

2.18.4.5.2.3.4 LED Intensity Control System

The SDMS shall be equipped with an LED intensity control system. The control shall support both manual and automatic control. The SDMS controller shall contain a read-write NTCIP object that adjusts the maximum usable intensity threshold.

2.18.4.5.2.3.5 Display Driver Circuit Board

The LED display shall have a minimum refresh rate of 100 frames per second. The manufacturer's submittal shall provide calculations that prove that the display conforms to this requirement.

2.18.4.5.2.3.6 Power Supplies

Each SDMS shall be equipped with a power supply. The SDMS sign controller shall be capable of monitoring the operational status ("normal" or "failed") of each individual power supply.

A copy of the power supply manufacturer's data sheet and its UL product card shall be provided with the manufacturer's submittal.

2.18.4.5.2.3.7 Transient Current Protection

LCS and sign controller signal and power inputs shall be protected from electrical spikes and transients. Digital input and output lines from the VMS to the control equipment shall be protected.

2.18.4.5.2.3.8 Sign Controller

Controllers shall meet all of the requirements of Section 2.18.5.11.4.9.

2.18.4.5.2.4 Sign Control Software

SDMS shall meet all of the requirements of Section 2.18.5.11.5. In addition, SDMS shall meet the requirements below.

2.18.4.5.2.4.1 Font

1. Provide manufacturer's standard font set, including single- and double-stroke fonts.
2. The sign shall support all NTCIP 1203 v2 font objects.
3. The sign shall support all NTCIP 1203 v2 MULTI tags.
4. Display Requirements
    a. Character Height: 9 inches and 18 inches.
    b. Characters per line: 8 characters each 18 inches high.
    c. Number of lines: 4 lines of 18 inch high characters.

2.18.4.5.2.4.2 Pixels

1. Full Matrix: 52 high by 52 wide.
2. Pitch: 1.4 inches maximum.
3. Color Display: Full Color.

2.18.4.5.2.4.3 Characters

1. Characters to be provided shall be Hex 20 to 7E inclusive of the ASCII Character Set.

2.18.4.5.2.4.4 Message Set

WSDOT will supply the Design-Builder with a message set at the conclusion of the sign design workshop (see Section 2.18.3.1.1.1). The signs shall store this message set in permanent memory as required in Section 2.18.5.11.4.9.

2.18.4.5.3 VMS Signs

VMS shall meet all of the requirements of 2.18.5.11.1, as well as the requirements below.

2.18.4.5.3.1 Pixels

The maximum pitch shall be 2.6 inches.

2.18.4.5.3.2 Characters

Characters to be provided shall be Hex 20 to 7E inclusive of the ASCII Character Set.

2.18.4.5.4 Tunnel (TNL) Signs

The Design-Builder shall remove and salvage two existing TNL signs in the I-90 portion of the project, at approximate LR LINE Sta 57. The Design-Builder shall remove the associated sign posts and foundations, backfill the foundation voids, and remove

conductors that are no longer needed to operate the removed TNL signs. The Design-Builder shall determine if the TNL sign controller cabinet serves only the two TNL signs or other items as well. If the cabinet serves only the two TNL signs that will be removed, the Design-Builder shall remove and salvage the controller cabinet, remove the foundation, and backfill the void. If the cabinet also serves other items, the Design-Builder shall remove and salvage the TNL controller equipment and preserve the cabinet and other equipment therein. The Design-Builder shall remove and abandon conduits connecting dismantled TNL cabinets to junction boxes and vaults, and plug entry holes left in the vaults with concrete.

The Design-Builder shall remove and salvage existing TNL equipment, including, but not limited to, signs, poles, cabinets, controller equipment, and electrical and communications equipment associated with TNL signs in accordance with this RFP.

2.18.4.5.5 Variable Speed Limit (VSL) Signs

The Design-Builder shall remove and salvage all existing VSL signs in the I-90 portion of the project. The Design-Builder shall remove the associated sign posts and foundations, backfill the foundation voids, and remove conductors that are no longer needed to operate the removed VSL signs. For all controller cabinets that serve VSL signs in the I-90 portion of the project, the Design-Builder shall determine if the cabinet serves only VSL signs or other items as well. If a cabinet serves only VSL signs that will be removed, the Design-Builder shall remove and salvage the controller cabinet, remove the foundation, and backfill the void. In locations where controller cabinets are removed, the Design-Builder shall install new distribution fiber between the last downstream cabinet, and first upstream cabinet of the removal location, to provide for a continuous fiber connection.

If a cabinet also serves other items, the Design-Builder shall remove and salvage the VSL controller equipment and preserve the cabinet and other equipment therein. The Design-Builder shall remove and abandon conduits connecting dismantled VSL cabinets to junction boxes and vaults, and plug entry holes left in the vaults with concrete.

The Design-Builder shall remove and salvage existing VSL equipment, including, but not limited to, signs, poles, foundations, cabinets, controller equipment, and electrical and communications equipment associated with VSL signs in accordance with this RFP.

2.18.4.5.6 Access to DMS

The Design-Builder shall provide access for maintenance vehicles such as bucket trucks to park adjacent to the structure for repairs to the DMS, and to provide access back on to the freeway. Refer to Section 2.11 for specific maintenance access requirements.

2.18.4.5.7 DMS Mounting

2.18.4.5.7.1 Mounting Height

Refer to Section 2.19 for DMS mounting height requirements.

2.18.4.5.7.2 Structural Analysis of DMS Mounting Structures

No structural analysis of signbridges installed as part of the following two WSDOT contracts will be required if signs meet the dimensional and weight restrictions in Sections 2.18.4.5.1.1 (LCS), 2.18.4.5.2.1 (SDMS) and 2.18.5.11.1.3 (VMS).

- WSDOT Boeing Access Road to I-90 I/C Sign Bridges.

- WSDOT I-90 and SR 520 Lake Washington Congestion Management Sign Bridges.

The Design-Builder shall perform a structural analysis of all other structures to which signs will be mounted. Signs mounted on signbridges may exceed the dimensional and weight restrictions above if an analysis of the signbridge by the Design-Builder meets the structural requirements of Section 2.13. All structural analyses shall meet the design and calculation requirements described in Section 2.13.

2.18.4.6 COMMUNICATION CONDUIT SYSTEM

Section 8-20.1 of the Standard Specifications is supplemented with the following:

The Design-Builder shall furnish and install the facilities used to mechanically accommodate the communication components of the ITS System. The Design-Builder shall be responsible for interfacing with the existing communications system and satisfying system compatibility with regard to the existing facilities and this communications system extension. Conduit shall be supplied as a system from a single manufacturer providing all of the steel and PVC conduit; all required fittings, terminations, and other installation accessories; all in accordance with the Standard Specifications and this Section.

Each controller cabinet mounting pad shall be provided with 2-3.5” conduits for cables.

All conduits shall be sized according to WSDOT design guidelines (26% fill for new and 40% fill for existing)

Refer to Section 2.16 for additional requirements.

2.18.4.7 COMMUNICATION CABLES AND INTERFACES

The Design-Builder shall provide communication cables and interfaces according to the Standard Specifications. Section 8-20.1 of the Standard Specifications is supplemented with the following:

The Design-Builder shall furnish, install and test all materials and equipment necessary to complete in place the communication cable and interface system and, when specified, the modification of such an existing system.

Communication hardware typically consists of modems, servers, network connections, cables, connectors, and switches. The backbone of the communication network shall be Single-Mode Fiber-Optic (SMFO) cable.

The Design-Builder shall furnish and install materials and equipment such that the highway ITS communications network is continuous throughout the Project, and provides a smooth transition to the existing communication network at each end.

The Design-Builder shall provide a communication cable and interface system to all ITS elements along I-5, I-90, and SR520 within the Project limits using existing and new SMFO and TWP cable as necessary.

The Design-Builder shall submit a Communications Cutover Plan prior to beginning work on the ITS. The Communications Cutover Plan shall include the following:

1. Location of all existing devices to be cut over and the devices to which they will be cut over.
2. Schedule date of cutover and testing.
3. Tests to be performed.

4. Equipment to be used for the testing.
5. List of Project contacts (including phone numbers) for the Design-Builder and WSDOT staff.

An updated version of the Communications Cutover Plan shall be submitted in Word format with each final plan submittal that includes ITS Work. The Communications Cutover Plan shall be updated as necessary with each design change affecting testing type and location.

2.18.4.7.1 Existing System

The existing communication cable and interface system is described below.

2.18.4.7.1.1 I-5 Corridor:

- 1-48 SMFO cable for mainline (backbone) communications.
- 1-24 SMFO for video distribution (SR900 to Albro Pl.).
- 1-25 TWP for data distribution.
- 1-36 SMFO for data distribution (Dearborn FTC to CCTV Cabinet at Spokane St.).

2.18.4.7.1.2 I-90 Corridor:

Dearborn FTC to Mt. Baker Tunnel Control Room

This segment includes the following cables:

- 1-24 SMFO for distribution.
- 1-25 TWP for distribution.
- 1-36 SMFO mainline (backbone) communications.

Mt. Baker Tunnel Control Room to Mercer Island Lid Control Room

This segment includes the following cables:

- 1-36 SMFO mainline (backbone) communications.
- Other distribution or drop communications, not crossing bridge.

Mercer Island Lid Control Room to Factoria Hub

This segment includes the following cables:

- 1-24 SMFO for distribution.
- 1-25 TWP for distribution.
- 1-48 SMFO mainline (backbone) communications.

Factoria Hub to East End of Project

This segment includes the following cables:

- 1-36 SMFO for distribution.
- 1-25 TWP for distribution.
- 1-48 SMFO mainline (backbone) communications.

2.18.4.7.1.3 SR520 Corridor

- 1-24 SMFO cable for mainline (backbone) communications.
- 1-12 MMFO for video distribution.
- 1-25 TWP for data distribution.

2.18.4.7.2 Distribution System

The Design-Builder shall perform the following:

- Ensure the functionality of existing communications during the construction period at all times;
- Design and construct a fully functioning and operable communications network to serve the highway ITS components along the Project.
- Propose solutions to achieve design objectives based on WSDOT functional, technical, operational, and maintenance requirements.

The Design-Builder shall not substitute, apply any part, or attach any piece of equipment contrary to the manufacturer's recommendations and standard practices.

The Design-Builder shall not use leased telephone lines, microwave, or wireless communications for permanent communications systems.

2.18.4.7.3 Twisted Pair (TWP) Cable

The Design-Builder may need to remove TWP cables where conduit capacity is needed. If a TWP cable is removed from a cabinet or cut, the cable ends shall be terminated inside of a cabinet or the cable shall be replaced. No underground splices of TWP cable shall be allowed.

2.18.4.7.4 Fiber-Optic Cable

The Design-Builder shall furnish and install new fiber optic cable for the Project and shall provide a temporary fiber optic cable system, if required, to provide a continuous and complete operation of the ITS distribution and transmission system.

The Design-Builder shall furnish, install, test, and maintain SMFO cable for trunk and distribution, including, but not limited to, the following:

- New 48-strand SMFO mainline cable between the Tukwila Hub and the Dearborn FTC, connecting to all new and existing devices with new preterminated patch panels.
- New 48-strand SMFO distribution cable between the Mercer Island Lid Control Room to the Factoria Hub, on the I-90 Corridor, connecting all new and existing ITS devices with new preterminated patch panels.
- New 48-strand SMFO distribution cable on the I-90 Corridor west of the Mercer Island Lid Control Room and east of the Factoria Hub, in various lengths, as needed to connect new ITS devices to the existing distribution system. The existing cable may be used provided it is undamaged and meets all requirements of this RFP, including slack requirement.

- New 48-strand SMFO distribution cable between the West Highrise CCTV cabinet on the SR520 floating bridge and the Roanoke Hub, connecting to all new and existing ITS devices with new preterminated patch panels.
- New 48-strand SMFO distribution cable between the east end of the SR520 floating bridge and the Northup Hub, connecting to all new and existing ITS devices with new preterminated patch panels.

The Design-Builder shall provide preterminated patch panels at the following locations:

- All new ITS cabinets.
- All existing ITS cabinets that will be connected to new fiber mainline distribution cable.
- Tukwila Hub.
- Roanoke Hub.
- Factoria Hub.
- Mount Baker Hub.
- Mercer Island Hub.

The Design-Builder shall install all cable within existing backbone conduit unless new conduit is indicated on the plans (Appendix M1).

The Design-Builder shall also install any ancillary fiber optic cables necessary to make the system functional.

All fiber-optic cable shall be designed and routed through pull boxes and cable vaults. Fiber-optic cable shall not be routed through junction boxes. The Design-Builder shall remove existing multi-mode and single-mode fiber-optic cables and twisted pair cables that are no longer needed to operate the ITS.

Splices in distribution cable shall be performed inside cable vaults placed in the vicinity of ITS cabinets. The splices shall be connected to new ITS cabinets with pre-terminated cables.

2.18.4.7.5 Fiber-Optic Connection Components

The Design-Builder shall provide all components necessary to ensure connections and splices within the communications system, including, but not limited to, the following:

- Indoor patch cords.
- LC-UPC fiber connectors.
- Pre-terminated patch panels.
- Outdoor fiber splice closures.
- Outer enclosures.
- Splice closures, which allow re-entry of fiber-optic cable.
- Splice trays.

2.18.4.7.5.1 Patch Panels

The Design-Builder shall provide new pre-terminated patch panels in each ITS cabinet where a fiber optic cable is installed or connected to. The Design-Builder shall upgrade any existing cabinet fiber distribution panels to make them compatible with new distribution cable. The Design-Builder shall provide new pre-terminated patch panels in hubs for new distribution cable.

The Design-Builder shall provide additional matching fiber distribution components as needed (e.g., splice trays, patch panel, and patch cords).

2.18.4.8 VIDEO, VOICE, AND DATA DISTRIBUTION AND TRANSMISSION SYSTEM

The Design-Builder shall provide a video, voice, and data distribution and transmission system according to the Standard Specifications. Section 8-20.1 of the Standard Specifications is supplemented with the following:

The Design-Builder shall furnish and install all materials and equipment necessary to complete in place the video, voice, and data distribution and video transmission systems, and when specified, the modification of such existing systems.

The Design Builder shall furnish and install all the necessary fiber-optic distribution and transmission system equipment to provide a fully-functioning ITS, including, but not limited to:

- Fiber-optic communications between each device and the ITS HUB.
- Fiber-optic communications between the ITS HUB and the TSMC in Shoreline, Washington.
- New communications equipment provided as necessary.

At minimum the each of the following types of cabinet/equipment receiving new fiber-optic cable, whether new or existing, shall be provided with the following equipment:

- Data Station Cabinet: 1 RuggedCom RMC30 unit and 1 RuggedCom RMC40 unit.
- Each Wavetronix Data Station Cabinet: One (1) RuggedCom RMC40 unit (WX-SC-301), and 1 Click! 301 – serial to Ethernet converter (WX-SC-301).
- Each CCTV Camera: 1 Optelecom Video/Data Transceiver.
- DMS Field Cabinet: 1 RuggedCom RS900 per every 6 controller.
- 1 Pre-terminated patch panel for each cable installed into the cabinet

All material and equipment shall be compatible with the existing ITS system.

The new ITS shall be connected to the single-mode fiber-optic system with all new equipment.

2.18.4.9 COMMUNICATION HUBS

The Design-Builder shall be responsible for providing within each communication hub all equipment necessary to support the new and upgraded field equipment. This will include but not be limited to, pre-terminated patch panels, Ethernet switches, video receivers, video multiplexors, data modems, and all cabling, mounting hardware, and accessories required

to complete a fully functional system, including the following in the Tukwila, Roanoke, Factoria, Mount Baker and Mercer Island hubs:

- 1 RuggedCom RS900 unit for each direction of communication into or out of the hub.
- A number of Video/Data Receivers equal to the number of CCTV cameras served by the hub.
- 1 Decimux transmitter per every of 10 cameras or part thereof served by the hub.
- 1 Decimux receiver for every Decimux transmitter, to be delivered to the Engineer for installation at the TMSC.
- 1Vicon 422 Combiner per every 10 cameras or part thereof served by the hub.
- 1 Optelecom Hub Chassis per every 10 Video/Data Receivers or part thereof.
- 2 Optelecom hub chassis Power Supplies per every 10 Video/Data Receivers or part thereof.
- 1 Pre-terminated patch panel for each cable installed into the hub.

2.18.4.10 ELECTRICAL SERVICE

Refer to Section 2.16.

2.18.4.10.1 Furnished and Installed Service Equipment

The Design-Builder shall furnish and install all required electrical service equipment and transformers. Refer to Section 2.16 for electrical services. Appendix M1 depicts conceptual locations for ITS transformers. Refer to Appendix M3 for conceptual breaker schedules.

2.18.4.10.2 Coordination with Power Utility

Refer to Section 2.16 for electrical services.

2.18.5 CONSTRUCTION REQUIREMENTS

The Design-Builder shall design the ITS as a whole before installation of any individual field component, including temporary and permanent ITS. The Design-Builder shall notify WSDOT a minimum of 7 Calendar Days in advance of staking locations for ITS devices. The Design-Builder shall not make final connections of the newly installed or temporary ITS components to the existing system until receiving approval from WSDOT.

The Design-Builder shall use stainless steel mounting hardware such as bolts, nuts, washers, and external hinges on vaults, cabinets, shelters, junction boxes, and other outdoor ITS devices. The Design-Builder shall use only components designed for 10 or more years of industrial use.

All material, equipment, and components furnished by the Design-Builder shall be new (within 12 months from the date of manufacture), of the latest design and manufacture, in an operable condition at the time of delivery and installation, and compatible with the existing system.

The finish coat for all ITS cabinets shall be powder coated in accordance with manufacturer's recommendations.

The finish coat for all ITS poles shall be painted or powder coated in accordance with this Section.

2.18.5.1 REPAIR PARTS

During construction, the Design-Builder shall identify local vendors for repair parts for all ITS components, so that required parts may be obtained within 4 hours. The Design-Builder shall provide a list of vendors to WSDOT within 60 Calendar Days of execution of the Contract.

2.18.5.2 MATERIALS AND FABRICATION

The Design-Builder shall round and smooth sharp corners and edges on all ITS components that the Design-Builder furnishes and installs.

2.18.5.3 UTILITY LOCATES

Refer to Section 2.16.

2.18.5.4 VEHICLE DETECTION

The Design-Builder shall provide and install induction loop detectors, ,non-intrusive detectors, and all associated equipment required to create a functional detection system for permanent detection in accordance with this Section.

The Design-Builder shall consult with the ITS Implementation Engineer to determine the distance when the distance is specified as "varies" in the *WSDOT Northwest Region ITS Design Guide*.

All loop lead-in wires shall be labeled with the loop name.

2.18.5.4.1 Loop Detectors

2.18.5.4.1.1 Loop Sealant

The Design-Builder shall seal loops according to the Standard Specifications. Section 9-29.18 of the Standard Specifications is supplemented with the following:

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

1. RAI Pro-Seal 6006EX.
2. QCM EAS-14.
3. 3M Black 5000.

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

1. 3M Black 5000.
2. Gold Label Flex 1P.
3. QCM EAS-14.

Installation shall conform to the manufacturer's recommendations.

2.18.5.4.1.2 Rack-Mounted Vehicle Detectors

The Design-Builder shall provide rack-mounted vehicle detectors according to the Standard Specifications. Section 9-20.13 of the Standard Specifications is supplemented with the following:

The Design-Builder shall provide, install and connect inductive loop detectors manufactured by Reno A&E in all existing cabinets that have new loops installed or existing loops replaced. .In each such cabinet, all existing rack-mounted vehicle detectors shall be removed, and new detectors shall be installed for all loops served by that cabinet. One rack-mounted vehicle detector shall be installed for every two loops.

1. Equipment Model Numbers:

   332/170 type with solid-state outputs and TrueCount outputs (C-1101-SS)

2. Manufacturer Information:

   Reno A&E
   4655 Aircenter Circle
   Reno, NV 89502
   Telephone: (775) 826-2020
   www.renoae.com

2.18.5.4.1.3 Loop Nameplates

The Design-Builder shall provide loop nameplates according to the Standard Specifications. Section 8-20.3(8) of the Standard Specifications is supplemented with the following:

Existing cabinets with new loops installed shall have all of the existing loop nameplates removed from the display panel. The display panel shall be cleaned of residue and debris. New nameplates shall be installed according to the new loop layout. The new nameplates shall be in accordance with the contract details and specifications.

2.18.5.4.1.4 Induction Loop Vehicle Detectors

The Design-Builder shall provide induction loop vehicle detectors according to the Standard Specifications. In Section 8-20.3(14)C of the Standard Specifications, Items 2 and 11 and the last two sentences of Item 4 are deleted.

2.18.5.4.1.5 Round Loops

The Design-Builder shall provide round loops according to the Standard Specifications. Section 8-20.3(14)C of the Standard Specifications is supplemented with the following:

Loop conductor and lead in cable shall conform to this Section.

Round sawcuts shall be 6 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 inch wide. The sawcut depth shall be a minimum of 2 5/8 inches and a maximum of 3 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.

The bottom of the sawcut shall be smooth. No edges created by differences in sawcut depths will be allowed.

All sawcut corners shall be rounded to a minimum 1.5-inch radius.

All sawcuts shall be cleaned with a 1,000 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 Chapter 1 of this RFP.

Loops shall be installed after all grinding and prior to paving the final lift of asphalt.

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.

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.

Use of kerosene solvent is prohibited.

2.18.5.4.1.6 ITS Traffic Data and Speed Induction Loop Detectors - Spacing

The Design-Builder shall space loop detectors according to the Standard Specifications. Section 8-20.3(14)C of the Standard Specifications is supplemented with the following:

Traffic data and speed loops shall be installed 17 feet (± 1 inch) apart, measured from leading edge to leading edge in each lane. Loop spacing not meeting this requirement shall be reinstalled, by the Design-Builder, in accordance with these provisions at no additional charge to WSDOT.

With the approval of the Engineer, the loop lead in junction box and the entire loop array (set) may be shifted up to 100 feet maximum, where the plan loop locations call for the loops to be installed in existing pavement with joints or severe cracking. If required, additional conduit and junction boxes necessary for loop shifting shall be addressed in accordance with Standard Specification Section 1-04.4.

2.18.5.4.1.7 Existing Traffic Loops

The Design-Builder shall modify existing traffic loops according to the Standard Specifications. Section 8-20.3(14)C of the Standard Specifications is supplemented with the following:

If advance loops are replaced, they shall be installed immediately ahead of or behind the existing loops. The Design-Builder shall avoid cutting through the existing loop conductors or lead-in cable.

If replacement loops are not operational within 48 hours, the Design-Builder shall install and maintain interim Wavetronix detection at no additional cost to WSDOT until the permanent loops are in place.

2.18.5.4.2 Non-Intrusive Vehicle Detection

The Design-Builder shall provide non-intrusive vehicle detection according to the Standard Specifications. Section 9-29.13 of the Standard Specifications is supplemented with the following:

The Design-Builder shall provide, install, and connect non-intrusive vehicle detector units in accordance with this RFP.

Non-Intrusive Vehicle Detectors shall be manufactured by Wavetronix LLC as a completed unit including detector sensor, cable, mounting brackets, and other associated equipment. Only the equipment models given in this Section shall be used to construct and make operational Non-Intrusive Vehicle Detectors.

Equipment Model Numbers:

- Wavetronix SmartSensor HD125 WX-SS-H125.
- Click! 301 – serial to Ethernet converter WX-SC-301.
- Standard Sensor Cable (40') WX-SS-H701-040.
- Sensor Mount WX-SS-H610.
- Click! 202 - Power Supply WX-SC-202.
- Click! 205 - AC Lighting Surge Protection WX-SC-205.
- Din Rail 19" Bent WX-SC-650-19.
- 3 Pair 22 AWG Foil Shield Cable (per foot) WX-SC-672.
- SmartSensor Manager Software WX-SS-S50.0

Manufacturer Information:

Wavetronix LLC
380 S. Technology Ct.
Linden, UT 84042
(801) 764-0277 (ext. 1011)
www.wavetronix.com

2.18.5.4.3 Non-Intrusive Data Station Cabinet

The Design-Builder shall provide non-intrusive data station cabinets according to the Standard Specifications. Section 9-29.13 of the Standard Specifications is supplemented with the following:

The Design-Builder shall provide, and install non-intrusive data station cabinets in accordance with this RFP.

The cabinet shall have the same external physical dimensions and appearance of Model 334 cabinets.

Cabinets shall be fabricated of 0.125” sheet aluminum, 5052 alloy, with mill finish, in accordance with Section 9-29.13(7)D, Item number 1. Painted or anodized aluminum is not allowed.

A spring loaded construction core lock capable of accepting a Best 6-pin core shall be installed on all doors accessing WSDOT equipment. A 6-pin green construction core shall

be installed in each core lock. Upon contract completion, 2 master keys for each cabinet shall be delivered to the Engineer.

The cabinet shall be equipped with an electric strip heater with a rating of 100 watts and 120 VAC and a ventilation fan meeting the requirements specified in Chapter 12 of FHWA IP-78-16.

The fan and strip heater shall be controlled by a high-low adjustable thermostat, which can be set to ensure the cabinet interior temperature remains between 60°F and 125°F. The heater strip shall be shielded.

Two shatterproof fluorescent interior cabinet lights with self-starting ballast shall be furnished, one fixture mounted on the rear rack near the top and the second mounted at the top of the front rack. Door switches shall automatically turn on both lights when either door is opened.

- The cabinet shall be equipped with a power distribution panel mounted on a standard EIA 19-inch (ANSI/EIA RS-310-C) rack utilizing no more than five RMU (8.75 inches). The following devices shall be provided with the power distribution panel:
- Duplex 120 VAC power receptacle.
- Main circuit breaker, 120 VAC, 20 amp.
- Four load circuit breakers, 120 VAC, 15 amp.
- Neutral bus.
- Ground bus.
- Surge suppresser and filter unit, 120 VAC, 50 amp.

Power distribution panel components shall be mounted in or on the panel such that they are readily accessible, provide dead front safety, and all hazardous voltage points are covered to prevent inadvertent contact.

One controller unit shelf, which attaches to the front and back rails of the EIA rack, shall be provided. The shelf shall be fabricated from aluminum and shall contain a roll-out flip-top drawer for storage of wiring diagrams and manuals.

Each cabinet shall house include a din-rail mounted to the 19” rack, for installation of the Ethernet switch and non-intrusive detection equipment.

The Contractor shall provide and install a rack-mounted fiber optic pre-terminated patch panel specified elsewhere in this RFP.

2.18.5.5 CONDUIT

The Design-Builder shall provide conduit according to the Standard Specifications. Section 8-20.3(5) of the Standard Specifications is replaced with the following:

Installation of conduit shall conform to appropriate articles of the National Electric Code and this Section.

Conduits smaller than 2-inch electrical trade size shall not be used, unless otherwise specified, except that grounding conductors at service points may be enclosed in ½-inch diameter conduit.

It shall be the option of the Design-Builder, at no expense to the WSDOT, 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.

The ends of all conduits, metallic and non-metallic shall be reamed to remove burrs and rough edges. Field cuts shall be made square and true. 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 RGS outerduct. When installing rigid galvanized steel conduit and standard coupling cannot be used, an approved 3-piece coupling shall be used. The threads on all conduit shall be rust-free, clean. 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. Non-metallic conduit shall be assembled using the solvent cement specified in Section 9-29.1 of the Standard Specifications. With the exception of connections to HDPE conduit, PVC conduit shall be connected with medium grade gray cement solvent applied per the manufacturer's recommendations. Where the coating on galvanized conduit has been damaged in handling or installing, such damaged areas shall be thoroughly painted with galvanizing repair paint, Formula A-9-73. All conduit including spare conduits shall be installed with bushings. Rigid galvanized steel conduit shall be installed with insulated grounding bushings which have standard threading that extends around the entire circumference of the bushing. PVC conduit shall be installed with molded one-piece end bell bushings. All conduit including spare conduits shall be installed with plugs, which shall not be removed until installation of conductors or pull string. Upon installation of wiring, all conduits entering pad mounted cabinets, all conduit entering ITS hubs, and all ITS conduit 2 inches in diameter or larger shall be sealed with an approved mechanical plug at both ends of the conduit run. Upon installation of wiring at other locations, conduit shall be sealed with duct seal. Upon installation of the pull string, spare conduit shall be plugged.

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

Metallic conduit bends shall have a radius consistent with the requirements of Article 344.24 and other articles of the National Electric 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.

Nonmetallic conduit bends, where allowed, shall conform to Article 352.24 of the National Electric Code. 18-inch radius elbows shall be used for PVC conduit of 2-inch nominal diameter or less. Standard sweep elbows shall be used for PVC conduit with greater than 2-inch nominal diameter. In nonmetallic conduit less than 2-inch nominal diameter, pull ropes for wire installation shall be not less than ¼ inch diameter. In nonmetallic conduit of 2-inch nominal diameter or larger, pull ropes for wire installation shall be not less than ½-inch diameter.

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

1. 24 inches below the bottom of curb in the sidewalk area.
2. 24 inches below the top of the roadway base.
3. 48 inches below the bottom of ties under railroad tracks unless otherwise specified by the railroad company.
4. 24 inches below the finish grade in all other areas.

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

1. Within railroad right of way unless otherwise specified in the contract.
2. All pole risers, except when as otherwise required by owning utilities.
3. All runs externally attached to structures other than conduit risers.
4. All runs within slip form structures.

Couplings in cabinet foundations shall be PVC schedule 40. The stub-outs above the couplings shall be PVC end bell bushings. The schedule 40 section of PVC between the coupling and end bell bushing shall be installed without glue.

Conduit installed using the directional boring method shall be High Density Polyethylene (HDPE) Schedule 80, Carlon Bore-Gard Schedule 80 or Rigid Galvanized Steel. When HDPE is used, the crossing shall be extended into the associated junction boxes with PVC schedule 80 elbows. The PVC elbows shall be connected to the HDPE conduit with an approved mechanical coupler.

At all other locations conduit shall be PVC or rigid galvanized steel.

With the exception of HDPE conduit crossings and associated PVC conduit elbows, the same type of conduit shall be used for the entire length of the run from outlet to outlet. Where PVC or HDPE conduit is used, the same schedule shall be used for the entire length of the run from outlet to outlet.

Where PVC conduit is installed, conduit shall be schedule 40 ,with the exception that roadway crossings and service lateral runs shall be schedule 80.

Where 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.

Metallic and nonmetallic conduit installation shall include equipment grounding conductor and shall conform to requirements noted in the Standard Plans.

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

Where boring with casing is called for, the casing shall be placed using an auger inside of the casing to remove the soil as the casing is jacked forward. The auger head shall proceed no more than 4 inches ahead of the pipe being jacked. Boring operations shall be conducted to prevent caving ahead of the pipe. Installed casing pipe shall be free from grease, dirt, rust, moisture and any other deleterious contaminants.

The space between the conduit and casing shall be plugged with sand bags and a grout seal 12 inches thick at each end of the casing. Casing abandoned due to an encountered obstruction shall be grout sealed in the same manner. Grout shall obtain a minimum of 4000 PSI compressive strength at 7 days.

In lieu of sand bags and grout, unopened bags of prepackaged concrete may be used to seal the casing.

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

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

Directional boring for electrical installations shall be supervised by a licensed electrical contractor in accordance with Standard Specification Section 8-20.1(1). Where directional boring is called for, conduit shall be installed using a surface launched, steerable drilling tool. Drilling shall be accomplished using a high-pressure fluid jet toolhead. The drilling fluid shall be used to maintain the stability of the tunnel, reduce drag on the conduit and provide backfill between the conduit and tunnel. A guidance system that measures the depth, lateral position and roll shall be used to guide the toolhead when creating the pilot hole. Once the pilot hole is established a reamer and swivel shall be used to install the conduit. Reaming diameter shall not exceed 1.5 times the diameter of the conduit being installed. Conduit that is being pulled into the tunnel shall be installed in such a manner so the conduit is not damaged during installation. The pullback force on the conduit shall be controlled to prevent damage to the conduit. A vacuum spoils extraction system shall be used to remove any excess spoils generated during the installation. Excess drilling fluid and spoils shall be disposed of. The method and location used for disposal of excess drilling fluid and spoils shall be subject to the Engineer's approval. Drilling fluid returns (caused by fracturing of formations) at locations other than the entry and exit points shall be minimized. Any drilling fluid that surfaces through fracturing shall be cleaned up immediately. Mobile spoils removal equipment capable of quickly removing spoils from entry or exit pits and areas with returns caused by fracturing shall be used as necessary during drilling operations.

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

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

When open trenching is allowed, trench construction shall conform to the following:

1. The pavement shall be sawcut a minimum of three inches deep. The cuts shall be parallel to each other and extend 2 feet beyond the edge of the trench.
2. Pavement shall be removed in an approved manner.
3. Trench depth shall provide 2 feet minimum cover over conduits.
4. Trench width shall be 4 inches or the conduit diameter plus 2 inches, whichever is larger.
5. Trenches located within paved roadway areas shall be backfilled with 3 inches of sand over the conduit, followed by controlled density fill (CDF) meeting the requirements of Section 2-09.3(1)E of the Standard Specifications. The controlled density fill shall be placed level to, and 3 inches below, the surface of the remaining pavement, followed by 3 inches of paving material. The pavement shall be replaced with paving material that matches the existing pavement.

On new construction, conduit shall be placed prior to placement of base course pavement.

Conduit stub-outs within cabinet foundations shall be placed so that they do not interfere with cabinet installation. Modification of the cabinet to accommodate stub-out placement is not allowed. Conduit terminating in foundations shall extend a maximum of 2 inches above the foundation vertically including grounded end bushing or end bell.

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 from the direction of the run, terminating 6 to 8 inches below the junction box lid and within 3 inches of the box wall nearest its entry location.

Galvanized rigid steel conduit entering cable vaults shall extend 2 inches for the installation of grounded end bushing and bonding. PVC conduit entering cable vaults and pull boxes shall terminate flush with the inside walls of the structure. All conduit ends shall be terminated with termination kits.

Innerduct conduit ends shall be terminated with termination kits. Galvanized rigid steel conduit ends shall be terminated with grounded end bushings. PVC conduit ends shall be terminated with bell ends.

Fittings shall be installed in accordance with the current electrical codes.

All covered underground conduit shall be cleaned with an approved sized mandrel and blown out with compressed air prior to pulling wire.

Conduits installed for future use shall be prepared as follows:

After final assembly in place, the conduit shall be blown clean with compressed air. Then, in the presence of the Engineer, a cleaning mandrel correctly sized for each size of conduit shall be pulled through to ensure that the conduit has not been deformed. As soon as the mandrel has been pulled through, both ends of the conduit shall be sealed with conduit caps. All conduits scheduled for future use shall originate in a foundation or junction box 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) of the Standard Specifications.

A pull string rated for 200 lbs. or greater shall be installed in all spare conduits.

Where surface mounting of conduit is required, supports shall consist of stainless steel channel with stainless steel or galvanized 2-hole clamps sized for the conduit. Support spacing shall comply with the National Electric Code or shall be as noted in the contract. Spacing of stainless steel channel supports for conduit shall not exceed 5 feet. Conduit clamps shall attach to the supports on both sides of the conduit with bolts and associated hardware. The minimum distance between adjacent clamps and between the clamp and the end of the supports shall be one inch. Channel supports shall be installed with stops, to prevent clamps from sliding out of the ends. Channel installations shall provide for future conduit installation. Channel shall be at least 1 foot longer than required.

Where conduit is installed in traffic barrier, bridge barrier, walls, or other concrete structures, approved expansion, deflection, and/or combination expansion/deflection fittings shall be installed at all expansion joints and at all other joints where structural movement is anticipated. These fittings shall be installed where the Design-Builder, due to construction method, installs expansion and/or construction joints with movement. These fittings shall be suitable for the anticipated movement of the structure. Approved deflection fittings shall also be installed at the joint between the bridge end and the retaining wall end, the transition point from the bridge attachment to the underground section and the transition point between ground and structure for fixed barrier.

Where conduit is surface-mounted, approved expansion, deflection, and/or combination expansion/deflection fittings shall be installed at all expansion joints. Approved deflection fittings shall be installed at the joint between the bridge end and the retaining wall end, the transition point from the bridge attachment to the underground section, and the transition

point between ground and structure for fixed barrier. PVC conduit shall not be installed on concrete surfaces or on bridge under-decks.

Expansion fittings shall be installed for up to 4 inches of horizontal movement. Deflection fittings shall be installed for up to ¾-inch movement in all directions. Combination expansion/deflection fittings shall be installed where up to four inches of horizontal movement and ¾-inch of movement in all other directions.

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.

Conduit with innerduct shall be installed encased in controlled density fill. A maximum of 1000 feet of continuous open trench will be allowed, unless otherwise approved by the Engineer. All conduit with innerduct exposed above grade level, or on any elevated structures, shall be galvanized rigid steel conduit.

Innerduct warning tape shall be placed above all innerduct installed in trenches. The warning tape shall be polyethylene with a metallic backing. The polyethylene shall have a minimum 4 mils thicknesses and be 3 inches wide. The polyethylene shall be orange in color and printed in black with words conveying the message of "Fiber Optic Cable Buried Below.".

Location 14 AWG stranded orange USE insulated wire shall be placed directly above all innerduct installed in trenches. Splices shall be crimped using a non- insulated butt splice, soldered and covered with moisture blocking heat shrink.

After final assembly in place, all innerducts shall be blown clean with compressed air. Then, in the presence of the Engineer, a cleaning mandrel, correctly sized for the innerduct, shall be pulled through to ensure that the conduit has not been deformed. As soon as the mandrel has been pulled through, a 200 lb. minimum tensile strength pull string shall be installed in each innerduct and attached to duct plugs at both ends of the innerduct.

At all innerduct conduit terminus points, including those in cable vaults and pull boxes, removable and reusable mechanical plugs shall be employed as follows:

Outerduct conduits shall be plugged using a quadplex expansion plug inside the conduit around the innerduct. Duct plugs shall be installed in all unused innerducts (those that are specified as empty) at the time of conduit installation. Duct plugs shall be installed in all used innerducts at the time of conduit installation, unless cable pulling for those innerducts will commence within 48 hours.

Innerduct containing 1 cable shall be plugged using an expandable split plug. Innerducts with multiple cables shall be sealed with self-expanding waterproof foam. The waterproof foam shall not be placed more than 2 inches into the innerduct.

2.18.5.5.1 4 inch PVC Schedule 40 and Schedule 80 Conduit with Innerduct

The Design-Builder shall provide 4 inch PVC Schedule 40 and Schedule 80 conduit with Innerduct according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

The conduit shall be free from defects, including non-circularity, foreign inclusions, etc. It shall be uniform in color, density, and physical properties. It shall be straight and the ends shall be cut square to the inside diameter. All conduit shall display the Underwriters Laboratory certification (UL Listed). All conduit shall continue to meet the requirements of Standard Specification Section 9-29.1 unless specified otherwise herein.

2.18.5.5.2 Location Wire and Warning Tape

The Design-Builder shall provide location wire and warning tape according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

2.18.5.5.2.1 Warning Tape

Warning tape shall be installed in continuous sections for all underground fiber-optic conduit installation where trenching is required. The warning tape shall be installed approximately 6 inches below the surface of pavement or existing grade. Warning tape shall be installed a minimum of 12 inches into all cable vaults and pull boxes at both ends of the trench.

Warning tape shall be polyethylene. The polyethylene shall have a minimum 4 mil thickness and be 3 inches wide. The polyethylene shall be orange in color and printed in black with the words "Fiber Optic Cable Buried Below."

2.18.5.5.2.2 Location Wire

Wire conductor shall be installed in continuous sections for all underground fiber-optic conduit installation where trenching is required. A minimum of 6 feet of location wire shall be extended into each cable vault or pull box. The locate wire 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. Locator wire shall be placed between the conduits in dual conduit installations or on top of conduits for single conduit installations.

Location wire shall be #14 AWG THWN or XHHW orange-colored wire.

2.18.5.5.3 Controlled-density Fill

The Design-Builder shall provide controlled-density fill according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

Controlled-density fill (CDF) shall be in accordance with Standard Specification Section 2-09.2 and Standard Specification Section 2-09.3(1)E. CDF shall be tinted orange.

2.18.5.5.4 Surface Mounting Conduit Attachment Components

The Design-Builder shall provide surface mounting conduit attachment components according to the Standard Specifications. Section 9-29.1 of the Standard Specifications is supplemented with the following:

Fastening hardware components for stainless steel channel supports shall be stainless steel. Conduit clamps shall be 1-piece, 2-bolt units with lock washers.

2.18.5.5.5 Cabinet Conduit Sealing

The Design-Builder shall seal cabinet conduit according to the Standard Specifications. Section 9-29.1 of the Standard Specifications is supplemented with the following:

All conduits entering pad mounted cabinets and all conduits entering ITS hubs shall be sealed with an approved mechanical plug at both ends of the conduit run. Conduit duct seal will not be accepted.

Pad mounted cabinets shall include, but not be limited to, service, signal controller, data station, Wavetronix, DMS, ATM, CCTV, ramp meter, environmental sensor station, gate controller, cable terminal, and transformer cabinets.

2.18.5.5.5.1 Cabinet Conduit Sealing Materials

The Design-Builder shall provide cabinet conduit sealing materials according to the Standard Specifications. Section 9-29.1 of the Standard Specifications is supplemented with the following:

Mechanical plugs for cabinet conduit sealing shall be one of the following:

1. Tyco Electronics – TDUX.
2. Jackmoon – Triplex Duct Plugs.
3. O-Z/Gedney – Conduit Sealing Bushings.

Installation shall conform to the manufacturer's recommendations.

The plug shall withstand a minimum of 5 psi of pressure.

2.18.5.6 JUNCTION BOXES, CABLE VAULTS AND PULL BOXES

The Design-Builder shall provide junction boxes, cable vaults and pull boxes according to the Standard Specifications. Section 8-20.3(6) of the Standard Specifications is replaced with the following:

Unless otherwise noted in this Section 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.

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 6 inches or more than 10 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 Design-Builder shall coordinate the work of the Design-Builder constructing the barrier and the electrical Design-Builder 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 ⅛-inch from the surface of the barrier,

the Design-Builder 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 of the Standard Specifications. 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 Section 9-03.9(3) of the Standard Specifications, placed on a compacted or undisturbed foundation. The crushed surfacing shall be compacted in accordance with Section 2-09.3(1)E of the Standard Specifications.
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.
5. When the lid/cover is closed for the final time, a liberal coating of anti-seize compound shall be applied to the bolts and nuts and the lid shall be securely tightened.
6. Hinges on the Type 4, 5 and 6 junction boxes shall be located on the side of the box, which is nearest to adjacent shoulder. Hinges shall allow the lid to open 180 degrees.

Section 8-20.2 of the Standard Specifications is supplemented with the following:

Cable vaults and pull boxes shall meet AASHTO M-199, H-20 or H-35 loading requirements. Cable vaults and pull boxes installed in paved shoulders or lanes that will be subjected to vehicular traffic during any phase of this contract or as specified in the Plans shall meet H-35 loading requirements. Cable vaults and pull boxes shall be fabricated in accordance with ASTM C857-83 and C858-83. All cable vaults and pull boxes shall include the following provisions:

1. A sump 6 inches in diameter by 2 inches in depth with a 1-inch diameter drain hole in the center of the sump.
2. Cable pulling irons positioned to afford bi-directional cable installation through the cable vault or pull box.
3. Factory installed knock-outs for conduit entry.
4. All cable racking hardware shall be stainless steel.
5. Cable vaults meeting H-20 requirements shall have a hinged and spring-assisted double steel plate cover. Cable vaults and pull boxes meeting H-35 requirements shall have round cast iron lids. Pull boxes meeting H-20 requirements shall have a hinged, single plate cover. All cable vault and pull box covers shall be marked with ITS legend according to Standard Plan J-11a.

Above ground pull boxes shall be a minimum 16 inches wide, 16 inches high and 8 inches deep. Above-ground boxes shall be fabricated in accordance with NEMA 4X designation for stainless steel enclosures. Pull boxes shall be equipped with a removable front panel

for access to all conduits. The front panel shall be hinged and the entire pull box shall be fabricated from stainless steel.

2.18.5.7 BONDING, GROUNDING

Refer to Section 2.16.

2.18.5.8 AMPLIFIER, TRANSFORMER AND TERMINAL CABINETS

Refer to Section 2.16.

2.18.5.9 CABINET LABELING

The Design-Builder shall provide label cabinets according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

The Design-Builder shall mark each ITS device cabinet and transformer cabinet by affixing black vinyl lettering which matches the alphanumeric device number(s) to the outside of the cabinet. The lettering shall be 4-inch C. The lettering shall be centered horizontally and begin at the top of the cabinet. The first line of text shall be the 3-number designation of the State Route. The following line(s) shall be the 7-character designation of the device(s). The lettering shall be on the side of the cabinet most visible from the roadway.

The Design Builder shall install an engraved nameplate, identifying the power source for each cabinet. The nameplate shall consist of white letters on a red background and be permanently affixed to the inside of the cabinet door. The nameplate text shall read "Cabinet Power Source" in ½ inch nominal letters followed by the service name or transformer name (e.g. SUA173 or 005tr17850), as appropriate, in 1-inch nominal letters.

2.18.5.9.1 Cable Vault and Pull Box Labeling

All cable vaults and pull boxes used as part of the ITS System shall be labeled in accordance with Section 9-29.2(4) of the Standard Specifications.

2.18.5.10 CLOSED CIRCUIT TELEVISION (CCTV)

The Design-Builder shall provide a CCTV system according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

2.18.5.10.1 Television Camera Assembly

Television cameras shall be supplied as a unit including camera with integrated lens, id generator, camera controller, pressurized environmental enclosure, pan and tilt mechanism and rain/sun shade. The camera assembly shall be a 3960 series I-view system, manufactured by Cohu. Top pole mount cameras shall be used at all locations.

1. Equipment Model Numbers:

   I-View Camera system with integrated positioner:

   Top pole mount Model 3965-5101/PEDD

2. Manufacturer Information:

   Cohu Inc., Electronics Division
   PO Box 85623

San Diego, CA 92186-5623
Telephone: (858) 277-6700
www.cohu-cameras.com
info@cohu.com

2.18.5.10.2 Camera Pole

The Design-Builder shall furnish and install round tapered steel poles for the CCTV camera installation. The camera pole installation shall include the pole foundations for the CCTV camera installation and all associated mounting hardware. Pole hand holes shall have cover plates. They shall provide a flat mounting surface at the top of the pole to attach the camera assembly. The mounting plate shall have a 1.75-inch hole to pass the camera connector into the top section of the pole. The plate shall also provide predrilled 7/16-inch bolt holes in a 4.75-inch bolt circle to match the base plate of the camera assembly.

2.18.5.10.2.1 Submittal

The Design-Builder shall submit all structural calculations and shop drawings to the Engineer for approval in accordance with Section 6-03.3(7) of the Standard Specifications, prior to fabrication of the poles and hardware. See Section 2.18.6.4.2.1 for submittal contents and format.

2.18.5.10.3 Existing Camera Pole

When modifying an existing camera pole that currently has a heavy-duty pan/tilt unit and 8200 series camera mounted on it, the Design-Builder shall perform the following tasks:

- Modify the top of the pole by cutting a 1.75-inch diameter hole in the center of the mounting plate for the camera control cable to pass through into the top section of the pole. Paint the mounting plate with cold galvanizing paint to repair the finish damaged by drilling and cutting.
- Install a short pedestal mount (Pelco PM2010) on the modified base plate.
- Remove the existing pole-mounted junction box and cap the remaining holes.
- Install new camera and cable in accordance with the details.

2.18.5.10.4 Camera Control Cabinet

Each Camera Control Cabinet shall have the same external physical dimensions and appearance of Model 334 cabinets.

Cabinets shall be fabricated of 0.125-inch sheet aluminum, 5052 alloy, with mill finish, in accordance with Section 9-29.13(7)D, Item number 1. Painted or anodized aluminum is not allowed.

A spring loaded construction core lock capable of accepting a Best 6-pin core shall be installed on all doors accessing WSDOT equipment. A 6-pin green construction core shall be installed in each core lock. Upon contract completion, 2 master keys for each cabinet shall be delivered to the Engineer.

The cabinet shall be equipped with an electric strip heater with a rating of 100 watts and 120 VAC and a ventilation fan meeting the requirements specified in Chapter 12 of FHWA IP-78-16.

The fan and strip heater shall be controlled by a high-low adjustable thermostat, which can be set to ensure the cabinet interior temperature remains between 60°F and 125°F. The heater strip shall be shielded.

2 shatterproof fluorescent interior cabinet lights with self-starting ballast shall be furnished, 1 fixture mounted on the rear rack near the top and the 1 mounted at the top of the front rack. Door switches shall automatically turn on both lights when either door is opened.

The cabinet shall be equipped with a power distribution panel mounted on a standard EIA 19-inch (ANSI/EIA RS-310-C) rack utilizing no more than five RMU (8.75 inches). The following devices shall be provided with the power distribution panel:

1. Duplex 120 VAC power receptacle.
2. Main circuit breaker, 120 VAC, 20 amp.
3. Four load circuit breakers, 120 VAC, 15 amp.
4. Neutral bus.
5. Ground bus.
6. Surge suppresser and filter unit, 120 VAC, 50 amp.

Power distribution panel components shall be mounted in or on the panel such that they are readily accessible, provide dead front safety, and all hazardous voltage points are covered to prevent inadvertent contact.

One controller unit shelf, which attaches to the front and back rails of the EIA rack, shall be provided. The shelf shall be fabricated from aluminum and shall contain a roll-out flip-top drawer for storage of wiring diagrams and manuals.

Each camera control cabinet shall house 1 termination block for termination of the camera control cable, the optical transmitter, and the camera control receiver. These cables shall be identified and marked by the Design-Builder.

2.18.5.10.4.1 Camera Control Cabinet (Pole Mount)

The camera control cabinet for the new camera site on the I-90 bridge at approximate LR LINE Sta 133 shall be designed to mount to the camera pole. All other camera control cabinets shall be pad-mount installations. Camera control cabinets shall contain the equipment shown in the Plans. The cabinet shall have the same features as the pad-mounted version except the dimensions shall be 36 inches high, 24 inches wide and 18 inches deep, and the cabinet shall have a solid bottom a single door. The cabinet and door shall meet the same requirements as the pad-mounted version. The cabinet shall include the following:

Cabinets shall be fabricated of 0.125” sheet aluminum, 5052 alloy, with mill finish, in accordance with Section 9-29.13(7)D, Item number 1. Painted or anodized aluminum shall not be allowed.

Cabinet doors shall have a three-point latch and two-position stop assembly with spring loaded construction core lock capable of accepting a Best Lock Company 6-pin CX series core. The Design-Builder shall supply green construction cores. Upon Substantial Completion, the Design-Builder shall deliver two master keys and one core removal key to the Engineer.

The cabinet shall be equipped with a rack-mounted power distribution panel. The panel shall contain one duplex 120 VAC power receptacle for each camera, main circuit breaker

(120 VAC, 15 amp), ground bus, neutral bus, and Surge suppresser and filter unit, (120 VAC, 50 amp). The power distribution panel components shall be mounted in or on the panel such that they are readily accessible, provide dead front safety, and all hazardous voltage points are covered to prevent inadvertent contact.

Each camera control cabinet shall house one termination block for termination of the camera control cable. The termination block shall be mounted on a 1/8" aluminum plate mounted to the rails of the EIA rack. The plate shall be bent such that the face of the plate is recessed from the inside of the cabinet door a minimum of 6 inches.

The Design-Builder shall provide and install a rack-mounted fiber optic patch panel as specified elsewhere in this Section.

The cabinet shall include a standard EIA 19-inch (ANSI/EIA RS-310-C) rack for mounting equipment.

2.18.5.10.5 CCTV System Cabling

The ends of cable connections between the camera system (Model 3965) and the control cabinet shall be factory terminated. Cable installation shall only require installing the connector shell at the camera end, and modifying the power cable at the cabinet end. The cable used between the CCTV camera and the camera control cabinet shall be manufactured by Cohu.

1. Equipment Model Numbers:

   Cable Assembly, 3965 control (CA295F)

2.18.5.11 DYNAMIC MESSAGE SIGNS (DMS)

The Design-Builder shall notify WSDOT when installation of the DMS sign hardware is complete.

The Design-Builder shall provide power to each DMS sign within ten Calendar Days of delivery of the sign to the installation location after acceptance testing, or house the sign in a controlled atmosphere facility.

2.18.5.11.1 VMS Sign Materials

The Design-Builder shall provide VMS sign materials according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

2.18.5.11.1.1 Sign Display

The sign display shall be a continuous matrix of pixels, 27 pixels high and 105 pixels wide. Each pixel shall be made from a grouping of amber light emitting diodes and contain no moving parts. The matrix of pixels shall be capable of displaying a message of 3 lines, 21 characters, and 18 inches high. The sign display and other associated VMS components shall permit a test message using all 2,835 pixels, running at the maximum brightness and 100% duty.

2.18.5.11.1.2 VMS Sign Beacon

Three flashing beacons shall be installed on top of the sign housing. The beacons shall be as specified in Section 9-29.21 of the Standard Specifications. The 12 inch lamps shall be

LED type, amber in color and meet the applicable portions of Section 9-29.16(2)A of the Standard Specifications.

The beacons shall be aluminum and consist of single section, 12 inch traffic signal heads with cadet visor, square doors, and amber display. The center beacon shall flash alternatively to the two outside beacons.

Controllers for flashing beacons shall be as specified in Section 9-29.15 of the Standard Specifications, with aluminum sheet metal cabinets. The sign controller shall operate the beacons as commanded by the NTCIP communications protocol.

2.18.5.11.1.3 Sign Housing

The VMS housing shall provide walk-in service access for all LED display modules, electronics, power supplies, environmental control equipment, air filters, wiring, and other internal VMS components. The internal size of the housing shall be a minimum of 75 inches high. The access doors shall be a minimum of 2 feet wide by 75 inches high.

Each access door shall be mounted to an integral frame, which bolts to the VMS housing frame using stainless steel hardware. A continuous vertical stainless steel hinge shall be used to support the door. In the closed position, the door shall latch to the frame with a three-point draw-roller mechanism. The latching mechanism shall include a handle and release lever inside the VMS housing so that a person with no tools or keys cannot become trapped inside the housing. The door frame shall be flanged on all sides so that it sheds water. The door shall close around the flanged frame and shall compress against the one-piece closed-cell neoprene gasket that adheres to the door frame. Doors shall contain a stop to retain the door in the fully open (90-degree) position. The doors shall have a 3-point latch and 2-position stop assembly with spring loaded construction core lock capable of accepting a Best Lock Company 6-pin CX series core. The Design-Builder shall supply green construction cores. Upon contract substantial completion, the Design-Builder shall deliver 2 master keys and one core removal key to the Engineer.

The nominal external dimensions of the sign shall not exceed 18 feet, 3 inches in width and 7 feet, 11 inches in height. The VMS back and side housing walls shall be vertical. The front VMS wall shall be built at an angle of 3 degrees toward the viewing motorists. Display modules shall be parallel to the front VMS wall, so that use of the LED viewing cone is optimized. The dead load of the housing and contents shall not exceed 1,400 lbs. Signs may exceed these dimensions and weight if an analysis of the mounting structure by the Design-Builder shows that loading and/or shear is not excessive. Any structural analysis shall meet the design and calculation requirements described in Section 2.13.

VMS housing exterior sheet material shall be aluminum alloy number 5052-H34, and shall have a minimum thickness of 0.125 inch. Exterior sheet seams shall be continuously welded and waterproof. VMS housing structural frame members (I-beams, C-channels, Zee-extrusions, and bar stock) shall be aluminum alloy number 6061-T6.

The minimum distance from the interior rear wall of the VMS housing to the closest display components shall be 36 inches. This free space shall be maintained across the entire interior of the sign housing, with the exception of structural members. Structural members shall be designed and positioned so as to not be an obstruction to free movement of maintenance technicians throughout the interior of the housing. Circuit boards/display components shall be protected from accidental contact by maintenance personnel.

VMS housings shall be constructed to present a clean, neat appearance, and the equipment located within shall be protected from rain, snow, dirt, and corrosion. Sign housing floors

shall contain small weep holes for draining water that accumulates due to condensation. Weep holes shall be fabricated in a manner which prevents the entrance of insects.

The front of the LED display matrix shall be completely covered with polycarbonate sheeting that is weather tight, ultraviolet (UV) light protected, non-glare, and which has a minimum thickness of 0.17 inch. To achieve maximum display contrast and legibility, the outside of the polycarbonate sign face shall be fully covered with a mask, which is formed from aluminum sheeting. The mask shall have a minimum thickness of 0.09 inch and shall contain a circular opening for each pixel. The openings shall not hinder the 15° LED viewing angle. All exposed metal on the VMS front face, which is visible to viewing motorists, shall be coated with black Kynar 500 resin or an equivalent oven-fired fluoropolymer-based coating having a minimum outdoor service life of 20 years. This shall include the aluminum face mask, the aluminum border outside the LED display matrix, and all the mounting and assembly hardware.

The VMS housing shall include a minimum of 2 NEMA 20-R, 120 VAC duplex electrical outlets, with ground-fault circuit interrupters. One duplex outlet shall be located at each end of the inside of the VMS housing.

The VMS housing shall contain one (1) 4-foot, 40-watt fluorescent lamp for every 5 feet of VMS housing length. Lamps shall be evenly spaced across the inside roof of the VMS housing, so they can provide uniform light distribution for night time maintenance purposes. Fluorescent light assemblies shall be covered with a protective wire cage. Fluorescent light ballasts shall be rated for operation at 0°F. The fluorescent light circuit shall be controlled by a manual timer switch having an adjustable on time of 2 hours.

All VMS equipment, components, modular assemblies and other materials located within the VMS housing shall be removable, transportable, and capable of being installed by a single technician utilizing a one-person aerial lift truck. VMS structural members are not included in this requirement.

Ribbon cable shall be protected at all points of physical contact where it touches metallic frameworks. Either the ribbon cable or the frame, or both, shall be wrapped with a protective covering where the cable touches the framework, to prevent cable insulation rub-through from road induced vibration in the sign framework.

The interior VMS environment shall be monitored and controlled by the sign controller. Environmental control shall be designed to maintain the internal VMS temperature at or below +140°F when the outdoor ambient temperature is at or below +115°F. The VMS environmental control system shall consist of 4 primary subsystems as follows:

2.18.5.11.1.3.1Internal Temperature Sensors

The VMS shall contain 2 internally mounted temperature sensors which are equipped with external thermocouples and which the sign controller continuously monitors. This temperature information shall be used by the sign controller to determine when to activate and deactivate the environmental control systems described herein. Sensors shall be located on opposite ends of the upper 1/3 of the LED display matrix, and their external thermocouples shall be attached to and make contact with an LED pixel circuit board.

The thermocouple and LED board shall be easily detached, in the event that one of the units requires removal and replacement. Sensors shall be capable of measuring temperatures from -40°F to +185°F. The sign controller shall automatically shut down the LED display whenever one or both sensors indicate that LED board temperature has exceeded +140°F. The sign controller shall automatically restart the LED display

whenever the suspect temperature falls below +130°F. Both shutdown and re-start temperature thresholds shall be user-programmable. Sensor temperatures and VMS shutdown/restart events shall be reportable to the VMS Central Software.

2.18.5.11.1.3.2Housing Cooling System

The VMS housing shall contain a positive pressure cooling system which circulates outside air into the VMS housing whenever LED board temperature exceeds a user-programmable threshold. This system shall consist of enough ventilation fans as needed to exchange the internal VMS housing air volume at a minimum rate of 3.8 times per minute. Fans shall be the ball-bearing type.

There shall be one filtered air intake fan for each intake port. Intake fans shall be located in a line across the lower rear wall of the VMS housing. Intake fans shall contain a removable filter which shall remove airborne particles measuring 5 microns in diameter and larger.

Exhaust vents shall be placed in a line across the upper rear wall of the VMS housing and shall allow air out of the cabinet.

On the VMS housing rear exterior wall, all air intake ports and exhaust vents shall be covered on their top, front, and sides by an aluminum shroud fabricated from 0.090 inch aluminum sheeting. Shrouds shall be securely fastened to the VMS housing, and all shroud-to-housing interfaces shall be thoroughly gasketed to prevent water from entering the VMS. All air filters and fans shall be removable from inside the VMS housing.

The sign controller shall initially be programmed to activate the VMS housing cooling system whenever the LED board temperature exceeds +100°F and will turn the cooling system off whenever LED board temperature falls below +95°F.

The VMS housing cooling system shall be controllable by an adjustable timer that will turn fans off after the set time has expired. The timer shall be adjustable to at least 4 hours, and it shall be located just inside the VMS housing door, within easy reach of a maintenance technician standing outside the VMS doorway.

2.18.5.11.1.3.3LED Display Cooling System

The VMS shall contain an LED display cooling system, which directs air across the LED display modules whenever LED board temperature exceeds a user-programmable threshold. This system shall be comprised of fan-forced air directed vertically across the back side of the entire LED display matrix. The air source shall consist of multiple ball-bearing fans. The sign controller shall initially be programmed to activate the LED cooling fan system whenever LED board temperature exceeds +110°F and shall deactivate the system whenever LED board temperature falls below +105°F. Cooling fans shall be located so as not to hinder removal of LED display modules and driver boards.

2.18.5.11.1.3.4Front Face Panel Defog/Defrost System

The VMS shall contain a defog/defrost system which circulates warm, fan-forced air across the inside of the polycarbonate front face whenever LED board temperature falls below a user-programmable threshold. The air source shall consist of multiple ball-bearing fans that provide uniform airflow across the polycarbonate face panel.

The sign controller shall initially be programmed to activate the defog/defrost system whenever LED board temperature falls below +40°F and shall deactivate the defog/defrost

system whenever LED board temperature exceeds +105°F. A 100-watt pencil-style heating element shall be mounted in front of each defog/defrost fan and shall serve to warm the air directed across the VMS face. Heating elements shall be on only when the defog/defrost fans are on.

VMS housing exterior sheet material shall be aluminum alloy number 5052-H34, and shall have a minimum thickness of 0.125 inches. Exterior sheet seams shall be continuously welded and waterproof. VMS housing structural frame members (I-beams, C-channels, Zee-extrusions, and bar stock) shall be aluminum alloy number 6061-T6.

VMS housings shall be constructed to present a clean, neat appearance, and the equipment located within shall be protected from rain, snow, dirt, and corrosion. Sign housing floors shall contain small weep holes for draining water that accumulates due to condensation. Weep holes shall be fabricated in a manner which prevents the entrance of insects.

The front of the LED display matrix shall be completely covered with polycarbonate sheeting that is weather tight, ultraviolet (UV) light protected, non-glare, and which has a minimum thickness of 0.17 inches. To achieve maximum display contrast and legibility, the outside of the polycarbonate sign face shall be fully covered with a mask, which is formed from aluminum sheeting. The mask shall have a minimum thickness of 0.09 inches and shall contain a circular opening for each pixel. The openings shall not hinder the LED viewing angle. All exposed metal on the VMS front face, which is visible to viewing motorists, shall be coated with black Kynar 500 resin or an equivalent oven-fired fluoropolymer-based coating having a minimum outdoor service life of 20 years. This shall include the aluminum face mask, the aluminum border outside the LED display matrix, and all the mounting and assembly hardware.

All VMS equipment, components, modular assemblies and other materials located within the VMS housing shall be removable, transportable, and capable of being installed as a single unit by a single technician utilizing a one-person aerial lift truck. VMS structural members are not included in this requirement.

Ribbon cable shall be protected at all points of physical contact where it touches metallic frameworks. Either the ribbon cable or the frame, or both, shall be wrapped with a protective covering where the cable touches the framework, to prevent cable insulation rub-through from road induced vibration in the sign framework.

The interior VMS environment shall be monitored and controlled by the sign controller. Environmental control shall be designed to maintain the internal VMS temperature at or below +140°F when the outdoor ambient temperature is at or below +115°F. The VMS environmental control system shall consist of four primary subsystems as follows:

2.18.5.11.2 VMS Sign Mounting Hardware

The sign housing shall be provided with all necessary hardware including sign mounting beams, vertical and horizontal brackets, and all related hardware to install the VMS.

All mounting hardware shall conform to the G series Standard Plans and the Standard Specifications. The use of clips or clamps to accomplish the attachment or mounting of such signs and assemblies is prohibited.

The VMS housing, structural framing, face covering, and mounting members shall be designed to withstand a wind velocity of 100 mph with a 30% gust factor and shall otherwise comply with the latest requirements of AASHTO's *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals.*

2.18.5.11.2.1 VMS Sign Landing

VMS shall include a landing as shown in the WSDOT Northwest Region *ITS Details*.

2.18.5.11.3 Ground-mounted VMS Field Cabinet

The Design-Builder shall provide ground-mounted VMS field-cabinets according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

The field cabinet shall contain all equipment necessary to control the VMS signs. The cabinet shall have the same external dimensions and appearance of double-wide Model 334 cabinets as specified in Chapter 12 of FHWA IP-78-16. The cabinet shall contain the main power feed from the 120/240v transformer.

1. Cabinets shall be fabricated of 0.125 inches sheet aluminum, 5052 alloy, with mill finish, in accordance with Standard Specification Section 9-29.13(7)D, Item number 1. Painted or anodized aluminum is not allowed.
2. Cabinet doors shall have a three-point latch and 2-position stop assembly with spring-loaded construction core lock capable of accepting a Best Lock Company 6-pin CX series core. The Design-Builder shall supply green construction cores with 2 master keys and one core removal key per lock. The Design-Builder shall deliver the keys to the Engineer.
3. The cabinet shall be equipped with an electric strip heater and a ventilation fan. The strip heater shall be rated at 100 watts and 120 VAC and be shielded in a manner that prevents damage to nearby electrical cables. The ventilation fan shall be mounted in the top of the cabinet, be equipped with a screened guard, and exhaust at least 10 CFM.

   The fan and strip heater shall be controlled by a high-low adjustable thermostat, which can be set to ensure the cabinet interior temperature remains between 60°F and 120°F.
4. 2 shatterproof fluorescent interior cabinet lights with self-starting ballast shall be furnished, one fixture mounted on the rear rack near the top and the second mounted at the top of the front rack. Door switches shall automatically turn on both lights when either door is opened.
5. The cabinet shall be provided with two 15 amp, 120 VAC duplex receptacles. One of the receptacles is for a laptop and/or tools and shall be GFCI-protected. The second receptacle is for communications equipment and shall not be GFCI-protected.
6. The cabinet shall be provided with 3 circuit breakers. One circuit breaker shall be rated at least 20 amps and shall operate the heater, ventilation fan, receptacles, and lamps. The second circuit breaker shall be 2-pole and control the power to the VMS defog/defrost heater elements. The third circuit breaker shall operate all other sign equipment. The second and third circuit breakers shall be rated in accordance with the NEC. Separate terminal strips shall be provided for each circuit breaker and an unfused terminal for the neutral side of the power supply line.
7. If containing more than one controller, the cabinet shall be clearly labeled with the names of each controller within. One shelf shall be installed for each new controller installed in a cabinet.

8. The cabinet shall be provided with two serial communication ports.
9. One communication port shall be used to connect a laptop to the controller. The interface shall be wired as a 9-pin, EIA-232 DCE port. The port shall connect to a laptop computer using a straight-through 9-pin cable. One cable shall be supplied for each VMS installed in this contract.
10. The second communication port interface shall be wired as a 25-pin, EIA-232 DTE port.
11. A reset button shall be provided in the cabinet that, when pressed, resets the VMS controller and all other VMS electronics.
12. A pullout shelf with built-in drawer shall be provided in the cabinet to facilitate a laptop during local testing and control of the VMS.
13. Noise and voltage spike protection shall be provided in the cabinet as stated in Section 2.18.5.11.4.8 and the Standard Specifications.
14. The conductor within the cabinet and the sign shall meet the requirements of Section 9-29.24 of the Standard Specifications. The conductors for communication shall be a minimum of 22 gauge.

2.18.5.11.4 VMS Control System

The Design-Builder shall provide VMS control systems according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

The Design-Builder shall provide the control system for each VMS. The VMS control system shall include all excavation, backfill, conduit, wiring, and all hardware associated with providing power and communication between the local control cabinet and the sign. Each VMS shall be fully compatible with and completely capable of being operated by WSDOT's computer system without requiring additional software or software modifications to be made to WSDOT's computer system.

VMS control cable shall be installed between each VMS ground control cabinet and each sign cabinet.

The Design-Builder shall furnish and install VMS control cable and all necessary cables and accessories in accordance with the manufacturer's specifications, to make the VMS operational.

The Design-Builder shall pull the VMS control cable between the ground control cabinet and the sign cabinet, and terminate it.

The Design-Builder shall provide 10 feet of coiled slack cable in the ground control cabinet, and 40 feet in the sign cabinet. If the sign cabinet does not contain space for coiled slack cable, it shall be coiled in the sign gantry or other nearby location.

2.18.5.11.4.1 Circuit Boards

The manufacturer's submittal shall include a schematic diagram for each type of circuit board used in the sign display and control system. Each circuit board used in the VMS display and control system shall conform to the following:

1. The printed circuit board through-hole for each LED cathode lead shall be connected to a large copper trace pad having a minimum surface area of 0.04 square inch. The

trace pads shall dissipate heat from the LEDs and shall be present on both the front and rear sides of the LED pixel board.

2. All exposed metal (except connectors) shall be protected from water and humidity exposure by a thorough application of acrylic conformal coating. Bench level repairs to individual devices, including discrete LED replacement and conformal coating repairs, shall be possible.

3. Printed circuit laminate shall be FR-4 fiberglass, having a minimum thickness of 1/16 inch. The circuit board traces shall be copper. Through-holes shall also be plated with copper.

4. All cables attaching to circuit boards shall be held in place by locking latch connectors that firmly hold the cables in place.

2.18.5.11.4.2 Display LEDs

LEDs used in the VMS display shall be from one LED manufacturer and of one part number.

LEDs shall be un-tinted, non-diffused, high-output, solid state lamps utilizing Indium Gallium Aluminum Phosphide (InGaAlP) technology. The LED manufacturer shall be Toshiba or Hewlett-Packard.

The discrete LEDs size shall be T 1-3/4. LED package style shall be the through-hole flush-mount type, and all LEDs shall be soldered with the base of their lens mounted within 0.010 inches of the printed circuit board.

LEDs shall emit amber light, having a peak wavelength of 590 ± 5 nanometers. The half-life rating shall be 100,000 hours. Rated brightness per LED shall be a minimum of three (3) candelas.

LEDs shall be pre-sorted by the LED manufacturer for luminous intensity and color. LEDs used shall be obtained from a one-bin luminous intensity sort. A bin is defined such that when all LEDs from a given bin are driven with an identical forward current, the dimmest LED shall emit no less than half the luminous intensity of the brightest LED in the bin.

Operating temperature range shall be -22° F to +185° F, and storage temperature range shall be -40° F to +248° F.

Minimum half-power viewing angle shall be 30°. Half-power viewing angle is defined such that, at a given distance from the LED, luminous intensity measured at any point at an angle of 15° from the LEDs center axis shall be no less than one-half the luminous intensity measured directly on the LEDs center axis.

The discrete LED manufacturer's data sheet showing compliance with this Section, and 10 samples, shall be provided with the VMS manufacturer's submittal.

2.18.5.11.4.3 LED Modules

The VMS shall be constructed with multiple display circuit boards, each of which contains no less than 5, but no more than 45 pixels. Each pixel, which is defined as the smallest programmable portion of a display matrix, shall consist of a cluster of closely spaced discrete LEDs (strings of LEDs).

The distance from the center of one pixel to the center of all adjacent pixels, both horizontally and vertically, shall be 66.0 millimeters.

Each LED string shall be in series with its own current limiting resistor. Current limiting resistors shall be rated to limit LED string forward current to 30 milliamperes whenever a forward voltage is applied.

Each pixel shall contain a minimum 2 strings of LEDs. Each LED string shall contain a minimum 6 LEDs.

The failure of an LED string shall not cause a change in the forward current of any other LED string, nor shall it cause the failure of any other LED string. Similarly, the failure of any LED pixel shall not cause the failure of any other pixel in the VMS.

Each LED pixel shall emit a minimum luminous intensity of 40 candelas when driven with a forward current of 20 milliamperes DC per LED string. An independent laboratory that utilizes equipment and procedures traceable to NIST standards shall certify LED pixel intensity. The independent laboratory's certification report shall be provided with the VMS manufacturer's submittal. This report shall contain the laboratory name, address, and contact information. The report shall also contain a description of the test procedure and test equipment used, test personnel name(s), pixel intensity test results, date(s) the VMS manufacturer's LED pixel samples were tested, and the VMS manufacturer's name.

Discrete LEDs shall be mounted perpendicular to their PC boards. Any variations in discrete LED color and intensity shall be thoroughly dispersed throughout the entire display, thereby creating a uniform visual appearance of both color and intensity.

The sign controller shall be able to measure the forward current of each LED pixel and determine if the pixel is operating normally. This information shall be stored in a read-only NTCIP object.

2.18.5.11.4.4 LED Output Control

The LEDs shall be driven using Pulse Width Modulation (PWM) of a nominal 30-milliampere forward current, where pulse width is used to achieve the programmed LED intensity level for a given ambient lighting condition.

The current pulse shall be modulated from a 10-millisecond period, and pulse amplitude shall not be allowed to exceed 30 milliamperes per LED string. An illustration of the PWM drive current waveforms, which are used to achieve minimum and maximum LED intensity, shall also be provided with the VMS manufacturer's submittal.

2.18.5.11.4.5 LED Intensity Control System

The VMS shall be equipped with an LED intensity control system. The control shall support both manual and automatic control. LED intensity control shall consist of 3 photo-sensors and associated circuitry. VMS controller analysis of these ambient light measurements shall automatically determine which of 16 pre-programmed LED intensity levels will provide the best VMS legibility for the given ambient light condition. The LED intensity control system shall not cause flickering of the LED display.

The VMS controller shall contain a read-write NTCIP object that adjusts the maximum usable intensity threshold, the Maximum Pulse Width Modulation (MPWM). This number is a percentage of the absolute maximum possible intensity. At the time of VMS delivery, MPWM shall be set to 67%. The LED intensity control system shall be designed such that a MPWM value of 100% delivers a time-average current of 30 milliamperes, and the MPWM value of 67% delivers a time-average current of 20 milliamperes.

Automatic intensity control shall select one of sixteen LED intensity levels based on the sensed ambient light. The threshold points for each intensity levels shall be user programmable. LED intensity levels shall be available in 1% increments and in a range of 1% to 100% of maximum display intensity.

2.18.5.11.4.6 Display Driver Circuit Boards

The VMS shall contain 9 pixel wide by 5 pixel wide (9x5) LED display modules.

LED pixel circuit boards shall be mounted to the back of an aluminum panel to form a 9 pixel high by 5 pixel wide LED display module. The pixel board(s) shall be mounted to the aluminum panel with durable, non-corrosive fasteners, and their removal from the panel shall not require use of tools.

One electronic driver circuit board shall be provided for each 9x5 LED pixel module and shall individually control all 45 pixels on that module.

Failure of a 9x5 driver board shall not cause the failure of any other 9x5 LED display module.

The LED display shall have a minimum refresh rate of 100 frames per second. The VMS manufacturer's submittal shall provide calculations that prove that the display conforms to this requirement.

The aluminum module panel shall have a minimum thickness of 1.5 millimeters, and it shall contain a circular opening for each LED pixel. The openings shall be sized so they do not block any portion of the 15° LED viewing cone.

The front side of the aluminum module panel, which faces the viewing motorists, shall be primed and coated with flat black paint.

Display modules and all of their components shall be easily replaceable. Display modules shall mount securely to a support frame using durable, non-corrosive hardware. Module removal and replacement shall be accomplished with the use of simple hand tools or no tools.

All display module electrical connections shall be the quick-disconnect locking connector type. Removal of a 9x5 display module from the VMS, or a pixel board or driver board from its display module, shall not require a soldering operation.

2.18.5.11.4.7 Power Supplies

The LED display matrix shall be powered by regulated switching DC power supplies that operate from 120 VAC input power and have an output of 24 volts DC or less. Power supplies shall be wired in a redundant parallel configuration that uses multiple supplies per display. The supplies shall have a "current sharing" capability that allows them to provide equal amounts of current to their portion of the LED display. Power supplies shall be rated such that if one supply fails, the remaining supplies will be able to operate their portion of the display under full load conditions (all pixels on at maximum drive current) while in an ambient temperature of +140° F.

Power supplies shall operate within a minimum input voltage range of +90 volts to +135 volts AC. Power supply output at an ambient temperature of +140° F shall be no less than 65% of its room temperature (+70° F) output. Power supply efficiency shall be a minimum of 74%. Power supplies shall have a minimum power factor rating of 0.95. Power supplies shall be short circuit protected. Under short circuit conditions, the DC side of the power supply shall be powered down. The power supplies shall reset automatically after 5

seconds of AC power off. Power supplies shall be protected by a minimum overload allowance of 105%. Inputs to power supplies shall be fused or circuit breaker protected. A failed power supply shall not interfere with the other operating power supplies.

The VMS sign controller shall be capable of monitoring the operational status ("normal" or "failed") of each individual power supply by reading a diagnostic signal located on the supply's DC output.

A copy of the power supply manufacturer's data sheet and its UL product card shall be provided with the VMS manufacturer's submittal.

The VMS manufacturer's submittal shall contain calculations demonstrating that the power supplies are rated for the criteria in this Section. These calculations shall account for power supply output de-rating at a temperature of +140° F.

2.18.5.11.4.8 Transient Current Protection

VMS and sign controller signal and power inputs shall be protected from electrical spikes and transients.

AC power for all equipment shall be protected at the load center inside the field cabinet. A parallel-connection surge suppresser, rated for a minimum surge of 10 kJ, shall be connected to the load center in a manner that protects the load center and the equipment it feeds.

AC power for control equipment, such as the field controller, shall be further protected by the use of a series-connected surge suppresser capable of passing 15 amps of current. This device shall be UL 1149 recognized.

EIA 232/485 communication ports in the sign controller shall be protected by avalanche diodes rated for 11.5 volts at 10 amps and 14 volts at 70 amps. The diodes shall be connected between each signal line and ground.

Digital input and output lines from the VMS to the control equipment shall be protected at the control equipment by optically isolated input and output modules, or optically isolated solid state relays. Inputs shall include, but shall not be limited to, the VMS regulated power supply diagnostics and the AC power failure alarm. Outputs shall include, but shall not be limited to, the cooling fan and defog/defrost fan control.

2.18.5.11.4.9 VMS Sign Controller

Each VMS shall include its own individual sign controller, which shall be installed in the field cabinet. The sign controller hardware and software shall support all VMS communication, control, and diagnostic features as listed below.

Memory

Sign controllers shall have both permanent and semi-permanent memory. Permanent memory shall be EE-PROM integrated circuits and shall contain the executable sign controller software. Semi-permanent memory shall be RAM-integrated circuits with a battery backup that retains the data in memory for a minimum of 1 year following a power failure. Semi-permanent memory shall contain the library of messages, the message display schedule and programmable operating parameters. Each message shall have the capability to be defined and stored as a 3-page message.

Power Interruptions

Contents of the sign controller's memory shall be preserved by battery backup during AC power interruptions, and the controller shall automatically resume operation once AC power is restored. Upon recovering from a power interruption, the sign controller shall display the message identified by the Power Recovery Message parameter. The sign controller shall report to the central computer that it has recovered from a power interruption.

2.18.5.11.5 VMS Sign Control Software

The Design-Builder shall provide sign control software according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

Each VMS sign controller shall cause the desired message to be displayed on a single VMS. The sign shall display alphanumeric character fonts. The sign controller shall provide a default value for each NTCIP object supported.

2.18.5.11.5.1 Message Selection

The central computer or laptop computer shall cause the sign controller to implement a message selected from those stored in controller memory, or a new message entered via the communication port.

The sign controller shall incorporate CRC checks to verify MULTI strings. The sign shall not display a message unless the MessageActivationCode CRC matches the MessageCRC.

The first permanent message shall blank the sign display. The second permanent message shall be the diagnostic message. A command to display a message shall not succeed if the activation priority is less than the run time priority of the message currently displayed.

2.18.5.11.5.2 Data Transmission Requirements

Each sign controller shall contain an Ethernet port. The Ethernet port shall be a 10/100 BaseT full duplex port. Each sign controller shall contain two serial communication ports. Each serial port shall be labeled ("Local" or "Central") and shall be set to 9600 baud at the factory. Each serial port shall operate independently at baud rates of 1200, 2400, 9600, and 19,200 bits per second. The user shall select the baud rate for each serial port via a DIP switch.

2.18.5.11.5.3 Communication

The sign controller hardware and software shall communicate with the central computer via Ethernet. Each controller shall be assigned a unique IP address. A sign controller shall only reply to messages sent to its IP address.

A laptop computer connected to the sign controller's local communication port shall have the same control and diagnostic capabilities as the central computer. However, local laptop control capability shall be limited to the VMS that is directly connected to that sign controller.

2.18.5.11.5.4 NTCIP Requirements

The sign controller software shall comply with the National Transportation Communications for ITS Protocol (NTCIP) documents and all related errata sheets published before July 1, 1999, and as referenced herein.

The sign controller software shall support the following standards:

1. NTCIP 1101, *Simple Transportation Management Framework* (STMF), Conformance Level 1 [Simple Network Management Protocol (SNMP)].
2. NTCIP 2001, *Class B Profile*. All serial ports on the device shall support communications according to these standards.
3. NTCIP 2101, *SP-PMPP/RS232* Point-to-Multi-Point Protocol (PMPP).
4. NTCIP 2201, *NTCIP TP-Null* Transport Profile Null (TP-NULL).

The sign controller software shall implement all mandatory objects of all mandatory conformance groups as defined in NTCIP 1201, *Global Object Definitions*, and NTCIP 1203, *Object Definitions for Dynamic Message Signs*. Software shall implement the following conformance groups:

NTCIP 1203, Object Definitions for VMS

1. VMS Sign Configuration
2. MULTI Configuration
3. Default Message Control
4. Pixel Service Control
5. MULTI Error Control
6. Sign Status
7. Status Error
8. Pixel Error Status
9. Lamp Error Status
10. Fan Error Status
11. Power Status
12. Temperature Status
13. Color background
14. Color foreground
15. Color rectangle
16. Graphic
17. Spacing character
18. Text rectangle

The software shall implement the following optional objects:

NTCIP 1203, Object Definitions for VMS

1. dmsMessageBeacon
2. dmsMessagePixelService
3. dmsCommunicationsLossMessage
4. dmsPowerLossMessage
5. dmsTimeCommLoss
6. dmsMultiOtherErrorDescription
7. dmsStatDoorOpen
8. fanFailures
9. fanTestActivation
10. lineVolts
11. tempMaxSignHousing

Objects required by these specifications shall support all values within its standardized range. The standardized range is defined by a size, range, or enumerated listing indicated in the object's SYNTAX field and/or through descriptive text in the object's description field. The following list indicates the modified object requirements for these objects.

Object Name	Object ID	Minimum Requirements
Number of Fonts	numFonts	9
Maximum Characters per Font	maxFontCharacters	255
Default Background Color	defaultBackgroundColor	0
Default Foreground Color	defaultForegroundColor	9
Default Justification Line	defaultJustificationLine	2, 3, and 4
Default Justification Page	defaultJustificationPage	2, 3, and 4
Number of Permanent Msgs.	DmsNumPermanentMsg.	2
Maximum No. Changeable Msg.	DmsMaxChangeableMsg.	8
Maximum Number Volatile Msg. *	dmsMaxVolatileMsg.	8
Control Mode	dmsControlMode	2, 4, and 5
* Changeable messages in excess of the minimum requirement are considered to meet the specification for an equivalent number of Volatile messages.		

The first permanent message shall be used to blank the sign display. The second permanent message shall be the diagnostic message.

Sign controller software shall implement the following tags (opening and closing where defined) of the Mark-Up Language for Transportation Information (MULTI) as defined in NTCIP 1203:

1. Flash
2. Font

3. Justification Line
4. Justification Page
5. Moving Text
6. New Line
7. New Page

2.18.5.11.5.5 Documentation

See Section 2.18.6.4.3.1.

2.18.5.11.5.6 Control Software

The Design Builder shall furnish Variable Message Sign (VMS) control software. The control software shall be a 32-bit application, designed to operate on Microsoft® Windows NT™, 98™, or 2000™ operating system. The control software shall provide for command and control of the following functions:

VMS Control

Software shall retrieve, display, update and download/upload the following functional parameters to the local sign controller in response to user-initiated instructions. The sign controller shall not perform pixel service tests when VMS are displaying messages. Software shall perform the following operations in conjunction with its monitoring and logging functions:

1. Display a message.
2. Blank the current message.
3. Change message priority.
4. Pixel service, lamp, and fan tests.
5. Set time and date in the sign controller.
6. Retrieve sign controller ID, type, and manufacturer.

Communications

Communications between the control software and sign controller shall be NTCIP compliant.

The control software shall verify all communications for errors. If a response from a sign controller contains a communication error, or if there is no response, the Control Software shall reestablish communications.

Data Collection

The control software shall retrieve errors detected, message number currently being displayed, and current message priority. Using different commands, the software shall retrieve message MULTI strings, a map of defective pixels, the time and date, the event schedule, and configuration parameters.

Message Library

The control software shall store messages and transfer messages to a sign for storage and/or display. When a user desires to send a message to a sign, the control software shall offer as choices only those messages compatible with the sign in question. The control

software shall allow message names of up to 25 characters in length. If the selected name already exists, the software shall notify the user and give the option of replacing the existing message or selecting another name.

The control software shall display all character fonts supported by the Variable Message Sign System. Messages shall be displayed on the computer monitor in exactly the same format (font, text centering and justification) as on the Variable Message Sign.

Software Duplication Rights

The Department shall have the right to duplicate the VMS Control Software as needed for use in controlling signs under its jurisdiction.

Documentation

See Section 2.18.6.4.3.2.

2.18.5.12 COMMUNICATION CABLES AND INTERFACES

All locations containing identical components of the same manufacturer, model, and installation configuration shall be configured and wired in an identical manner by the Design-Builder, including internal wiring and harnesses, wiring color codes, labeling terminal block positions, termination strips, power service configuration, and panel and equipment mounting and locations.

2.18.5.12.1 Conductors, Cable

The Design-Builder shall provide conductors and cables according to the Standard Specifications. Section 9-29.3 of the Standard Specifications is supplemented with the following:

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

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

2.18.5.12.2 Twisted Pair (TWP) Cable

The Design-Builder shall terminate all new or relocated TWP on new Krone 110 blocks. TWP cables used for ITS shall be 22 gauge (22 AWG) solid core and should conform to the standard specifications as supplemented with the following:

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

2.18.5.12.3 Fiber-Optic Cable

The Design-Builder shall provide fiber-optic cable according to the Standard Specifications. Section 9-29.3(1) of the Standard Specifications is supplemented with the following:

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

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

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

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

The cable shall be constructed with the following components:

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

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

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

2.18.5.12.3.1 Singlemode Optical Fibers

The Design-Builder shall provide singlemode optical fibers according to the Standard Specifications. Section 9-29.3(1)A of the Standard Specifications is supplemented with the following:

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

2.18.5.12.3.2 Preterminated Patch Panel

The Design-Builder shall provide preterminated patch panels according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

A wiring diagram shall be supplied with each preterminated patch. The wiring diagram shall identify each fiber terminated in the distribution panel using the fiber-optic cable labeling method as specified later in these provisions. The wiring diagram shall be placed in a plastic sheet protector next to the distribution panel.

The Design-Builder shall provide, install, and connect preterminated patch panels. The Design-Builder shall provide additional matching fiber distribution components as needed (e.g., splice closures, patch cords, loom, and fiber routing trays). The panels shall be manufactured by ADC Telecommunications, Inc. Outside plant cable meeting ITU G652.D and G694.2 shall be utilized for the stubs on all preterminated patch panels and the Design-Builder shall confirm with the manufacturer that the length of each stub is sufficient for the needs at each location. All openings in the patch panels shall be plugged by the manufacturer. Connections shall be FC\UPC type and shall be terminated by the manufacturer.

1. Equipment Model Numbers:

Description	Part Numbers (all three parts are required)
12-Port Preterminated Patch Panel	FL2-S1201JXXX-CU00, FL2-FLM0175, and FL2-ACC0071
24-Port Preterminated Patch Panel	FL2-S2202JXXX-CU00, FL2-FLM0350, and FL2-ACC0072
48-Port Preterminated Patch Panel	FL2-S4204JXXX-CB00, FL2-FLM0525, and FL2-ACC0073
72-Port Preterminated Patch Panel	FL2-S7207JXXX-CB00, FL2-FLM0875, and FL2-ACC0074
96-Port Preterminated Patch Panel	FL2-S9209JXXX-CB00, FL2-FLM0105, and FL2-ACC0075

The stub length for each panel shall be determined by the Design-Builder for each location and shall include 50 feet of slack in the cable vault. Preterminated patch panels shall have stubs exiting downward from the panel for all cabinet and mini-hub locations and upward for all hub locations. All stubs shall exit from the left side of the preterm panel as viewed from the front.

2. Manufacturer Information:

ADC Telecommunications, Inc.
P.O. Box 1101
Minneapolis, MN 55440-1101.
Telephone: (800) 366-3891

2.18.5.12.3.3 Identification and Labeling

All fibers inside the preterminated patch panels shall be identified and labeled. Printed labels shall be installed for each fiber and shall include the fiber number and what direction the fiber is going such as “6 north”. There shall also be a label grouping fibers together and describe where they are going such as “fibers 1-12 to Roanoke Hub

2.18.5.12.3.4 Fiber Management Tray

The Design-Builder shall provide and install one fiber management tray for each preterminated patch panel installed.

1. Equipment Model Numbers:

Description	Part Number
Fiber Management Tray	FMT-DBS000000-A00B

2. Manufacturer Information:

   ADC Telecommunications, Inc.
   P.O. Box 1101
   Minneapolis, MN 55440-1101.
   Telephone: (800) 366-3891

2.18.5.12.3.5 Fiber-Optic Connector

The Design-Builder shall provide fiber-optic connectors according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

All fiber-optic connectors used on this project shall meet the following:

1. All shall be LC/UPC (55dB) in accordance with Telcordia 6R-326.

2. All shall be factory-connectorized.

Fiber-optic patch cords and connectors may be multi-mode between individual devices and the controller cabinet if the control cable is multi-mode. In this case, the fiber-optic connectors shall be SC and shall be factory-connectorized.

2.18.5.12.3.5.1 LC-UPC Fiber Connectors

The Design-Builder shall use factory-installed FC-UPC connectors with yellow or blue boots for single-mode fibers and shall follow these requirements:

- LC-UPC connector loss shall be < 0.3 dB; maximum reflectance value shall be -55 dB;
- Connector ratings shall be from -22 degrees Fahrenheit to 140 degrees Fahrenheit for operation; and from -40 degrees Fahrenheit to 140 degrees Fahrenheit for storage;
- Connectors shall have protective caps;
- Connectors shall be secured to the aramid fibers surrounding the individual optic fibers;
- Connector bodies shall be of one-piece construction, have metallic coupling nuts and bodies, and zirconia ceramic ferrules; and
- Boots shall be glued in place to prevent spinning.

2.18.5.12.3.6 Fiber-Optic Cable Lubricant

The Design-Builder shall provide fiber-optic lubricant according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

Fiber-optic cable lubricant shall be as follows:

1. Compatible with the cable jacket.
2. Non-combustible.
3. Water-based leaving little or no residue.

2.18.5.12.3.7 Fiber-Optic Cable Splicing

The Design-Builder shall follow the fiber optic cable manufacturer's methods, recommendations, materials, and techniques for splicing.

Field splices shall be located where the distribution cable is spliced to a preterminated patch panel stub. No additional splices will be allowed without the approval of the Engineer.

The Design-Builder shall fusion-splice the fiber optic cable only. Cable splices will be allowed if approved by WSDOT; only at the location specified; and then only when there are no practical alternatives. Splices shall be made in cable vaults using splice closures approved by WSDOT. Acceptable fusion splicing techniques are:

1. Local Injections and Detection.
2. Profile Alignment System.

The Design-Builder's splicing equipment shall be in good working order, properly calibrated, and meet all industry standards and safety regulations. The cable preparation, closure installation, and splicing shall be accomplished in accordance with industry standards.

To minimize mechanical stress on splicing locations, cables shall be trained into final position observing minimum bending radii of the cable of not less than 20 times the diameter of the cable, or as specified in the manufacturer's requirements, whichever is greater.

The Design-Builder shall seal all cables where the cable jacket is removed. The cable shall be sealed per the cable manufacturer's recommendation with an approved blocking material.

The Design-Builder shall seal all buffer tubes with an approved blocking material to prevent migration of gel into splice trays.

All splices shall be contained in splice trays utilizing strain relief, such as heat shrink wraps, as recommended by the splice tray manufacturer.

Cleanliness and freedom from contamination shall be strictly observed with respect to splicing materials and joint construction. Upon completion of the splicing operation, the Design-Builder shall deposit all waste material in suitable containers for fiber-optic

disposal, remove it from the job site, and dispose of it in accordance with State and Federal laws.

2.18.5.12.3.7.1Outdoor Fiber-Optic Splice Closures

All below ground splices shall be contained in waterproof splice closures. Fiber-optic splice closures shall be re-enterable and reusable and be designed for use on fiber-optic cables in an underground, submerged environment. Closures shall utilize two half shells bolted together with stainless steel bolts and be fitted with a neoprene gasket. Selected splices shall not require a re-entry kit. Upon sealing the splice closure, the Design-Builder shall show that the closure maintains 10 psi of pressure for a 24-hour period. All splice closures shall be rated for 1310 and 1550 nanometer wavelengths. Splice closures shall contain a valve to allow pressurization of the housing. The temperature rating for the splice closure shall be -22 degrees Fahrenheit to 140 degrees Fahrenheit.

The splice closure shall permit the cable to enter without exceeding the minimum bending radius; shall have non-oxidizing coating on all connections; and shall have a cable clamp bonding it to the cable. The enclosure shall have space to terminate up to two trunk cables.

The splice closure shall permit selective fiber splicing (i.e., a cable can loop in and out with only the selected fibers cut).

Outdoor fiber optic-splice closures shall be comprised of an outer enclosure and an inner enclosure.

Outer Enclosure

The Design-Builder shall provide an outer enclosure, which meets the following requirements:

- Protects splices from damage.
- Is composed of salt corrosion-resistant material and compatible materials not supporting galvanic cell action.
- Is re-enterable.
- Permits splicing without circuit disruption.
- Has a grounding lug (ground all fiber optic cable shields).
- Has cable (trunk and pigtail) strain relief and is compatible with the inner enclosure, splice trays, and cables.

Inner Enclosure

The Design-Builder shall provide a plastic splice tray (inner enclosure), which meets the following requirements:

- Allows entry to individual fibers.
- Is stackable.
- Holds 12 splices and 24 fibers.
- Does not violate the bare fiber bend radius.
- Has room for identification of the splice on the cover.

2.18.5.12.3.8 Fiber-Optic Cable Labeling

The Design-Builder shall label fiber-optic cable according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

The Design-Builder shall identify all fiber optic cable at all terminals, and whenever the cable is entering or leaving a vault, junction box, housing, or enclosure. The Design-Builder shall use permanent non-conducting white-colored heat shrink wraps, with identification based on the ITS detail sheets fastened securely to the cables.

The Design-Builder shall use cable designations that consistently conform to the accepted overall scheme developed by the Design-Builder to indicate location, circuit, device, cable number, terminal branch, and position. The Design-Builder shall use letters and numbers.

The surface of the outer jackets shall be printed with the manufacturer's identification, date of manufacture, and part number.

2.18.5.12.4 Cable Installation, General

The Design-Builder shall install cable according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

The Design-Builder shall determine a suitable cable installation method to ensure that all cable installation requirements shall be met in all conduit sections. All work shall be carried out in accordance and consistent with the highest standards of quality and craftsmanship in the communication industry with regard to the electrical and mechanical integrity of the connections; the finished appearance of the installation; as well as the accuracy and completeness of the documentation.

The Design-Builder shall make a physical survey of the Project site for the purpose of establishing the exact cable routing and cutting lengths prior to the commencement of any fiber-optic work or committing any fiber-optic materials. Splicing is only allowed for the programmed connection of reels to connect a lateral fiber-optic cable to the mainline distribution fiber-optic cable. The Design-Builder shall submit a cable routing plan that shows the locations of all splices.

2.18.5.12.4.1 Fiber-Optic Cable Installation

Fiber-optic cables shall be installed in continuous lengths without intermediate splices throughout the project as approved in writing by the Engineer.

The Design-Builder shall comply with the cable manufacturer's specifications and recommended procedures including, but not limited to the following:

1. Installation.
2. Proper attachment to the cable strength elements for pulling during installation.
3. Bi-directional pulling.
4. Cable tensile limitations and the tension monitoring procedure.
5. Cable bending radius limitations.

The Design-Builder shall protect the loops from tangling or kinking. At no time during the length of the project shall the cable's minimum bending radius specification be violated.

To accommodate long, continuous installation lengths, bi-directional pulling of the fiber-optic cable shall be permitted.

In all cable vaults, pull boxes, and at all splice locations cable slack of 50 feet shall be left by the Design-Builder. The 50 feet length of fiber-optic cable shall be coiled and secured with tie raps to racking.

Installation shall involve the placement of fiber-optic cables in a specified inner duct as defined in the Plans. The Design-Builder shall ensure that inner ducts are secured to prevent movement during the cable installation process.

The pulling eye/sheath termination hardware on the fiber-optic cables shall not be pulled over any sheave blocks.

When power equipment is used to install fiber-optic cabling, the pulling speed shall not exceed 100 feet per minute. The pulling tension limitation for fiber-optic cables shall not be exceeded under any circumstances.

Large diameter wheels, pulling sheaves, and cable guides shall be used to maintain the appropriate bending radius. Tension monitoring shall be accomplished using commercial dynamometers or load-cell instruments.

The Design-Builder shall install cable in accordance with the Special Provisions and the following:

- The Design-Builder shall calculate the expected tension on fiber optic trunk cable and pulling tape prior to installing trunk cable in conduit runs. The Design-Builder shall distribute the pulling force between the inner strength member and the aramid fibers by securing both to the main pulling device.
- The Design-Builder shall use a “break-away” type pulling attachment to protect against over-stressing the cable. The Design-Builder shall not use a cable grip that pulls only on the outer jacket to pull fiber optic cable.

Damage to the cable from any source which exceeds the manufacturer’s recommended tensile strength limits or cable-bending radius is cause for the cables to be rejected.

The Design-Builder shall use lubricants during cable-pulling operations, in accordance with the Special Provisions. The lubricants shall be compatible with cable insulation materials, and shall not deteriorate the cable insulation.

2.18.5.12.4.1.1Repair of Fiber-Optic Cable Damaged During Installation

The Design-Builder shall exercise caution and excavate manually using hand-held tools when exposing an existing fiber optic cable. The Design-Builder shall report all nicks or abrasions to WSDOT prior to replacement. The Design-Builder shall not exceed the bending radius while handling and re-routing the cable.

In the event a cable is severed or otherwise rendered not usable because of Work preformed as part of the Contract, the Design-Builder shall perform the following activities:

- Use fusion splices to make the initial emergency repair to fiber optic cable.
- Install the splices in existing splice vaults using all of the materials required for splicing fiber optic cable. The fusion splices shall meet the requirements for splices made by the Design-Builder. The Design-Builder shall install approved fiber optic cable with fusion splices.

- Install new cable between existing terminations or splices as appropriate for cable severed because of Work performed as part of the Contract.
- If nicks or abrasions occur, the Design-Builder shall replace the entire fiber optic cable run with new fiber optic cable.

Spliced fiber optic cable shall be replaced with new, unspliced cable, unless otherwise provided for in this RFP. The Design-Builder shall notify the WSDOT Electrical Inspector as soon as cable damage is discovered.

2.18.5.12.5 Cable Racking in Pull Boxes and Cable Vaults

The Design-Builder shall rack cable according to the Standard Specifications. Section 8-20.3 of the Standard Specifications is supplemented with the following:

The Design-Builder shall rack the cable in vertical figure eight loops, which shall permit pulling slack from the vaults without introducing twist to the cable.

Cables shall be secured in racked positions with nylon ties. Identification or warning tags shall be securely attached to the cables in at least 2 locations in each pull box or cable vault.

All coiled cable shall be protected to prevent damage to the cable and fibers. Racking shall include securing cables to brackets (racking hardware) that extend from the side walls of the pull box.

All racking hardware shall be stainless steel.

2.18.5.12.6 As-Built Records

See Section 2.12.

2.18.5.13 VIDEO, VOICE & DATA DISTRIBUTION AND TRANSMISSION SYSTEMS

Electric, electronic, DMS control, video, and telephone cables may exist within the Project limits and may be impacted by construction activities and/or require replacement. The Design-Builder shall exercise caution when working near existing cables. When exposing existing cables, the Design-Builder shall excavate manually using only hand-held tools.

Industry-accepted lubricants used during cable pulling operations shall be compatible with cable insulation materials and shall not degrade the cable insulation. The Design-Builder shall stock splice kits meeting the technical requirements to repair any cable damaged by construction activities. When making temporary twisted pair control cable splices, the Design-Builder shall use button-style, gel-filled, crimp-on, butt splices enclosed in zippered poly bags. The Design-Builder shall protect the splices above ground until the permanent splices are installed.

For cable damaged by Work performed as part of the Contract, the Design-Builder shall install new cable between existing terminations or splices.

The Design-Builder shall seal all nicks or abrasions caused when exposing a cable by hand-digging, with rubber splicing tape. The Design-Builder shall seal a nick penetrating the cable jacket to the underlying material with a cast epoxy kit using 3M Scotchcast kits and 3M Scotch #23 rubberized splicing tape that have met the requirements for cable jacket repair, or by using an equivalent approved by WSDOT.

All cables connecting equipment such as DMS, CCTV cameras, and cabinets shall conform to the equipment manufacturer's specifications, the Standard Specifications, and the requirements of this Section.

A mounting panel shall be provided for every cabinet and hub location where RuggedCom equipment is being installed, according to the WSDOT Northwest Region ITS details.

2.18.5.13.1 Materials

The Design-Builder shall provide materials according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

If any cabling equipment specified in this Section has been superseded by a newer product that is interchangeable, the newer product shall be supplied. If the product is no longer available and has no replacement, the Design-Builder shall propose a different product meeting the same performance and material specifications as the discontinued one.

2.18.5.13.2 Patch Cords

The Design-Builder shall provide and install fiber optic patch cords between the fiber optic distribution panels and the equipment specified herein where singlemode fiber optic cable is utilized as the transmission medium. Patch cords shall not be more than 1 foot longer than required to make a connection. Patch cords between a patch panel and a device shall be contained inside of appropriately-sized yellow split loom.

Patch cords placed between pad mounted cabinets that share a conduit shall be protected by appropriately sized yellow split loom. The loom shall cover the entire length of the patch cord(s) to within 12-inches of each end. The loom shall be installed before the patch cords are pulled into the conduits. Cabinets not sharing a conduit shall not have patch cords installed between them, but shall utilize outdoor rated fiber optic cable and a preterminated patch panel.

2.18.5.13.3 Electric and Electronic Cable

The Design-Builder shall not splice electric or electronic cables without the WSDOT Electrical Inspector's approval. The Design-Builder shall use 1-piece cables between termination points for power, communications control, and RF cables.

When using crimp-on connectors, the Design-Builder shall install the insulation of electrical cables deep enough into the lug so that the insulation acts as a strain relief.

The Design-Builder shall maintain the electrical continuity of the cable shields. The Design-Builder shall comply with Section 3.3 of the USDA RUS Splicing Standard PC-2 for shield bonding. The Design-Builder shall use bonding connectors complying with RUS standard PE-33 (Cable Shield Connectors).

2.18.5.13.4 Video, Voice, & Data Distribution and Transmission System Cabling

The Design-Builder shall provide video, voice and data distribution and transmission system cabling according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

The Design-Builder shall provide and install all required equipment interconnection cabling to include T1 cables, data cables, RG-59/U video coaxial cables, power cables,

ancillary cables, and connectors as recommended by the equipment vendor at the cabinet locations and at the TMC. Conductors shall be of all copper construction.

2.18.5.13.5 Video, Voice, and Data Distribution Equipment

The Design-Builder shall provide video, voice, and data distribution equipment according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

Video, voice, and data distribution equipment shall be manufactured by Optelecom, Inc.

1. Equipment Model Numbers:

Digital Video Transmitter (stand-alone)	9225DT/SM-LC
Digital Video Receiver	9221DR/SM-LC
Drop/Insert Data Modem	9522A-LD-LC
Network Interface Card	9942A
Network Interface Software	9900-NMS
Hub Chassis	9002
Cabinet Chassis	9003-2
Power Supply (for Hub Chassis)	9030B
AC/DC Adapter (for Cabinet Chassis)	9010PS
AC/DC Adapter (for 9225DT)	9014PS

2. Manufacturer Information:

Optelecom Inc.
12920 Cloverleaf Center Dr.
Germantown, MD 20874
Telephone: (301) 444-2200

2.18.5.13.6 Ethernet Switches

The Design-Builder shall provide Ethernet switches according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

Ethernet switches shall be manufactured by RuggedCom, Inc., and installed in each cabinet and Communication Hub.

1. Equipment Model Numbers

<u>Unmanaged Switch</u>
Rugged Switch (RMC40-HI-L2L2)
<u>Managed Switch</u>
8 port Rugged Switch (RS900-HI-D-L2-L2-00)
9 port Rugged Switch (RS900-HI-D-L2-L2-L2)

2. Manufacturer

RuggedCom, Inc.
64 Jardin Drive Unit #3G
Concord, Ontario, Canada L4K3P3
Tel: (905) 760-7799 Fax: (905) 760-9909
Toll Free: (888) 264-0006

2.18.5.13.7 Cabinet Device Server

The Design-Builder shall provide cabinet device servers according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

Cabinet device terminal servers shall be manufactured by RuggedCom, Inc. and installed in each cabinet and the Communication Hubs.

1. Equipment Model Numbers

   Cabinet Device Servers
   RuggedServer (RMC30-HI)

2. Manufacturer

   RuggedCom, Inc.
   64 Jardin Drive Unit #3G
   Concord, Ontario, Canada L4K3P3
   Tel: (905) 760-7799 Fax: (905) 760-9909
   Toll Free: (888) 264-0006

2.18.5.13.8 Video Transmission System Equipment

The Design-Builder shall provide video transmission system equipment according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

Video transmission system equipment shall be manufactured by Communication Specialties, Inc.

1. Equipment Model Numbers:

10-channel digital video transmitter	Pure Digital Fiberlink (3132-F-9)
10-channel digital video receiver	Pure Digital Fiberlink (3133-F-9)

2. Manufacturer Information:

   Communication Specialties, Inc.
   55 Cabot Court
   Hauppauge, NY 11788
   Telephone: (631) 273-0404
   Fax: (631) 273-1638
   www.commspecial.com
   info@commspecial.com

2.18.5.13.9 EIA-422 Combiner Unit

The Design-Builder shall provide and install EIA-422 Combiner Unit equipment according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

The Design-Builder shall install the EIA-422, 4-wire combiner in communication hubs that serve new CCTV cameras. The combiner shall be manufactured by Vicon, Inc. The Contractor shall provide and install cables from the combiner to the Video/data receivers. The combiner shall have one master port and 10 output ports:

1. Equipment Model Numbers:

Combiner: Model V1400X-IDL Intelligent Distribution Line Control

2. Manufacturer Information:

Vicon Industries, Inc.
89 Arkay Drive
Hauppauge, NY 11788
Telephone: (800) 645-9116
or (631) 952-2288
www.vicon-cctv.com

2.18.5.14 GROUNDING

The Design-Builder shall install a grounding system and protection devices that are suitable for the specific installation and equipment being supplied, in accordance with Section 8-20 of the Standard Specifications, and Standard Plan J-9a.

2.18.5.15 ITS COMMUNICATION HUB

All work in ITS communications hubs shall meet manufacturer's requirements. All construction within existing hubs shall be done under the direct supervision of the WSDOT ITS Implementation Engineer. Working hours within the hub shall conform to Section 2.18.3.4.3.

2.18.5.16 ITS ACCEPTANCE

The Design-Builder shall notify WSDOT when all ITS requirements have been met. WSDOT will accept the ITS after verifying the proper operation of all components.

2.18.6 SUBMITTALS

The Design-Builder shall comply with Sections 2.12 and 2.28 for plan/test report submittals, reviews, and other administrative processes, unless otherwise specified.

2.18.6.1 ITS PRELIMINARY PLANS SUBMITTAL

The ITS Preliminary Plans, Fiber Optic System Test, and other test plans described in this Section shall be submitted to WSDOT for Review and Comment as part of the Preliminary Design Submittal described in Section 2.28.

The ITS Preliminary Plans Submittal shall include the devices described in this Section, in addition to the following:

- Title block, north arrow, and scale bar.
- Legend of symbols.
- Existing ITS features and utilities.
- Locations of all proposed ITS devices with labels.
- Existing channelization.

- Proposed fiber-optic cable/conduit location plan.
- Communications cutover plan.
- Cabinet locations.

2.18.6.2 ITS FINAL DESIGN SUBMITTAL

The Design-Builder shall provide an ITS Final Design Submittal, as part of the Final Design Submittals described in Section 2.28, that addresses the comments received from the ITS Preliminary Plans Submittal review, and any issues raised during the ITS design meetings.

The ITS Final Design Submittal shall be complete and include all of the items from the ITS Preliminary Plans, in addition to the following:

- All ITS details in accordance with the WSDOT *Northwest Region ITS Details*.
- All ITS labels.
- Temporary ITS plan.
- Pull box, cable vault, and junction box locations and details.
- Communication schematics and fiber distribution diagrams.
- Fiber-optic splice details.
- Loop termination schedule.
- Panel service details.
- Transformer/breaker schedule.
- Power service locations.
- Power distribution schematic.
- Cabinet foundation details.
- Hub details.
- Fiber termination cabinet details.
- DMS (including LCS, SDMS, and VMS) mounting details.
- CCTV camera pole structure details.
- Foundation details for CCTV camera poles.
- Details for non-standard elements.
- Wire notes (including identification of new and existing conductors and cable) and construction notes.
- Calculations to support transformer sizing and transformer over current protection devices.
- Conduit fill and junction box capacity calculations.
- Service load calculations.

Cabinet details shall include provide technical information about equipment layout and connections between components.

The Design-Builder shall submit a Fiber Optic Splicing and Testing Plan with each Final Design Submittal that includes ITS Work.

2.18.6.3 RELEASED FOR CONSTRUCTION ITS PLANS

Refer to Sections 2.12 and 2.28 for submittal and review requirements.

2.18.6.4 MISCELLANOUS TESTING

The Design-Builder shall provide shop drawings and information on materials according to the Standard Specifications. Section 8-20.2(1) of the Standard Specifications is supplemented with the following:

When submitting material lists for approval, the Design-Builder shall identify all revisions or changes to manufacturer names, component names, and model numbers listed in these Special Provisions. The Design-Builder shall also include a brief justification for the revision or change.

2.18.6.4.1 Detection

2.18.6.4.1.1 Loop Accuracy

The documentation of testing required in Section 2.18.3.2.2.2.2 shall include the cabinet name, the location of each loop on the terminal block in the cabinet, each loop name associated with the number of vehicles that drove over the loop during the testing period, and the number of 'hits' shown on the display panel during the testing period.

2.18.6.4.2 CCTV

2.18.6.4.2.1 CCTV Poles

The Design-Builder shall submit CCTV pole structural calculations according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

The Design-Builder shall submit all structural calculations and shop drawings for CCTV poles to the Engineer for review and comment in accordance with Section 2.12, Section 2.25 and Standard Specification Section 6-03.3(7), prior to fabrication of the poles and hardware.

2.18.6.4.3 DMS

2.18.6.4.3.1 Test Results

The Design-Builder shall provide a copy of all Factory Test reports to the Engineer at the time of shipment. The Design-Builder shall provide the Engineer with a copy of the Field Test reports for each VMS, once the VMS equipment is found to be fully functional. The test reports required by this specification shall include:

1. A list of all equipment used to perform the tests.
2. A record of each test step, who performed the tests, who witnessed the tests, and the test results.

3. A record of test failures, corrective action taken, and results of the retest.

2.18.6.4.3.2 Sign Control Software Documentation

The Design-Builder shall provide sign control software documentation according to the Standard Specifications. Section 8-20.2 of the Standard Specifications is supplemented with the following:

Software shall be supplied with all documentation on CD-ROM. ASCII versions of the following Management Information Base (MIB) files in Abstract Syntax Notation 1 (ASN.1) format shall be provided on CD-ROM:

1. The official MIB Module referenced by the device functionality.
2. A manufacturer-specific version of the official MIB Module with the non-standardized range indicated in the SYNTAX field. The filename shall match the official MIB Module, with the extension "spc."
3. A MIB Module of all manufacturer-specific objects supported by the device with accurate and meaningful DESCRIPTION fields and the supported ranges indicated in the SYNTAX field.

The Design-Builder shall furnish 12 copies of the Control Software user manuals for each type of DMS sign (LCS, SDMS and VMS) to the Engineer. In addition, 3 sets of the software, installation program, instructions and user manual for each type of DMS sign shall be furnished on CD-ROM to the Engineer.

2.18.6.4.4 Communication Conduit System

The Design-Builder shall comply with Section 2.12, Section 2.25 and the following requirements, which supplement Section 8-20.2 of the Standard Specifications:

Within a minimum of 30 Calendar Days prior to the first use of the material in construction, the Design-Builder shall provide all documentation pertaining to the materials proposed to satisfy the requirements of Section 2.18.4.6.

The Design-Builder shall anticipate a minimum of 30 Calendar Days for review of each submitted item. Actual time for the Engineer's review is dependent upon the completeness and appropriateness of the documentation being submitted. Any deficiencies will require additional time for review. Any delays caused by such deficiencies will not be considered grounds for extension of project time. The Design-Builder shall anticipate review intervals to ensure project progress in accordance with Chapter 1 of this RFP.

Submittals required by this item shall include, but not be limited to, the following:

1. The manufacturer's specifications for cable vaults and pull boxes.
2. Detailed shop drawings of pull box and cable vault fabrication.
3. Manufacturer's specifications for all conduit, fittings, and accessories.
4. 3-foot sample of each type (PVC schedule 40 and PVC schedule 80) of conduit with bell ends.
5. Certificate of compliance with requirements for coefficient of friction and Bellcore GR-356-CORE for innerducts.

2.18.6.4.5 Communications Cables and Interfaces

The Design-Builder shall comply with Section 2.12, Section 2.25 and the following requirements, which supplement Section 8-20.3 of the Standard Specifications:

Within a minimum of 30 Calendar Days prior to installation of the first communications cable and/or interface, the Design-Builder shall provide all documentation pertaining to the materials and method of execution proposed to satisfy the requirements of Section 2.18.4.7. The Engineer's review and comment is required prior to the committing of any materials or the commencement of any work.

The Engineer shall review and comment on each submitted item within 30 Calendar Days of submittal subject to the completeness of the submittal. Actual elapsed time for the Engineer's review is dependent upon the completeness and appropriateness of the documentation being submitted. Any deficiencies in the Design-Builder's submittals shall require additional time for review. Any delays caused by such deficiencies shall not be grounds for extension of project completion dates. The Design-Builder shall anticipate review intervals and schedule submittals accordingly to ensure project progress in accordance with Chapter 1 of this RFP.

The Engineer's review of any submitted documentation shall in no way relieve the Design-Builder from compliance with the safety and performance requirements as specified herein.

Submittals required by this item shall include, but not be limited to, the following:

1. A material staging plan, should the Design-Builder propose State-owned property as a staging area.
2. Manufacturer's complete specifications for all communication system cables and associated electronics and hardware components.
3. Manufacturer's complete specifications for twisted-pair cable splice enclosures.
4. A detailed fiber-optic and twisted-pair cable installation procedure including the following:
    a. Fiber-optic cable cutting lengths reflecting the cable order and reel allocations.
    b. Cable pulling plan which shall state the exact operational procedures to be utilized and which identifies the physical locations for equipment placement, proposed equipment setup at each location, pulling tension on all cables for each pull, staffing, and the pulling methodology for each type of cable.
    c. Exact splice points as provided for herein.
    d. Workforce proposed for all equipment, safety, and manual assist operations
5. Factory test data sheets for each reel of cable delivered.

2.18.6.4.5.1 Twisted Pair (TWP) Test Documentation

The Design-Builder shall document testing described in Section 2.18.3.2.5 in accordance with this Section.

The Design-Builder shall document the transmission quality test results for 50% of the pairs in each cable of the installed TWP cable and provide documentation for each cable that the cable meets or exceeds the manufacturer's published specifications and otherwise complies with the requirements set forth in Section 2.18.3.2.5 for characteristic impedance, longitudinal balance, resistive and impedance losses, and near-end crosstalk.

2.18.6.4.5.2 Fiber-Optic Cable Test Documentation

The Design-Builder shall comply with Section 2.12, Section 2.25 and the following requirements, which supplement Section 8-20.3 of the Standard Specifications:

Submittal of the results of testing described in Section 2.18.3.2.6 shall be as follows:

The Design Builder shall submit one hard copy and one electronic copy of the fiber test results to the ITS Implementation Engineer for review and comment. Only one OTDR test result shall be on each page.

Upon resolution of comments on the cable installation and test results, the Design-Builder shall submit 3 hard copies and 3 electronic copies of the fiber test results to the ITS Implementation Engineer.

Hard copy submittals shall be bound in 3-ring binders. Each 3-ring binder shall have the following information on the front and side:

1. The title "Fiber Optic Test Results."
2. The name of the roadway(s) where fiber was installed.
3. Contract name and number.
4. Date.

The front cover shall also include the following:

1. The size of each cable installed and the beginning and ending mileposts of each cable replaced.
2. The name, address, and phone number of the company that did the fiber-optic installation

Each 3-ring binder shall also include a table of contents and index dividers for each cable segment and each direction tested. The electronic submittals shall be on compact discs and include one licensed copy of the applicable OTDR reader program.

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

1. Contract number, contract name, Design-Builder name and address
2. Dates of cable manufacture, installation, and testing.
3. Cable specifications.
    - Manufacturer data sheet.
    - Helix Factor.
    - Date of manufacture.
4. Fiber (Glass) specifications:
    - Manufacturer and Part #.
    - Index of Refraction.
    - Optical performance (loss/km).
    - Mode Field Diameter.
5. As-Built Records.

6. OTDR test results – No more than 1 test per page.
7. Power Meter test results.

The Design-Builder shall submit fiber-optic cable test documentation, including calibration and certification of the fiber-optic cable test equipment, as part of the component documentation

The Design-Builder shall use WSDOT's file naming convention for all test files.

The Design-Builder shall provide a test summary describing the final measurements that are out of range, any approved changes in specified methods, and actual dates of tests performed by both power meter and Optical Time Domain Reflectometer.

Upon completion of the Project, the Design-Builder shall provide the WSDOT Implementation Engineer with 2 copies of the manufacturer's reel (spool) test documentation.

2.18.6.4.6 Video, Voice, and Data Distribution and Transmission System Documentation

The Design-Builder shall comply with Section 2.12, Section 2.25 and the following requirements, which supplement Section 8-20.3 of the Standard Specifications:

Documentation for each system element described in Section 2.18.5.13 shall consist of the manufacturer's name and model number, serial number when available, materials and operating specifications, wiring schematic and parts list, owners manuals, factory service manuals, and procedures for factory testing and system acceptance testing specified elsewhere herein. The Design-Builder shall submit 3 copies of the documentation specified above prior to the installation of the cable or components described in the submittal. In addition, the Design-Builder shall submit 3 copies of an overall system wiring schematic and termination chart for the installed TMS elements (operation and maintenance manuals). All documentation for each individual element shall be neatly bound in such a way that the information is secured together and is totally legible without removing the information from the binding.

2.18.6.5 OTHER SUBMITTALS

- Component, test, and project documentation.
- Maintenance and Operations Plan.
- List of repair part vendors.
- Product manuals.

The Design-Builder shall provide WSDOT with the x, y, and z GPS coordinates of the newly installed ITS components including, but not limited to, the following elements:

- CCTV Systems.
- DMS (including LCS, SDMS and VMS).
- Data Stations Systems.
- Communication Conduit Systems.
- Communication Cable and Interface Systems.
- Video, Voice, and Data Distribution and Transmission Systems.

- Communication HUBs.
- Permanent Traffic Recorder Stations.
- Loop detectors.
- Non-intrusive vehicle detectors.
- Control cabinets.
- All junction and pull boxes, and cable vaults.
- Mainline fiber-optic cable (every 50 feet).
- Fiber-optic splices vaults.
- Stand-alone electric service pads.

The Design-Builder shall also provide WSDOT with the x, y, and z GPS coordinates of existing components when they are connected to the new components.

End of Section

2.19 SIGNING

2.19.1 GENERAL

The Design-Builder shall conduct all Work necessary to meet the requirements for permanent signing for the Project.

The Design-Builder shall place static signs with the legend "ENTERING VARIABLE SPEED ZONE" on I-5 southbound, I-90 eastbound, and SR 520 eastbound prior to the beginning of the Active Traffic Management Implementation Area. In addition, "Entering Variable Speed Limit" signs shall be placed on the following freeway-to-freeway ramps:

- The ramp from I-5 northbound to SR 520 eastbound.
- The ramp from I-5 southbound to SR 520 eastbound.
- The ramp from I-5 southbound to I-90 eastbound.
- All ramps from I-405 northbound and southbound to I-90 eastbound and westbound.

The Design-Builder shall remove all speed limit signs within the Project Area and shall remove speed limit signs outside of the Project Area, as noted in the Conceptual Plans.

The Design-Builder shall remove all existing variable speed limit signs and related equipment on I-90. See Section 2.18 for additional requirements regarding variable speed limit sign and equipment removal.

The Design Builder shall design and place Dynamic Message Signs (DMS) as detailed in Section 2.18.

Refer to Section 2.22 for additional temporary signing requirements.

2.19.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Standard Plans* (M21-01) (Appendix D15).
- WSDOT *Traffic Manual* (M51-02) (Appendix D17).
- *Manual on Uniform Traffic Control Devices – Washington State Modifications* (M24-01) (MUTCD) (Appendix D23).
- WSDOT *Materials Manual* (M46-01) (Appendix D9).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- *I-90 Architectural Standards* , December, 1986 (Appendix L1).

- WSDOT *Northwest Region Sign Design Current Practices Manual* (Appendix T19).
- WSDOT *HOV Design Guide for the Northwest Region* (Appendix T4).
- WSDOT *Sign Fabrication Manual* (M55-05) (Appendix D24).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D11).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D8).
- FHWA *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD), 2003.
- AASHTO *A Policy on Geometric Design of Highways and Streets*, 5th Edition, 2004.
- AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, 5th Edition, 2009.
- AASHTO *Roadside Design Guide*, 3rd Edition, 2002, and 2006 Chapter 6 Update.
- Transportation Research Board *Highway Capacity Manual*, 2000.
- ITE *Traffic Control Devices Handbook*, 2001.
- FHWA *Traffic Control Systems Handbook*, 2005.
- ITE *Traffic Engineering Handbook,* 6th Edition, 2009.

2.19.3 PERFORMANCE REQUIREMENTS

2.19.3.1 SOFTWARE

The Design-Builder shall use software for producing engineering drawings of guide signs that can either create or seamlessly convert files to MicroStation DGN.

Sign specifications shall be provided in the format described in WSDOT's Sign Spec 2000 Microsoft Excel program (sheet tab *INS Page 1*).

The program can be accessed from the following link:

http://www.wsdot.wa.gov/northwest/trafficdesign

2.19.3.2 MEETINGS

Refer to Section 2.18 for mandatory meetings.

2.19.3.3 NOTIFICATION

The Design-Builder shall notify WSDOT a minimum of 7 Calendar Days prior to removal of the existing Variable Speed Limit (VMS) signs and related equipment on I-90. See Section 2.18 for further requirements related to these signs.

2.19.4 DESIGN AND CONSTRUCTION REQUIREMENTS

2.19.4.1 SIGNING DESIGN REQUIREMENTS

2.19.4.1.1 General

Prior to furnishing and installing signs, the Design-Builder shall prepare a Signing Plan to be reviewed by WSDOT.

The Conceptual Plans (Appendix M1) are intended to identify the location of required DMS, including Lane Control Signs (LCS), Side-Mount Dynamic Message Signs (SMDS) and VMS. The Design-Builder shall be responsible for including required signs that are not shown in the Conceptual Plans in the permanent signing design. Final placement of all overhead-mounted DMS and all DMS mounted to the vertical members of existing structures shall be as shown in the Conceptual Plans. Final placement of all ground-mounted signs shall be determined by the Design-Builder, subject to the approval of WSDOT.

2.19.4.1.2 Plan Requirements

The Design-Builder shall prepare and submit a Permanent Signing Concept Plan for the Project. This Plan shall include all required signs and DMS. The Permanent Signing Concept Plan shall provide for modifications to signs outside of the Project limits that are determined by WSDTO to have been rendered inaccurate, ineffective, confusing, or unnecessary as a result of modifications by the Project. The modifications shall include the addition, removal, or alteration of signs and appurtenances. The Permanent Signing Concept Plan shall include and provide for all Project signing within and outside of the Project limits.

The Permanent Signing Concept Plan shall include, but is not limited to, the following:

- Locations of existing guide signs.
- Locations of variable speed limit signs and static speed limit signs to be removed by the Project.
- New and exiting DMS.
- New ground-mounted signs.
- Types of existing structure to which signs will be mounted.

All signs that are relocated shall be installed on new steel sign posts and on new foundations.

A sample of the required static sign with legend “ENTERING VARIABLE SPEED ZONE” is shown in Appendix T14. In each location where it is placed, the sign shall be located so that the maximum number of drivers may view the sign before entering the Active Traffic Management implementation area.

Lateral clearance requirements for all signs are included in the WSDOT *Design Manual*. The minimum clearance between the bottom of overhead signs and the finished grade or roadway wearing surface shall be 20 feet, and that maximum clearance shall be 21 feet. The minimum clearance between the bottom of signs mounted on the vertical members of ATM sign gantries shall be 14 feet.

The Permanent Signing Plans shall include, but are not limited to, the sign legend, the legend layout and spacing, and the sign material requirements, in accordance with the WSDOT *Northwest Region Sign Design Current Practices Manual*. Placement of the signs shall account for the required sight distances.

When it is necessary to mount signs on bridges, the Design-Builder shall design the signs so that the structure and the sign panel height complement the depth of the structure and/or the railing height.

2.19.4.1.3 Motorist Information Signs (MIS)

If the removal of any MIS is required for construction, the Design-Builder shall salvage and reinstall the existing MIS at a location acceptable to WSDOT, in accordance with this Section. Existing MIS shall be relocated, replaced, or temporarily mounted within 24 hours of removal.

WSDOT will supply new sign back panels or business logo signs at its discretion, to replace existing MIS being relocated. The Design-Builder shall furnish new sign foundations and steel posts, and install the new sign panels or relocated existing sign panels.

2.19.4.1.4 Material Requirements

2.19.4.1.4.1 *Signing Materials and Fabrication*

All traffic signs shall be constructed in accordance with Section 9-28 of the Standard Specifications. Section 2.1C of the WSDOT *Traffic Manual* describes the requirements for reflective sheeting types. The urban classification shall be used for determining minimum sheeting requirements.

Steel sign posts shall be used for all ground-mounted signs. Refer to Section 2.18 for additional requirements related to DMS materials.

Section 9-28.14 of the Standard Specifications is supplemented with the following:

2.19.4.1.4.1.1 Manufacturers for Steel Sign Supports

The Standard Plans lists several steel sign support types. These supports are patented devices and many are sole-source. All of the sign support types listed below are acceptable when shown in the plans.

Steel Sign Support Type	Manufacturer
Type TP-A & TP-B	Transpo Industries, Inc.
Type PL, PL-T & PL-U	Northwest Pipe Co.
Type AS	Transpo Industries, Inc.
Type AP	Transpo Industries, Inc.
Type ST 1, ST 2, ST 3, & ST 4	Ultimate Highway Products, Allied Tube & Conduit, Inc., Northwest Pipe, Inc.
Type SB-1, SB-2, & SB-3	Ultimate Highway Products, Xcessories Squared Development and Manufacturing Incorporated, Northwest Pipe, Inc.

2.19.4.1.4.2 *Structural Steel and Related Materials*

2.19.4.1.4.2.1 Roadsign Sign Structures

The Design-Builder shall provide structural steel according to the Standard Specifications. Section 9-06.16 of the Standard Specifications is supplemented with the following:

Perforated Steel Square Sign Post System

Where noted in the Plans, steel sign post systems shall be square, pre-punched galvanized steel tubing that are NCHRP 350 Test Level 3-Certified and FHWA-approved.

The steel sign post system shall include all anchor sleeves, and other hardware required for a complete sign installation.

System Acceptance

Systems listed in the current Qualified Products List (QPL) will be accepted per the QPL approval code. Systems not listed in the QPL will be accepted based on a Supplier's Certificate of Compliance. The Supplier's Certificate of Compliance will be a contract specific letter from the supplier stating the system is NCHRP 350 Test Level 3-compliant. A Certificate of Material Origin (WSDOT Form 350-109) will be required for contracts containing the "Foreign Made Materials" clause and will include a dollar value for any foreign steel used in the system being supplied.

2.19.4.1.5 Aesthetics

The Design-Builder shall design and construct all Work on I-90 in compliance with the *I-90 Architectural Standards* (Appendix L1).

2.19.4.1.6 Overhead Sign Illumination

Sign illumination requirements shall be in accordance with the policy outlined in the WSDOT *Design Manual*.

2.19.4.2 PERMANENT SIGNING CONSTRUCTION REQUIREMENTS

2.19.4.2.1 General

Signs shall be covered when not in use in accordance with Section 8-21.3(3) of the Standard Specifications.

Sign structure foundations shall not encroach onto shoulders. The Design-Builder shall prepare and submit a deviation for any clear zone or shoulder encroachment of sign structure supports or foundations in accordance with Section 2.12.

The Design-Builder shall use materials approved in accordance with Section 2.25.

Existing sign panels and sign structures shall remain in place or shall be temporarily mounted until new or replacement signs are installed. New or replacement signs shall not be installed in a location that obscures the visibility of an existing sign.

Refer to Section 2.22 for additional requirements.

2.19.4.2.2 Material Requirements

The Design-Builder shall supply new materials for all sign posts, structures, and foundations.

2.19.4.2.3 Salvage

See Section 2.18 for DMS and variable speed limit sign salvage requirements.

MIS and business logo signs shall be salvaged as directed by WSDOT.

All other sign panels and sign materials removed from the Right-of-Way shall become the property of the Design-Builder.

2.19.5 SUBMITTALS

All submittals shall be in accordance with Section 2.12 and the Quality Management Plan described in Section 2.28.

2.19.5.1 PRELIMINARY DESIGN SUBMITTAL

Existing Sign Inventories for the project have been conducted. The Sign Inventories are provided in Appendix T15. The Design-Builder is solely responsible for the accuracy of content and completeness of all information in the Existing Sign Inventories used in the design and construction of the Project. The Design-Builder shall verify and confirm the accuracy of all information in the Existing Sign Inventories upon which it intends to rely.

They Design-Builder shall prepare Amended Existing Sign Inventories if during its investigations is makes any modifications to the Existing Sign Inventories. The format and type of data provided as part of any Amended Existing Sign Inventories shall match the format and data of the Existing Sign Inventories in all respects.

2.19.5.2 PERMANENT SIGNING PLANS (FINAL DESIGN SUBMITTAL)

The Design-Builder shall prepare plan sheets in accordance with Section 2.28, and the PPM.

The Permanent Signing Plans shall include, but are not limited to, the following items:

- Sign Specification Sheets containing all necessary fabrication (size, color, sheeting type), installation (mounting), station offset, relocation, and removal information for each sign.
- Design drawings showing the location of all new signs and existing signs to remain, to be relocated, or to be removed.
    - Include sign number referenced from Sign Specification Sheet.
    - Include small-scale layout of all signs, including guide, regulatory, warning, and object markers.
    - Include existing and proposed utilities within a 20-foot radius of new overhead sign structure foundations.
- Show final pavement markings on the Permanent Signing Plans.
- Sign format plans, including panel sizes; background and legend color; border width and corner radius; text height; font and character spacing; and sign numbers corresponding to the Sign Specification Sheets.

- Sign drawings (other than Standard Plans) showing details of sign mounting, foundations, base connections, and frames.
- For each overhead span and cantilever sign structure, the Design-Builder shall provide depictions of cross-sections showing footing details; locations of utilities within 20 feet of foundations; offsets; sign placement, including relations to travel lanes; mounting heights; and vertical clearance.
- Structural calculations for complete design of overhead signs, sign structures, and foundations, including provisions for sign lighting where required. Sign structure designs shall be included in the structural plans.
- Analysis of signal system mast arm loading for mast arm-installed signs.

The Permanent Signing Plans shall be submitted to WSDOT for Review and Comment as part of the Final Design Submittal.

End of Section

2.22 MAINTENANCE OF TRAFFIC (MOT)

2.22.1 GENERAL

The Design-Builder shall conduct all Work necessary to meet the requirements associated with Maintenance of Traffic (MOT), including providing for the safe and efficient movement of people, goods, and services through and around the Project, while minimizing negative impacts to residents, commuters, and businesses.

The Design-Builder shall prepare a Traffic Management Plan (TMP), a Traffic Incident Management Plan (TIMP), and MOT Plans, and shall conduct all on-site activities relating to traffic maintenance in accordance with this Section.

The Design-Builder shall be responsible for coordinating with other projects within the vicinity of the Project, including but not limited to, scheduling of lane closures, detours, ramp closures, temporary alignments, and phasing of construction activity. Construction activities shall be scheduled to minimize the number of required closures, and to maximize the opportunities available to perform Work during closures required by other projects. The Design-Builder shall not schedule or perform activities that will impede or hinder the progress and schedule of other projects.

Refer to Section 2.1 for projects anticipated to be under construction at the same time as the Project. The Design-Builder shall coordinate with local municipalities and utility companies to identify other projects scheduled for construction during the duration of the Project.

2.22.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Standard Plans** (M21-01) (Appendix D15). **Note: Section K is not for use on the Project. Site-specific MOT Plans are required.*
- WSDOT *Traffic Manual* (M51-02) (Appendix D17).
- *Manual on Uniform Traffic Control Devices – Washington State Modifications* (M24-01) (MUTCD) (Appendix D23).
- WSDOT *Materials Manual* (M46-01) (Appendix D9).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Sign Fabrication Manual* (M55-05) (Appendix D24).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D11).

- WSDOT *Maintenance Manual* (M51-01) (Appendix D8).
- WSDOT *Work Zone Traffic Control Guidelines* (M54-44) (Appendix D25).
- Instructional Letter IL 4008.00, Washington State Patrol Traffic Control Assistance in Work Zones.
- WSDOT Directive D55-20, *Reduced Speed in Maintenance and Construction Zones.*
- WSDOT Work Zone Safety and Mobility Secretary's Executive Order (E 1001.00).
- FHWA *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD), 2003.
- National Cooperative Highway Research Project (NCHRP) Report 350.
- AASHTO *A Policy on Geometric Design of Highways and Streets*, 5th Edition, 2004.
- AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals,* 5th Edition, 2009.
- AASHTO *Roadside Design Guide*, 3rd Edition, 2002, and 2006 Chapter 6 Update.
- Transportation Research Board *Highway Capacity Manual*, 2000.
- ITE *Traffic Control Devices Handbook*, 2001.
- FHWA *Traffic Control Systems Handbook*, 2005.
- FHWA *Traffic Monitoring Guide*, 2001.
- ITE *Traffic Engineering Handbook*, 6th Edition, 2009.
- ITE *Manual of Transportation Engineering Studies*, 2000.
- ATSSA *Quality Guidelines for Work Zone Traffic Control Devices*.

2.22.2.1 CONFORMANCE TO ESTABLISHED STANDARDS

Flagging, signs, and all other traffic control devices and procedures provided by the Design-Builder shall conform to the standards established in the FHWA MUTCD adopted by WSDOT, the Washington State MUTCD, and the FHWA Final Rule - 23 CFR Part 630. The quality of devices provided shall be based on the ATSSA *Quality Guidelines for Work Zone Traffic Control Devices*. Copies of the FHWA MUTCD and the ATSSA *Quality Guidelines for Work Zone Traffic Control Devices* may be purchased from the ATSSA, 15 Riverside Parkway, Suite 100, Fredricksburg, Virginia, 22406-1022. The *Washington State Modifications to the MUTCD* may be obtained from the Department of Transportation, Olympia, Washington 98504.

In addition to the standards of the Washington State and FHWA MUTCDs described above, WSDOT has scheduled the implementation of crashworthiness requirements for most Work zone devices. The NCHRP Report 350 has established requirements for crash testing. Work zone devices are divided into four categories. Each of those categories and, where applicable, the schedule for implementation is described below:

- Category 1 includes those items that are small and lightweight, channelizing, and delineating that have been in common use for many years and are known to be crashworthy through testing of similar devices, or years of demonstrable safe performance. These devices include cones, tubular markers, flexible delineator posts,

and plastic drums. All Category 1 devices used on the Project shall meet the requirements of the NCHRP Report 350 as certified by the manufacturers of the devices.

- Category 2 includes devices that are not expected to produce significant vehicular velocity change, but may otherwise be hazardous. Examples of this class are barricades, portable sign supports and signs, intrusion alarms, and vertical panels. All Category 2 devices shall meet the requirements of the NCHRP Report 350. For the purpose of definition, a sign support and sign shall be considered a single unit.
- Category 3 is for hardware expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. Examples of this class are barriers, fixed sign supports, crash cushions, Truck-Mounted Impact Attenuators (TMAs), and other Work zone devices not meeting the definitions of Categories 1 or 2. Many Category 3 devices are defined in the design of the Project. Where this is the case, the NCHRP Report 350 requirements shall be incorporated into the design. Where the device is a product chosen by the Design-Builder, the device chosen must comply with the requirements of the NCHRP Report 350.
- Category 4 includes portable or trailer-mounted devices such as arrow displays, temporary traffic signals, area lighting supports, and Portable Changeable Message Signs (PCMS). Presently, there is no implementation schedule for mandatory crashworthiness compliance of these devices.

The condition of signs and traffic control devices shall be new or "acceptable" as defined in the ATSSA *Quality Guidelines for Work Zone Traffic Control Devices*, and will be accepted based on a visual inspection by the Traffic Control Supervisor (TCS). WSDOT may also identify devices that are unacceptable. WSDOT's decision on the condition of a sign or traffic control device will be final. The Design-Builder shall remove a sign or traffic control device determined to be unacceptable, and replace it within 12 hours of notification.

2.22.3 PERFORMANCE REQUIREMENTS

2.22.3.1 GENERAL

The Design-Builder shall prepare a TMP and a TIMP to be approved by WSDOT, and establish a MOT Task Force prior to any construction activity that may impact traffic. WSDOT will only permit activities such as surveying or environmental and other design-related Work prior to approval of the TMP and the TIMP, provided the Design-Builder prepares MOT Plans in accordance with the requirements of this Section. MOT plans which will be implemented within a jurisdiction other than WSDOT will require approval from the jurisdiction within which they will be implemented.

2.22.3.2 TRAFFIC MANAGEMENT PLAN (TMP)

The Design-Builder shall develop a TMP that includes the following items:

- Descriptions of traffic phasing, including conceptual MOT Plans, to accommodate construction staging.
- Descriptions of the requirements for temporary roadways.
- Procedures to identify and incorporate the needs of transit operators, Utility Owners, and business owners in the Project corridor.

- Procedures for obtaining concurrence of stakeholders and implementing road and lane closures.
- Processes for developing and obtaining agreement among stakeholders for switching procedures.
- Procedures to identify and incorporate the needs of local agencies affected by the Work.
- Processes for signing transitions during construction from one stage to the next, and from interim to permanent signing.
- Procedures to identify and incorporate the needs of emergency service providers, law enforcement entities, and other related corridor users. The Design-Builder shall also include procedures to ensure all information required by these agencies to protect the public is made available.
- Provisions for incident and emergency response.
- Methods and frequency of inspection and maintenance of all traffic control throughout the Project limits, including response times to correct, modify, or implement changes to pavement marking, signing, temporary lane configurations, and changes in Temporary Concrete Barrier (TCB) configurations.
- Descriptions of contact methods, personnel available, and response times for responses to any conditions requiring attention during off-hours. Include communications plan to WSDOT radio and field offices.
- Identification of measurable limits for the repair and replacement of traffic control devices.
- Provisions to maintain existing access to all properties within the Project limits for the duration of the Project, except as provided by other Sections. Appropriate information about access modifications shall be made available to the appropriate parties.
- Provisions to provide continuous access to established truck routes, hazardous material routes, transit routes, and school bus routes.
- Procedures to modify the plans, as needed, to adapt to current Project circumstances.
- Procedures to determine detour routes, if necessary, and for obtaining acceptance from all stakeholders for all proposed detour routes. The Design-Builder shall identify special needs for transit service and truck routes.
- Procedures to communicate MOT information to the Design-Builder's public information personnel, and to notify the public of MOT issues in accordance with Section 2.9.
- Procedures to accommodate adjacent project's MOT Plans, if applicable.
- Procedures to accommodate the MOT Plans when the staging schedule of the Project or any adjacent project changes.
- Procedures during ATM sign testing.

2.22.3.3 TRAFFIC INCIDENT MANAGEMENT PLAN (TIMP)

During construction, MOT will become increasingly sensitive to incidents such as equipment malfunctions, traffic crashes, inclement weather, and special events. The Design-Builder shall prepare and implement a formal TIMP to address how these incidents shall be managed.

2.22.3.3.1 General

The TIMP shall identify methods for incident detection and verification, response, site management, clearance, and motorist information. The TIMP shall include procedures for interaction with the Traffic Systems Management Center (TSMC). In addition, if any local agencies along the Project corridor have adopted incident management guidelines, the Design-Builder shall be responsible for coordinating with local policies and procedures.

The TIMP shall reflect proposed construction phasing. The Design-Builder shall modify and implement the TIMP in conjunction with planned special events. The TIMP shall include specific time limits for the detection, verification, and classification of incidents, as well as for the dissemination of information about the incidents. The TIMP shall provide a mechanism to review and capture lessons learned from incidents.

The TIMP shall identify and provide for the incorporation of design elements to aid incident management, including turn-around for emergency vehicles, emergency access points, incident investigation sites, and signing to help motorists report the location of incidents in the Project.

2.22.3.3.2 Incident Response Team

The Design-Builder will not be required to provide Incident Response Team equipment or personnel; however, the Design-Builder shall make materials and equipment available that are on site as requested by WSDOT or the Washington State Patrol.

2.22.3.3.3 Intentionally Omitted

2.22.3.3.4 Intentionally Omitted

2.22.3.3.5 Staging Areas

The Design-Builder shall provide staging areas where equipment or vehicles needed for incident clearance can be stored and easily accessible from the construction zone. The staging area can be used for storing additional traffic control devices and parking equipment, such as loaders or tow trucks.

The Design-Builder shall comply with the environmental requirements including performance standards and permit conditions (Appendices E and P). Staging areas shall be designed to achieve the following:

- Provide an area large enough to store equipment.
- Provide easy access to mainline.
- Maintain spare traffic control devices, including but not limited to, the following:
    - Cones and/or drums.
    - Type III barricades.

- Adequate signs for lane closures.
- TCB sections.

2.22.3.3.6 Emergency Vehicle Access

The Design-Builder shall provide coordination with local and regional emergency service providers, law enforcement entities, and other related corridor users including timely communication of lane closure plans, detour plans, and other Project elements that may affect the appropriate delivery of time-sensitive services. Emergency vehicle access shall be maintained through all nighttime, weekend, and evening closures, when feasible.

Refer to Section 2.9 for additional requirements.

2.22.3.3.7 Maintain Camera Surveillance

Refer to Section 2.18 for maintenance requirements of the Closed Circuit Television system during construction.

2.22.3.3.8 Dynamic Message Signs (DMS)

Refer to Section 2.18 for maintenance requirements of the existing Dynamic Message Signs (DMS).

Existing DMS approaching the Project may be used, with WSDOT's concurrence, to provide motorists with incident and construction-related information prior to entering the Work zone. The Design-Builder shall coordinate with the TSMC to provide timely, accurate information regarding planned closures and updated traffic and construction information. Refer to Section 2.9 for additional requirements.

The Design-Builder shall also provide PCMS to provide information to motorists, in accordance with this Section.

2.22.3.3.9 Highway Advisory Radio (HAR)

There are existing Highway Advisory Radio (HAR) transmitters located within the project area. The existing HAR transmitters may be used by WSDOT to provide motorists with incident and construction-related information prior to entering the Work zone.

The Design-Builder shall coordinate with the TSMC to provide timely, accurate information regarding planned closures and updated traffic and construction information.

Refer to Section 2.9 for additional requirements.

2.22.3.3.10 Design-Builder Response Time

The Design-Builder shall have a TCS on call or on site equipped with a mobile phone that can respond to and take appropriate action to manage an emergency situation. The TCS shall be on site within 45 minutes of notification of an emergency situation, in accordance with this Section. Upon arrival, the TCS shall have the experience, resources, and equipment required to set up temporary traffic control, as necessary. This may include closing lanes, ramps, setting up detours, and replacing or repairing TCB.

2.22.3.3.11 Contingency Plan

The Design-Builder shall provide WSDOT with a Contingency Plan for reopening each closed lane to traffic in the event of an equipment breakdown, shortage of materials, lack

of production of materials, other production failure, or when it becomes necessary to re-open the closure for use by traffic. The Design-Builder shall submit the Contingency Plan at least 7 Calendar Days prior to the scheduled closure. The submission of a Contingency Plan and its acceptance by WSDOT shall not relieve the Design-Builder from the liquidated damages specified in this Section and Chapter 1 of the RFP.

2.22.3.4 MOT TASK FORCE

2.22.3.4.1 Membership

The Design-Builder shall establish and chair an MOT Task Force, which shall include:

- Design-Builder personnel.
- WSDOT personnel.
- Representatives from the WSDOT I-5 ATM Gantry Project.
- Representatives from the WSDOT I-90/SR 520 ATM Gantry Project.
- Representatives from the I-405, NE 8th St. to SR 520 Braided Ramps – Interchange Improvements Project.
- Other agencies and utility companies whose operations affect or are affected by the MOT Plans.

The MOT Task Force will serve as an advisory committee to the Design-Builder. The Design-Builder shall consider all recommendations and input provided by the task force; however, final design and implementation remain the responsibility of the Design-Builder.

2.22.3.4.2 Meetings

The Design-Builder shall schedule and chair MOT Task Force meetings twice each month from Contract execution to Project completion. The meeting schedule and frequency of meetings may be adjusted upon agreement by the MOT Task Force members.

The purpose of the meetings shall be to achieve the following:

- Further refine and develop the MOT Plans and strategies.
- Review the Design-Builder's MOT details.
- Disseminate Project MOT information to Task Force meeting attendees.
- Obtain MOT input from Task Force meeting attendees.
- Develop, refine, and review the TIMP and its implementation
- Review the TCS log.
- Identify the need for improvements based on traffic control implemented previously.
- Discuss comments/complaints about traffic control from WSDOT and the public, and determine how they will be addressed.
- Discuss Work zone related crashes and identify appropriate revisions to traffic control to prevent future crashes.

The Design-Builder shall prepare the agenda, meeting minutes, exhibits, and design plans required for the meetings, and shall invite representatives from adjacent projects to the meetings.

2.22.4 DESIGN AND CONSTRUCTION REQUIREMENTS

2.22.4.1 DESIGN REQUIREMENTS

2.22.4.1.1 MOT Plans

The Design-Builder shall use the procedures in the TMP to develop detailed MOT Plans that provide for all construction stages and phasing, and identify opportunities to expedite construction throughout the course of the Project. The MOT Plans shall be prepared under the direction of the Design-Builder's Workzone Traffic Engineering Manager (WTEM).

The WTEM shall be responsible for ensuring that the design of all elements related to construction phasing, Work zone safety, and Work zone traffic control are completed and all applicable design requirements are met. The WTEM shall be on site for the duration of the construction phasing and MOT Plan development. The WTEM shall also be available for approval of modifications to the phasing or MOT Plans through Substantial Completion. The WTEM shall be a Professional Engineer, registered in the State of Washington.

Design elements that the WTEM is responsible for include, but are not limited to, the following:

- Detours.
- Phasing and MOT Plans.
- Temporary plans for signals, Intelligent Transportation Systems (ITS), lighting, signing, and striping.

All construction signs, flaggers, spotters, and other traffic control devices shall be shown on the MOT Plans, except for emergency situations. Where mainline MOT Plans are developed with the intent of operating without the use of flaggers or spotters, the MOT Plans shall include a note that states, "NO FLAGGERS OR SPOTTERS". The use of flaggers or spotters will not be allowed, except when no other means of traffic control can be used, or in the event of an emergency. The MOT Plans shall show locations of all required advance warning signs, and a safe, protected location for the flagging station. If flagging is to be performed during hours of darkness, the modified MOT Plans shall require a minimum of 150W illumination for the flagging station.

The MOT Plans shall show the necessary construction signs, flaggers, spotters, and other traffic control devices required to support the Work. The Design-Builder shall be solely responsible for submitting proposed MOT Plans to WSDOT; obtaining WSDOT's comments; releasing the drawings for construction; and providing copies of the MOT Plans to the TCS.

At a minimum, the MOT Plans shall include the following items:

- Complete plan sheets and details for all stages of construction.
- The appropriate details when temporary construction of traffic signals, detour roadways, bridges, retaining structures, drainage, and other miscellaneous construction is required to maintain traffic.

- Roadway plan sheets showing all existing traffic control devices that will be retained, relocated, or removed, and all temporary traffic control devices that will be installed, retained, relocated, or removed.
- The spacing, size, color (legend and background, if applicable), and quantity of all traffic control devices.
- Work areas, including ingress and egress for construction vehicles.
- Roadway plan sheets with the location of each sign so it can be easily read in relation to the roadway and other traffic control devices. A small-scale layout of each sign shall be shown on the corresponding roadway plan sheet where the sign is to be placed.
- Provisions for using temporary barriers and attenuators to satisfy clear zone requirements, and to protect the traveling public and the Design-Builder's personnel, including lateral displacement distance behind barrier.
- Temporary lighting and ITS details, as required. The Design-Builder shall refer to additional requirements described in this RFP.
- Layouts showing the locations of ground-mounted and overhead signs, special sign details, clear zones, and structural and foundation requirements.
- Drawings on how to fabricate any sign not detailed in the WSDOT *Sign Fabrication Manual* showing dimensions, background color, and legend.
- Methods for covering, partially covering, or modifying signs when not applicable to the current phase of construction.
- Striping and traffic delineators.
- Type and location of any pavement markings to be installed, removed, or renewed for each stage of construction, and locations of the final pavement markings.
- Typical cross-sections covering each change in configuration including, but not limited to, reduction in lane and/or shoulder widths; reduction or increase in number of lanes; and changes of lateral barrier placement or type. Cross-sections shall show lane configuration (including direction of travel) and widths, shoulder widths, lateral buffer distance behind barrier, Work areas, and pavement marking type. Cross-sections shall include the station limits the section applies to. Cross-sections shall be provided covering the entire length of the segment included in the MOT Plans.
- Typical sections shall identify direction of travel, lane widths, lane type (general purpose, shoulder, or High Occupancy Vehicle [HOV]), and number of lanes.
- Where bicycles and pedestrians are allowed, access and control of bicyclists and pedestrians, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 and its Amendments (ADA), through the traffic control zones shall be included on the MOT Plans.
- Detail modifications to the MOT Plans to address wintertime conditions or periods of suspended Work.
- A switching procedure for each control stage change identified in the MOT Plans. The switching procedure shall consist of the methods, actions, and signing necessary to complete the switch and the number and duties of traffic personnel assigned to perform the switch.

The MOT Plans shall be complete, including all necessary details. Typical traffic control configurations, such as those found in the FHWA MUTCD and the WSDOT *Work Zone Traffic Control Guidelines*, may be used to assist in developing the MOT Plans. Only site-specific MOT Plans that have been Released For Construction shall be used by the Design-Builder, typical plans are not acceptable unless incorporated as details into the MOT Plans.

The Design-Builder shall prepare documentation to justify all proposed detour routes and reductions in lane storage at traffic signals or ramp meters. The documentation shall be submitted to WSDOT for Review and Comment with the proposed MOT Plans.

2.22.4.1.2 Design Vehicle

The mainline design vehicle shall be a WB-67. A WB-50 shall be used for all turning movements at ramp intersections with local roadways, unless use of a larger design vehicle is required. At locations where the existing geometry does not currently accommodate the design vehicle, the Design-Builder shall maintain the existing minimum curb radius. Provisions for oversized vehicles shall be coordinated with WSDOT when detours or limited vertical clearance are required by the MOT Plans.

2.22.4.1.3 Allowable Closures

This Section lists the allowable lane, ramp, and shoulder closure hours on I-5, I-90, and SR 520 during the Project. Any restrictions for roadway segments not listed in this Section require WSDOT approval. No lane, ramp, or shoulder closures shall occur outside of the hours specified within this Section, unless approved in advance and in writing by WSDOT. The Design-Builder shall notify the public in advance of closures, in accordance with Section 2.9.

No temporary lane, ramp, or shoulder closures or restrictions, including set-up of traffic control devices, will be allowed, except during the hours where permitted lane, ramp and shoulder closures are allowed. In addition, no Work that restricts or interferes with traffic will be allowed from 12:00 p.m. on the day preceding, through 12:00 p.m. on the day following, a holiday or holiday weekend. Holidays that occur on Friday, Saturday, Sunday, or Monday are considered a holiday weekend. January 1, the third Monday of January, the third Monday of February, Memorial Day, July 4, Labor Day, November 11, Thanksgiving Day, the day after Thanksgiving, and Christmas Day shall be considered holidays. When any of these holidays fall on a Sunday, the following Monday shall be considered a holiday. When any of these holidays fall on a Saturday, the preceding Friday shall be considered a holiday.

In addition, closures will not be allowed on any roadways in the Project Area during the following time periods:

- Vancouver Winter Olympics - February 12 to February 28, 2010.
- Annual Seafair Hydroplane Race Weekend from 12 p.m. Friday to 8:00 p.m. Sunday.
- Scheduled closures of the I-90 floating bridge.
- 2 scheduled closures of the SR 520 floating bridge.
- 4 scheduled closures of the Alaskan Way Viaduct.
- Scheduled weekend lane closures of the I-5 Spokane Street to I-90 Bridge Repair Project.

- Allowable lane closures hours may be reduced during extended lane closures of I-5 associated with the I-5 Spokane Street to I-90 Bridge Repair Project.

Exceptions to the allowable lane closures may be necessary to accommodate wide loads or other permit loads through the temporary traffic control area. In addition, the Design-Builder shall coordinate with adjacent concurrent projects to provide continuity in the lane configurations.

The Design-Builder shall coordinate their Work activities with other local events in the area, so that the events will not be impacted. In addition, closures on the portions of roadways in the Project Area indicated with an "X," including ramps leading to or from the indicated roadways, will not be allowed during the following Annual Special Events, including the two-hour period prior to and the two-hour period after the Event.

Annual Special Event	SR520, East of I-405	SR520, West of I-405	I-90, East of I-405	I-90, West of I-405	I-5
Seattle Center Events (single event or combination of events) with projected combined attendance over 8,000	X	X	X	X	X
All Seattle Seahawk and University of Washington home football games	X	X	X	X	X
Major Safeco Field and QWEST Field events with projected attendance over 25,000	X	X	X	X	X
M. L. King Jr. March		X		X	X
Seattle Home Show				X	X
Northwest Flower and Garden Show		X		X	X
St. Patrick's Day Parade					X
St. Patrick's Day Dash					X
Northwest Women's Show		X		X	X
March of Dimes					X
Opening Day of Boating Season	X	X		X	X
Niketown 5K					X
University Street Fair		X		X	X
Beat the Bridge	X	X		X	X
Folklife Festival					X
Pike Place Market Festival		X		X	X
Graduation Ceremonies at QWEST Field and Hec Edmundson Pavillion	X	X	X	X	X
Race for the Cure					X
Fremont Fair, Solstice Parade, 5K Run					X
Seafair Rock n Roll Marathon		X		X	X
Pride Parade and Festival		X		X	X
Lake Union Wooden Boat Festival					X
July 4th Fireworks in all of the following cities: of Seattle, Bellevue, Kirkland, Redmond and Mercer Island	X	X	X	X	X
Bite of Seattle		X		X	X

Annual Special Event	SR520, East of I-405	SR520, West of I-405	I-90, East of I-405	I-90, West of I-405	I-5
Wallingford Kiddies Parade & Street Fair					X
Capitol Hill Block Party		X		X	X
Mercer Island Street Fair			X	X	
Seafair Triathlon		X		X	X
Seafair Torchlight Run & Parade	X	X	X	X	X
Blue Angels	X	X	X	X	X
Hempfest		X		X	X
Danskin Women's Triathlon		X		X	
Pacific Northwest Arts & Crafts Fair	X	X	X	X	
Bumbershoot		X		X	X
Escape from the Rock Triathlon				X	X
START! Puget Sound Heart Walk					X
Seattle Marathon		X		X	X
Jingle Bell Run/Walk					X
LiveStrong		X		X	X

WSDOT reserves the right to not approve traffic restrictions and freeway closures.

Liquidated damages will be assessed for failure to complete Work and open all lanes and ramps to traffic by the specified times (see Chapter 1 of this RFP).

When only the HOV lane is to remain open, the HOV lane shall be signed for general purpose use.

2.22.4.1.3.1 *Northbound I-5 Allowable Lane Closures*

The Design-Builder shall, at a minimum, maintain the existing configuration at all times outside of the allowable closures described in this Section, unless otherwise permitted in this Section. The Design-Builder shall open the HOV lane to all traffic when two or more general purpose lanes are closed.

Northbound Mainline (5-Lane Section)				
Existing Configuration	4 GP + 1 HOV			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
HOV lane closed	7:00 p.m.	5:00 a.m.	None allowed.	
HOV and one adjacent lane closed	8:00 p.m.	5:00 a.m.		
HOV and two adjacent lanes closed	10:00 p.m.	5:00 a.m.		
1 GP lane closed	8:00 p.m.	5:00 a.m.		
2 GP lanes closed	9:00 p.m.	5:00 a.m.		
3 GP lanes closed	11:00 p.m.	5:00 a.m.		

Northbound Mainline (4-Lane Section)				
Existing Configuration	3 GP + 1 HOV			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
HOV lane closed	8:00 p.m.	5:00 a.m.	None allowed.	
HOV and one adjacent lane closed	10:00 p.m.	5:00 a.m.		
HOV and two adjacent lanes closed	Midnight	5:00 a.m.		
1 GP lane closed	9:00 p.m.	5:00 a.m.		
2 GP lanes closed	10:00 p.m.	5:00 a.m.		

2.22.4.1.3.2 *Southbound I-5 Allowable Lane Closures*

The Design-Builder shall, at a minimum, maintain the existing configuration at all times outside of the allowable closures described in this Section, unless otherwise permitted in this Section. The Design-Builder shall open the HOV lane to all traffic when two or more general purpose lanes are closed.

Southbound Mainline (5-Lane Section)				
Existing Configuration	4 GP + 1 HOV			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
HOV lane closed	7:00 p.m.	5:00 a.m.	None allowed.	
1 GP lane closed	8:00 p.m.	5:00 a.m.		

Southbound Mainline (4-Lane Section)				
Existing Configuration	3 GP + 1 HOV			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
HOV lane closed	8:00 p.m.	5:00 a.m.	None allowed.	
1 GP lane closed	9:00 p.m.	5:00 a.m.		

2.22.4.1.3.3 *Eastbound I-90 Allowable Lane Closures*

The Design-Builder shall, at a minimum, maintain the existing configuration at all times outside of the allowable closures described in this Section, unless otherwise permitted in this Section.

Eastbound I-90 Mainline (4 or more lane section)				
Existing Configuration	3 or more GP + 1 HOV			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
HOV lane closed	7:00 p.m.	5:00 a.m.	None allowed.	
HOV and 1 adjacent lane closed	9:00 p.m.	5:00 a.m.		
HOV and 2 adjacent lanes closed	11 p.m.	5:00 a.m.		
1 GP lane closed	9:00 p.m.	5:00 a.m.		
2 GP lanes closed	11:00 p.m.	5:00 a.m.		
3 GP lanes closed (HOV opened to all traffic)	Midnight	5:00 a.m.		

Eastbound I-90 Mainline (3 lane section)				
Existing Configuration	3 GP			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
1 GP lane closed	9:00 p.m.	5:00 a.m.	None allowed.	
2 GP lanes closed	11:00 p.m.	5:00 a.m.		

Eastbound I-90 Mainline (2 lane section) – vicinity of I-5				
Existing Configuration	2GP			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
1 GP lane closed	9:00 p.m.	5:00 a.m.	None allowed.	

2.22.4.1.3.4 *Westbound I-90 Allowable Lane Closures*

The Design-Builder shall, at a minimum, maintain the existing configuration at all times outside of the allowable closures described in this Section, unless otherwise permitted in this Section.

Westbound I-90 Mainline (4 or more lane section)				
Existing Configuration	3 or more GP + 1 HOV			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
HOV lane closed	7:00 p.m.	5:00 a.m.	8:00 p.m.	10:00 a.m.
HOV and 1 adjacent lane closed	9:00 p.m.	4:00 a.m.	Midnight	8:00 a.m.
HOV and 2 adjacent lanes closed	11:00 p.m	5:00 a.m.		
1 GP lane closed	9:00 p.m.	5:00 a.m.	8:00 p.m.	8:00 a.m.
2 GP lanes closed	11:00 p.m.	5:0 a.m.	Midnight	8:00 a.m.
3 GP lanes closed (HOV opened to all traffic)	Midnight	5:00 a.m.		

Westbound I-90 Mainline (3 lane section)				
Existing Configuration	3 GP			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	To	From	To
1 GP lane closed	9:00 p.m.	5:00 a.m.	None allowed.	
2 GP lanes closed	11:00 p.m.	5:00 a.m.		

2.22.4.1.3.5 *Eastbound SR 520 Allowable Lane Closures*

The Design-Builder shall, at a minimum, maintain the existing configuration at all times outside of the allowable closures described in this Section, unless otherwise permitted in this Section.

Eastbound SR 520 Mainline (4 lane section) – 108th Ave. NE to I-405				
Existing Configuration	3 GP + 1 HOV			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
Left-most lane closed	9:00 p.m.	5:00 a.m.	None allowed.	
Left 2 lanes closed	11:00 p.m.	5:00 a.m.		
Right-most lane closed	8:00 p.m.	5:00 a.m.		
2 Right lanes closed	9:00 p.m.	5:00 a.m.		

Eastbound SR 520 Mainline (3 lane section)				
Existing Configuration	2 GP + 1 HOV			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	To	From	To
HOV lane closed	9:00 p.m.	5:00 a.m.	None allowed.	
HOV and 1 adjacent lane closed	10:00 p.m.	5:00 a.m.		
1 GP lane closed	9:00 p.m.	5:00 a.m.		
2 GP lanes closed	11:00 p.m.	5:00 a.m.		

Eastbound SR 520 Mainline (2 lane section)				
Existing Configuration	**2 GP**			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
1 GP lane closed	11:00 p.m.	5:00 a.m.	None allowed.	

2.22.4.1.3.6 *Westbound SR 520 Allowable Lane Closures*

The Design-Builder shall, at a minimum, maintain the existing configuration at all times outside of the allowable closures described in this Section, unless otherwise permitted in this Section.

Westbound SR 520 Mainline (3 or more lane section)				
Existing Configuration	2 or more GP + 1 HOV			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	To	From	To
HOV lane closed	7:00 p.m.	5:00 a.m.	None allowed.	
HOV and 1 adjacent lane closed	11:00 p.m.	5:00 a.m.		
1 GP lane closed (HOV opened to all traffic)	8:00 p.m.	5:00 a.m.		
1 GP lanes closed (HOV not opened to all traffic)	11:00 p.m.	5:00 a.m.		
3 GP lanes closed (HOV opened to all traffic)	11:00 p.m.	5:00 a.m.		

Eastbound SR 520 Mainline (2 lane section)				
Existing Configuration	2 GP			
Allowable Closure Times	Sun Night to Mon Morning Mon Night to Tue Morning Tue Night to Wed Morning Wed Night to Thur Morning Thur Night to Fri Morning		Sat Night to Sun Morning	
	From	**To**	**From**	**To**
1 GP lane closed	11:00 p.m.	5:00 a.m.	None allowed.	

2.22.4.1.3.7 *Allowable Ramp Closures*

The Design-Builder shall maintain the existing ramp configurations at all times outside of the allowable closures described in this Section, unless otherwise permitted.

The Design-Builder shall be allowed to close entrance and exit ramps upon written notification to WSDOT and upon prior approval by WSDOT and the jurisdiction within which the ramp begins or ends of the MOT details, including detour routing; and provided that the requirements for ramp access are satisfied. Consecutive off-ramps or on-ramps, including Freeway to Freeway ramps, shall not be closed concurrently. No ramp, including Freeway to Freeway ramps, shall be closed if it is being used as a detour for another ramp closure. No more than one ramp in the same freeway-to-freeway interchange shall be closed at the same time. The following allowable ramp closure limitations shall apply:

SB I-5 to EB I-90 On-Ramp Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	11:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

NB I-5 to EB I-90 On-Ramp Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	10:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

EB I-90 to SB I-405 On-Ramp Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	11:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

SB I-405 to EB I-90 On-Ramp Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	11:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

NB I-405 to EB I-90 On-Ramp Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	10:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

NB I-5 to EB SR 520 Ramp Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	11:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

SB I-5 to EB SR 520 Ramp Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	11:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

West Seattle & Columbian Way to NB I-5 On-Ramp Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	11:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

West Seattle Freeway to NB I-5 On-Ramp Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	11:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

NB I-5 exit to West Seattle Freeway & Columbian Way On-Ramp Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	11:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

SB SR 513 to WB SR 520 On-Ramp Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	10:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

All Other SR 520 Ramps Within the Project Limits Not Mentioned Above Full Closure

	From	To
Sun, Mon, Tue, Wed, and Thur Nights	9:00 p.m.	5:00 a.m.
Saturday Night	None allowed.	

The Design-Builder shall provide a written ramp closure schedule to WSDOT at least 14 Calendar Days in advance of a ramp closure. The schedule shall show the locations and times of all ramp closures and the closure time limits specified in the Contract. Any schedule that does not conform to the Contract time limits, is incomplete, unintelligible, or includes inaccurate information will be returned to the Design-Builder for correction. The Design-Builder will be notified promptly of any disapproved closures or any closure that will require coordination with other parties as a condition of approval. Requests for ramp closures made less than 14 Calendar Days in advance will not be approved.

The Design-Builder shall confirm all scheduled closures with WSDOT at least 7 Calendar Days prior to the date on which the ramp closure is scheduled. All ramp closures not confirmed as scheduled shall be cancelled. Confirmed ramp closures that are cancelled for unsuitable weather may be rescheduled for the next allowable day.

Detour routes shall be provided by the Design-Builder for ramp closures and all roadway closures. Detours must be approved by impacted local agencies a minimum of 14 Calendar Days prior to implementing the closure. All detours shall be in place, including all signing, prior to closure of the ramp. If more than one ramp and/or roadway will be closed at the same time, all detour routes shall be shown on the same plan.

The Design-Builder shall coordinate ramp closures with adjoining projects to ensure consecutive on-ramps or off-ramps are not closed simultaneously or result in conflicting or overlapping detours.

The Design-Builder shall complete all ramp Work within the specified closure times prior to opening the ramps to traffic.

2.22.4.1.3.8 *Nighttime Closures*

The Design-Builder will be allowed to close ramps during the hours listed in the allowable closures section above, upon approval from WSDOT.

2.22.4.1.3.9 *Full Freeway Closure*

Northbound I-5

- No full freeway closures will be permitted, in accordance with this Section. Rolling slowdowns will be permitted.

Southbound I-5

- No full freeway closures will be permitted, in accordance with this Section. No rolling slowdowns will be permitted.

Eastbound and Westbound I-90

- No full freeway closures will be permitted, in accordance with this Section. Rolling slowdowns will be permitted.

Eastbound and Westbound SR 520

- No full freeway closures will be permitted, in accordance with this Section. Rolling slowdowns will be permitted.

2.22.4.1.3.10 *Allowable Shoulder Closures*

On I-90 and SR 520, shoulder closures will be permitted as shown in this Section. The following allowable shoulder closure limitations shall apply:

I-90 and SR 520 Allowable Shoulder Closure

	From	To
Monday to Friday (daily)	9:00 a.m.	2:30 p.m.
Sunday to Thursday (nightly)	7:00 p.m.	5:00 a.m.

In addition, temporary shoulder closures will be allowed between 9:00 a.m. and 3:00 p.m. daily, including weekends, in accordance with the approved MOT Plans.

On I-5, northbound and southbound shoulder closures will be permitted as shown in this Section. The following allowable shoulder closure limitations shall apply:

I-90 and SR 520 Allowable Shoulder Closure

	From	To
Monday to Friday (daily)	9:00 a.m.	3:00 p.m.
Sunday to Thursday (nightly)	7:00 p.m.	5:00 a.m.

In addition, temporary shoulder closures will be allowed between 9:00 a.m. and 3:00 p.m. daily Monday through Friday, and between 7:00 p.m. and 5:00 a.m. Sunday through Thursday, in accordance with the approved MOT Plans.

2.22.4.2 TRAFFIC OPERATIONS DURING CONSTRUCTION

The Design-Builder shall contact Seattle Radio at (206) 440-4490 when setting up and removing lane, ramp, and roadway closures.

The Design-Builder shall use protective vehicles with warning beacons and TMAs for protection of Work zones on roadways with a posted speed limit equal to or greater than 45 mph.

2.22.4.2.1 I-5, I-90 and SR 520 Mainline During Construction

There may be existing facilities in the existing roadway shoulder, which may not be adequate for sustained traffic operations. These may include, but are not limited to, drainage structures, junction boxes, cable and drainage vaults, manholes, pull boxes, and the lids for these facilities. Prior to using an existing shoulder as all or part of the traveled way, the Design-Builder shall inspect all existing facilities within the roadway shoulder, which may be subjected to sustained traffic; and remediate any existing facilities within the roadway shoulder that are not adequate to support sustained traffic. Sustained traffic is defined as any traffic that is more than occasional traffic. Any damaged facilities shall be replaced at the Design-Builder's expense.

Mainline and HOV lanes shall be a minimum of 11 feet wide, and maximum lane widths shall not exceed 13 feet. Lanes shall be 12 feet wide when adequate room and 4-foot shoulders are available.

When shoulders are less than 5 feet wide, signs shall be barrier-mounted or placed behind the barrier at an elevated height to ensure visibility. Tripod-mounted signs are allowed when shoulders are between 5 feet and 10 feet wide. Tripod-mounted signs shall not be placed in shoulders less than 5 feet wide.

When shoulders are greater than 10 feet wide, the Design-Builder shall place drums at 80-foot spacing, 10 feet from the edge line, supplemented by a minimum of two transverse devices at 500-foot nominal spacing.

The Design-Builder shall provide a nominal 8-foot right shoulder/distress lane, when feasible. Each shoulder shall be a minimum of 2 feet wide and shall be paved. Wider shoulders may be required to accommodate the necessary sight distance.

The Design-Builder shall design any temporary construction and/or widening to withstand the anticipated traffic volumes and loadings during the applicable stage of the Project.

Mainline general purpose lanes in the same direction of travel shall not be split or separated.

2.22.4.2.1.1 *Design Criteria*

The design speed shall not be less than the posted speed. All mainline shifting tapers and lane closure tapers shall use a minimum taper rate of 70:1.

2.22.4.2.1.2 *Temporary Lane Closures*

The Design-Builder shall provide written notification to WSDOT a minimum of 7 Calendar Days prior to any closures. Each lane closure shall have 1 sequential arrow board per closed lane, as part of the traffic control layout. No closures shall be scheduled until the MOT Plans are Released for Construction.

The Design-Builder shall use traffic safety drums on all lane closures.

For lane closures longer than 500 feet, the Design-Builder shall use a minimum of two transverse devices in the closed lane at 500-foot nominal spacing.

2.22.4.2.1.3 *Law Enforcement*

Law enforcement for the Work zone, when shown on Released For Construction Documents, shall be included in the proposal price. Law enforcement shall be provided for full freeway closures, rolling slowdowns, and to control intersections when traffic signals are temporarily turned off.

2.22.4.2.1.4 *Sequential Arrow Displays*

Each vehicle used to place, maintain, or remove components of a traffic control system on multilane highways shall be equipped with a sequential arrow display that shall be in operation when the vehicle is in use. Vehicles equipped with sequential arrow displays not involved in placing, maintaining, or removing components when operated within a stationary-type lane closure shall display only the 4-corner flash caution mode. The operator of the vehicle shall control the arrow display while the vehicle is in motion. Sequential arrow displays used in moving lane closures shall be truck-mounted. This requirement applies to all vehicles placing, maintaining, and removing traffic control devices, including concrete barrier trailers and "cherry pickers."

2.22.4.2.1.5 *Advance Signing*

The Design-Builder shall, furnish and install 6 G24-501 signs with the Project hotline phone number and 6 project-specific "Jobs Now" signs, with specific project information within the Project limits. See Section 2.9.7.4 for information on the establishment of the Project hotline. See Appendix Y2 for an example of the "Jobs Now" sign. Two (2) of each sign shall be placed in each direction of I-5, I-90 and SR 520. The signs shall be installed within 30 Calendar Days of the date the Contract is executed, and prior to any other construction activity on the Project. The signs on each Corridor shall remain in place until Final Acceptance of that Corridor. Coordination with adjacent projects may be required for placement of the signs. If it is necessary to relocate the signs for any reason, the Design-Builder shall be responsible for relocation.

2.22.4.2.1.6 *Exceptions to Allowable Mainline Lane Closures*

Only the mainline lane closures described in this Section will be allowed.

2.22.4.2.2 Ramps During Construction

2.22.4.2.2.1 *Design Criteria*

The Design-Builder shall provide acceleration and deceleration lanes to ensure vehicles are within 10 mph of the mainline speed at the point they must merge or diverge from mainline lanes. Exit speeds shall be posted for all ramps. For ramps where the design speed during construction is reduced from existing conditions, black on orange construction signs shall be used for the exit speed signs.

The number of lanes and lane configurations shall equal or exceed the existing configuration. Adequate storage for queuing and throughput volumes at traffic signals and ramp meters must be maintained. Ramp meters may not operate with 2 vehicles per green indication. Lanes shall be a minimum of 12 feet wide on entrance and exit ramps. Paved shoulders a minimum of 2 feet wide shall be provided on both sides of each ramp. Wider

ramp widths than these minimums shall be required where necessary to satisfy AASHTO design widths for turning roadways and horizontal stopping sight distances, and to accommodate WB-67 design vehicle tracking. Refer to the WSDOT *Design Manual.* All exit ramp tapers shall use a desirable taper rate of 20:1, and a minimum taper rate of 15:1.

Turning movements at the ramp termini shall be designed to accommodate a WB-50 design vehicle.

2.22.4.2.2.2 *Notice of Closures*

Refer to Section 2.9 and Section 2.22.4.3.1.6 for advance notification, public notification, and signing requirements.

2.22.4.2.2.3 *Late Reopening of Lanes and Ramps*

Liquidated damages will be assessed for failure to complete Work and open all lanes and ramps to traffic by the specified times (see Chapter 1 of this RFP).

2.22.4.2.2.4 *Specific Ramp Requirements*

Only the ramp closures described in this Section will be allowed.

2.22.4.2.3 Local Roads During Construction

All MOT Plans affecting local roads, including but not limited to, I-5, I-90, and SR 520 entrance and exit ramp closures, shall follow the requirements of each jurisdiction impacted. The Design-Builder shall be responsible for submitting plans and obtaining approvals from each local jurisdiction impacted for each planned closure. Allowable closure hours for lane closures on local roads shall be included in the approval of the local jurisdiction. The Design-Builder shall coordinate with the jurisdiction(s) impacted regarding concurrent construction work along city cross streets that may be affected by traffic control for the Project.

No local road closures will be allowed.

2.22.4.2.3.1 *Design Criteria*

The design speed of all local roads during construction shall be at the existing posted speed limit. A design speed 10 mph under the posted speed limit may be used only with approval from the local jurisdiction impacted. Any required reduction from the existing posted speed limit shall be identified in the TMP.

The existing number of through lanes shall be maintained at all times except as approved by WSDOT, and the local jurisdiction impacted. All lanes for local roads shall be a minimum of 11 feet wide, measured to the front of gutter, unless the existing lane width is less than 11 feet, in which case the lane shall not be less than the existing width.

2.22.4.2.3.2 *Detours*

All detours shall be in place, including all signing, prior to closure of any road. Detours using local roads shall follow traffic control permit requirements for each municipality impacted.

The Design-Builder shall identify all bus routes that may be affected by the detour, and shall coordinate with the bus agency regarding impacts to the schedule and location of the bus stops.

2.22.4.2.4 Intentionally Omitted

2.22.4.2.5 Temporary Guardrail and Barrier Attenuators

2.22.4.2.5.1 *Vehicle Protection*

The Design-Builder shall be responsible for using temporary guardrail, barrier, and attenuators to protect the traveling public from the following:

- Hitting fixed objects within the clear zone.
- Driving off drop-offs as required by this Section.
- Driving off slopes steeper than 3H:1V.

2.22.4.2.6 Pedestrian Access During Construction

All existing pedestrian routes and access points within the project limits, including sidewalks and crosswalks, shall remain open and clear at all times. The Design-Builder's MOT plans shall comply with the MUTCD, ADA requirements, and this Section. MOT plans detailing a required alternative accessible pedestrian route shall be reviewed by the Engineer prior to implementation. When the Engineer allows work areas to encroach upon a sidewalk or crosswalk area, and minimum clear width of 48 inches cannot be maintained for pedestrian use, an alternative accessible pedestrian route shall be provided. Separation of pedestrians from the work area and vehicular traffic is required.

Protective barricades, fencing, and bridges, together with warning and guidance devices and signs, shall be utilized so that the passageway for pedestrians is safe, well-defined, and accessible. Whenever pedestrian walkways are provided across excavations, they shall be provided with suitable handrails. Foot bridges shall be safe, strong, and free of bounce and sway; have a slip resistant coating; and be free of cracks, holes and irregularities that could cause tripping. Ramps, with a maximum slope of 8.3% shall be provided at the entrance and exit of all raised footbridges. The maximum cross slope shall be 2.0%. When the existing facility is illuminated or MOT plans require illumination, illumination shall be provided during the hours of darkness. Retroreflective delineation shall be provided during hours of darkness.

Where accessible pedestrian routes are allowed to be closed by the Engineer during construction, an alternate accessible pedestrian route shall be provided that complies with the MUTCD, ADA requirements; and this Section. The alternate accessible pedestrian route shall not have abrupt changes in grade or terrain. Barriers and channelizing devices shall be detectable to pedestrians who have visual disabilities. Where it is necessary to divert pedestrians into the roadway, barricading or channelizing devices shall be provided to separate the pedestrian route from the adjacent vehicular traffic lane. Barricading or channelizing devices used to separate pedestrian and vehicular traffic shall be crashworthy and, when struck by vehicles, present a minimum threat to pedestrians, workers, and occupants of impacting vehicles. At no time shall pedestrians be diverted into a portion of the street used concurrently by moving vehicular traffic.

In addition the MOT plans shall address the following:

All pedestrians, including persons with disabilities, shall be provided with a safe and accessible route.

The width of the existing pedestrian facility shall be maintained if possible. When it is not possible to maintain a minimum width of 60 inches throughout the entire length of the pedestrian route, a minimum width of 48 inches shall be provided with 60- x 60-inch passing zones spaced at maximum intervals of 200 feet to allow individuals in wheelchairs to pass.

Traffic control devices and other construction materials and features shall not intrude into the usable width of the sidewalk, alternate accessible pedestrian route, or other pedestrian facility.

Signs and other devices mounted lower than 84 inches above the temporary accessible pedestrian route shall not project more than 4 inches into the accessible pedestrian route.

A smooth, continuous hard surface shall be provided throughout the entire length and width of the pedestrian route throughout construction. There shall be no curbs or vertical elevation changes greater than ½-inch in grade or terrain that could cause tripping or be a barrier to wheelchair use. Vertical elevation differences between ¼-inch and ½-inch shall be beveled at a maximum 2:1 slope.

When channelization is used to delineate a pedestrian pathway, a continuous detectable edging shall be provided throughout the length of the facility such that pedestrians using a cane can follow it. Edging shall protrude at least 6 inches above the surface of the sidewalk or pathway with the bottom of the edging a maximum of 2-½ inches above the surface.

Temporary ramps shall be provided when an alternate accessible pedestrian route crosses a curb and no permanent curb ramps are in place. The width of the curb ramp shall be a minimum of 48 inches and the maximum slope of the ramp shall be 8.3%. The maximum cross slope shall be 2.0%. The bottom of the curb ramp shall be flush with the Roadway. Temporary detectable warning mats shall be installed at street crossings.

When possible, an alternate accessible pedestrian route shall be provided on the same side of the street as the disrupted route. When it is not possible, the alternate route shall be clearly identified at the nearest intersection crossing prior to the closure area.

Information regarding closed pedestrian routes, alternate crossings, and sign and signal information shall be communicated to pedestrians with visual disabilities by providing devices, such as audible information devices, accessible pedestrian signals, or barriers and channelizing devices, that are detectable to the pedestrians traveling with the aid of a cane or who have low vision.

It is desirable that pedestrians cross to the opposite side of the roadway at intersections rather than mid-block. Appropriate signing shall be placed at the intersections prior to any pedestrian route closure.

Access to transit stops shall be provided and maintained at all times. Transit stops may be temporarily relocated with approval of the transit agency and the Engineer.

At locations where adjacent alternate walkways cannot be provided, appropriate signs shall be posted at the limits of construction and in advance of the closure at the nearest crosswalk or intersection, to divert pedestrians across the street. Physical barricades shall be installed to prevent visually impaired people from inadvertently entering a closed area.

2.22.4.3 PUBLIC CONVENIENCE AND SAFETY

2.22.4.3.1 Construction Under Traffic

The Design-Builder shall conduct all operations with the least possible obstruction and inconvenience to the public. The Design-Builder shall not have under construction a greater length or amount of Work than can be prosecuted properly with due regard to the rights of the public. To the extent possible, the Design-Builder shall finish each section of Work before commencing Work on the next section. The Design-Builder shall enter interstate highways only through legal movements from existing roads, streets, and other access points specifically permitted by the Contract.

To disrupt public traffic as little as possible, the Design-Builder shall permit traffic to pass through the Work zone with the least possible inconvenience or delay. The Design-Builder shall maintain existing roads and streets within the Project limits, keeping them open, and in a good, clean, safe condition at all times. Deficiencies caused by the Design-Builder's operations shall be repaired at the Design-Builder's expense. Deficiencies not caused by the Design-Builder's operations shall be repaired by the Design-Builder, when directed by the WSDOT Engineer, at WSDOT's expense. The Design-Builder shall also maintain roads and streets adjacent to the Project limits when affected by the Design-Builder's operations. Snow and ice control will be performed in accordance with Section 2.29. The Design-Builder shall perform the following, when directed by the WSDOT Engineer:

- Remove or repair any condition resulting from the Work that might impede traffic or create a hazard.
- Keep existing traffic signal and highway lighting systems in operation as the Work proceeds.
- Maintain the striping on the roadway in accordance with Section 2.29.
- Maintain existing permanent signing. Sign repairs will be at WSDOT's expense, except those damaged due to the Design-Builder's operations.

To protect the rights of abutting property owners, the Design-Builder shall perform the following:

- Conduct the construction so that the least inconvenience as possible is caused to abutting property owners.
- Maintain ready access to driveways, houses, and buildings within the Project limits.
- Provide temporary approaches to crossing or intersecting roads, and keep these approaches in good condition.
- Provide another access before closing an existing access whenever the Contract calls for removing and replacing an abutting owner's access.

When traffic must pass through grading areas, the Design-Builder shall perform the following:

- Make cuts and fills that provide a reasonably smooth, even roadbed.
- After rough grading or placement of any subsequent layers, prepare the final roadbed to a smooth, even surface (free of humps and dips), suitable for use by public traffic.
- Settle dust with water or other dust palliative.

If grading Work is on or next to a roadway in use, the Design-Builder shall finish the grade immediately after rough grading and place surfacing materials as the Work progresses.

The Design-Builder shall conduct all operations to minimize any drop-offs (abrupt changes in roadway elevation) left exposed to traffic during non-working hours. Unless otherwise specified in the Traffic Control Plan, drop-offs left exposed to traffic during non-working hours shall be protected as follows:

1) Drop-offs up to 0.20 foot may remain exposed with appropriate warning signs alerting motorists of the condition.

2) Drop-offs more than 0.20 foot, but no more than 0.50 foot, that are not within the traveled way shall be protected with appropriate warning signs and further protected by using one of the following:

   (a) A wedge of compacted stable material placed at a slope of 4:1 or flatter.

   (b) Channelizing devices (Type I barricades, plastic safety drums, or other devices 36 inches or more in height) placed along the traffic side of the drop-off and a new edge of pavement stripes placed a minimum of 3 feet from the drop-off. The maximum spacing between the devices in feet shall be the posted speed in miles per hour. Pavement drop-off warning signs shall be placed in advance and throughout the drop-off treatment.

   (c) TCB or other approved barrier installed on the traffic side of the drop-off with 2 feet between the drop-off and the back of the barrier, and a new edge of pavement stripe a minimum of 2 feet from the face of the barrier. An approved terminal, flare, or impact attenuator shall be required at the beginning of the section. For night use, the barrier shall have standard delineation such as paint, reflective tape, lane markers, or warning lights.

3) Drop-offs more than 0.50 foot not within the traveled way or auxiliary lane shall be protected with appropriate warning signs and further protected as indicated in 3a, 3b, or 3c above, if all of the following conditions are met:

   (a) The drop-off is less than 2 feet.

   (b) The total length throughout the Project is less than 1 mile.

   (c) The drop-off does not remain for more than 3 Calendar Days.

   (d) The drop-off is not present on any holiday or holiday weekend described in this Section.

   (e) The drop-off is only on one side of the roadway.

4) Drop-offs more than 0.50 foot that are not within the traveled way or auxiliary lane and are not otherwise accounted for by 4) above, shall be protected with appropriate warning signs, and further protected as indicated in 3a or 3c above.

5) No saw cuts or open trenches across mainline or ramps will be allowed under any circumstances.

Work Zone Clear Zone (WZCZ)

The Work Zone Clear Zone (WZCZ) applies during working and non-working hours. During non-working hours, equipment or materials shall not be within the WZCZ unless it is protected by permanent guardrail or TCB.

During actual hours of Work, unless protected as described above, only materials absolutely necessary for construction shall be allowed within the WZCZ; and only

construction vehicles absolutely necessary for construction shall be allowed within the WZCZ or allowed to stop or park on the shoulder of the roadway.

The Design-Builder's non-essential vehicles and employees' private vehicles shall not be permitted to park within the WZCZ at any time, unless protected as described above.

The WZCZ applies only to roadside objects introduced by the Design Builder's operations, and is not intended to resolve preexisting deficiencies in the Design Clear Zone or clear zone values established at the completion of the Project. Work operations or objects that are actively in progress and delineated by approved traffic control measures are not subject to the WZCZ requirements.

Minimum WZCZ distances are measured from the edge of the traveled way, and shall be determined as follows:

Minimum Work Zone Clear Zone Distance

Posted Speed	Distance From Traveled Way (Feet)
35 mph or less	10
40 mph	15
45 to 55 mph	20
60 mph or greater	30

Construction vehicles using a closed traffic lane shall travel only in the normal direction of traffic flow, unless expressly allowed in the approved MOT Plans. Construction vehicles shall be equipped with flashing or rotating amber lights.

Work over an open lane of traffic shall not be allowed, unless a plan for the protection of the traveling public from debris falling onto the traveled way is approved by the Engineer of Record. This protection shall remain in place during construction, and shall meet minimum vertical clearance for the highway.

2.22.4.3.1.1 *Controlled Access*

The Design-Builder shall not be allowed any special access, egress, including leaving the roadway shoulder to enter the Work area, or breaks in limited access, other than normal legal movements or movements as approved by WSDOT. The Design-Builder shall be allowed short-duration shoulder stops in the Work area, using light vehicles properly equipped with amber warning lights.

All ingress and egress to the Work area shall be shown on site-specific MOT Plans. The Design-Builder shall maximize the distance from the end of ramp tapers to the access points. The merging point for construction vehicles and public traffic shall provide a minimum decision sight distance for the traveling public of 1,640 feet. The Design-Builder shall provide appropriate warning signs and traffic control devices when vehicles will be departing or entering the mainline traffic flow.

The Design-Builder shall close a lane of traffic in locations where the length and width of shoulders is not adequate for construction vehicles to decelerate from departing the mainline or ramp traffic to enter the Work area or to accelerate from exiting the Work area to merge with the mainline or ramp traffic. The design speed for departing and merging into a mainline or ramp lane shall not be less than 10 mph below the design speed of the mainline or ramp. Lane closures shall be restricted to the hours described in this Section.

Existing median crossings within 1.5 miles of the access point shall not be used in conjunction with the access. No new median crossings shall be created for use in conjunction with the access points within 1.5 miles of the access point.

For an approved break in limited access, the Design-Builder shall prohibit unauthorized use of the access from adjacent property by the use of flaggers, or by physical means such as barriers or locked gates, as conditions warrant.

The access location shall not adversely affect wetlands or other sensitive areas. Airborne particulates created as a result of using the access shall be effectively controlled. The continuity of the existing drainage system shall be maintained throughout the access site.

At the completion of the Project, the Design-Builder shall restore the area of the access site to its original, pre-Contract, condition. Any damage to the traveled way, shoulders, auxiliary lanes, side slopes or other areas caused by the access shall be repaired. All Work to comply with this provision or to build, maintain, provide erosion control, control airborne particulates, ensure that drainage continues throughout the access site, provide traffic control when necessary, remove the temporary access, and restore the surrounding area when no longer required for use is the responsibility of the Design-Builder. The Design-Builder shall include all related costs in the proposal price of the Contract.

2.22.4.3.1.2 *Work During Hours of Darkness*

Work during hours of darkness may be required for the Project. The Design-Builder shall obtain any required noise variance or exemption for such Work. The Design-Builder shall, at no additional cost to WSDOT, make all arrangements for operations during hours of darkness. Flagger stations shall be illuminated using a minimum 150-watt, steady-burn floodlight during hours of darkness. Lighting for construction activity shall be directed away from maintained traffic to minimize glare to motorists.

Refer to this Section and Section 1-07 of the General Provisions for additional requirements.

2.22.4.3.1.3 *Signs and Traffic Control Devices*

All signs and traffic control devices for lane, ramp, and roadway closures shall be installed only during the hours specified in this Section. If placed earlier than the specified hours of closure, the construction signs shall be turned or covered so as not to be visible to motorists.

2.22.4.3.1.4 *Advance Notification*

The Design-Builder shall submit MOT Plans for lane, ramp and shoulder closure requests in writing to WSDOT in advance of the proposed closure, in accordance with Section 2.9 and these Technical Requirements.

2.22.4.3.1.5 *Hour Adjustment*

If WSDOT determines that the permitted closure hours adversely affect traffic, causing queues that extend beyond 1.5 miles for any lane, ramp, or total roadway closure, WSDOT may adjust the closure hours accordingly. WSDOT will notify the Design-Builder in writing of any change in the closure hours.

2.22.4.3.1.6 *Public Notification*

The Design-Builder shall furnish and install information signs that provide advance notification of ramp and road closures a minimum of 7 Calendar Days prior to the scheduled closure. The signs shall have a black legend on a white reflective background. Sign locations, messages, letter sizes, and sign sizes shall be shown in the MOT Plans. For ramp and local road closures, PCMS shall be used to supplement the required signs. The Design-Builder shall notify the Washington State Patrol, local fire departments, police departments, city engineering departments, public transit agencies, and the affected school districts in writing a minimum of 7 Calendar Days prior to scheduled closures. The Design-Builder shall provide written copies of these notifications to WSDOT. Refer to Section 2.9 for additional requirements.

2.22.4.3.2 Construction and Maintenance of Detours

Unless otherwise approved, the Design-Builder shall maintain two-way traffic during construction. The Design-Builder shall build, maintain in a safe condition, keep open to traffic, and remove when no longer needed, the following:

- Detours and detour bridges that will accommodate traffic diverted from the roadway or bridge during construction.
- Detour crossings of intersecting highways.
- Temporary approaches.

The Design-Builder shall pay all costs to build, maintain, and remove any other detours, whether built for the Design-Builder's convenience or to facilitate construction operations. Any detour proposed by the Design-Builder shall conform to the requirements of the Contract. Surfacing and paving shall be consistent with traffic requirements.

Detours shall not extend into a detour already in place, whether placed by the Design-Builder or by another project or entity.

Upon failure of the Design-Builder to immediately provide, maintain, or remove detours or detour bridges, WSDOT may, without further notice to the Design-Builder or the Surety, provide, maintain, or remove the detours or detour bridges, and deduct the costs from any payments due or coming due to the Design-Builder.

2.22.4.4 CONSTRUCTION REQUIREMENTS

2.22.4.4.1 General

The Design-Builder shall plan, manage, supervise, and perform all temporary traffic control activities required to support the Work using labor, equipment, and materials provided by the Design-Builder (except when such labor, equipment, or materials are to be provided by WSDOT as specifically identified herein).

The Design-Builder shall be responsible for all MOT starting at 12:01 a.m. on the day following Notice to Proceed. The traffic control devices, including temporary and permanent signal systems, must be continually and adequately monitored and maintained to ensure proper placement and working order, and to ensure the safe and efficient flow of all traffic through and adjacent to the Project. Such responsibility and maintenance shall continue until 11:59 p.m. on the day of Final Acceptance of the Project by WSDOT.

WSDOT may, in writing, temporarily suspend such responsibility in conjunction with an official suspension for weather or other reasons.

2.22.4.4.2 Materials

All materials shall meet the requirements of Section 9-35 of the Standard Specifications. Additionally, all materials shall conform to the requirements of the Special Provision for Traffic Control Materials.

The Design-Builder shall not use the Advanced Dynamic Impact Extension Module (ADIEM) impact attenuators/end treatments for the Project.

2.22.4.4.3 Description

The Design-Builder shall provide flaggers, spotters, and all other personnel required for traffic control activities, and not otherwise specified in the Contract as being provided by WSDOT.

The Design-Builder shall perform all procedures necessary to support the Work.

The Design-Builder shall provide signs and other traffic control devices not otherwise specified in the Contract as being provided by WSDOT. The Design-Builder shall erect and maintain all construction signs, warning signs, detour signs, and other traffic control devices necessary to warn and protect the public at all times from injury or damage as a result of the Design-Builder's operations which may occur on or adjacent to highways, roads, or streets. No Work shall be done on or adjacent to the roadway until all necessary signs and traffic control devices are in place.

The traffic control resources and activities described shall be used for the safety of the public, the Design-Builder's employees, and WSDOT personnel; and to facilitate the movement of the traveling public. Traffic control resources and activities may be used for the separation or merging of public and construction traffic when such use is in accordance with the approved MOT Plans.

Upon failure of the Design-Builder to immediately provide flaggers; erect, maintain, and remove signs; or provide, erect, maintain, and remove other traffic control devices when requested to do so by WSDOT, WSDOT may, without further notice to the Design-Builder or the Surety, perform any of the above and deduct all of the costs from any payments due or coming due to the Design-Builder.

The Design-Builder shall be responsible for providing adequate labor, sufficient signs, and other traffic control devices, and for performing traffic control procedures needed for the protection of the Work and the public at all times regardless of whether or not the labor, devices, or procedures have been ordered by WSDOT, provided by WSDOT, or paid for by WSDOT.

Wherever possible when performing Work, the Design-Builder's equipment shall follow normal and legal traffic movements. The Design-Builder's ingress and egress of the Work area shall be accomplished with as little disruption to traffic as possible. Traffic control devices shall be removed by picking up the devices in a reverse sequence to that used for installation. This may require backing up through the Work area. When located behind barrier or at other locations shown on approved MOT Plans, equipment may operate in a direction opposite to adjacent traffic.

The Design-Builder is advised that WSDOT may have entered into operating agreements with one or more law enforcement agencies for cooperative activities. Under such

agreements, at the sole discretion of WSDOT, law enforcement personnel may enter the Work area for enforcement purposes and may participate in the Design-Builder's traffic control activities. Under the Contract, the Design-Builder is responsible for all traffic control, and any such participation by law enforcement personnel in traffic control activities will be preceded by an agreement and, if appropriate, a cost adjustment. Nothing in the Contract is intended to create an entitlement, on the part of the Design-Builder, to the services or participation of the law enforcement organization.

2.22.4.4.4 Signing, Pavement Markings, and Traffic Control Devices During Construction

The Design-Builder shall inspect all temporary signing daily, noting damaged signs, misplaced signs, and graffiti affecting legibility of the sign. Every detour route shall be driven hourly to ensure all detour signing is in place. Signing for detours shall be covered or removed when detours are not in use. The Design-Builder shall provide a schedule for repairing, cleaning, or replacing signs; procedures shall address rectifying incorrect or misleading signing that may present a hazard to road users.

The Design-Builder shall ensure there are no conflicting or misleading signs due to adjacent projects. The Design-Builder shall coordinate with adjacent projects and relocate signs as required to avoid conflicting information.

The Design-Builder shall have adequate spare sections of temporary barrier and the necessary equipment on site to replace and repair temporary barrier within 4 hours of identification by or notice given to the Design-Builder of damaged barrier. This requirement shall include replacement of impact attenuators. Temporary traffic control shall be set up immediately upon notice of damage to ensure vehicle safety.

2.22.4.4.5 Intentionally Omitted

2.22.4.4.6 Temporary Illumination

Typical construction requires reduction in lane and shoulder widths, shifting of lanes, and modification to gore points at the ramps. Additional lighting is often necessary for the safety of the traveling public and workers.

Existing overhead sign lighting shall be maintained at all times.

The Design-Builder shall provide temporary lighting satisfying the "construction lanes and detours" light level and uniformity ratios when existing lighting must be removed or disconnected. Where temporary illumination is required, the existing illumination system shall not be removed until the temporary system is operational.

The Design-Builder shall provide temporary lighting for all intersections where traffic control devices are in place. The temporary lighting shall satisfy the greater of the "construction lanes and detours" or the specific intersection light level and uniformity ratios.

The Design-Builder shall provide temporary lighting satisfying the "construction lanes and detours" light level and uniformity ratios at locations where HOV lanes separate from general purpose lanes, if any.

In addition to the requirements of the WSDOT *Design Manual*, the Design-Builder shall provide temporary lighting satisfying the "construction lanes and detours" light level and uniformity ratios for temporary channelization or traffic control.

Floodlights or portable light stands shall not be used for temporary roadway lighting.

At a minimum, the Design-Builder shall provide temporary illumination satisfying the Required Illumination described in the WSDOT *Design Manual*. Temporary illumination shall be in place and in operation prior to implementing the MOT Plans which require the temporary illumination.

2.22.4.4.6.1 *General*

If temporary lighting is required, the Design-Builder, shall, at minimum, perform the following:

- Design temporary lighting plans.
- Maintain current levels of roadway illumination for all roadway segments and interchanges that are currently lit.
- Provide all materials and equipment for temporary lighting installations.
- In the clear zone, provide only lighting units that are breakaway or protected from crash potential.
- Provide maintenance for the temporary lighting system. Any damage to the existing illumination system shall be repaired prior to hours of darkness on the following day.

Temporary illumination shall be provided in accordance with the requirements of Figure 840-23 (Traffic Split Around an Obstruction) and Figure 840-24 (Construction Work Zone and Detour) of the WSDOT *Design Manual*.

2.22.4.4.6.2 *Timber Light Standards*

Timber light standards may be used for temporary lighting where breakaway or slip bases are not required. Timber light standards must be outside of the clear zone or protected by barrier.

2.22.4.4.6.3 *Power Service Costs*

Refer to Section 2.16.

2.22.4.5 TRAFFIC CONTROL PERSONNEL

The Design-Builder shall plan, conduct, and safely perform the Work. The Design-Builder shall manage temporary traffic control. One or more of the Design-Builder's supervisors who are actively involved in the planning and management of field Contract activities shall assume the responsibilities for traffic control management. The supervisors shall have at least 5 years of practical MOT experience with design and/or implementation of traffic control on highway construction projects. The Design-Builder shall provide WSDOT with a copy of the formal assignment. The duties of traffic control management may not be subcontracted.

The Design-Builder shall designate one or more people to perform the duties of the primary TCS, and identify an alternate TCS who can assume the duties of the primary TCS in the event of that person's inability to perform. The TCS shall be responsible for safe implementation of the approved MOT Plans.

The TCS shall be certified as a Work site traffic control supervisor by one of the following agencies:

The Northwest Laborers-Employers Training Trust
27055 Ohio Avenue
Kingston, WA 98346
(360) 297-3035

Evergreen Safety Council
401 Pontius Avenue North
Seattle, WA 98109
1-800-521-0778 or
(206) 382-4090

Possession of a current flagging card by the TCS is mandatory. A traffic control management assignment and a TCS designation are required for the Project.

The Design-Builder shall provide all personnel for flagging; spotting; execution of all procedures related to temporary traffic control; and setup, maintenance, and removal of all temporary traffic control devices and construction signs necessary to control traffic during construction operations.

Workers engaged as flaggers or spotters shall wear reflective vests and hard hats. During hours of darkness, white coveralls or white or yellow rain gear shall be worn. The vests and other apparel shall be in accordance with Section 1-07 of the General Provisions.

2.22.4.5.1 Traffic Control Management

The Design-Builder's traffic control management personnel shall be responsible for the following:

- Overseeing and approving the actions of the TCS to ensure that proper safety and traffic control measures are implemented and consistent with the specific requirements of the Project. An alternate form of oversight shall be in place and effective when the traffic control management personnel are not present at the Work area.
- Providing the Design-Builder's designated TCS with approved MOT Plans that are compatible with the Work and traffic control for which they will be implemented. Having the latest adopted edition of the FHWA MUTCD and the *Washington State Modifications to the MUTCD*, and applicable standards and specifications available at all times on the Project.
- Discussing proposed traffic control measures and coordinating implementation of the MOT Plans with WSDOT.
- Coordinating all traffic control operations, including those of subcontractors and suppliers, with each other and with any adjacent construction or maintenance operations.
- Coordinating the Project's activities (such as ramp closures, road closures, and lane closures) with appropriate police, fire control agencies, city or county engineering, medical emergency agencies, school districts, and transit companies.
- Overseeing all requirements of the Contract that contribute to the convenience, safety, and orderly movement of vehicular and pedestrian traffic.
- Reviewing the TCS's diaries daily and being aware of field traffic control operations.
- Being present on site a sufficient amount of time to adequately satisfy the above-referenced responsibilities.

Failure to carry out any of the above-referenced responsibilities shall be considered a failure to comply with the Contract and may result in a suspension of Work as described in Section 1-08 of the General Provisions.

2.22.4.5.2 Traffic Control Supervisor (TCS)

A TCS shall be present on the Project whenever flagging, spotting, or other traffic control is occurring; or less frequently, as authorized by WSDOT.

The TCS shall personally perform all of the duties of the TCS. During non-working hours, the TCS shall be available at the Project within 45 minutes after notification by WSDOT.

The TCS's duties shall include the following:

- Possessing a current set of approved MOT Plans; applicable Contract provisions as provided by the Design-Builder; the latest adopted edition of the Washington State and FHWA MUTCDs, including the *Washington State Modifications to the MUTCD*; the publication *Quality Standards for Work Zone Traffic Control Devices*; and applicable standards and specifications.
- Inspecting traffic control devices and nighttime lighting for proper location, installation, message, cleanliness, and effect on the traveling public. Traffic control devices shall be inspected at least once per hour during working hours, except that Class A signs and nighttime lighting may be inspected only twice a week. Traffic control devices left in place for 24 hours or more shall also be inspected once during non-working hours when they are initially set up (during daylight or darkness, whichever is opposite of the working hours). The TCS shall correct, or arrange to have corrected, any deficiencies noted during these inspections.
- Preparing a daily traffic control diary on each day that traffic control is performed using DOT Forms 421-040A and 421-040B and submitting them to the WSDOT Engineer no later than the end of the next business day. The daily traffic control diaries shall be maintained at the Project office and made available to WSDOT at any time upon request. The Design-Builder may use alternate forms if approved by WSDOT. Diary entries shall include, but are not limited to, the following:
    - (a) Time of day when signs and traffic control devices are installed and removed.
    - (b) Location and condition of signs and traffic control devices.
    - (c) Revisions to the MOT Plans.
    - (d) Lighting used at night.
    - (e) Observations of traffic conditions.
- Making minor revisions to the MOT Plans to accommodate site conditions, provided that the original intent of the MOT Plans is maintained. The revisions shall be documented in the daily traffic control diary. The MOT Plans shall be revised and re-released when determined necessary by the WTEM.
- Attending traffic control coordination meetings or coordination activities, including meetings and activities for adjacent projects, as necessary, for a complete understanding of the Project and effective performance.
- Ensuring that all required traffic control devices and equipment are available and in good working condition prior to the need to install or use them.

Provided that the duties of the TCS are accomplished, the TCS may perform other duties described in this Section.

The TCS shall be considered a critical component of the Design-Builder's management team, and shall have prior experience managing MOT operations on similarly complex projects. Registration as a licensed Professional Engineer is not required; however, the Design-Builder may elect to use his WTEM in this position. The TCS shall attend all MOT Task Force meetings. The TCS shall also coordinate activities with the public information officer.

The TCS or a designee shall be available on a 24-hour basis with a single contact phone number throughout the duration of the Project; supervise and verify all changes in the MOT setup; and perform daily Project reviews to verify that MOT devices are correctly placed and traffic is safely and efficiently moving through the Project. The TCS or a designee shall be available on the Project within 45 minutes of notification of an emergency situation, and shall be prepared to positively respond to the need to repair the traffic control system or to provide alternate traffic arrangements. The TCS shall have the resources, ability, and authority to expeditiously correct any deficiencies in the traffic control system, or to demobilize any construction operation that is resulting in excessive delays to traffic or creating an unsafe condition.

The TCS shall maintain a 30 Calendar Day advance schedule of all traffic control activities and a long-range schedule for all planned ramp and roadway closures. The TCS shall coordinate with the Design-Builder's Public Information Team to ensure the information is disseminated to WSDOT and to the public.

The TCS shall perform drive-through inspections each Calendar Day and immediately after any shift in MOT setup, while crews are still on-site to make modifications. If the Project has signalized intersections, the review shall be done prior to each morning peak traffic period, and each signal cycle shall be reviewed. At least two of the daily inspections each week shall be performed at night so that the arrangement and condition of the lights can be reviewed. The inspections shall also include assurances that pedestrians and bicyclists have a safe travel path around or through the Project area, and that existing businesses have adequate access during business hours, if applicable. The results of the inspections shall be documented in a daily report that, at a minimum, lists the time frame of the drive-through inspection and the defects noted. The report shall also document any maintenance or corrective action ordered as a result of the inspection, and the name and position of the Design-Builder's personnel who have been directed to provide the maintenance or corrective action. The daily report shall state that the MOT setup and all traffic control devices substantially conform to the Contract requirements, except as noted, and shall be signed by the TCS.

2.22.4.5.3 Flaggers and Spotters

Flaggers and Spotters shall be posted where shown on the approved MOT Plans, or where directed by WSDOT. All flaggers or spotters shall possess a current flagging card issued by the States of Washington, Oregon, Montana, or Idaho. The flagging card shall be immediately available and shown to WSDOT upon request.

Flagging stations shall be shown on MOT Plans at locations where construction operations require stopping or diverting public traffic. Flagging stations shall be staffed only when flagging is required. This staffing may be continuous or intermittent, depending on the nature of the construction activity. Whenever a flagger is not required to stop or divert traffic, the flagger shall move away from the flagging station to a safer location. During

hours of darkness, flagging stations shall be illuminated in a manner that ensures that flaggers can be seen easily, but that does not cause glare to the traveling public. Flaggers shall be equipped with portable two-way radios, with a range suitable for the Project. The radios shall be capable of having direct contact with Project management (e.g., foremen and superintendents).

The Design-Builder shall provide the standard Stop/Slow paddles for all flagging operations. The specification for Stop/Slow paddles in Section 9-35 of the Standard Specifications requires 24-inch paddles and all new paddles purchased for the Project shall conform to those provisions.

Spotting stations shall be shown on MOT Plans at locations where a spotter can detect errant drivers or other hazards, and provide an effective warning to other workers. Spotting stations will not be allowed at locations where the spotter will be in unnecessary danger. The Design-Builder shall provide noise-makers or other effective warning devices for spotting operations. The duties of a spotter shall not include flagging.

2.22.4.5.4 Other Traffic Control Labor

In addition to flagging or spotting duties, the Design-Builder shall provide personnel for all other traffic control procedures required by the construction operations, and personnel to install, maintain, and remove any traffic control devices shown on the MOT Plans.

2.22.4.6 VIDEO RECORD

A drive-through video of all MOT devices shall be made each week; immediately after each accident causing injuries; and after each shift in MOT setup. The tapes shall be maintained in a remote, fireproof location, and a log of the tapes with dates and times shall be provided to WSDOT on a monthly basis. WSDOT shall have the right to review the tapes at any time with a 24-hour notice to the Design-Builder.

2.22.4.7 TRAFFIC CONTROL PROCEDURES

2.22.4.7.1 Intentionally Omitted

2.22.4.7.2 Rolling Slowdown

Rolling slowdown traffic control operations shall not be used for routine Work that can be addressed by standard lane or shoulder closure traffic control. When a short-term roadway closure of 15 minutes or less is needed for an infrequent, non-repetitive Work operation such as a sign bridge removal or utility wire crossing, the Design-Builder may implement a rolling slowdown on a multilane roadway, as part of an approved traffic control plan. Rolling slowdowns on I-5, SR 520 and I-90 will only be permitted between 12:01 a.m. and 4:00 a.m., Sunday through Friday.

Where included in the approved MOT Plans, a rolling slowdown shall be accomplished using 1 traffic control vehicle with flashing amber lights for each lane to be slowed down, plus 1 control vehicle to serve as a chase vehicle for traffic ahead of the blockade. The Design-Builder shall provide and pay for a minimum of 2 Washington State Patrol officers per direction, for mainline rolling slowdowns. The traffic control vehicles shall enter the roadway and form a moving blockade to reduce traffic speeds and create a clear area in front of the moving blockade to accomplish the Work without a complete stoppage of traffic.

A PCMS shall be placed ahead of the starting point of the traffic control to warn traffic of the slowdown. The sign shall be placed far enough ahead of the Work to avoid any expected backup of vehicles.

The location where the traffic control vehicles shall begin the slowdown and the speed at which the moving blockade shall be allowed to travel shall be calculated to accommodate the estimated time needed for closure. The chase control vehicle shall follow the slowest vehicle ahead of the blockade. When the chase vehicle passes, the Design-Builder may begin the Work operation. In the event that the Work operation is not completed when the moving blockade reaches the site, all Work, except the Work necessary to clear the roadway, shall cease immediately, and the roadway shall be cleared and reopened as soon as possible.

All ramps and entrances to the roadway between the moving blockade and the Work operation shall be temporarily closed using construction vehicles. Radio communications between the Work operation and the moving blockade shall be established and utilized to adjust the speed of the blockade to accommodate the closure time needed.

If more than one rolling slowdown occurs during the same period, the Design-Builder shall ensure that any queues originating from previous rolling slowdowns have fully dissipated.

2.22.4.7.3 Lane Closure Setup/Takedown

Where allowed by the Contract and where shown on the approved MOT Plans or as directed by WSDOT, the Design-Builder shall establish traffic control measures to close one or more lanes of a multilane facility. When this is scheduled to occur, the Design-Builder shall adhere to the following sequence:

- Set up advance warning signs on the shoulder of the roadway opposite the lane to be closed.
- Set up advance warning signs on the same shoulder as the lane to be closed.
- Move a TMA with arrow board into place at the beginning of the closure taper.
- Place channelization devices to mark the taper and the length of the closure as shown on the MOT plans.
- Once the lane is closed, the TMA/arrow board combination may be replaced with an arrow board without attenuator.

If additional lanes are to be closed, this shall be done in sequence with previous lane closures, using the same sequence of activities. A TMA with arrow board is required during the process of closing each additional lane, and may be replaced with an arrow board without attenuator after the lane is closed. Each closed lane shall be marked with a separate arrow board at all times.

Traffic control for lane closures shall be removed in the reverse order of its installation.

2.22.4.7.4 Patrol and Maintain Traffic Control Measures

When temporary traffic control measures are in place, the Design-Builder shall patrol and maintain these measures at all times. The Work shall consist of resetting mislocated devices; assuring visibility of all devices; cleaning and repairing where necessary; providing maintenance for all equipment, including replacing batteries and light bulbs, as well as keeping motorized and electronic items functioning; and adjusting the location of

devices to respond to actual conditions, such as queue length, unanticipated traffic conflicts, and other areas where planned traffic control has proven ineffective.

This Work shall be performed by the Design-Builder, either by or under the direction of the TCS. Personnel, with vehicles if necessary, shall be dispatched so that all traffic control can be reviewed at least once per hour during working hours, and at least once during each Calendar Day.

2.22.4.8 TRAFFIC CONTROL DEVICES

Traffic control devices are used to visually guide drivers through Work zones. Signing, channelizing devices, arrow boards, and warning beacons all display a message to the driver. Work zone credibility is established through the proper use of these devices to send correct messages to drivers. Poor Work zone credibility has a direct, negative impact on Work zone safety by causing driver confusion, frustration, and disrespect, which results in a high potential for accidents.

2.22.4.8.1 Construction Signs

All construction signs required by the approved MOT Plans, as well as any other appropriate signs directed by WSDOT, shall be provided by the Design-Builder. The Design-Builder shall provide the posts or supports, and erect and maintain the signs in a clean, neat, and presentable condition until they are no longer required. Post-mounted signs shall be installed as shown in the WSDOT *Standard Plans*. Sign attachment to posts shall conform to the applicable detail shown in the Standard Plans. When the construction signs are no longer required, the Design-Builder shall remove all signs, posts, and supports from the Project and they shall remain the property of the Design-Builder.

No passing zones on the existing roadway, if any, that are marked with paint striping and where striping is anticipated to be destroyed by construction operations shall be replaced by “Do Not Pass” and “Pass With Care” signs. The Design-Builder shall furnish and install the signs and posts. The signs shall be maintained by the Design-Builder until they are removed, or upon Physical Completion. When the Project includes striping by the Design-Builder, the signs and posts shall be removed by the Design-Builder when the no passing zones are reestablished by striping. The signs and posts shall become the property of the Design-Builder. When the Design-Builder is not responsible for striping, and when striping by others is not completed by Physical Completion, the signs and posts shall be left in place and shall become the property of WSDOT.

All existing signs, new permanent signs installed as part of the Work, and construction signs installed as part of the Work that are inappropriate for the traffic configuration at a given time, shall be removed or completely covered with metal, plywood, or an approved product specifically manufactured for sign covering, during periods when they are not needed.

Construction signs are divided into two classes. Class A construction signs are those signs that remain in service throughout the construction or during a major phase of the Work. They are mounted on posts, existing fixed structures, or substantial supports of a semi-permanent nature. Class A signs shall be designated as such on the approved MOT Plans. “Do Not Pass” and “Pass With Care” signs are Class A construction signs. Sign and support installation for Class A signs shall be in accordance with the Contract or the WSDOT *Standard Plans*. Class B construction signs are those signs that are placed and removed daily, or are used for short durations which may extend for 1 or more days. They are mounted on portable or temporary mountings.

Where it is necessary to add weight to signs for stability, the Design-Builder shall follow the manufacturer's recommendations for sign ballasting.

Signs, posts, or supports that are lost, stolen, damaged, destroyed, or which WSDOT deems to be unacceptable while used on the Project, shall be replaced by the Design-Builder.

2.22.4.8.2 Sequential Arrow Signs

Where shown on the approved MOT Plans or when requested by WSDOT, the Design-Builder shall provide, operate, and maintain sequential arrow signs. In some locations, the signs shall be shown on the MOT Plans as a unit with a TMA. In other locations, the MOT Plans shall indicate a stand-alone unit.

2.22.4.8.3 Portable Changeable Message Signs (PCMS)

Where shown on the approved MOT Plans or when requested by WSDOT, the Design-Builder shall provide, operate, and maintain PCMS. The Design-Builder shall provide a minimum of 4 PCMS available for use throughout the duration of the Project, and shall provide additional PCMS as required. These signs shall be available on site for the entire duration of their anticipated use.

2.22.4.8.4 Barricades

Where shown on the approved MOT Plans or when requested by WSDOT, the Design-Builder shall furnish, install, and maintain barricades. Barricades shall be kept in good repair, and shall be removed and/or replaced immediately when, in the opinion of WSDOT, they are no longer functioning as designed.

Where it is necessary to add weight to barricades for stability, the Design-Builder shall follow the manufacturer's recommendations for sign ballasting.

2.22.4.8.5 Traffic Safety Drums

Where shown on the approved MOT Plans, or when requested by WSDOT, the Design-Builder shall furnish, install, and maintain traffic safety drums.

Used traffic safety drums may be utilized, provided all drums used on the Project are of essentially the same configuration and in acceptable condition.

Traffic safety drums shall be designed to resist overturning by means of a weighted lower unit that will separate from the drum when impacted by a vehicle.

Traffic safety drums shall be regularly maintained to ensure that they are clean and that the drum and reflective material are in good condition. If WSDOT determines that a drum has been damaged beyond usefulness, or provides inadequate reflectivity, a replacement drum shall be provided by the Design-Builder at no cost to WSDOT.

When WSDOT determines that the traffic safety drums are no longer required, they shall be removed from the Project and shall remain the property of the Design-Builder.

2.22.4.8.6 Traffic Cones

Where shown on the approved MOT Plan, or when requested by WSDOT, the Design-Builder shall furnish, install, and maintain traffic cones. The Design-Builder shall not use traffic cones on ramps or on the interstate. Traffic cones shall be kept in good repair, and shall be removed immediately when directed by WSDOT. Where wind or moving traffic

frequently displaces cones, an effective method of stabilizing cones, such as stacking two together at each location, shall be employed.

2.22.4.8.7 Tubular Markers and Tall Channelizing Devices

The Design-Builder shall not use tubular markers or tall channelizing devices on ramps or state highways.

2.22.4.8.8 Warning Lights and Flashers

The Design-Builder shall provide and maintain Type C, steady-burning lights attached to traffic safety drums, barricades, or other traffic control devices used for lane closures or shifting tapers during hours of darkness.

2.22.4.8.9 Truck-Mounted Attenuator (TMA)

Where shown on the approved MOT Plans, or when requested by WSDOT, the Design-Builder shall provide, operate, and maintain TMA. These attenuators shall be available, on site, for the entire duration of their anticipated use.

The TMA shall be positioned to separate and protect construction Work zone activities from normal traffic flow. During use, the attenuator shall be in the full down-and-locked position. For stationary operations, the truck's parking brake shall be set.

2.22.4.8.10 Temporary Concrete Barrier (TCB)

All TCB installation and end treatments shall conform to Standard Plan C-8d and to the requirements of Sections 6-10 and 8-17 of the Standard Specifications. Impact attenuators shall be used to protect the ends of barrier within the clear zone. See Sections 6-10 and 8-17 of the Standard Specifications and Chapters 710, 720, 810 and 830 of the WSDOT *Design Manual* for material and construction details regarding the barrier, glare screen, attenuators, and barrier delineators.

2.22.4.8.11 Quickchange Moveable Barrier (QMB)

If the Design-Builder uses QMB provided by WSDOT, the Design-Builder shall transport, install, relocate, and maintain all QMB provided by WSDOT. The Design-Builder shall also transport, operate, and maintain one TTV provided by WSDOT, as manufactured by Barrier Systems Incorporated.

The Design-Builder shall transport the QMB, TTV, and replacement parts to the Project area from WSDOT storage sites located within 10 miles of Seattle as listed below.

TTV and Replacement Parts Pickup and Delivery Location
WSDOT Shop/Equipment Maintenance Facility
6431 Corson Avenue South
Seattle, Washington 98108

QMB Pickup and Delivery Location
WSDOT Yard
Northbound I-5, Milepost 152 vicinity
Southbound I-5, between Exit 149 and Exit 147

The Design-Builder shall notify WSDOT, in writing, a minimum of 21 Calendar Days in advance of the pickup date.

The Design-Builder shall load the TTV on a trailer, lowboy, or similar conveyance, and haul it between the pickup location and the Project area. The Design-Builder shall not attempt to transport the TTV to the Project area by driving it under its own power or by towing. The Design-Builder shall provide the certified personnel and equipment necessary for loading and unloading the QMB and TTV at the pickup and delivery locations.

The Design-Builder shall deliver the QMB and TTV to the locations listed above when they are no longer required for the Project. The Design-Builder shall be relieved of responsibility for the TTV after WSDOT determines that the TTV has been returned to WSDOT in the same condition as it was when initially received by the Design-Builder. The Design-Builder shall return to WSDOT the same quantity of undamaged QMB as originally provided.

All proposed positions of the QMB shall be shown on the approved MOT Plans. The TTV shall be used to move the QMB for access to the Project area only during the lane closure hours specified in this Section. Traffic control devices shown on the approved MOT Plans shall be in place prior to the QMB shift.

When positioned in a lane closure, the QMB leading end shall be protected by a TMA. When placed in temporary storage, all QMB leading ends within the safety zone shall be protected by a method approved by WSDOT.

During non-working hours or when not in use, the TTV shall be stored at the WSDOT Shop/Equipment Maintenance Facility, unless on-site storage for the TTV is provided by the Design-Builder and approved by WSDOT. The same requirements for initial pickup and final delivery described above shall apply to transporting the TTV to and from the storage site between uses.

QMB in use shall be inspected daily for cracks, chips, spalls, dirt, and traffic marks. Damaged QMB sections shall be repaired or replaced by the Design Builder.

The Design-Builder shall be responsible for fueling, lubricating, and performing all routine maintenance on the TTV recommended by the manufacturer, to ensure that the TTV is returned to WSDOT in the same condition as it was when initially received by the Design-Builder. The Design-Builder shall provide WSDOT with complete monthly maintenance records. The Design-Builder shall also be responsible for repairing the TTV if it is damaged while in the Design-Builder's possession.

Maintenance shall be scheduled during periods when the TTV is not in use. A complete set of replacement parts as listed below will be provided by WSDOT at the TTV pickup locations. To minimize down time, the Design-Builder shall maintain in stock the following quantities of these replacement parts which are noted by the manufacturer to be typically required to maintain and repair the TTV:

- 30 Standard Conveyor Wheels, B900802.
- 10 Spindle, Conveyor, S1350.
- 5 Hub, Conveyor 1-100-03-01.
- 6 Bearing, Conveyor Hub, L44649.
- 5 Seal, Conveyor Hub, SL122-1.
- 10 Dust Cap, Conveyor Hub, 1505.
- 3 Engine Oil Filter, LF3349.

- 2 Engine Fuel Filter, FF5052.
- 1 Primary Air Filter, AF4668.
- 1 Secondary Air Filter, AF 963.
- 2 Water Fuel Separator, FF5079.
- 2 Sets Engine Belts, 3911560.
- 100 Conveyor Wheel Bolts (Lockwire), 1/2 x 2-1/4 Grd 5.
- 10 5-inch OD Conveyor Wheel Washer, B880601 Rev A.
- 30.5 m 12 Gauge Stainless Steel Ty-Wire.
- 4 Electrical Contact Blocks, ZB2-BZ102 NC.
- 1 Manual Control Valve Body, DGMFN-3-Y-A2W-B2W-21.
- 1 Valve Bolt Kit, A920701.
- 1 Filter, Ground Drive Suction, HC7500-SKS-8H.
- 2 Filter, Auxiliary Return, HV7500-SKN-8H.
- 1 Reservoir Breather, HC7500-SDP-4H.
- 2 Seal Kit, Side Shaft Cylinder, KT25.
- 2 Seal Kit, Steering Cylinder, KT35.
- 2 Seal Kit, Leg Lift Cylinder, KT4.
- 1 Idec Electrical Relay, RH2BUL-12VDC.
- 1 P.Q. Controller, PQ 100-674.
- 1 Backup Alarm 850.
- 3 Fuses Buss 3 AGC.
- 1 Tire and Wheel Assembly, C870715 rev 5.
- 1 1400R20 Tire / 10-20 MD on 13-3/16 BC.
- 2 Adjustable Carrier Wheel Assembly for Turn Section C880602 rev 1.

WSDOT may, at any time, require the Design-Builder to purchase additional replacement parts. When the TTV is no longer required for the Project, new unused excess replacement parts will be purchased from the Design-Builder by WSDOT, if listed above or ordered by WSDOT. WSDOT will pay only for parts that are replaced due to normal wear and tear of the TTV. Replacement parts not listed above or ordered by WSDOT shall be considered ordered by the Design-Builder for its convenience, and will not be eligible for reimbursement.

The Design-Builder shall be responsible for the repair or replacement of the TTV and any section of QMB damaged while in the Design-Builder's possession. The Design-Builder shall notify WSDOT of the extent of the damage, and give an estimate of the time it will take to complete the repair.

If WSDOT agrees to the repair, the Design-Builder shall undertake repairs immediately.

QMB damaged beyond repair, as determined by WSDOT, shall be replaced with undamaged sections, at the Design-Builder's cost. If the TTV is damaged beyond repair, the Design-Builder shall notify WSDOT immediately so that scheduling its use can be evaluated. Should a replacement TTV be needed to complete the remaining Work on the Project, the Design-Builder, at the Design-Builder's expense, shall acquire a replacement or loaner TTV to complete the unfinished Work.

2.22.5 SUBMITTALS

The TMP and TIMP shall be submitted and approved by WSDOT prior to commencement of any construction activity that has the potential to impact traffic. MOT Plans for individual construction phases require a Preliminary Design Submittal and a Final Design Submittal prior to approval for each phase of construction.

2.22.5.1 TRAFFIC MANAGEMENT PLAN (TMP)

The Design-Builder shall submit 6 copies of the Draft TMP to WSDOT. WSDOT will respond to the submittal within 14 Calendar Days of receipt.

The Design-Builder shall prepare a Final TMP for WSDOT's approval, responding to all WSDOT comments. The Final TMP shall carry the WTEM's Professional Engineering stamp. The Design-Builder shall submit 6 copies and an electronic copy of the Final TMP to WSDOT. WSDOT will respond to the Final TMP within 14 Calendar Days of receipt. The TMP must be approved prior to commencement of any construction activity that has the potential to impact traffic.

2.22.5.2 TRAFFIC INCIDENT MANAGEMENT PLAN (TIMP)

The Design-Builder shall submit 6 copies of the Draft TIMP to WSDOT within 30 Calendar Days of the date the Contract is executed. WSDOT will provide comments on the Draft TIMP within 14 Calendar Days of receipt.

The Design-Builder shall prepare a Final TIMP for WSDOT approval responding to all WSDOT comments. The Final TIMP shall carry the WTEM's Professional Engineering stamp. The Design-Builder shall submit 6 copies and 1 electronic copy of the Final TIMP to WSDOT. WSDOT will respond to the Final TIMP within 14 Calendar Days of receipt. The TIMP must be approved prior to commencement of any construction activity that has the potential to impact traffic.

2.22.5.3 MAINTENANCE OF TRAFFIC (MOT) PLANS

The Design-Builder shall submit MOT Plans to WSDOT for review with the Preliminary and Final Design Submittals. The Design-Builder may submit MOT Plans separately for each phase of construction. The plans must be distributed and approved prior to implementation. The Design-Builder shall consider the review times when planning for implementation of the MOT phases.

The Design-Builder shall prepare plan sheets in Microstation format and in accordance with Section 2.28 and the WSDOT *Plans Preparation Manual*.

The Preliminary Design Submittal shall show lane configurations including typical cross sections, signing, and Work zones. General notes to show the intent shall also be included; however, it is not required that stations and offsets be identified for all elements. The Design-Builder shall submit six copies and one electronic copy of the MOT Plans to

WSDOT for review. WSDOT will provide comments on the Preliminary Design Submittal MOT Plans within 14 Calendar Days of receipt.

The Final Design Submittal shall include, at a minimum, all required details including station and offset for all elements, cross sections, temporary paving, pavement marking details, signing, traffic control devices, temporary or modified traffic signals, and temporary lighting. The Design-Builder shall submit 6 copies and 1 electronic copy of the MOT Plans to WSDOT for review. WSDOT will provide comments on the Final Design Submittal MOT Plans within 14 Calendar Days of receipt.

When all comments from the Final Design Submittal MOT Plans have been incorporated, the Design-Builder shall prepare Released For Construction MOT Plans, carrying the stamp of a Professional Engineer licensed under Title 18 RCW. For roadways outside of limited access, the Design-Builder shall submit plans for review and approval to the local jurisdiction responsible for the roadway. The Design-Builder shall provide an informational copy of the submittal to WSDOT. The Design-Builder shall allow a minimum of 14 Calendar Days for the local jurisdiction to review the plans. If the plans are not approved, they must be corrected and resubmitted until they are approved. Once approval is received and all requirements of the Quality Management Plan are satisfied, the plans may be Released For Construction. The Design-Builder shall provide 4 sets of the approved Released for Construction MOT Plans to WSDOT prior to implementation.

The Released for Construction MOT Plans shall be distributed to all stakeholders a minimum of 7 Calendar Days prior to implementation of any lane, ramp, sidewalk, or roadway closures or detours, in order to allow for public notification.

2.22.5.4 INTENTIONALLY OMITTED

2.22.5.5 TEMPORARY ILLUMINATION PLANS

Lighting level calculations, including electronic files, shall be submitted to WSDOT for Review and Comment prior to planning any pavement marking changes, as required in Section 2.16. When the analysis shows temporary illumination is required, the Design-Builder shall submit temporary illumination plans as part of the MOT Plans package for the stage in which the illumination will be required.

2.22.5.6 TRANSFER/TRANSPORT VEHICLE (TTV) AND QUICKCHANGE MOVEABLE BARRIER (QMB)

If QMB is used, the Design-Builder shall submit a list of TTV/QMB operators and mechanics certified by Barrier Systems Incorporated to WSDOT for Review and Comment. Certified operators and mechanics shall be trained in the manufacturer's recommended operations, maintenance, and repair procedures for the TTV and QMB. Training shall be obtained through Barrier Systems Incorporated, and shall be completed a minimum of 21 Calendar Days prior to pickup of the TTV and QMB. Only certified personnel shall operate, maintain, or repair the TTV and QMB.

The Design-Builder shall submit monthly maintenance records to WSDOT at the end of each month that the Design-Builder is in possession of QMB and/or TTV provided by WSDOT.

2.22.5.7 OTHER SUBMITTAL REQUIREMENTS

The Design-Builder shall deliver to WSDOT a list of all parties invited to take part in the MOT Task Force, and the responses to all of the invitations. The Design-Builder shall take meeting minutes and distribute them to all task force members in accordance with Section 2.1.

A copy of the MOT diary shall be submitted to WSDOT on a monthly basis. Upon completion of the Project, the MOT diaries shall be delivered to and become the property of WSDOT.

End of Section

2.25 CONTROL OF MATERIALS

2.25.1 GENERAL

The Design-Builder shall be responsible for the quality of materials, methods of construction, and testing incorporated into the Project, and shall comply with FHWA and WSDOT requirements for approval of materials, sampling, and testing used in the Project. The Design-Builder's Quality Assurance (QA) procedures shall ensure that operational techniques and activities comply with the Contract, and that all materials used in the Work are of acceptable quality.

Refer to Section 2.28 for information regarding the Quality Management Plan.

2.25.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Materials Manual* (M46-01) (Appendix D9).
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D12).
- AASHTO *Guide Specifications for LRFD Seismic Bridge Design,* 1st Edition, 2009.
- AASHTO *LRFD Bridge Design Specifications,* Customary U.S. Units, 4th Edition, 2007 with 2008 Interim Revisions.
- AASHTO *LRFD Bridge Construction Specifications*, 2nd Edition with 2006, 2007, 2008, and 2009 Interim Revisions.

2.25.3 MATERIALS APPROVAL

The Design-Builder shall use the Qualified Product List (QPL) or the Request for Approval of Material (RAM) form, which can be accessed on line at the following Web site:

www.wsdot.wa.gov.

All permanent equipment, materials, and articles incorporated into the Project, and any temporary equipment, materials, and articles that have a specification shown in Division 9 of the Standard Specifications, such as erosion control devices and temporary traffic control devices, shall adhere to the following standards:

- Shall be new, unless specified otherwise in these Technical Requirements.
- Shall meet the requirements of the Contract and be approved by the Materials Approval Engineer.

- Shall be inspected or tested in accordance with the General Provisions, these Technical Requirements, WSDOT standards, and WSDOT manuals.
- Shall not be used in the Work if they become unfit after being previously approved.

Prior to use by the Design-Builder, all materials shall be reviewed and approved by the Materials Approval Engineer. The Design-Builder may use the QPL; may submit a RAM to the Materials Approval Engineer for approval; or may list the material in the plans and specifications that have been stamped by the Engineer of Record.

The Design-Builder shall be responsible for approval and acceptance of all materials by means of testing, inspection, and documentation. A Materials Certification Package, as described in this Section and approved by the Design-Builder's Construction Quality Assurance Manager, shall be submitted to WSDOT prior to Final Acceptance of the Project.

Qualified Products List (QPL) – The Design-Builder may use products listed on the most recent edition of WSDOT's QPL, without submitting a RAM to the Materials Approval Engineer. The Design-Builder shall follow the acceptance requirements listed in the QPL for the product/material used. The current QPL can be accessed on line at the following Web site:

www.wsdot.wa.gov/biz/mats/QPL/QPl.cfm.

Request for Approval of Material (RAM) – The RAM shall be used if the Design-Builder elects not to use the QPL, or if the material is not listed in the QPL or not shown on the plans and specifications stamped by the Engineer of Record. The RAM shall be prepared by the Design-Builder and submitted to the Materials Approval Engineer for approval before the material is incorporated into the Work. Approval of the material does not constitute acceptance of the material for incorporation into the Work.

Proprietary Items – Proprietary Items are those items that the Engineer of Record has identified on the plans and specifications as a single source by manufacturer's make and model number. These items are considered approved if they are shown on the plans and specifications stamped by the Engineer of Record.

WSDOT Aggregate Source Approval (ASA) Database – The Design-Builder may use any approved aggregate that is included in the WSDOT ASA Database. If the Design-Builder wishes to use an aggregate source that is not in the WSDOT ASA Database, preliminary samples shall be evaluated for quality, in addition to the testing performed for acceptance. The WSDOT ASA Database can be accessed online at the following Web site:

www.wsdot.wa.gov/biz/mats/ASA.

WSDOT Oversight – The Design-Builder shall distribute copies of all documents that list materials which have been approved to WSDOT for review within 3 Calendar Days of receipt of approval. WSDOT will use these documents to verify the materials being used.

2.25.4 ACCEPTANCE OF MATERIALS

2.25.4.1 GENERAL

All materials that the Design-Builder intends to use shall be approved prior to use, and shall be tested and/or inspected, field-verified, and documented. The Design-Builder shall also track and maintain a daily listing of material quantities. The materials acceptance

program shall be in accordance with the WSDOT *Construction Manual*, the WSDOT *Materials Manual*, the Standard Specifications, or other provisions of the Contract.

For most materials, the method of acceptance can be found in Chapter 9 of the WSDOT *Construction Manual*.

Record of Materials (ROM) – The Design-Builder shall develop a tracking system for the ROM that will number and list all materials used on the Project; track the estimated quantities required; and identify the required acceptance criteria, acceptance frequency, and number of tests and/or inspections required for the estimated quantities. The ROM will also be used for tracking the quantities of materials used; the number of acceptance tests or inspections performed; and the acceptance status for each (i.e., approved or rejected). The ROM shall be updated on a daily basis; shall be kept at the Project Office, and shall be available for WSDOT review.

Upon award of the Contract, WSDOT will provide the Design-Builder's Construction QA Manager with a CDROM containing the most recent listing of the method of acceptance for materials, to assist the Design-Builder in developing the ROM.

Visual Inspection – If a visual inspection is required as part of the acceptance criteria for materials, or is the acceptance criteria, the materials shall be inspected by the Construction QA Inspector to ensure it is what was specified, and the QA Inspector shall document it in a signed field note record, or an additional entry on the Construction QA Inspector's daily report.

Manufacturer's Certificate of Compliance – If a Manufacturer's Certificate of Compliance is required as part of the acceptance criteria for materials, the Construction QA Manager shall review the certificate for compliance with the required specification, prior to incorporating the materials into the Project. The Manufacturer's Certificate of Compliance shall meet the requirements of this Section.

Field Verification – The Construction QA Inspector shall field verify and document all materials permanently incorporated into the Project. The field verification or visual inspection shall occur prior to or during placement of materials. Documentation of the field verification shall consist of sufficient information to identify what materials were used, including manufacturer and/or source, product identity, and quantities. The field verification information shall be recorded on a field note record or as an entry in the Construction QA Inspector's daily report, and shall include the date and the initials or signature of the inspector verifying the work. The field verification information is the link between what is specified by the Engineer of Record or approved on the RAM or QPL, and what is placed.

Proprietary Items – Proprietary Items shall be tested and/or inspected for acceptance, as required, and field verified.

Tested Materials – The Design-Builder's Quality Assurance staff shall test materials that require testing for acceptance. All materials with 5 or more sublots as listed in Table 6, Section 1-06 of the General Provisions, or any other materials where 5 or more tests are required, shall be statistically accepted. In order to use the Design-Builder's QA test results for acceptance, the QA test results shall be statistically validated by comparing them with WSDOT's independent Quality Verification (QV) test results.

Materials that only require 1 or 2 QA tests for acceptance or that have less than 5 sublots will require validation using the QA test results and WSDOT's QV test results in accordance with this Section.

All field and laboratory materials testing by the Design-Builder shall follow the methods described in the WSDOT *Materials Manual* and the Contract.

2.25.4.2 VALIDATION BY F AND T TEST ANALYSIS

The Construction QA Manager shall be responsible for statistically evaluating the QA test results to WSDOT's QV test results to determine the acceptability of the QA test results. This evaluation shall be performed by using the F and t Test analysis as described in Section 2.28.

If the test results are validated, then the QA test results shall be used for acceptance. If the test results are not validated, then an investigation shall be conducted by the Quality Assurance Team, as described in Section 2.28, to resolve the discrepancy. If a resolution cannot be reached, then WSDOT's QV test results will be used for acceptance.

2.25.4.3 STATISTICAL ACCEPTANCE OF MATERIALS

The Construction QA Manager shall be responsible for statistically evaluating the validated QA test results to determine if the materials tested are acceptable, as described in Section 2.28. Section 1-06 of the General Provisions defines acceptance specifications for Statistical and Non-Statistical Materials.

2.25.4.4 COMPARISON TESTING ACCEPTANCE OF MATERIALS

The Construction QA Manager shall be responsible for comparing the QA test results to WSDOT's QV test results to determine the acceptability of the test results. This validation process compares the differences between the QA and QV test results to the limits in Table 3, Section 1-06 of the General Provisions, or to the precision and bias statement in the test procedure. If the test results are within the tolerances, then the Design-Builder's QA test results shall be used for acceptance. If the test results are outside of the tolerances, then WSDOT's QV test results shall be used for acceptance.

2.25.4.5 MANUFACTURER'S CERTIFICATE OF COMPLIANCE

When authorized by these specifications or the Special Provisions and prior to use, the Construction QA Manager may accept certain materials on the basis of a Manufacturer's Certificate of Compliance as an alternative to material inspection and testing.

The Manufacturer's Certificate of Compliance must identify the manufacturer; the type and quantity of material being certified; the applicable specifications being affirmed, and the signature of a responsible corporate official of the manufacturer; and include supporting mill tests or documents. A Manufacturer's Certificate of Compliance shall be furnished with each lot of material delivered to the Project, and the lot shall be clearly identified in the Certificate.

Upon receipt of the Manufacturer's Certificate of Compliance, the Construction QA Manager shall review it for compliance with the specifications requirements using the Manufacturer's Certificate of Compliance Checklist Form 350-572, or develop its own checklist with the same information.

All materials used on the basis of a Manufacturer's Certificate of Compliance may be sampled and tested at any time by the Construction QA Manager or by WSDOT. Any material not conforming to the requirements will be subject to rejection whether or not it has been used. The Construction QA Manager has the authority to refuse to accept materials on the basis of a Manufacturer's Certificate of Compliance.

In lieu of using the material without a proper Manufacturer's Certificate of Compliance, the Design-Builder may request that the Construction QA Manager sample and test the materials prior to incorporating them into the Project. Any material not conforming to the requirements will be subject to rejection whether or not it has been used.

2.25.4.6 ACCEPTANCE OF SMALL QUANTITIES OF MATERIALS

Upon the request of the Design-Builder, the Construction QA Manager may elect to accept small quantities of materials without normal sampling and testing frequencies. The determination to accept materials using this provision is at the sole discretion of the Construction QA Manager. Structural concrete will not be considered under the small quantity definition.

An item can be accepted as a small quantity if the proposed total quantity for a specific material is less than 1 testing frequency. For mainline paving, a small quantity shall be less than 1 half of a sublot, as defined in Table 6, Section 1-06 of the General Provisions.

Questions that the Design-Builder shall consider prior to use of small quantity acceptance are:

- Has the material been previously approved?
- Is the material certified?
- Is there a current mix design or reference design?
- Has it been recently tested with satisfactory results?
- Is the material structurally significant?

Small quantity acceptance may be accomplished by visual inspection, certification, or other methods. Acceptance of small quantities of materials by these methods shall be fully documented. Documentation of materials shall be provided by the Design-Builder's QA Inspector accepting the material. For visual acceptance, the Construction QA Manager shall have written documentation, such as an entry in the Construction QA Inspector's Daily Report or a note on field records, with a statement as to the basis of acceptance of the material and the approximate quantity involved.

Small quantity acceptance may be used for any quantity of the following:

- Curbs and sidewalks.
- Driveways.
- Road approaches.
- Paved ditches and slopes.

2.25.4.7 FABRICATION INSPECTION

The WSDOT Fabrication Inspection Office will be responsible for in-plant inspection and approval of items fabricated specifically for the Project, including DMS signs, as detailed in the WSDOT Construction Manual and as determined by the Design-Builder and WSDOT.

The Design-Builder shall notify WSDOT at least 60 Calendar Days prior to fabrication to allow for fabrication plant approval. If deficiencies are found during the plant approval process, additional time will be required to obtain fabrication plant approval.

The Design-Builder shall include the fabrication schedule in a detailed report submitted to WSDOT as part of the Monthly Contract Schedule Update. Any change to the currently published fabrication schedule shall be communicated in writing to WSDOT at least 3 Calendar Days before the proposed effective date.

The Design-Builder shall notify WSDOT 14 Calendar Days prior to commencing fabrication of any item, and provide 2 copies of plans, specifications, and approved shop drawings for items being fabricated. No fabrication inspection will be performed until the fabrication facility has been approved by WSDOT, and the approved shop drawings have been received.

A pre-fabrication meeting shall be held prior to fabrication of any major item requiring WSDOT fabrication inspection and approval. Major items include, but are not limited to, the following:

- ATM signs, including LCS, SDMS and VMS.
- ATM sign mounting brackets.
- ATM connectors.
- Prestresssed concrete products.
- Precast 3-sided structures.
- Steel pedestrian and highway bridges.
- Wood bridges.
- Bridge bearings.
- Modular expansion joints.
- Sign bridges and cantilever sign bridges.

The Design-Builder shall be responsible for scheduling the pre-fabrication meeting, which shall be held at the facility where the fabrication will take place. The pre-fabrication meeting may be waived upon mutual agreement between WSDOT and the Design-Builder. At a minimum, the fabricator's Production Manager and QA Manager, the Construction QA Manager, and the WSDOT fabrication office representative shall attend the pre-fabrication meeting.

WSDOT's Fabrication Inspector will be responsible for the following:

- Collect and review all material certification documents for acceptance.
- Collect and review all of the fabricator's inspection reports for acceptance.
- Visually inspect the fabricated items for acceptance.
- Maintain the Inspection Daily Report.

Items requiring fabrication inspection will be stamped or tagged for approval as specified in Section 9-1.5D of the WSDOT *Construction Manual* prior to the item being shipped to the job site. Exceptions to in-plant inspections are described in Section 9-4 of the WSDOT *Construction Manual*.

WSDOT will perform random dimensional inspections. The fabricator or the Design-Builder shall be responsible for assuring compliance with the Contract, performing the QC

inspections, and maintaining all QC records. These records shall be available for review by WSDOT.

All items requiring WSDOT fabrication inspection shall be inspected and approved prior to being incorporated into the Project. All documentation collected as part of the WSDOT fabrication inspection shall be retained in the WSDOT Fabrication Inspection Office.

The fabricator or the Design-Builder shall be responsible for all materials QC sampling and testing. WSDOT's Fabrication Inspector will be responsible for sampling and testing moisture-cured polyurethane, pre-stressing strand, and high strength bolts that are being used by the fabricator and the shop coating facilities prior to their use.

In the event of non-compliance that will prevent approval of a fabricated item, WSDOT's Fabrication Inspector will notify the fabricator, the Construction QA Manager, and the WSDOT Engineer's office for resolution. All risk for schedule delay due to non-approval of a fabricated item shall be borne by the Design-Builder.

2.25.5 HANDLING AND STORING MATERIALS

In storage and handling, the Design-Builder shall protect materials against damage, such as careless handling, exposure to weather, mixture with foreign matter, and all other causes. The Construction QA Manager shall reject and refuse to test materials improperly handled or stored.

The Design-Builder shall repair, replace, or make good all WSDOT-provided materials that are damaged or lost due to the Design-Builder's operation or while in the Design-Builder's possession, at no expense to WSDOT.

2.25.6 PORTLAND CEMENT CONCRETE MIX DESIGN AND BATCH PLANT

The Design-Builder, or its designee, shall develop the concrete mix design in accordance with the Standard Specifications. The Construction QA Manager shall certify that the concrete mix design conforms to the Contract provisions and to the Standard Specifications.

The concrete batch plant that the Design-Builder uses for the production of Portland Cement Concrete shall have a current National Ready Mix Concrete Association plant certification. The certification shall be maintained for the duration of the Contract.

2.25.7 HOT MIX ASPHALT (HMA) MIX DESIGN AND ASPHALT CONCRETE PLANT

HMA Mix Design – Prior to the production of HMA, the Design-Builder or mix supplier shall determine a design aggregate structure and asphalt binder content in accordance with Standard Operating Procedure 732 of the WSDOT *Materials Manual*. Once the design aggregate structure and asphalt binder content have been determined, the Design-Builder or mix supplier shall submit the HMA mix design on DOT Form 350-042, demonstrating that the design meets the requirements of Section 9-03 of the Standard Specifications.

Changes to the aggregate or asphalt binder require approval from the Construction QA Manager with concurrence from WSDOT, and may require a new mix design submittal from the Design-Builder or mix supplier. For aggregate, this will include changes in the source of material or a change in the percentage of material from a stockpile greater than 5%. Asphalt binder changes include the source of the crude petroleum supplied to the refinery, the refining process, and additives or modifiers in the asphalt binder. For mix

designs that will be used beyond the calendar year of the original mix design and no change to the mix design is proposed, the Design-Builder or mix supplier shall submit a certification to the WSDOT Engineer that the original mix design has not changed.

The Design-Builder shall submit representative samples of the mineral materials that are to be used in the HMA production to the State Materials Laboratory in Tumwater, Washington. WSDOT will use these samples to determine anti-strip requirements, if any, in accordance with WSDOT test method T718, and will also conduct verification testing of the mix design. Verification testing of HMA mix designs proposed by the Design-Builder or mix supplier that includes Recycled Asphalt Pavement (RAP) will be completed without inclusion of the RAP. Submittal of RAP samples is not required. A mix design verification report will be provided within 25 Calendar Days after a mix design submittal has been received in the State Materials Laboratory in Tumwater, Washington.

If the results of the verification testing of the mix design by WSDOT are within the tolerances described in Section 9-03 of the Standard Specifications, the mix design will be considered verified. If the HMA mix design does not meet the required tolerances, the Design-Builder or mix supplier shall have the option to either resubmit a new mix design or proceed to paving the HMA mixture test section.

The mix design shall be the initial Job Mix Formula (JMF) for the class of mix. Any additional adjustment, in accordance with Section 9-03 of the Standard Specifications, to the JMF shall require the approval of the Construction QA Manager with concurrence from WSDOT.

Asphalt Plant - The asphalt concrete plants that the Design-Builder uses for the production of asphalt concrete shall meet all of the requirements of the Standard Specifications. The Construction QA Manager shall inspect the asphalt concrete plants and document that they meet all requirements.

2.25.8 STATE INSPECTED AND TESTED ITEMS

Certain items have been identified by WSDOT as critical to the everyday operations of the Project. These items shall be inspected and tested by WSDOT to ensure that they meet State and Federal requirements. These items include the following:

Traffic Signs – All traffic signs will be inspected at the point of fabrication by WSDOT. All inspected traffic signs will be tagged by WSDOT's Fabrication Inspector prior to shipment.

Hot Mix Asphalt HMA and Asphalt Treated Base (ATB) – The verification and anti-strip requirements for the HMA and ATB mix designs shall be performed by the State Materials Laboratory in Tumwater, Washington. All acceptance testing for HMA and ATB aggregate, mixture, in-place density, cyclic density, longitudinal joint density, and coring as required shall be performed by WSDOT or its representatives.

Miscellaneous Materials Testing – The materials listed below are not statistically accepted and are not included in Table 6, Section 1-06 of the General Provisions, but may still require testing. These materials shall generally require a single sample for each lot of material to be tested for acceptance. The Design-Builder shall be responsible for sampling the materials; providing the proper paperwork as described in Chapter 9 of the WSDOT *Construction Manual;* and delivering the samples to the State Materials Laboratory in Tumwater, Washington. Prior to any sampling of the materials listed below, the Design-Builder shall provide notice to WSDOT 14 Calendar Days prior to sampling, and

coordinate these activities with the WSDOT Engineer. The sampling requirements and the testing procedures shall be in accordance with the WSDOT *Construction Manual:*

- Premolded joint filler.
- Joint sealant and longitudinal joint seal.
- Hot-poured joint sealant.
- Elastomeric expansion joint seals.
- 2-component poured rubber joint sealer.
- Hot melt traffic button adhesive.
- Plastic RPMs.
- Thermoplastic RPMs.
- Bagged Portland Cement.
- Aggregate extenders.
- Rubberized asphalt.
- Mineral filler.
- Epoxy systems and epoxy resin.
- Crack injection resin.
- Pigmented sealer.
- Paint for structures.
- Abrasive sand.
- Construction geosynthetic.
- Curing compound.
- Pre-packaged concrete.
- RGS conduit.
- Electrical conductors.
- Chain link fabric.
- Wire mesh.
- Fencing tension and barbed wire.
- Grade 1 fence posts.
- Wire fence line posts.
- Mechanical rebar splices.

2.25.9 SUBMITTALS

2.25.9.1 PRODUCT DATA

The Design-Builder shall submit 2 hard copies of all manufacturer's warranties, guarantees, instruction sheets, parts lists, and other product data to WSDOT for acceptance within 20 Calendar Days of installation of the items to which they relate, unless stated otherwise within this Section. WSDOT will advise the Design-Builder of the status of this product data within 14 Calendar Days of receipt.

The Design-Builder shall submit 2 hard copies of all inspection reports to WSDOT daily, and copies of testing reports within 24 hours of test completion, unless stated otherwise within this Section. The Design-Builder shall ensure that the product data delivered in accordance with this Section is organized and indexed in a manner to allow easy retrieval of information.

2.25.9.2 MATERIALS CERTIFICATION PACKAGE

The Design-Builder shall submit a final Materials Certification Package to WSDOT. The Design-Builder may use DOT Form 350-115, Contract Materials Checklist, or develop one of its own with the same information. The Materials Certification Package shall include all necessary supporting documentation. This documentation shall consist of all documentation practices used for material acceptance, and an explanation of any deficiencies noted in the checklist. The summary of this documentation shall be organized in an order similar to Division 9 of the Standard Specifications.

The Design-Builder shall also submit to WSDOT the final materials records, temporary final records, and Final Record Book 1 as defined in Chapter 10-3 of the WSDOT *Construction Manual*. The temporary final records are comprised of all relevant materials records not included in the final records. Copies of these records shall be submitted to WSDOT within 60 Calendar Days of Physical Completion, and will be retained for a 7-year period following acceptance of the Project as required by RCW 40.14.

End of Section

2.28 DESIGN-BUILD QUALITY MANAGEMENT PLAN (QMP) REQUIREMENTS

2.28.1 GENERAL

The Quality Management Plan (QMP) shall be consistent with the Summary Information submitted with the Design-Builder's proposal, and shall be approved in writing by WSDOT. A draft QMP shall be submitted to WSDOT within 30 Calendar Days after Notice to Proceed. WSDOT will not accept any Final Design Submittals until the Design-Builder's Final QMP for design has been approved in writing by WSDOT. No construction Work activities that require Quality Assurance (QA)/Quality Control (QC) inspection and testing shall commence until the Design-Builder's Final QMP for construction has been approved in writing by WSDOT. The QMP shall be in effect until all requirements of the Contract have been fulfilled and the Project is accepted.

The QA organization is responsible for obtaining all documentation necessary for approval and acceptance of materials; obtaining materials certifications as required; and ensuring that all required materials testing is completed, all with satisfactory results, prior to the materials being incorporated into the Project. The QA organization shall ensure that sufficient inspection is conducted in order to determine that the Work complies with the processes outlined in Chapters 2 through 9 of the WSDOT *Construction Manual* (M41-01) (Appendix D2) and other relevant Reference Documents and Mandatory Standards.

The QMP shall detail how the Design-Builder shall provide QA and QC for design and construction of the Project, and verify that all environmental and permit commitments are met to ensure the Work conforms to the Contract requirements. The Design-Builder shall consult the applicable environmental requirements and WSDOT and AASHTO publications listed in this RFP to prepare the QMP. The Design-Builder shall revise its QMP and its implementation when repetitive or recurring quality issues arise.

The Design-Builder's QMP shall include an organizational chart of the QA and QC personnel, listing the number of full-time equivalent employees, specific responsibilities for each employee, and the lines of authority and reporting responsibilities. The QA and QC organizations and personnel shall be completely independent of each other, with separate reporting authorities. The personnel and organizations performing QA functions shall have sufficient authority and organizational autonomy to identify quality issues, and to be able to initiate, recommend, and verify implementation of Corrective Action Plans. Personnel performing QA functions shall be at an organizational level that ensures they will not be influenced by the impact of the QA measures on the Project schedule, performance, or cost. The QMP shall list by discipline the name, qualifications, applicable certifications, duties, responsibilities, and authority for all personnel proposed to be responsible for QA and QC. All key personnel performing QA functions shall be exclusively designated to those functions, and shall not be assigned to perform conflicting duties.

2.28.1.1 PARTNERING AND DISPUTE RESOLUTION

Partnering shall be considered an integral part of the QMP. A partnering agreement is recommended for handling disputes. During the initial partnering session, a separate procedure for conflict resolution shall be developed and agreed to by the partners. The procedure shall include, but is not limited to, the following elements:

- Before the Project begins, a time frame for resolving disputes at each level of authority shall be established and a list of typical disputes that could occur on the Project shall be developed.
- Disputes shall be delegated to the lowest appropriate level of authority on the Project team to resolve within the specified time frame.
- If the dispute is not resolved to the satisfaction of both parties within the specified time frame, the dispute shall be automatically elevated to the next level of authority on the Project team. The elevation process shall be developed by and agreed to by both WSDOT and the Design-Builder at the conclusion of the initial partnering session.
- If still unresolved, the dispute shall then be directed to the highest level of authority where a final resolution shall be arbitrated by an unbiased third party, whose selection would be agreed upon in advance as part of the QMP.
- A written report prepared by the Design-Builder and signed by both WSDOT and the Design-Builder, describing the dispute, all subsequent actions, and final disposition of the dispute shall be submitted to the Project records.
- If subsequent disputes arise on the same issue, the written report shall be included as a resource during the resolution process.

Disputes not resolved informally through the partnering process may be brought to the Disputes Review Board in accordance with Section 1-04.5 of the General Provisions.

2.28.1.2 PRE-ACTIVITY MEETINGS

Prior to the start of any Work activity, the Design-Builder shall hold Pre-Activity Meetings to ensure that all Project personnel have a thorough understanding of the Work to be accomplished. Work activities include design, survey, fabrication, and construction activities that generally correspond to the Sections of the Standard Specifications (M41-10) (Appendix D16), such as clearing and grubbing, earthwork, aggregate base, and Hot Mix Asphalt (HMA), or a definable feature of Work, such as pre-paving conference, and pre-pour conferences for bridge decks.

The Pre-Activity Meetings should include discussions relating to what will be accomplished; by whom it will be performed; and where, when, and how the Work will be done. The Pre-Activity Meetings are to ensure that all parties have the same understanding of the design intent; have the appropriate plans, specifications, and any special details; and are aware of safety regulations and procedures that need to be followed. The QA Inspection Checklist for each activity should be reviewed.

Pre-Activity Meetings shall be scheduled a minimum of 7 Calendar Days in advance of the start of any Work activity to allow for additional preparation, if necessary. The Design-Builder's Design QA Manager and/or Construction QA Manager shall plan, conduct, and take minutes at the Pre-Activity Meetings. The Design-Builder shall document any clarifications and understandings related to the Work activity that are not documented elsewhere in the minutes of the meeting. The Design-Builder shall distribute the minutes to attendees and other QA, QC, and Quality Verification (QV) staff who require the information. Pre-Activity Meetings are classified as Hold Points, and shall be identified in the QMP.

Example Topics for a Pre-Activity Meeting:

- Scope (design criteria and intent, constraints).

- Applicable documents.
- Work activity outline and schedule (what, where, who, when, and how).
- Staking plan.
- Safety regulations and procedures.
- Maintenance of Traffic (MOT) Plan.
- Work area ingress/egress.
- Coordination and utilities.
- Inspection Plan/QA procedures.
- Status of submittals.
- Acceptance criteria, including Hold Points.
- Frequency of materials testing.
- Examination of the Work area.
- Examination of stored material.
- Open discussion.

2.28.1.3 QUALITY ASSURANCE TEAM

WSDOT and the Design-Builder will jointly form a Quality Assurance Team. The team meetings will address and rectify issues relating to inspection, substandard material quality, inadequate QA and QC processes that need to be adjusted, test results that are out of tolerance, disparity between QA and QV test data, future quality concerns, and any issues that WSDOT and the Design-Builder may have regarding quality of the Project.

At a minimum, the Design-Builder shall assign the personnel in charge of QA and QC activities, superintendents, and any other personnel the Design-Builder acknowledges as having quality-related concerns from the Design-Build team to the Quality Assurance Team. WSDOT may assign similar personnel related to the Project or others having quality concerns on the Project to the Quality Assurance Team.

The Project Quality Manager (described below) or the Construction QA Manager shall be responsible for setting the meeting schedule and agenda, and documenting the meeting minutes and distribution to attendees. At the start of the design and construction phases, meetings shall be held weekly to discuss quality issues. The meeting frequency may decrease as quality issues decrease. In the event that Contract performance becomes substandard, WSDOT will require that the Quality Assurance Team meet more frequently.

The Design-Builder shall review all of the current and unresolved Non-conformance Reports (NCRs) and Nonconforming Issues (NCI) during the Quality Assurance Team meetings. For each NCR and NCI, the Design-Builder shall address the following items at the Quality Assurance Team meetings:

- Action taken by QC – How will QC or production ensure the NCR/NCI will not be repeated? How has this action been addressed in the QMP?
- Action taken by QA – How will QA ensure the NCR/NCI will not be repeated? How has this action been addressed in the QMP?

- Resolution of the initial issue that caused the NCR/NCI – How was it corrected?
- How to prevent the issue from becoming a recurring error.

Example Topics for a Weekly Quality Assurance Team Meeting:

- Safety.
- Schedule.
- Review of previous action items from prior weeks.
- Current and upcoming activities.
- QA/QC inspections and testing.
- Review of statistical materials evaluation.
- Open NCRs/NCIs.
- New issues.

Note: For each item, the Design-Builder shall record clear action items, due dates, and responsibilities in the meeting minutes.

2.28.1.4 MANAGEMENT REPRESENTATIVE

The Design-Builder shall designate a Project Quality Manager who shall be responsible for developing and updating the QMP, and scheduling and facilitating the Executive Management Review.

2.28.1.5 EXECUTIVE MANAGEMENT REVIEW

The Design-Builder's Executive Management shall approve the QMP, and conduct a review or an internal audit of the QMP at least quarterly, and more frequently if repetitive QA issues and Corrective Action Reports have been issued. This review or internal audit shall ensure the QMP's ongoing suitability and effectiveness in satisfying the requirements of the Contract and the Design-Builder's stated quality policy and objectives.

The Design-Builder shall invite WSDOT to participate in the Executive Management Reviews.

At a minimum, the Executive Management Review or internal audit shall evaluate the results of the review, WSDOT audit results, Corrective Action Reports, and plans implemented as a result of the NCRs and NCIs. The Design-Builder shall respond within 20 Calendar Days to requests for the implementation of Corrective Action Plans that result from Executive Management Reviews. The Design-Builder shall incorporate the updated Corrective Action Plan into the QMP in a timely manner. Any changes to the QMP shall be approved by WSDOT.

2.28.1.6 QUALITY SYSTEM

2.28.1.6.1 General

The Design-Builder shall prepare a QMP that includes a Quality System that meets the Contract requirements.

The precedence of the documents describing the Quality System shall be:

- Quality Policy (for the entire system).

- Quality objectives.
- Resources (for each section of the QMP).
- Procedures.
- Work instructions.

The QMP shall include a flow chart or other graphical representation showing the processes and their relationships to each other, the inspection and test controls, and a narrative for each process.

The QMP shall include written procedures that describe the purpose, overview, responsibilities, and steps of the Quality System process, and records resulting from the process.

2.28.1.6.2 Quality Planning

The QMP shall include an Inspection and Test Plan describing all of the proposed QA inspections and tests to be performed throughout the construction process. Activity specific Inspection and Test Plans shall be prepared during the preparatory phase for each definable feature of Work. The Inspection and Test Plans shall be updated when new subcontractor or supplier contracts are implemented. The Construction QA Manager shall review and approve all Inspection and Test Plans prior to submittal to WSDOT for review at least 14 Calendar Days prior to the start of the Work activity.

Inspection and Test Plans shall:

- Identify Hold Points when Work shall be accepted by QA personnel prior to proceeding to the next stage of the Work.
- Define the activity to be tested/inspected, the agency/laboratory to perform the test/inspection, the frequency of the test/inspection, the test/inspection procedure or reference standard, the specified requirement reference, and the record that documents the results.
- Develop the Test Plan for materials that will be statistically accepted, for materials that will be non-statistically accepted, and for materials that will be accepted by small quantities according to this RFP.

In addition, the QMP shall:

- Describe all of the material receiving, in-process, and final inspections and tests to be undertaken.
- Show what products or services are to be subcontracted.
- Describe verification of compliance by suppliers and subcontractors with requirements.
- Identify who within the Construction QA organization has stop work authority.

2.28.1.6.3 Other Project Documents

The QMP shall describe how it is applied to all submittals required by the Contract. The following is a list of plans and documents that are required in addition to the design and construction documents specifically addressed in this Section. This is not a comprehensive list; other documents may be required to complete the Work.

- Safety Management Plan, including Accident Prevention Program, and Site Safety Plan.
- Public Information Plan.
- Environmental Compliance Plan.
- Environmental Commitment Close-Out Report.
- Utility Management Plan.
- Roadside Work Plan.
- Traffic Management Plan.
- Traffic Incident Management Plan.
- Document Control Work Plan.
- Construction documentation, including, but not limited to:
    - Inspector's Daily Reports.
    - Non-Conformance Reports.
    - QA and QC Inspection Checklists.
    - Materials Testing Reports.
    - Traffic Control Supervisor's Daily Report.

2.28.1.7 PREAPPROVED CORRECTIVE ACTION PLAN

The Design-Builder shall develop a Pre-Approved Corrective Action Plan that shall be incorporated into the QMP. The Pre-Approved Corrective Action Plan shall be approved by WSDOT.

The Pre-Approved Corrective Action Plan shall address Work that does not meet specifications, out of specification material, or preapproved rework or repair procedures.

The following is a sample list of areas where preapproved retesting and/or rework or repair procedures are commonly needed. Anticipated failures may include, but are not limited to, the following:

Soil

- Use of improper or incorrect density standards.
- Lack of compaction.
- Subgrade too wet.
- Materials out of specification.
- Soil too wet.

Rebar

- Poor or incorrect locations.
- Insufficient clearance or lack of support.
- Broken ties or displaced bars.

Concrete

- Slump out of specification.
- Improper cold weather curing.
- Rock pockets, small and large.
- Temperature out of specification.
- Air content out of specification (too low or too high).
- Inadequate counter reporting.
- Improper certification of compliance.
- Over time limit.
- Incorrect mix design.

ITS

- Component failure, such as cameras, DMSs, and communication equipment, due to manufacturing defects.
- Cables failure due to being over-pulling.

The Design-Builder shall add retesting and/or rework and repair procedures to the QMP as repetitive nonconformances are identified.

2.28.2 DESIGN-BUILDER QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC) STAFF

At a minimum, the Design-Builder's QA and QC staff shall include the following personnel:

2.28.2.1 DESIGN QUALITY ASSURANCE (QA) MANAGER

The Design QA Manager shall have overall responsibility for the design portion of the QMP. Through audits, the Design QA Manager shall be responsible for verifying and validating that the QA and QC procedures required by the QMP are administered and being followed. The Design QA Manager shall report to the Design Manager or the Project Manager.

In accordance with this Section and the QMP, the Design QA Manager shall certify that all Design Documents have been subjected to all required QC checking procedures, all documentation has been completed and filed in an acceptable manner, and all design packages have been subjected to a QA audit prior to submittal to WSDOT or prior to release.

Minimum Qualifications

The Design QA Manager must have at least 10 years of recent experience in the design or quality management of large transportation projects.

2.28.2.2 CONSTRUCTION QUALITY ASSURANCE (QA) MANAGER

The Construction QA Manager shall have overall responsibility for implementation of the construction portion of the QMP. The Construction QA Manager shall be responsible for implementing, monitoring, and adjusting the processes to assure acceptable quality. The

Construction QA Manager shall report directly to the person or group with overall Project management responsibilities. It is the responsibility of the Construction QA Manager to implement quality planning; oversee the QA testing and inspection; and coordinate with WSDOT's verification testing, inspection, and Independent Assurance (IA) requirements. All duties listed for the Project Engineer in Sections 9-1.5C, E, and H of the WSDOT *Construction Manual* shall be the responsibility of the Construction QA Manager or designee. The Construction QA Manager shall not be assigned any other duties or responsibilities on the Project. The Construction QA Manager shall have the authority to stop any Work that does not meet the standards, specifications, or criteria established for the Project.

The Construction QA Manager or a designated Assistant Construction QA Manager shall be available so that they can be on the Project site within 2 hours of being notified of a problem regarding the QA of any Work being performed by the Design-Builder, or any of its subcontractors or agents.

Minimum Qualifications

The Construction QA Manager must have at least 6 years, 10 years preferred, of recent experience overseeing the inspection and materials testing on major highway construction projects. Of the 6 years minimum, the Construction QA Manager shall have a minimum of 3 years experience in construction materials acceptance administration and a minimum of 3 years experience in construction inspection administration. The experience of an assistant to the Construction QA Manager may be used to meet the experience requirement of up to 3 years of either construction inspection or construction materials administration.

2.28.2.3 MATERIALS APPROVAL ENGINEER

The Materials Approval Engineer shall have authority for the approval of materials in accordance with Section 9-1.5B of the WSDOT *Construction Manual*.

Minimum Qualifications

The Materials Approval Engineer must be a registered Professional Engineer in the State of Washington.

2.28.2.4 ENVIRONMENTAL COMPLIANCE MANAGER (ECM)

Refer to Section 2.8.

2.28.2.5 QUALITY TESTING SUPERVISOR (QTS)

The Quality Testing Supervisor (QTS) may be an employee of the Design-Builder's QA testing laboratory or of the testing laboratory hired by the Design-Builder to perform the QA testing. The QTS or their representative shall be at the site where the testing is being performed. The QTS shall schedule, review, and verify for compliance all test reports performed by the QA testing laboratory. The QTS shall report to the Construction QA Manager.

Minimum Qualifications

The QTS shall meet one of the following qualifications:

- Professional Engineer license; an Engineer-In-Training; or a Bachelor of Science Degree in Civil Engineering, Civil Engineering Technology, Construction, or related experience; and at least 4 years of highway materials testing experience.

- Certification by the National Institute for Certification in Engineering Technologies in the Construction Materials Testing field as an Engineering Technician (Level III) or higher, with at least 4 years of experience in the appropriate subfield in which sampling and testing is being performed.
- 8 years of highway materials testing and construction experience.

2.28.2.6 ELECTRICAL/ITS INSPECTOR

The Design-Builder's Electrical/ITS Inspector shall have the following minimum qualifications:

- Administrator and Master Electrician certificate (AD-01) issued by the Department of Labor and Industries, and 4 years of experience supervising the installation of highway electrical and/or ITS systems.
- 8 years of experience in engineering highway electrical systems, including illumination, traffic signals, and/or ITS systems, and 4 years of full-time experience as an electrical inspector on highway construction projects.

WSDOT will inspect all electrical and ITS systems for code compliance, functionality, and acceptance as required by WAC 296-46B-040.

2.28.2.7 QA TESTING TECHNICIANS AND QA INSPECTION TECHNICIANS

The QA Testing Technicians and QA Inspection Technicians shall perform the required QA inspections and tests. The QA Testing Technicians and QA Inspection Technicians shall have the following qualifications:

QA Testing Technicians - The Design-Builder shall have acceptance testing performed by qualified QA Testing Technicians, who shall be qualified in accordance with AASHTO R-18, using the procedural checklist in the WSDOT *Materials Manual* (M46-01) (Appendix D9). The qualifications of the laboratory technicians employed by an AASHTO-accredited laboratory will be accepted for performing AASHTO test methods only when confirmed by the laboratory's training and evaluation records. The competency of each QA Testing Technician shall be reevaluated annually in all tests they perform, in accordance with the laboratory's Laboratory Quality Systems Manual approved by WSDOT.

A testing technician currently qualified in concrete testing by the American Concrete Institute (Level I) will be considered qualified to perform concrete tests.

The QA Testing Technicians performing the field and laboratory QA sampling and testing shall be employed by the Design-Builder or an agent's laboratory, and supervised by the QTS. The QA Testing Technicians shall not be affiliated with or employed by any materials supplier or the QC organization. The QA Testing Technicians shall not perform QC testing.

QA Inspection Technicians -The QA Inspection Technicians shall inspect, verify materials, and document all construction activities for compliance to the Contract. The QA Inspection Technicians shall have a minimum of 4 years of qualifying experience in roadway construction inspection.

2.28.2.7.1 Quality Assurance (QA) Staff Training

QA staff shall be trained in the applicable procedures for inspection of Work, geotechnical and environmental monitoring, and material sampling and testing. The professional training and experience of the QA staff (including biologists, hydrologists, and geotechnical engineers) shall be commensurate with the scope, complexity, and nature of the activity to be inspected, monitored, or tested.

The QA Testing Technicians and construction inspectors may attend the instructional courses WSDOT provides its personnel on a space-available basis, at no cost to the Design-Builder. These classes may be offered only once a year. The following classes will be available:

Course	Hours
Asphalt Paving Street Inspection	4
Bridge Substructure Inspection	4
Bridge Superstructure Inspection	4
Drilled Shafts	4
MSE Walls	4
Project Documentation	4
Excavation and Embankment Inspection	4
Nuclear Gauge, Embankment/Surfacing/Pavement Applications	4
PCC Pavement Production, Placement, and Field Testing Procedures	4
Electrical – Illumination and Signals	4

2.28.2.7.2 Quality Assurance (QA) Staffing Levels

QA staffing levels shall be identified in the QMP and updated as necessary during the course of the Project to reflect the actual construction schedule. The size of the QA staff shall reflect the complexity, needs, shifts, and composition of the construction activities consistent with the construction schedule, relative locations of the Work to be covered, geotechnical considerations, environmentally sensitive areas, and specific nature of the Work. WSDOT will review and comment on proposed staffing levels to ensure the Project requirements are adequately met. Construction shall not take place when QA staffing levels are inadequate to provide the inspection and testing required by the Contract. At a minimum, there shall be at least 1 QA Inspector on the Project site at all times when permanent Work is being incorporated into the Project.

2.28.2.7.3 Restrictions on Quality Assurance (QA) Staff

The restrictions for QA staff are included in the Restrictions on QA Staff (Appendix V).

2.28.2.7.4 Rights to Remove Quality Assurance (QA) Staff

By written notice, WSDOT reserves the right to permanently remove any of the following personnel from the Project:

- A QA Testing Technician who does not perform the QA tests in accordance with the test methods.

- A QA Testing Technician who does not report test results accurately.
- A QA Inspecting Technician or geotechnical or environmental monitor who, in the opinion of WSDOT, does not exercise good judgment in the performance of their duty.
- A QA Testing Technician who is not certified in accordance with the Contract requirements.

2.28.2.8 QUALITY CONTROL (QC) TESTERS AND PERSONNEL

The Design-Builder shall perform, control, and ensure that operational techniques and activities provide acceptable quality, and are in compliance with the Contract. The QC personnel may be a separate organization within the Design Builder's organization; the Design-Builder's front line supervisors; the supplier, producer, or manufacturer; but in no case shall be associated with the QA organization. The QC personnel shall be trained and provided the necessary tools, testing procedures, and inspection checklists to ensure the Work product meets the Contract requirements. The QC Testers and Inspectors shall report to the Construction Manager or designee. The designee shall not be the Construction QA Manager.

2.28.3 DESIGN QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC) REQUIREMENTS OF THE QUALITY MANAGEMENT PLAN (QMP)

2.28.3.1 GENERAL

The QMP shall specify all aspects of the QA and QC for design. The QA and QC procedures for each type of Design Document and Released For Construction (RFC) Document shall be organized by engineering discipline. The Design-Builder shall include measures and objective evidence to ensure that appropriate quality standards are specified and included in the Design Documents and RFC Documents, and to control deviations from the standards. The Design-Builder shall not deviate from the standards unless the deviation has been approved by WSDOT.

The QMP shall include the following:

- QA and QC procedures for preparing, submitting, and checking all plans, calculations, drawings, and other items to ensure that they are independently checked and back-checked by experienced architects and engineers, in accordance with generally accepted architectural and engineering practices. The originator, checker, and back-checker shall be clearly identified on the face of all submittals.
- Specific procedures for validating computer programs used on the Project.
- QA and QC procedures for verifying that all submittals meet the requirements of the Contract.
- Assurance that all materials, equipment, and elements of Work have been provided for and designed to perform satisfactorily for the purpose intended.
- A defined process for stamping, signing, and dating, plans, reports, and other documents by the responsible Professional Engineer licensed under Title 18 RCW in the State of Washington, where required by the Contract.
- The level, frequency, and methods of review for the adequacy of the design of the Project.
- The method by which drawing changes are incorporated into a revision change.

- The procedures for coordinating Work performed by different personnel in the same area, in adjacent areas, or on related tasks to ensure that conflicts, omissions, or misalignments do not occur between the drawings or between the drawings and the specifications; and to coordinate the review, approval, release, distribution, and revision of documents involving such personnel.
- Identification of those elements of the Contract, Design Documents, or RFC Documents requiring special QA and/or QC attention or emphasis, including applicable standards of quality or practice to be met, and level of completeness and/or extent of detailing required.
- Identification by discipline of the name, qualifications, duties, responsibilities, and authorities for all persons responsible for QA and QC.
- Description of the name, qualifications, duties, responsibilities, and authorities of external technical experts necessary to ensure the quality of the design of the Project. Information regarding the anticipated timing, use, anticipated availability, and any coordination required with respect to any experts.
- Procedures for assuring that the documents fully provide for constructability and compatibility of materials.
- Identification of the inspection guidelines for each item of Work to determine what significant characteristics of each item needs to be monitored during the construction phase to ensure that the completed Project will function in accordance with the design intent over its expected lifetime. The inspection guidelines shall include the appropriate criteria, tests, and inspection requirements described in this Section.
- Descriptions of the required design QA and QC functions, including scheduled activities for design QA and QC identifying the Design Documents and RFC Documents to be delivered to WSDOT for its review at each stage of the design or construction phase of the Project. The QMP shall specify written certifications by the Design QA Manager for each submittal document showing that all QMP requirements have been completed satisfactorily.
- Development and maintenance of an accessible Document Control System (DCS) by the Design-Builder to provide all relevant design inputs, including a list of references to design inputs that should be used by design personnel in the design.
- Verification by the Design-Builder that the design inputs are communicated to, and accessible by, the relevant designers responsible for incorporating design inputs into the design.
- Specification of QA procedures to verify the construction surveying, property surveying, establishment of Right-of-Way markers, As-Built Plans, reestablished county and subdivision monuments, and Record of Survey Map.
- A defined process for tracking the design drawings through the Final Design Documents and including the RFC Documents.

The QMP shall describe procedures to require that a written certification is signed by the Design QA Manager verifying that all quality procedures have been completed in accordance with the QMP.

2.28.3.2 WSDOT DESIGN REVIEW

The QMP shall define the timing, content, and format of all design reviews. The Design-Builder shall provide a 14 Calendar Days review period for WSDOT Review and Comment on all design submittals. WSDOT reserves the right to extend the review time by up to 7 Calendar Days for submittals that are received between November 15th and January 1st, and for submittals with overlapping review periods.

The Design-Builder shall address all comments made by WSDOT in each submittal, and shall include comment resolutions in subsequent submittals.

The Design-Builder shall schedule and maintain minutes of all resolution meetings with the appropriate WSDOT staff to document and resolve the Design-Builder's responses to the comments. It is intended that all comments will be resolved at these meetings. If agreement is not reached on any specific comment, it shall be resolved as described in the QMP.

2.28.3.3 DESIGN TASK FORCES AND OVER-THE-SHOULDER REVIEWS

The QMP shall also include processes and procedures for how regular (weekly) scheduled coordination meetings between WSDOT and the Design-Builder will be used to support quality goals. These meetings, combined with over-the-shoulder reviews, shall be an integral part of the process to discuss and resolve design issues outside of the formal review process.

The QMP shall define how over-the-shoulder reviews with WSDOT during the course of the development of each design package will be included. The over-the-shoulder reviews are not Hold Points that restrict the progress of design. They are reviews of the design as it progresses, and opportunities for WSDOT to provide comments and feedback on the design.

2.28.3.4 RELEASED FOR CONSTRUCTION (RFC) DOCUMENT REVIEW

At a minimum, the Design-Builder shall provide a preliminary and a final submittal of all plans and Technical Specifications and resolve all comments prior to being Released For Construction.

2.28.3.4.1 Technical Specifications

The Standard Specifications are supplemented and modified by the Amendments to the Standard Specifications, the Special Provisions, and these Technical Requirements. The Design-Builder shall develop any additional Technical Specifications required to address Work not covered by the Standard Specifications, Amendments to the Standard Specifications, Special Provisions, or these Technical Requirements.

2.28.3.4.2 Preliminary Design Submittal

The intent of the Preliminary Design Submittal is to provide a formal opportunity for WSDOT, the Design-Builder, various design team disciplines, and other approved Project stakeholders to review the construction documents in order to ensure that the design is progressing appropriately and proceeding in the right direction; the plans reflect Design-Builder requirements for construction; design features are coordinated; and there are no fatal flaws within a given discipline or between disciplines. The contents of the

Preliminary Design Submittal for each discipline shall be as specified in these Technical Requirements and as mutually agreed upon by members of the applicable task force, or by agreement between WSDOT and the Design-Builder if no specific task force applies.

2.28.3.4.3 Final Design Submittal

The Final Design Submittal shall be prepared when the design for a given element or area is 100% complete. The Final Design Submittal may include plan sheets, specifications, technical memos, reports, calculations, and other pertinent data, as applicable. As a result of the ongoing discussion and resolution of design and construction issues through the regularly-scheduled task force meetings and over-the-shoulder reviews, it is anticipated that there will be very few revisions or changes at this stage.

The Final Design Submittal shall include all specifications, including but not limited to, all Amendments to the Standard Specifications Special Provisions, Technical Requirements, and Technical Specifications, necessary to construct the Work represented in the submittal. Following resolution of all comments, the Final Design Submittal may proceed through the written certification process described below in preparation for being Released For Construction.

2.28.3.4.4 Released For Construction (RFC) Documents

The QMP shall describe how the Design-Builder will ensure that the RFC Documents reflect all QA, QC, and design reviews required by the QMP and the Contract. The QMP shall also describe the written certification process to be used to verify to WSDOT that all QA procedures have been completed to ensure that all review comments have been incorporated as agreed to during the comment resolution process among WSDOT and the Design-Builder, and that the documents are ready to be Released For Construction.

Each sheet of the plan set and the cover of each set of Technical Specifications in the RFC Documents shall carry the Professional Engineer's stamp and shall be stamped "Released For Construction" by the Design QA Manager.

Once plans and Technical Specifications have been Released for Construction, the Design-Builder shall provide WSDOT with 6 hard copies and electronic files (in both Microstation and PDF formats) on CDROM of all RFC Documents. The electronic drawing files shall include copies of all sheet and reference files used in the RFC Documents.

Prior to submittal, electronic files for all RFC Documents, except the MOT Plans, shall be checked by the Design-Builder to ensure that they conform to the WSDOT Plans Preparation Manual file naming and drawing symbology (e.g., level contents, and line and text symbology). The drawing symbology and file naming for each electronic drawing file shall meet or exceed a minimum conformance level of 90%, and the average conformance level for all drawing files shall be 95% or greater. MOT Plans are not required to meet the conformance level criteria. The Design-Builder shall provide WSDOT with a Microsoft Excel (version 2003) spreadsheet for each RFC Submittal containing the file name and the corresponding conformance level for every file that is part of the submittal. WSDOT will provide a template that shall be used for this task. Certain files provided to the Design-Builder by WSDOT, such as base mapping or vicinity maps, may be excluded from the conformance level requirement. The Design-Builder shall obtain written confirmation from WSDOT as to which files are exempt from compliance with the WSDOT *Plans Preparation Manual*.

Construction shall not proceed on any element of Work until the relevant submittal is stamped "Released For Construction" by the Design QA Manager, and all required government and private approvals have been obtained by the Design-Builder.

2.28.3.5 QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC) OF DESIGN CHANGES

The QMP shall describe the process for implementing design changes, including field changes, shown on the Design Documents and RFC Documents. The design changes shall be subject to QA and QC measures and procedures, commensurate with those applied to the original design or that portion of the Project under consideration for change.

The QMP shall also address and clearly define the number of changes to a drawing that will result in a drawing revision, and the time frame for the release of the updated drawing. Each drawing revision shall be assigned a number. The revision number shall be assigned sequentially, with each change in a document or plan sheet identified by the revision number. The assigned number shall be located both at the location of the change on the sheet and in the revision block of the document, together with an explanation of the change.

2.28.3.6 SHOP DRAWINGS

The QMP shall describe the personnel assigned to shop drawing review and approval, including critical structure shop drawings; the procedures for documenting reviews and obtaining approvals; the process for implementing corrective actions; the procedures for auditing and checking compliance to shop and falsework drawings; and the distribution to WSDOT.

The Design-Builder shall submit all shop drawings to WSDOT, prior to implementation. The submittal shall include 1 hard copy and 1 electronic copy of shop drawings.

Prior to submittal to WSDOT, the Design-Builder shall mark the shop drawings in the lower right corner with one of the two following indicators:

- APP'D (Approved, no corrections required).
- AAN (Approved-As-Noted, minor corrections only. The Design-Builder shall not place written questions on Approved-As-Noted sheets, but shall clearly note the corrections).

2.28.3.7 AS-BUILT DOCUMENTATION

The QMP shall describe how the Design-Builder will ensure that the As-Built Documents meet the requirements of the Contract and accurately represent the as-constructed conditions in the field, and how the As-Built Documents are updated continuously and made available for periodic reviews conducted by WSDOT or their designees.

2.28.3.8 DOCUMENT AND DATA CONTROL

The QMP shall describe the procedures to be used in managing and documenting all Project files. The Design-Builder shall establish and maintain its own DCS to store and record hard copies and electronic records, including but not limited to, all correspondence, meeting minutes, design inputs, drawings, progress reports, technical reports, specifications, Contract documents, submittals, calculations, test results, inspection reports, NCRs, administrative documents, and other documents generated under the Contract. The Design-Builder shall ensure that its DCS is compatible with the DCS used by WSDOT.

The QMP shall describe the methods by which all documents issued and received by the Design-Builder will contain a unique serialization; date issued or received; Project name; Contract name; Contract number; specific subject or content of the correspondence; name of the sender or recipient; and reference information to which the correspondence relates to, such as prior correspondence. The Design-Builder shall maintain separate incoming and outgoing correspondence logs.

All documents shall be maintained by the Design-Builder for the duration of the Contract, and shall be organized, indexed, and delivered to WSDOT upon Final Acceptance unless required to be delivered earlier pursuant to the Contract, or within 7 Calendar Days of receipt of request from WSDOT, even if the documents are incomplete.

2.28.3.8.1 Document and Data Approval and Issuance

The QMP shall include a requirement that all deliverables include a signed and dated certification by the originator of the deliverable, and that the deliverable is complete and meets the Contract requirements.

2.28.3.8.2 Document and Data Changes

The QMP shall include a requirement that any changes to documents provided to WSDOT are in a format that shows the changes clearly, and in a method that is easily trackable (e.g., documents use the redline/strikeout method).

2.28.3.9 DESIGN VALIDATION

The QMP shall describe all verification, validation, monitoring, inspection, and activities to be carried out for the purposes of demonstrating that the Work is acceptable.

2.28.4 MATERIALS QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC) PLAN REQUIREMENTS

2.28.4.1 GENERAL

The QMP shall specify all aspects of the Materials QA and QC Plan. At a minimum, The Materials QA and QC Plan shall include the items described in this Section to verify that all materials conform to the Contract requirements. The Materials QA and QC shall be separate functions performed by separate personnel who have no affiliation to each other or to the same organization.

2.28.4.2 DESIGN-BUILDER RESPONSIBILITIES

The Design-Builder shall be responsible for the quality of construction and materials incorporated into the Project. The Design-Builder's QC measures are intended to ensure that operational techniques and activities provide material of acceptable quality.

The Materials QA organization shall be responsible for the acceptance of all materials and workmanship incorporated into the Project. The Materials QA organization shall also perform sampling and testing, determine acceptance/rejection of the materials, and implement a tracking system to monitor nonconforming materials and disposition of nonconforming materials, according to the Contract.

2.28.4.3 MATERIALS TESTING QUALITY PROGRAM

The Design-Builder shall monitor and measure the characteristics of all Work activities to verify that all Project requirements have been met. This monitoring and measurement shall be carried out at appropriate stages of manufacture and construction in accordance with the planned Work and minimum frequencies for sampling and testing as described in Table 6, Section 1-06 of the General Provisions.

The Design-Builder's QA test data shall be used for acceptance, provided it can be statistically verified by WSDOT's QV test data, except as noted in Section 2.25. In the event of discrepancies between WSDOT's and the Design-Builder's test data, the Quality Assurance Team will attempt to resolve them. If a resolution cannot be reached, then WSDOT's QV test results will be used for acceptance.

The five levels of quality management provided by the Design-Builder and WSDOT where testing is being used for acceptance are:

Quality Assurance (QA): The Construction QA Manager shall be responsible for the materials sampling, testing, and processes for QA. Testing for QA includes all planned (e.g., audits and assessments) and systematic actions necessary to ensure that all materials incorporated into the Work meet the Contract requirements for the material being used, and will perform satisfactorily for the purposes intended. All materials sampling and testing for QA will be performed by a statistically valid, random sampling method using testing methods and minimum frequencies defined in Section 1-06 of the General Provisions, the WSDOT *Construction Manual*, the WSDOT *Materials Manual,* and the Contract.

Quality Control (QC): The Design-Builder shall be responsible for QC, which is defined as activities performed by the Design-Builder, the producer, or the manufacturer to ensure that a product is of uniform quality meeting the Contract requirements. Components of QC may include inspecting and obtaining material certifications; materials handling; construction procedures; calibration and maintenance of equipment; production process controls; and any sampling, testing, or retesting conducted for these purposes.

Quality Verification (QV): WSDOT or its agent will perform an independent materials QV to validate the Design-Builder's sampling and testing QA program. All verification sampling and testing will be performed by a statistically valid, random sampling method using testing methods defined in the WSDOT *Construction Manual,* the WSDOT *Materials Manual,* and the Contract.

Independent Assurance (IA): The IA is an independent verification performed by WSDOT which includes an observation of sampling and testing procedures, a review of the qualifications of the tester, and a verification of the testing equipment used to perform acceptance testing activities. The IA will validate both the Design-Builder's QA processes and WSDOT's QV processes. The IA may include auditing of acceptance testing records, observing the tests being performed by the Design-Builder's technicians, or taking split samples with the Design-Builder on a random basis for verifying the Design-Builder's testing equipment. WSDOT will enter findings of all IA observations into the Construction Audit Tracking Systems (CATS). Any deficiency will result in a NCI. The Design-Builder shall take corrective action immediately for any noted deficiencies.

Quality Assessment: WSDOT will perform non-scheduled Quality Assessments of the Design-Builder's Work, including sampling, testing, and documentation reviews for the benefit of the owner.

2.28.4.4 MATERIALS TESTING LABORATORY

All QA testing that will be used for acceptance of materials shall be performed by a laboratory approved by WSDOT. The laboratory shall report directly to the Construction QA Manager. The Design-Builder or a subcontractor shall employ the laboratory personnel. The materials testing laboratory that is used for QA testing shall not perform QC testing, and shall not be owned, operated, equipped, or staffed by material suppliers. The laboratory shall meet the requirements of AASHTO R-18 for qualified testers and calibrated/verified equipment, and be able to accomplish the testing according to the test procedure they are performing.

The Design-Builder's laboratory shall develop and maintain a Laboratory Quality Systems Manual. The Manual shall include:

- Staff qualifications, position description, and qualification process.
- Listing of test procedures approved for performance throughout the Project.
- Equipment, including verification, calibration, recall procedures, and inventory.
- Test reports, worksheet, summary logs, and forms.
- Sample management.
- Diagnostic and Corrective Action Reports.
- Quality Systems review.

WSDOT will perform an on-site evaluation of the facility to ensure all Work is being performed according to the Contract. The evaluation will include audit and inspection functions; review of training, equipment calibration, and verification of records; and observance of testers as they perform the test procedures. For laboratories located outside of Washington State, or laboratories performing only minor testing, WSDOT may use the AASHTO Accreditation program, or another state's Department of Transportation to inspect the laboratory.

The Design-Builder shall request the WSDOT inspection a minimum of 14 Calendar Days prior to the start of construction. Together with the request, the Design-Builder shall submit a copy of the Laboratory Quality Systems Manual, and a list of the testing procedures that the laboratory shall perform throughout the Project. The laboratory shall be properly equipped, staffed, and fully operational at the time of WSDOT's inspection and for the duration of its use on the Project.

WSDOT will advise the Design-Builder in writing of any deficiencies noted during the inspection, and the Design-Builder shall take immediate action to correct them. Work requiring laboratory acceptance will not proceed until the laboratory and staff have been inspected and have received written approval from the WSDOT Engineer.

The test equipment for the following test procedure shall be as shown below and in the Field Operation Procedure in accordance with the WSDOT *Materials Manual* so that proper correlation between the QA and QV test results may be established.

- WSDOT Field Operation Procedure for AASHTO T-310 In-place Densities by Nuclear Method (Troxler 3430, or 3440 Series Moisture/Density Gauge).

2.28.4.5 MATERIALS TESTING FREQUENCIES AND RANDOM SAMPLING

The Design-Builder shall perform field and laboratory sampling and testing as specified in the Standard Specifications and the WSDOT *Materials Manual* to control these processes. Sampling and testing shall be performed by qualified testing personnel described in this Section. Representative samples shall be randomly obtained by the Design-Builder at specified frequencies as shown in Table 6, Section 1-06 of the General Provisions. The Design-Builder shall furnish copies of all test results to WSDOT within 24 hours of completion of the test or the next business day. For concrete cylinders, the test results shall be furnished within 24 hours after cylinder break.

WSDOT or its agent will perform independent materials QV sampling and testing to validate the Design-Builder's sampling and testing QA program. Typically, the testing rate will be 1 verification test to every 5 of the Design-Builder's acceptance tests. During production startup, the QV testing will be performed at the same frequency as the Design-Builder's QA program for the first 5 samples, to establish a statistical base for verification and acceptance. After that, the QV testing will be performed on a more frequent basis as needed until the process is established and considered to be under control. When QV testing reaches 25 samples, and the QA and QV testing can be statistically validated, the frequency of the QV tests may be reduced to 1 in 20. If at any time the QA and QV testing has wide variances or cannot be validated, the QV testing frequency shall be increased to 1 in 5 until 25 samples are reached again with satisfactory statistical validation.

If the Design-Builder elects to take extra samples, the QV sampling frequency will continue to be based on the frequency described in Table 6, Section 1-06 of the General Provisions.

Materials that only require less than 5 tests for acceptance, or that have less than 5 sublots, will require WSDOT and the QA personnel to test at the same frequency. Refer to Chapter 9 of the WSDOT *Construction Manual* for testing requirements. For all materials that are not addressed by WSDOT standards, the material testing specifications, testing procedures, and frequencies will be determined by the Quality Assurance Team with the Engineer of Record's concurrence.

Small quantities of materials can be accepted without sampling and testing when the quantity of materials proposed for use by the Design-Builder are less than the minimum sampling and testing frequencies. Structural concrete will not be considered as a small quantity. The Construction QA Manager shall follow the procedure for acceptance of small quantities described in Section 2.25.

2.28.4.6 TESTING PLAN

All acceptance and verification sampling and testing shall be randomly obtained, at the location and frequency stated in the Contract. The Design-Builder shall provide a Testing Plan for each material to WSDOT. The Testing Plan shall identify the frequency, location for testing, test procedures, attributes to test, material acceptance requirements, Sampling Plan developed using WSDOT Test Method T 716 Method of Random Sampling, or other random number generator, and the estimated Project quantity. The Testing Plan shall be submitted prior to the beginning of production or placement of the material. The QMP shall include a method for notifying the QA organization of the quantity of material produced, placed, or delivered to the Project, so that the testing effort can be current.

2.28.4.7 MATERIALS QUALITY ANALYSIS PROGRAM

The Design-Builder's QA sampling and testing results shall be used for acceptance, provided that they are validated by WSDOT's QV sampling and testing.

Both the Design-Builder's QA and WSDOT's QV test results shall be recorded in the Statistical Analysis of Materials software that will be provided by WSDOT. This software shall be used to statistically evaluate the QA test data against the QV test data to determine the acceptability of the QA test data. This evaluation will be performed by using the F and t Test analysis tool. The Construction QA Manager shall be responsible for performing this evaluation. Any test data that is found to be outside the normal F and t distribution shall be reviewed by the Quality Assurance Team, and a determination shall be made as to why the test data is outside the normal distribution.

The Quality Assurance Team shall identify the cause of discrepancies in the test results and generate a report defining the problems, the cause of the problems, and the solutions to prevent a recurrence. At a minimum, the review shall include the following actions:

- A check of test data, calculations, and results.
- An observation of the sampling and testing by the IA Inspector.
- A check of test equipment by the IA Inspector.

If the Quality Assurance Team fails to identify the cause of discrepancies in the test results, then WSDOT's QV test results will be used for acceptance.

2.28.4.8 MATERIALS DOCUMENTATION REVIEW

The Design-Builder shall schedule regular documentation reviews to ensure that all materials documentation and certifications are complete prior to the material being installed on the Project.

WSDOT will perform periodic formal materials documentation reviews at approximately 25% and 75% completion of construction. Items to be reviewed will be randomly selected by WSDOT. These reviews are intended to ensure the Design-Builder is maintaining all necessary materials documentation and records. A final review will be performed at the completion of the Project to review all materials documentation.

In addition to the formal reviews, WSDOT on-site personnel will perform periodic materials documentation checks. Examples of these checks include materials approval, materials acceptance, and field verification that the approved material was placed.

2.28.5 CONSTRUCTION QUALITY ASSURANCE (QA) AND QUALITY CONTROL (QC) PLAN REQUIREMENTS

2.28.5.1 GENERAL

The QMP shall include a program for construction inspections, examinations, measurements, and tests of materials or elements for each Work operation, where appropriate, to verify quality. The requirement for these inspections is not limited to those required for quality testing purposes.

The QMP shall specify all aspects of QA and QC for construction. At a minimum, the QMP shall include the following items to verify that all construction activities conform to the Contract requirements:

- Inspection requirements.

- Instrumentation and survey monitoring for verification of the performance of the Project geotechnical features.
- Specific documentation for QA and QC activities.
- WSDOT requirements for corrective action and Corrective Action Plans when QC and/or acceptance QA criteria are not met.

2.28.5.2 WEEKLY SCHEDULING NOTICE TO WSDOT

The Design-Builder shall notify WSDOT in writing by noon on Friday of each week of planned construction activities, including fabrication, and shall describe the anticipated construction activities for the following week (Monday through Sunday) to allow WSDOT to schedule its resources. For activities occurring beyond 60 miles of the Project, the Design-Builder shall give WSDOT notification at least 14 Calendar Days prior to the planned Work.

2.28.5.3 COORDINATION AND NOTIFICATION

The Construction QA Manager shall designate a primary point of contact for notifications of inspections at Hold Points. An alternate contact may be designated to function in the primary contact's absence. WSDOT will designate 1 person to handle responses to the Design-Builder for written reports or releases for Hold Points.

The time necessary to respond to the notification for inspection at Hold Points shall be included in the QMP, and mutually agreed to by the Design-Builder and WSDOT.

2.28.5.4 HOLD POINTS

Hold Points shall be identified in the construction process where critical characteristics are to be measured and maintained, and at points where it is impractical to determine the adequacy of either materials or workmanship once Work proceeds past this point. Pre-Activity Meetings shall be included in the Design-Builder's QMP as Hold Points. Hold Points shall be established where required QA inspection is mandatory. The Design-Builder shall provide WSDOT with 3 Calendar Days notice of each Hold Point (7 Calendar Days for ATM Hold Points) so that WSDOT, at its discretion, can observe or visually examine a specific Work operation or test. Work shall not proceed until inspection is performed and a written release is granted by the Design-Builder's QA organization.

At a minimum, the Construction QA Manager shall establish Hold Points at the stages listed below. The QMP shall identify any additional Hold Points necessary to certify compliance. The following Hold Points are not intended to limit or diminish the Design-Builder's responsibility to inspect all construction and fabrication Work.

Temporary Erosion and Sediment Control

- After installation of high-visibility fencing around environmentally sensitive areas, clearing limits, travel corridors, and stockpile sites.
- After completion of placement of Temporary Erosion and Sediment Control devices, and prior to any construction operations.

Embankments

- At intervals of embankment construction every 5 vertical feet.

Structures (Bridge, Retaining Walls, Noise Walls, Curtain, and End Walls)

- After installation of bridge-mounted sign brackets and before signs are mounted using the brackets.
- Before pile driving or drilled shaft operations.
- After completion of each drilled shaft along with Cross Holed Sonic Logging testing, and at the completion of each drilled shaft group, for each structure support.
- Before concrete placement of any subsurface element including concrete for cast in place piles and drilled shafts.

Retaining Wall

- After completion of soil foundation and before the placement of the leveling pad of a Structural Earth wall or the foundation of any other type of retaining wall.

ATM

- After delivery of the equipment resulting from the ATM sign design workshop described in Sections 2.18.3.1.1 and 2.18.3.2.4.6.1, and prior to sign manufacture.

Electrical/ITS

- Prior to removal of existing ITS equipment, and new or temporary ITS equipment in place and operational, in accordance with Section 2.18.
- Prior to removal of existing CCTV cameras, and new CCTV cameras in place and operational.
- As required by WAC 296-46B-040, inspection of electrical and traffic management systems that will be performed by WSDOT.
- Prior to any work in an ITS hub, or in a cabinet operating as a hub.

2.28.5.5 TRAFFIC ELECTRICAL INSPECTION

The Design-Builder shall inspect all electrical and ITS systems. In addition, WSDOT will inspect all electrical and ITS systems for code compliance, functionality, and acceptance as required by WAC 296-46B-040. Refer to Section 2.18.

2.28.5.6 PERFORMANCE VERIFICATION OF PROJECT GEOTECHNICAL ELEMENTS/FEATURES

The QMP shall include inspection and verification tests to determine the integrity of foundation structures and elements, and to verify that their performance is as anticipated from the design.

Walls shall be designed for anticipated total and differential settlements based on site geotechnical analyses. The QMP shall include inspection, wall face tolerance and deflection measurements, and verification and proof tests for anchors and soil nails to determine the integrity of foundation structures and wall elements, and to verify that the wall performance is as anticipated from the design.

If soil densification or other foundation soil stabilization techniques are used, the Design-Builder's QMP shall address how the integrity and success of the soil densification technique will be investigated, monitored, and compared to the intended design.

2.28.5.7 WSDOT OVERSIGHT

WSDOT will periodically audit the field performance of the Design-Builder's QA staff, testing frequencies, and acceptance testing results. WSDOT will conduct oversight inspection audits to verify the adequacy of the Design-Builder's inspection activities and testing procedures.

If WSDOT observes nonconforming Work, a NCI report will be generated in the CATS program.

2.28.5.8 QUALITY ASSURANCE INSPECTION

The QMP shall contain inspection plans for each construction Work item included in the Project, whether performed by the Design-Builder, a subcontractor, or a vendor. Work items may be definable features or items of Work defined by the Standard Specifications.

2.28.5.9 INSPECTION GUIDELINES

During the design of the Project, the Design-Builder shall review each item of Work to determine which significant characteristics of the items need to be monitored during the construction phase, to ensure that the completed Project will function in accordance with the design intent over its expected lifetime. The inspection guidelines shall include the appropriate criteria, tests, and inspection requirements identified in the Standard Specifications, the WSDOT *Construction Manual,* and the WSDOT *Materials Manual.* The Inspection Plan shall address the following elements within each item of Work:

- Identification - Work items included in the Inspection Plan.
- Characteristics - What characteristics of the item will be inspected?
- Acceptance Criteria - Directly or by reference, the Design-Builder shall provide sufficient information for the Inspector to use to determine if the item or activity is conforming or nonconforming. Maximum use of checklists shall be made for this purpose.

Inspections shall be performed during all phases of the Project from start to completion in order to ensure that the Work meets and is being performed in accordance with the Contract, RFC Documents, approved submittals, and any requirements of local jurisdictions.

The Design-Builder shall conduct an examination of the quality of workmanship to confirm that all Work is being performed in accordance with the RFC Documents, and any understandings reached at the Pre-Activity Meeting for that item of Work.

The Design-Builder shall conduct appropriate follow-up inspections, and sampling and testing of materials as each item of Work progresses, to assure consistency in workmanship, compliance with Contract requirements, Design Documents, and RFC Documents; and to assure satisfactory performance of the Work in service.

2.28.5.10 INSPECTION DOCUMENTATION

Each of the QA Inspectors shall summarize their daily inspections, tests, and material sampling activities in a daily report. The QA Inspectors shall use WSDOT's Inspectors Daily Report or a similar form to maintain a written record of inspection results, and shall

provide copies of the daily reports to WSDOT the next business day. The Inspector's Daily Reports shall include the following key points of record:

- Work performed by the Design-Builder, subcontractor, or material supplier.
- Weather conditions.
- Inspections performed and their results, including any corrective actions taken.
- Materials used, the manufacturer or source, product identity, and quantities.
- Communications.
- Type, location, and results of all tests performed.
- Delays encountered.
- Type of traffic control setup and any inspection and corrective action taken by the Design-Builder.
- Any safety-related problems and corrective action taken.
- All nonconforming Work and the corrective action taken.
- A copy of any checklist used for the inspection.
- The Inspector's signature.

2.28.5.11 CONSTRUCTION INSPECTION FORMS AND CHECKLISTS

The Design-Builder's QMP shall include construction inspection forms and checklists for all anticipated construction operations and processes, which shall be used by the Design-Builder's QA inspection personnel and other personnel responsible for QC, such as foreman and individual workers.

Construction inspection forms shall be used to document all construction Work activities required in the QMP. For each critical construction Work activity, construction inspection forms shall include activity specific checklists approved by WSDOT, prior to the start of the Work activity. The checklist for each Work activity shall include the construction requirements described in the Standard Specifications or the Contract for that Work activity. At a minimum, each checklist shall address the following:

Date	
Time	
Location	> Service Number > ITS Cabinet Number > Structure Location
Type of Inspection	Completion of electrical code, final check, pre-pour check, etc.
Specification Requirement	List of applicable specifications for this item
Frequency	Indicated test or inspection frequency if any (see Section 1-06 of General Provisions for material test requirements)
Items Inspected	List elements or items inspected (e.g., rebar, terminations, splices, etc.)
Conformance to Specifications	Verify Work and materials meet the appropriate specifications
Deficiencies Noted	Note any deficiencies to specifications
Individual Notified	Individual notified for corrective action (WSDOT notified)
Corrective Action Noted	What corrective action is required to ensure products conform to specifications

2.28.5.12 NONCONFORMING WORK

The construction QA staff shall identify and document all elements of Work that have not, or are believed to have not, been constructed in accordance with the approved drawings and specifications, and the reason for nonconformance in a NCR. The NCR shall be submitted to WSDOT in writing within 24 hours of identification, and a copy sent to the Design Manager or designated Engineers.

2.28.5.13 NONCONFORMANCE REPORT (NCR) REMEDIATION

The Design Manager or a designated Engineer shall evaluate and determine whether a nonconformance exists; and the effect of the nonconformance on performance, safety, durability, long-term maintenance, and the life of the item of Work.

If required, documented remedial actions shall be stamped by a Professional Engineer licensed under Title 18 RCW. The Design-Builder shall submit copies to WSDOT for review within 24 hours, and prior to performing the remedial action. The Construction QA Manager shall also sign the NCR stating that the remedial actions to be implemented have undergone the same level of inspection and testing as required by the original design.

If the nonconforming condition is repetitive and recurring, the Design-Builder shall develop and implement a Corrective Action Plan to eliminate the nonconforming conditions.

2.28.5.14 WORK WITH NONCONFORMANCE (NCR) REPORTS

When WSDOT does not agree with the remedial actions set forth in the NCR, WSDOT has the authority to call for removal of the nonconforming Work, or to stop Work within that area until the Corrective Action Plan has been approved by WSDOT.

2.28.5.15 NCR REPORTING

The Construction QA Manager shall maintain a log of all NCRs and Corrective Action Plans, and present them at the Quality Assurance Team Meetings. The Construction QA Manager shall number each NCR and Corrective Action Plan sequentially, and maintain an active summary log that provides a brief description and status of the nonconforming Work. The Construction QA Manager shall not grant acceptance for any portion of Work that has an outstanding NCR.

2.28.5.16 WSDOT NONCONFORMING ISSUES (NCIS) AND AUDIT FINDINGS

WSDOT shall retain the right to write its own NCIs and Audit Findings based on its observance of Work. NCIs and Audit Findings generated by WSDOT will be entered into the CATS program, and will require the same review and ultimate closure as NCRs generated by the Construction QA Manager.

2.28.5.17 RIGHT TO STOP WORK

If there is evidence that QMP procedures are not adequate, or if a problem is encountered during the oversight inspections or becomes evident during construction, WSDOT may, at its sole discretion, stop Work until appropriate quality procedures have been established and implemented.

In addition, WSDOT retains authority to stop Work without liability wholly or in part, if the Design-Builder fails to perform the following:

- Correct conditions that are unsafe for Project personnel or the general public
- Correct unacceptable construction practices.

2.28.6 SUBMITTALS

2.28.6.1 QUALITY MANAGEMENT PLAN (QMP)

The Design-Builder shall submit 6 hard copies and 1 electronic copy on CDROM of the Draft QMP for evaluation. WSDOT will provide comments to the Design-Builder on the Draft QMP. Following resolution of the comments, and receipt of a written approval from WSDOT, the Design-Builder shall submit 6 hard copies and 6 electronic copies on CDROM of the Final QMP.

Modifications to the Final QMP shall be approved in writing by WSDOT. When the modifications are approved, the Design-Builder shall correct the 6 hard copies of the Final QMP, and submit 6 electronic copies of the revised QMP on CDROM. Each hardcopy or CDROM shall be clearly marked with which revision has been included in that copy.

2.28.6.2 EXECUTIVE MANAGEMENT REVIEWS AND INTERNAL AUDITS

The Design-Builder shall provide a hard copy of its Executive Management Review to WSDOT within 20 Calendar Days of completion of the review.

The Design-Builder shall provide a hard copy of its internal audit of the QMP to WSDOT within 20 Calendar Days of completion of the audit.

2.28.6.3 REVIEW DOCUMENTS

Prior to every design review, the Design-Builder shall provide WSDOT with 6 hard copies and a complete set of electronic files on CDROM of each design submittal to be reviewed, unless specified otherwise in this RFP.

2.28.6.4 QUALITY ASSURANCE (QA)/QUALITY CONTROL (QC) DOCUMENTATION

The Design-Builder shall include documentation with each submittal showing that the QA and QC processes have been completed. WSDOT will not accept submittals without documentation that the QA and QC processes have been completed.

End of Section

2.29 MAINTENANCE DURING CONSTRUCTION

2.29.1 GENERAL

The Design-Builder shall conduct all Work necessary to meet the maintenance requirements described in this Section. Elements of Work shall include limited operation, maintenance, and repair of the existing facilities, and complete operation, maintenance and repair of facilities constructed under the Contract beginning at Notice to Proceed, and ending on the day of Physical Completion, at which time the General Warranty shall govern the Work. Refer to Chapter 1 of this RFP for General Warranty provisions.

The Design-Builder shall perform maintenance during construction in a safe, reasonable, and prudent manner, and shall employ good business practices and appropriate management techniques. The Design-Builder shall furnish all labor, materials, equipment and necessary services, such as highway safety controls, in connection with maintenance during construction.

For the purpose of maintenance during construction, the Project limits are defined as all Right-of-Way, including any easements that may be necessary to construct the Project, that are located within the following areas:

- The area parallel to the northbound lanes of I-5 from the median to the Right-of-Way limit from Milepost (MP) 154.5 to MP 164.6.
- The area parallel to the southbound lanes of I-5 from the median to the Right-of-Way limit from MP 154.5 to MP 164.6.
- The area parallel to the eastbound lanes of I-90 from the median to the Right-of-Way limit from MP 2.7 to MP 11.9.
- The area parallel to the westbound lanes of I-90 from the median to the Right-of-Way limit from MP 2.7 to MP 11.9.
- The area parallel to the eastbound lanes of SR 520 from the median to the Right–of-Way limit from MP 0.1 to MP 8.1.
- The area parallel to the westbound lanes of SR 520 from the median to the Right-of-Way limit from MP 0.1 to MP 8.1.

Following Notice to Proceed, the Design-Builder shall provide maintenance, inspections, and repairs as described in this Section throughout the duration of the Contract in a manner acceptable to WSDOT. If WSDOT determines that the Design-Builder has failed to provide adequate routine maintenance, emergency and operational response, or inspections and repairs, WSDOT will issue a verbal notification of the failure to the Design-Builder.

WSDOT will follow the verbal notification with a written notification to commence and continue correction of the failure. Failure by the Design-Builder to correct the stated deficiency within 24 hours of the verbal notification may result in WSDOT performing the Work without prejudice to other remedies WSDOT may have. In such case, WSDOT will deduct the cost of correcting such deficiencies from payments then or thereafter due to the Design-Builder. If payments then or thereafter due are not sufficient to cover the cost of correcting the deficiencies, the Design-Builder shall pay the difference to WSDOT upon demand.

2.29.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction. They are listed in hierarchical order, with the most important appearing at the top of the list. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating in any way to the Mandatory Standards, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D16).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D8).
- WSDOT *Roadside Manual* (M25-30) (Appendix D14).
- WSDOT *Right-of-Way Manual* (M26-01) (Appendix D13).

2.29.3 MAINTENANCE OF THE RIGHT-OF-WAY

2.29.3.1 INTENTIONALLY OMITTED

2.29.3.2 INTENTIONALLY OMITTED

2.29.3.3 NOXIOUS WEED CONTROL

The Design-Builder shall allow WSDOT and King County Weed Board personnel access to any part of the Right-of-Way within the Project limits to identify and/or control noxious weeds with herbicides. Areas with weed infestations will be identified by WSDOT or the King County Weed Board, and reported to the Design-Builder through verbal and written notice of the location and required compliance date.

Within 3 Calendar Days of reporting WSDOT will schedule the work with the Design-Builder to occur Monday through Friday, between the hours of 9:00 a.m. and 3:00 p.m., and before the required compliance date.

The Design-Builder shall provide WSDOT with access to the area the herbicide will be applied, and shall ensure that all materials, equipment, and personnel are outside of the area when the herbicide is applied.

Any delay to the Design-Builder for the application of herbicide by the King County Weed Board, WSDOT, or other parties shall not be reason for an extension of time or additional compensation, including claims of differing site conditions.

2.29.3.4 INTENTIONALLY OMITTED

2.29.3.5 INTENTIONALLY OMITTED

2.29.3.6 HEALTH HAZARDS

The Project Area is occupied by transients, birds, bats, and rodents, and will contain biological and associated physical hazards. The areas most impacted by these hazards are the areas under the ends of the bridges within the Project. Other areas may also be impacted.

Transients

The Project Area includes materials and waste that pose a physical and/or biological safety and health hazard, such as waste associated with transients and drug users. Materials and waste may include, but are not limited to, hypodermic needles, food, garbage, clothing, bedding, broken glass, human and animal excrement, drug paraphernalia, makeshift dwellings, and other hazards. The Project Area may also be occupied by violent and dangerous individuals.

In the event transients are encountered within the Project limits and are hampering work or causing unsafe work conditions, the Design-Builder shall notify the responsible enforcement agency (Washington State Patrol, local law enforcement agency, community service patrol), who will assist the Design-Builder with removing the transients. The Design-Builder shall schedule a place, date, and time to meet the enforcement agencies, so that the enforcement agencies can escort the transients from the Project limits.

WSDOT will provide the Design-Builder with a contact number for the enforcement agencies, and will assist the Design-Builder with initial contact of the enforcement agencies to remove the transients from the Project limits.

The Design-Builder shall ensure that the public, including persons who may be non-English speaking or those who may not be able to recognize potential safety and health hazards within the Project Area, are not harmed by the Design-Builder's activities.

The Design-Builder shall follow the instructions in Appendix R1, WSDOT's Guidelines to Address Illegal Encampments within State Right of Way. All costs to remove the transients and clean up the site within the Project limits shall be included in the Contract Price.

Health and Safety Requirements

The Design-Builder shall communicate with the WSDOT Engineer to ensure a coordinated effort for providing and maintaining a safe Project Area for WSDOT's and the Design-Builder’s personnel.

Construction Requirements

The Design-Builder shall be responsible for the sanitation measures required to provide and maintain a safe and healthy Project Area for the duration of the Project, in accordance with applicable laws and this RFP. The Design-Builder shall develop and maintain a plan for mitigation of health hazards at the Project site. The plan shall be available at WSDOT's request.

Site Maintenance for Biological and Physical Hazards

Prior to commencement of the construction Work, the Design-Builder shall perform an initial cleanup of the Project Area, including all preparatory Work required to make the Project Area sanitary and safe in accordance with applicable laws and the health hazards plan, and to address all biological and physical hazards present. Necessary training of personnel, on-site and off-site preparations, and safety equipment shall be provided by the Design-Builder to complete the initial cleanup and disposal of the biological and physical hazards.

Public Notification

The Design-Builder shall furnish and install informational signs approved by WSDOT 3 Calendar Days prior to performing hazardous activities within the Project Area known to be occupied by transients. Hazardous activities include, but are not limited to, cleaning, clearing brush, overhead activities, excavating, or operating other heavy equipment. The

Design-Builder shall conduct a visual reconnaissance of the area at least 72 hours in advance to determine the type of cleanup and removal effort needed. The signs shall include dates and locations of the activity and state that trespassing is not authorized. The signs shall be visible from each apparent access route into the Work area. Each sign shall be weather-resistant and post-mounted; be written in both English and Spanish; state "No Trespassing"; and include the dates and location of the Work. Signs shall be maintained in legible condition until the hazardous Work at the Work area is physically completed, at which time the signs shall be removed from the Project.

The Design-Builder shall provide notification to homeless service organizations, homeless advocacy groups, shelters, and free health clinics. WSDOT will provide contact information and flyer templates for the Design-Builder's use. The Design-Builder's flyer shall contain the information included in the flyer templates. The Design-Builder shall submit the flyer and general plans to WSDOT for Review and Comment at least 14 Calendar Days prior to commencing the hazardous activities.

The Design-Builder shall distribute the approved flyers by mail or hand delivery 7 Calendar Days prior to commencing activities within areas known to be occupied by transients.

Periodic Site Maintenance

If the Project Area becomes unsanitary or unsafe due to biological and physical hazards after the Design-Builder prepares the site for the first phase of construction activities, the Design-Builder shall perform additional site maintenance and take additional measures as needed to protect the public and WSDOT's and the Design-Builder's personnel. The nature and frequency of the site maintenance activities shall be included in the health hazards plan. Periodic maintenance of the Project Area may include the use of signs, fencing, lighting, law enforcement, or security.

2.29.4 MAINTENANCE OF ROADWAYS

2.29.4.1 GENERAL

The Design-Builder shall complete all components of the Work to allow for unrestricted traffic access to lanes and shoulders in accordance with Section 2.22.

2.29.4.2 ROADWAY SWEEPING

The Design-Builder shall take care to prevent spillage on haul routes. If spillage occurs, the Design-Builder shall remove it and clean the area within 1 hour of the spillage being observed or verbal notification from WSDOT. Tracking of dirt and gravel from the Work zone is prohibited. The Work shall be performed in accordance with the Fugitive Dust Control Plan described in Section 2.8.

2.29.4.3 INTENTIONALLY OMITTED

2.29.4.4 INTENTIONALLY OMITTED

2.29.4.5 TRAFFIC CONTROL DEVICES

The Design-Builder shall be responsible for maintaining active travel lanes free from traffic control devices such as traffic barrels, cones, and other devices.

All traffic control devices shall be placed behind barrier or guardrail away from traffic when not in use. In areas where traffic control devices cannot be placed behind barrier or guardrail, the devices may be placed on the shoulder of the roadway when the shoulder width is 5 feet or greater. When the shoulder width is less than 5 feet, the devices shall be placed off the paved shoulder and a minimum of 8 feet from the traveled lanes. The Design-Builder shall locate traffic control devices so as not to block existing sidewalks and provide adequate space for wheelchairs.

2.29.4.6 GUARDRAIL, CONCRETE BARRIER, AND ATTENUATORS

The Design-Builder shall replace or repair any guardrail, concrete barrier, and attenuators that become damaged by the Design-Builder's operations. Attenuators that are damaged and must be replaced shall meet current National Cooperative Highway Research Program and WSDOT standards. Any parts used to repair a damaged attenuator shall be direct replacement parts as required by the manufacturer. Payment for any damaged guardrail, concrete barrier, or attenuators qualifying for relief under Section 1-07 of the General Provisions, shall be in accordance with Section 1-09 of the General Provisions, except for temporary devices installed by the Design-Builder.

2.29.4.7 TRAFFIC SYSTEM SIGNS

Payment for repairing permanent signs qualifying for relief under Section 1-07 of the General Provisions shall be in accordance with Section 1-09 of the General Provisions. Repair of damage caused by the Design-Builder's operations shall be at the Design-Builder's expense.

2.29.4.8 INTENTIONALLY OMITTED

2.29.4.9 ACCESS TO PUBLIC FACILITIES

The Design-Builder shall maintain uninterrupted access to all public facilities affected by the Project. Access shall mean providing a clear and easily understood route into and out of existing public and private facilities and businesses. The Design-Builder shall provide all necessary signing to convey that the route to the facilities and businesses is open to traffic. WSDOT will determine whether the signing is adequate. The Design-Builder shall provide access for all types of vehicles, including delivery trucks.

2.29.4.10 PROTECTION OF DRAINAGE STRUCTURES AND ELECTRICAL BOXES

The Design-Builder shall verify that all new electrical boxes located within 2 feet of temporary or permanent travel lanes have sufficient strength to safely carry highway traffic loads without failing. If any of these boxes have insufficient strength, they shall be reinforced and/or protected prior to opening the travel lanes to traffic.

2.29.5 SNOW AND ICE OPERATIONS

2.29.5.1 PUBLIC TRAVEL WAY

WSDOT will perform snowplowing and application of deicer or abrasives for public travel lanes. The snowplowing will be done as part of the normal course of plowing the public roadways within and in the vicinity of the Project. WSDOT will not remove snow and/or ice from the public travel lanes to facilitate the Work or construction.

When plowing within the Project limits, WSDOT will take no special measures to protect materials, traffic control devices, or equipment the Design-Builder has stored or stockpiled on shoulders or within the Project limits. The Design-Builder shall maintain any channelization devices that may be displaced or damaged by snowplowing operations and application of de-icer or abrasives.

WSDOT will not remove snow, ice, abrasives, or other debris, such as car parts and tire chains, that are plowed or migrate from the public traffic lanes or shoulders into the Work area. Any removal of this material within the Project limits shall be at the Design-Builder's expense.

2.29.5.2 WORK ZONE

The Design-Builder shall perform any snow and ice removal for the Design-Builder's operations within the Work area. The Design-Builder shall not allow any snow and ice removal from its operations to be placed within the public traffic lanes.

2.29.6 ELECTRICAL

2.29.6.1 INTENTIONALLY OMITTED

2.29.6.2 INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

All ITS equipment within the Project limits shall be maintained by the Design-Builder. Refer to Section 2.18 for ITS requirements.

2.29.6.3 LUMINAIRES

Payment for repairing damaged permanent luminaires qualifying for relief under Section 1-07 of the General Provisions shall be in accordance with Section 1-09 of the General Provisions.

2.29.7 HAZARDOUS SPILLS RESPONSE

2.29.7.1 PUBLIC TRAVEL WAY

Cleanup of hazardous spills within the public traffic lanes and shoulders will be the responsibility of WSDOT and the Washington State Department of Ecology. The Design-Builder shall allow access to the Project Area for spill response. The Design-Builder shall make personnel and equipment available to respond to all emergencies, except when such emergencies are life threatening to the personnel.

In the event the hazardous spill is caused by the Design-Builder's equipment, operations, or Work, the Design-Builder shall be responsible for costs incurred by WSDOT, the Washington State Department of Ecology, and other resource agencies and/or contractors required to mitigate the hazard.

2.29.7.2 WORK ZONE

Any hazardous spills within the Work area and outside of the public travel lanes shall be the responsibility of the Design-Builder. The Work shall be performed in accordance with the Spill Prevention, Control, and Countermeasures Plan described in Section 2.8.

2.29.8 STRUCTURES

2.29.8.1 EXISTING BRIDGES

The Design-Builder shall maintain drainage structures on and off the bridges within the Project. Free draining of water through any drainage structure shall be maintained.

2.29.9 EMERGENCY RESPONSE

2.29.9.1 COOPERATION

The Design-Builder shall cooperate with law enforcement and other emergency response agencies in response to accidents, fires, spills, or other emergencies in any area affected by the Project, including the Project Area and public traffic lanes. The Design-Builder shall cooperate in all WSDOT investigations of accidents and other incidents within the Project Area. Refer to Section 2.9 for additional public information requirements regarding emergency response.

2.29.9.2 EMERGENCY ACCESS

The Design-Builder shall work with emergency service providers to address their concerns about emergency access to and through the Project Area. This may include installing gates to allow emergency personnel to access the Project Area. Refer to Section 2.22 for additional Maintenance of Traffic requirements.

2.29.9.3 NOTIFICATION

The Design-Builder shall notify WSDOT, the Washington State Patrol, and all emergency service providers in the affected area in writing of any access closures at the construction site. Notification shall include the names, pager numbers, telephone numbers (business, residence, and cellular) of Project personnel to contact in case of emergencies. This contact list shall be updated as necessary. Refer to Section 2.9 for additional public information requirements.

2.29.9.4 USE OF DESIGN-BUILDER RESOURCES

The Design-Builder shall make personnel and equipment available to respond to all emergencies, except when the emergency is life-threatening to the personnel. Refer to Section 2.22 for additional Maintenance of Traffic requirements.

2.29.10 MAINTENANCE OF PROPERTY

2.29.10.1 GENERAL

The Design-Builder shall preserve public and private property at all times in accordance with Section 1-07 of the General Provisions.

The Design-Builder shall witness or reference land monument and property marker locations by a Land Surveyor licensed in the State of Washington, before moving, disturbing, or damaging any property. Refer to Section 2.5 for additional requirements regarding monumentation and surveying.

2.29.10.2 RESTORATION OF PROPERTY AND LANDSCAPE

The Design-Builder shall restore, at its own cost, property and landscaping that is damaged in the course of construction, to a condition similar, equal, or better to that existing prior to the occurrence of damage by repairing, replacing in kind, rebuilding, replanting, or compensating the property owner.

2.29.10.3 TEMPORARY FENCING

The Design-Builder shall be required to furnish and install temporary chain-link security fencing in order to contain animals and people, prior to removal of any existing sound barrier or Right-of-Way fencing within the Project limits.

2.29.11 INTENTIONALLY OMITTED

2.29.12 INTENTIONALLY OMITTED

End of Section