# SR 520 Evergreen Point Floating Bridge and Landings Project

# Request for Proposal

**December 6, 2010**

# Chapter 2: Technical Requirements

Final Conformed Document

(Through Addendum #28)

# Contents

2.1 General Information ..... 1
2.1.1 General ..... 1
2.1.3 Meetings and Coordination ..... 4
2.1.4 Software ..... 8
2.1.5 Service Agreements ..... 8
2.2 Project Documentation ..... 10
2.2.1 General ..... 10
2.2.2 Mandatory Standards ..... 10
2.2.3 Performance requirements ..... 10
2.2.4 Submittals ..... 19
2.3 Risk Management ..... 21
2.3.1 General ..... 21
2.3.2 Performance Requirements ..... 21
2.3.3 Risk Manager ..... 21
2.3.4 Risk Management Plan ..... 22
2.3.5 Project Risk Register ..... 23
2.3.6 Submittals ..... 25
2.4 Intentionally Omitted ..... 26
2.5 Surveys and Mapping ..... 27
2.5.1 General ..... 27
2.5.2 Performance Requirements ..... 28
2.5.3 Design Requirements ..... 29
2.5.4 Construction Requirements ..... 29
2.5.5 Submittals ..... 31
2.6 Geotechnical Design ..... 33
2.6.1 General ..... 33
2.6.2 Mandatory Standards ..... 33
2.6.3 Performance Requirements ..... 35
2.6.4 Design Criteria ..... 39
2.6.5 Construction Criteria ..... 43
2.6.6 Submittals ..... 48
2.7 Pavement ..... 50
2.7.1 General ..... 50
2.7.2 Mandatory Standards ..... 50

2.7.3 Performance Requirements ..... 51
2.7.4 Design Requirements ..... 53
2.7.5 Construction Requirements ..... 55
2.7.6 Submittals ..... 58
2.8 Environmental ..... 60
2.8.1 General ..... 60
2.8.2 Mandatory Standards ..... 61
2.8.3 Performance Requirements ..... 63
2.8.4 Design and Construction Requirements (Environmental Commitments) ..... 80
2.8.5 Submittals ..... 92
2.9 Public Information ..... 94
2.9.1 General ..... 94
2.9.2 Mandatory Standards ..... 95
2.9.3 Roles and Responsibilities ..... 95
2.9.4 Performance Requirements ..... 100
2.9.5 Design-Builder Public Information Specifications ..... 104
2.9.6 Methods and Tools for Dissemination of Information ..... 109
2.9.7 Document Control ..... 113
2.9.8 Submittals ..... 113
2.10 Utilities and Relocation Agreements ..... 115
2.10.1 General ..... 115
2.10.2 Mandatory Standards ..... 116
2.10.3 Performance Requirements ..... 117
2.10.4 Relocation Agreements, Franchises and Permits ..... 118
2.10.5 Identification of Utilities ..... 121
2.10.6 Scheduling, Coordination and Correspondence ..... 123
2.10.7 Design Requirements ..... 125
2.10.8 Construction Requirements ..... 126
2.11 Roadway Design ..... 131
2.11.1 General ..... 131
2.11.2 Mandatory Standards ..... 131
2.11.3 Intentionally Omitted ..... 132
2.11.4 Design Requirements ..... 132
2.11.5 Construction Requirements ..... 135
2.11.6 Submittals ..... 135

2.12 Floating Bridge ..... 137
2.12.1 General ..... 137
2.12.2 Mandatory Standards ..... 139
2.12.3 Performance Requirements ..... 142
2.12.4 Design Criteria ..... 144
2.12.5 Construction Criteria ..... 179
2.12.6 Submittals ..... 224
2.13 Bridges and Structures ..... 237
2.13.1 General ..... 237
2.13.2 Mandatory Standards ..... 238
2.13.3 Performance Requirements ..... 240
2.13.4 Design Criteria ..... 241
2.13.5 Construction Criteria ..... 257
2.13.6 Submittals ..... 258
2.14 Stormwater Management ..... 262
2.14.1 General ..... 262
2.14.2 Mandatory Standards ..... 262
2.14.3 Performance Requirements ..... 264
2.14.4 Design Requirements ..... 267
2.14.5 Submittals ..... 280
2.15 Landscape and Aesthetics Design ..... 284
2.15.1 General ..... 284
2.15.2 Mandatory Standards ..... 284
2.15.3 Performance Requirements ..... 285
2.15.4 Design Criteria ..... 287
2.15.5 General ..... 287
2.15.6 Construction Criteria ..... 297
2.15.7 Submittals ..... 300
2.16 Illumination and Roadway Electrical systems ..... 303
2.16.1 General ..... 303
2.16.2 Mandatory Standards ..... 305
2.16.3 Performance Requirements ..... 307
2.16.4 Design Requirements ..... 315
2.16.5 Construction Requirements ..... 332
2.16.6 Submittals ..... 336

2.17 Electrical Bridge and Services ..... 340
2.17.1 General ..... 340
2.17.2 Mandatory Standards ..... 341
2.17.3 Summary of Work ..... 342
2.17.4 Performance Requirements ..... 345
2.17.5 Submittals ..... 350
2.17.6 Training ..... 354
2.17.7 Special Project Conditions ..... 355
2.17.8 Field Measuring ..... 361
2.17.9 Design calculations ..... 362
2.17.10 Start Up and Commissioning ..... 362
2.17.11 Warranty ..... 369
2.17.12 Cathodic Protection and Stray Current Mitigation ..... 371
2.17.13 Stray Current Monitoring ..... 382
2.17.14 Grounding and Bonding ..... 382
2.17.15 Electrical Incoming Service, Generator, and Automatic Transfer Switch Equipment ..... 385
2.17.16 Bridge Power Distribution Equipment ..... 393
2.17.17 Wire and Cable ..... 396
2.17.18 Raceway ..... 400
2.17.19 Junction Boxes, Pull Boxes and Cabinets ..... 405
2.17.20 Hardware and Supports ..... 406
2.17.21 Lights, Switches, and Receptacles ..... 407
2.17.22 Jib Hoist ..... 411
2.17.23 Bridge Control System ..... 413
2.17.24 Navigation and Pontoon Lighting ..... 435
2.17.25 Security Closed Circuit Television ..... 436
2.17.26 Electrical Demolition ..... 440
2.17.27 Emergency Response System for Stranded Boaters ..... 442
2.18 Intelligent Transportation Systems (ITS) ..... 443
2.18.1 General ..... 443
2.18.2 Mandatory Standards ..... 446
2.18.3 Performance Requirements ..... 448
2.18.4 Design Requirements ..... 466
2.18.5 Construction Requirements ..... 490

2.18.6 Submittals ..... 499
2.19 Signing ..... 503
2.19.1 General ..... 503
2.19.2 Mandatory Standards ..... 503
2.19.3 Performance Requirements ..... 505
2.19.4 Design Requirements ..... 506
2.19.5 Construction Requirements ..... 509
2.19.6 Submittals ..... 510
2.20 Pavement Marking ..... 514
2.20.1 General ..... 514
2.20.2 Mandatory Standards ..... 514
2.20.3 Performance Requirements ..... 515
2.20.4 Design and Constructon Requirements ..... 516
2.20.5 Submittals ..... 519
2.21 Lake WashinGton Marine Transportation ..... 520
2.21.1 General ..... 520
2.21.2 Performance Requirements ..... 521
2.21.3 Design and Construction Requirements ..... 522
2.21.4 Submittals ..... 527
2.22 Maintenance of Traffic (MOT) ..... 529
2.22.1 General ..... 529
2.22.2 Mandatory Standards ..... 529
2.22.3 Performance Requirements ..... 532
2.22.4 Design and Construction Requirements ..... 537
2.22.5 Submittals ..... 574
2.23 All Electronic Tolling Infrastructure ..... 576
2.23.1 General ..... 576
2.23.2 Mandatory Standards ..... 577
2.23.3 Performance Requirements ..... 578
2.23.4 Design Requirements ..... 586
2.23.5 Construction Requirements ..... 594
2.23.6 Submittals ..... 595
2.24 Right-of-Way (ROW) ..... 600
2.24.1 Available Right-of-Way and Easement Areas ..... 600
2.24.2 Acquisition of Additional Rights-of-Way and Easements ..... 600

2.24.3 Construction Permits and Rights of Entry ..... 601
2.24.4 Temporary Easements ..... 602
2.24.5 Construction Commitments ..... 602
2.24.6 Acquisition Subject to Existing Easements ..... 603
2.24.7 Submittals ..... 603
2.24.8 Illegal Encampments Within State Right-of-Way ..... 603
2.25 Control of Materials ..... 604
2.25.1 General ..... 604
2.25.2 Mandatory Standards ..... 604
2.25.3 Buy America ..... 604
2.25.4 Materials Approval ..... 605
2.25.5 Acceptance of Materials ..... 607
2.25.6 Handling and Storing Materials ..... 612
2.25.7 Portland Cement Concrete Mix Design and Batch Plant ..... 612
2.25.8 Hot Mix Asphalt (HMA) Mix Design and Asphalt Concrete Plant ..... 613
2.25.9 State Inspected and Tested Items ..... 613
2.25.10 Submittals ..... 615
2.25.11 Statistical Evaluation of Materials for Acceptance ..... 616
2.25.12 Materials Tables ..... 621
2.26 Removal of Existing Floating Bridge ..... 641
2.26.1 General ..... 641
2.26.2 Mandatory Standards ..... 641
2.26.3 Performance Requirements ..... 642
2.26.4 Construction Criteria ..... 643
2.26.5 Submittals ..... 645
2.27 Moorage and Towing ..... 648
2.27.1 General ..... 648
2.27.2 Mandatory Standards ..... 650
2.27.3 Performance Requirements ..... 651
2.27.4 Pontoon Transfer ..... 652
2.27.5 Design Criteria ..... 656
2.27.6 Construction Criteria ..... 658
2.27.7 Submittals ..... 659
2.28 Quality Management Plan (QMP) Requirements ..... 665
2.28.1 General ..... 665

2.28.2 Design-Builder Quality Assurance (QA) and Quality Control (QC) Staff ... 672
2.28.3 Design Quality Assurance (QA) and Quality Control (QC) Requirements of the Quality Management Plan (QMP) ... 676
2.28.4 Materials Quality Assurance (QA) and Quality Control (QC) Plan Requirements ... 682
2.28.5 Construction Quality Assurance (QA) and Quality Control (QC) Plan Requirements ... 686
2.28.6 Submittals ... 698
2.29 Maintenance During Construction ... 700
2.29.1 General ... 700
2.29.2 Mandatory Standards ... 701
2.29.3 Maintenance of the Project Sites ... 701
2.29.4 Maintenance of Roadways and Facilities ... 705
2.29.5 Snow and Ice Operations ... 709
2.29.6 Electrical and Mechanical ... 710
2.29.7 Hazardous Spills Response ... 710
2.29.8 Structures ... 711
2.29.9 Floating Bridge ... 711
2.29.10 Emergency Response ... 711
2.29.11 Maintenance of Property ... 712
2.29.12 Maintenance of Aesthetic Treatment ... 713
2.29.13 Submittals ... 713
2.30 Bridge Maintenance Facility and Dock ... 714
2.30.1 General ... 714
2.30.2 Mandatory Standards ... 715
2.30.3 Performance Requirements ... 719
2.30.4 Design Requirements ... 723
2.30.5 Construction Criteria ... 799
2.30.6 Operations and Maintenance Manuals, Training, Commissioning and Warranties ... 800
2.30.7 Submittals ... 809
2.31 Temporary Transit Facility Demolition and Pavement Restoration ... 817
2.31.1 General ... 817
2.31.2 Mandatory Standards ... 817
2.31.3 Performance Requirements ... 818
2.31.4 Construction Requirements ... 818

2.31.5 Demolition Submittals ....819
2.32 Mechanical Bridge and Services ....820
2.32.1 General ....820
2.32.2 Mandatory Standards ....820
2.32.3 Performance Requirements ....822
2.32.4 Design Requirements – General ....825
2.32.5 Material Specifications and System Requirements ....841
2.32.6 System Configuration ....860
2.32.7 Construction Requirements ....868
2.32.8 Submittals ....869
2.33 Pontoon Casting Facilities ....874
2.33.1 General ....874
2.33.2 Mandatory Standards ....874
2.33.3 PCF Site Availability ....877
2.33.4 Performance Requirements ....879
2.33.5 Design Criteria ....885
2.33.6 Submittals ....887
2.34 Commissioning ....892
2.34.1 General ....892
2.34.2 Guidelines ....894
2.34.3 Performance Requirements ....894
2.34.4 Comissioning Team and Coordination ....896
2.34.5 Systems to be Commissioned ....899
2.34.6 Commissioning Process ....899
2.34.7 Commissioning Documentation/Checklists ....902
2.34.8 Submittals ....903
2.35 Bridge Fire Protection ....905
2.35.1 General ....905
2.35.2 Mandatory Standards ....905
2.35.3 Performance Requirements ....906
2.35.4 Design Requirements – General ....908
2.35.5 Material Specifications and System Requirements ....910
2.35.6 System Configuration ....914
2.35.7 Construction Requirements ....917
2.35.8 Submittals ....918

2.36 Final Cleanup ..... 923
2.36.1 General ..... 923

# 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 consistent with project and community commitments identified elsewhere in the Contract.

**Other Agencies** – WSDOT reviewed the Project with public and private agencies and incorporated some of the feedback from those agencies into these Technical Requirements and Appendices. WSDOT does not guarantee that the agencies will not impose additional requirements after completion of their review of the Design-Builder's design, or that additional feedback from the agencies will not be incorporated. The Design-Builder shall coordinate all contacts with King County, Grays Harbor County, and the cities of Medina, Seattle, Aberdeen, and Bellevue through the WSDOT Engineer unless otherwise specified in the Contract.

The Design-Builder shall promptly notify WSDOT of any additional agency requirements. 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. The Design-Builder is responsible for Quality Control and Quality Assurance of all its Work, including but not limited to: design, construction, environmental compliance, maintenance of traffic, public involvement, Utilities and control of materials. The Design-Builder shall outline these processes in the Quality Management Plan (Section 2.28).

### 2.1.1.2 UNITS OF MEASUREMENT

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

### 2.1.1.3 PURPOSE

This project is one of many projects within the SR 520 program that will relieve congestion by improving transit and HOV operations. The improved operation will benefit the public by improving transit reliability and benefit safety by reducing vehicle collisions.

### 2.1.1.4 PROJECT DESCRIPTION

The Project requires design and construction of improvements on SR 520 from MP 1.97 to MP 4.65, including the following major elements:

- A new six-lane bridge, with HOV lanes, bicycle/pedestrian facilities, and the ability to accommodate future light rail.

- A floating bridge structure with a fixed East Approach and transition structures on the east and west ends between the fixed structures and floating bridge.
- Use of 33 Pontoons Furnished by the State (PFS).
- Pontoons Provided by the Design-Builder (PPDB), anchors and anchor cables.
- Maintenance of moorage and towing of all PFS.
- Maintenance of moorage and towing of PPDB to Lake Washington.
- Floating bridge assembly, including assembly of the Pontoon substructure and installation of the superstructure and roadway deck.
- Final roadway connections between the East Approach and the new roadway section that will be constructed as part of the SR 520 Eastside Transit and HOV Project in the Evergreen Point Road vicinity.
- Removal of temporary platform extensions at transit station at Evergreen Point Road lid.
- New Bridge Maintenance Facility, dock and access located beneath the East Approach structure.
- Removal of existing floating bridge, East Approach and West Approach structures, and existing infrastructure associated with the east roadway connection.
- Removal of Structures and Obstructions as shown in the Conceptual Plans and as otherwise necessary for the completion of the Work
- Stormwater Treatment Facilities.
- Pedestrian path and pedestrian path overlook located south and west of the Evergreen Point Road lid.

WSDOT is preparing an Environmental Impact Statement for the Project in compliance with the State Environmental Policy Act (SEPA) and the National Environmental Policy Act (NEPA). WSDOT is engaged in early coordination with all federal, State, tribal, regional, and local agencies that have permitting authority, special expertise or interest in transportation projects.

### 2.1.1.5 PROJECT LAKE LEVEL

The Project Lake Level for Lake Washington shall be Elevation 18.72, North American Vertical Datum of 1988 (NAVD 88). This is equivalent to Elevation 22.00 in the Corps of Engineers Datum. This is the maximum high (summer) lake level as established by Congress on June 25, 1910 and as regulated by the Corps of Engineers.

### 2.1.1.6 PROJECT GOALS

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

### 2.1.1.7 COORDINATION WITH OTHER PROJECTS

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

- SR 520 Eastside Transit and HOV Project
- SR 520 I-5 to Medina – West Approach Bridge (currently unfunded)
- SR 520 I-5 to Medina (SR 520 West Connection Bridge and Shared Use Path)
- SR 520 Pontoon Construction Design-Build Project
- SR 520/I-90 Lake Washington Congestion Management Sign Bridges Project
- SR 520 Toll Collection System Project
- SR 520 Evergreen Point Floating Bridge Toll Signing Project
- I-90 & SR 520 BR 90/50N & SR 520/I-405 Vicinity Seismic Retrofit
- I-90 – Two-Way Transit and HOV Operations
- I-405 NE 8th St. to SR 520 Braided Ramps – Interchange Improvements
- I-405 – SR 520 to I-5 Widening Project
- I-405/Wilburton Pedestrian Bridge
- I-405/NE 116th St Interchange and Street Improvement
- I-405/NE 6th St to I-5 Widening and Express Toll Lanes
- Sound Transit University Link at Husky Stadium Light Rail Project
- I-5/Spokane Street Interchange Vicinity – Special Bridge Repair
- I-5/Express Lane Automation
- I-5/Downtown Seattle Area Sign Structure Replacement
- I-5 Puyallup River Bridge to King County Line (Paving)
- I-5 M St to Portland Ave (NB Widening and Bridge)
- I-5 Portland Ave to Port of Tacoma Rd (NB HOV)
- I-5 Portland Ave to Port of Tacoma Rd (SB HOV)
- I-5 SR16/EB Nalley Valley (HOV)
- I-5 SR16 Interchange (Rebuild Interchange)
- I-5 Lynnwood Braided Ramps Project
- USACE, Ballard Locks, Bearing Replacement of the Main Gates
- USACE, Ballard Locks, Stoney Gate Valve Conversion
- Other projects in the vicinity

# 2.1.3 MEETINGS AND COORDINATION

## 2.1.3.1 MEETINGS AND COORDINATION

### 2.1.3.1.1 All Meetings

The Design-Builder shall be responsible for scheduling all meetings, developing all meeting agendas and providing all meeting facilities. Meeting schedules and agendas shall be sent to invitees at least 24 hours 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.

### 2.1.3.1.2 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. If the Design-Builder chooses to hold task force meetings for other disciplines, WSDOT will be available on a weekly basis to attend them.

### 2.1.3.1.3 Pre-Contract Meeting

As soon as practical, but not more than 30 Calendar Days after NTP 1, 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). Additional topics relevant to the design phase, as identified by the Design-Builder, shall also be discussed at this meeting.

### 2.1.3.1.4 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.

### 2.1.3.1.5 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.

The Design-Builder shall accept sole responsibility for the environmental performance of all Subcontractors on the Project. The Design-Builder remains the sole responsible party

for all environmental compliance and commitments and is responsible for the compliance of its subconsultants and Subcontractors.

### 2.1.3.2 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 parking for 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. The Design-Builder shall co-locate its staff with WSDOT into a main Project office and satellite offices, as necessary.

#### 2.1.3.2.1 Main Project Office

The Design-Builder shall provide an office with space for WSDOT. Each work space shall be wired for one personal computer (unless otherwise specified) on the WSDOT network and wired for one telephone. The Design-Builder shall provide the following office and storage spaces for WSDOT:

- Thirteen full-time, reasonably soundproof closed-door work spaces, at least 120 square feet each;
- Thirty full-time work spaces, at least 64 square feet each;
- One network room meeting the requirements of this section;
- Sixty parking spaces, at least ten spaces for full-sized vehicles/trucks, or if the office is located in downtown Seattle or downtown Bellevue, access to paid parking garage or lot for co-located WSDOT staff at no charge; and
- Sufficient storage capacity for hard copy files; at a minimum, ten 8.5-inch by 11-inch four-drawer locking file cabinets and five 11-inch by 17-inch locking file cabinets.

#### 2.1.3.2.2 WSDOT Main Project Office Facilities – Materials Testing Trailer

The Design-Builder shall also provide sufficient space for the WSDOT materials testing trailer and four parking spaces sized to accommodate three full-sized trucks and a materials testing van, enclosed by fencing. The parking space shall be parallel and adjacent to the trailer, on the same side as the access doors. The Design-Builder shall provide a water connection, a sewer or bladder system connection to the sink drain and a connection to 200 amp electrical service. Drawings and specifications of the WSDOT materials testing trailer are included in the Material Trailer Drawings and Specifications (Appendix R8).

The Materials Testing Trailer does not have to be located adjacent to the main Project office.

#### 2.1.3.2.3 WSDOT Facilities - Satellite

The Design-Builder shall provide an office with space for WSDOT near each Pontoon Casting Facility. Each work space shall be wired for one personal computer (unless

otherwise specified) on the WSDOT network and wired for one telephone. The Design-Builder shall provide the following office and storage spaces for WSDOT:

- Two full-time, reasonably soundproof closed-door work spaces, at least 120 square feet each;
- Ten full-time work spaces, at least 64 square feet each;
- One network room meeting the requirements of this section;
- Twenty parking spaces, at least ten spaces for full-sized vehicle/trucks; and
- Sufficient storage capacity for hard copy files; at a minimum, ten 8.5-inch by 11-inch four-drawer locking file cabinets and five 11-inch by 17-inch locking file cabinets.

The Design-Builder shall also provide sufficient space for the WSDOT materials testing trailer and one parking space for the materials testing van. The parking space shall be parallel and adjacent to the trailer, on the same side as the access doors. The Design-Builder shall provide a water connection, a sewer or bladder system connection to the sink drain and a connection to 200 amp electrical service. Drawings and specifications of the WSDOT materials testing trailer are included in the Material Trailer Drawings and Specifications (Appendix R8).

#### 2.1.3.2.4 General Requirements

In addition to the requirements described above, the main Project and satellite offices for WSDOT that are provided by the Design-Builder shall include the following:

- The main Project office shall meet all local building code requirements, with safe and easy access to transit during all business hours. WSDOT places great value on Commute Trip Reduction and encourages employees to take transit, and other alternate modes of transportation to reduce single occupancy vehicle trips.
- Well-lit (both natural and artificial), ergonomic work spaces with one desk, one desk chair and one guest chair, two-drawer locking filing cabinet, and bookcase in each work space.
- Multifunction color copier/printer, color scanner and fax all-in-one equipment that can accommodate letter, legal and tabloid paper size and telephone lines to support each, and a plotter, all in good working order. Equipment maintenance shall be provided as needed.
- One touch-tone speaker telephone with a status indicator for each work space 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. Caller ID desirable. WSDOT will pay all long-distance charges for WSDOT phones after installation.
- Meeting facilities for all Project-related meetings. Access to video conference equipment. 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 two miles of the Project limits. The alternate location will not be required to be wired for the WSDOT network.

- At least two exits from each building or trailer, equipped with emergency access. A secure door lock plus a deadbolt lock on each entrance. Elevators if more than two levels.
- Sufficient men's and women's restroom facilities to accommodate the number of people utilizing office space. The restrooms shall be indoor with hot and cold running water. Portable facilities will not be acceptable.
- A kitchen equipped with a sink with hot and cold running water, refrigerator, microwave, and water cooler/filter. Breakroom space desirable.
- Trash and paper recycle containers
- Daily janitorial service (except holidays) including furnishing of toilet paper, paper towels and/or hand dryer, soap and other restroom supplies along with trash and paper recycle pickup.
- Well lit, well maintained exterior office areas, including safe and secure 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 offices, which shall include a minimum circuit capacity of 20 amperes and at least two duplex receptacles for each office space.
- Heating, ventilation, air conditioning and cooling systems which can maintain temperatures between 65 and 75 degrees Fahrenheit in all spaces, including the network room, throughout the year.
- Emergency equipment including first aid kits, earthquake survival kits, and defibrillators.
- Access requirements that meet the Americans with Disabilities Act.

The Design-Builder shall maintain all main Project office space from 60 Calendar Days after NTP 1 until at least 90 Calendar Days after Physical Completion of the Project unless otherwise agreed to by WSDOT in writing. The Design-Builder shall coordinate with WSDOT when to make satellite office space available. Satellite office space shall be maintained through construction at the associated PCF.

Except for the main Project and satellite construction offices, 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 office 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.

#### 2.1.3.2.5 Location

The Design-Builder's main Project office shall be located within a five-mile radius of the SR 520 Floating Bridge and Landings Project limits. A location in a commercial or business district with easy access to the freeway or multiple alternative surface routes not impacted by ongoing major construction is preferred.

The materials testing trailer at the Floating Bridge and Landings project site shall be located within a one-mile radius of the SR 520 Floating Bridge and Landings Project limits.

Satellite offices shall be located within two miles of Pontoon Casting Facilities.

#### 2.1.3.2.6 Information Technology

##### 2.1.3.2.6.1 Personal Computer Workstations

WSDOT will furnish and install, for its exclusive use, personal computer workstations and network printers in the work spaces described above. WSDOT will connect these devices, with its own 12-foot patch cords, to wall plates furnished by the Design-Builder. Equipment and infrastructure provided by the Design-Builder shall not interfere with WSDOT's network. Network devices provided by the Design-Builder shall be on a different subnet than WSDOT's and shall not connect to WSDOT's hub or other devices.

##### 2.1.3.2.6.2 Network Communications

The Design-Builder shall ensure that the main office space for WSDOT will have access to Qwest's Metro Optical Ethernet (QMOE) data services equal to or faster than 50 Mbps and can be wired for QMOE data services designated for the exclusive use of WSDOT. The Design-Builder shall ensure that the satellite office space(s) for WSDOT will have access to local Telco data services equal to or faster than 1.54 Mbps and can be wired for Telco data services designated for the exclusive use of WSDOT. The Telco demarcation shall be extended into the wiring closet for the satellite office space(s). WSDOT will arrange for the installation and will pay for the connection charges at each location. In addition, the Design-Builder shall provide 1000 BASE-T (Category 6) Ethernet wiring from each WSDOT closed-door office and work space to the wiring closet at each location. The wall plates shall be located to permit the use of the 12-foot patch cords provided by WSDOT. In addition to the 12-foot patch cords, WSDOT will provide its own hub, router, and DSU/CSU to connect its computers to the Internet. The Design-Builder may, at its own expense, provide additional infrastructure for its own use, provided that the additional infrastructure does not interfere with WSDOT's use.

## 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 NTP 1 unless otherwise specified in this section.

**Updates –** The Design-Builder shall update and upgrade software programs throughout the Contract within six months of WSDOT upgrading to a newer release.

**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.

## 2.1.5 SERVICE AGREEMENTS

A Service Agreement is entered into whenever WSDOT requires a utility service (such as water, power, or sewer). Service Agreements may or may not have an associated cost. (Refer to Chapter 2 of the WSDOT *Utilities Manual* located in Appendix D21.)

The Design-Builder shall pay all costs charged by the utility companies for the Service Agreements and for the utility companies' costs associated with upgrading facilities to meet the requirements of the Service Agreements. WSDOT will pay the monthly utility

bills, starting on the day Work begins, for the existing services and for the services installed under the Project until Final Acceptance.

The Design-Builder shall submit all requests for new or modifications to existing electrical, water, telecommunications, and sanitary sewer services to WSDOT for processing. WSDOT will process requests for new or modified service agreements in accordance with Chapter 4 of the WSDOT Utilities Manual. For the purposes of this RFP, where Chapter 4 refers to the "assigned WSDOT office," that means the Design-Builder, and where Chapter 4 refers to the "Regional Utilities Office," that means the SR 520 Utilities Engineer.

A Service Agreement Request Checklist is provided in Appendix I16.

The Design-Builder shall submit the Service Agreement Request a minimum of 120 Calendar Days in advance of when the utility connection 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 Request are required by the Design-Builder, the Design-Builder shall pay all costs associated with the Service Agreement Request revisions. A new 120 Calendar Day advance notice period shall begin when the revision to the Service Agreement Request is accepted and determined complete by WSDOT. A utility connection may take longer to establish than the Service Agreement execution, depending on the workload of the utility company. WSDOT is not responsible for any delays incurred by the Design-Builder as a result of the utility company's actions.

The Design-Builder shall be responsible for construction of portions of utility service infrastructure for new and modified services in accordance with executed service agreements. The Design-Builder shall also be responsible for coordination with utility companies to connect new and modified services and any associated disconnections.

King County Metro Transit enters into service agreements for utility services at transit centers, and utilities will provide services to the lids by agreements with local agencies. The Design-Builder shall coordinate with these entities to request new or modified agreements for the services at transit centers or on the lids for other than WSDOT-owned facilities.

End of Section

# 2.2 PROJECT DOCUMENTATION

## 2.2.1 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. 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. The Design-Builder shall make all Project documentation available to WSDOT for reference and review in accordance with Sections 2.25 (Control of Materials) and 2.28 (Quality Management Plan) and these Technical Requirements.

## 2.2.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D18).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Bridge Design Manual* (M23-50.04) (BDM) (Appendix D1).
- WSDOT *Highway Runoff Manual* (M31-16) (Appendix D6).
- WSDOT *Hydraulics Manual* (M23-03) (Appendix D7).
- WSDOT *Environmental Procedures Manual* (M31-11), October 2010 (Appendix D4).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- WSDOT Electronic Engineering Data Standards (M-3028) (Appendix D24).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- City of Medina, Washington Municipal Code.
- City of Bellevue Transportation Department Design Manual, February 12, 2009 (Appendix D32).

## 2.2.3 PERFORMANCE REQUIREMENTS

### 2.2.3.1 DOCUMENTATION ORIENTATION MEETING

Within 30 days of execution of the Contract, the Design-Builder shall hold an orientation meeting between the Design-Builder and WSDOT to address documentation

requirements. At a minimum, the documentation orientation meeting shall address the following as defined within these Technical Requirements:

- Document Control System (DCS)
- Document Control Work Plan
- Data Backup and Recovery Plan
- Document Security and Access Control

## 2.2.3.2 DOCUMENT CONTROL REQUIREMENTS

### 2.2.3.2.1 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. 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 design /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. 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 shall maintain and store all Project documentation at the Design-Builder's office. Project documentation shall be organized and filed at a consolidated storage location in accordance with the Mandatory Standards, the General Provisions and these Technical Requirements. 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 NTP 1.

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.

Any documents such as reports, photographs and manuals that use a variety of software packages and file formats shall be submitted as PDFs (version 9.0 or later) in addition to being submitted in the base file format.

### 2.2.3.2.2 Communications Distribution

At a minimum, within 7 Calendar Days of each meeting, 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;

- Local Jurisdictions;
- Agencies;
- Owners of the Pontoon and anchor facilities; and
- The general public.

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

#### 2.2.3.2.3 Electronic Files

##### 2.2.3.2.3.1 Backups

The Design-Builder shall back up all revised electronic files every Calendar Day, back up all electronic files every week and store all backup media in a secure off-site area in accordance with this section.

##### 2.2.3.2.3.2 Data Backup and Recovery

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

### 2.2.3.3 DESIGN DOCUMENTATION

#### 2.2.3.3.1 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, one complete set of the following documents:

- Contract;
- Design Approval Package;
- Design Calculations;
- Reports, Design Decisions, and Technical Memorandums;
- 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;
- Permanent and Temporary Easement agreements;
- Utility Agreements;
- Environmental Permits and Documentation;

- Leases related to Pontoon and anchor construction and storage/moorage sites; and
- Foreign Steel log.

#### 2.2.3.3.2 Design Documentation Package and Project File

The Design Documentation Package (DDP) and the Project File (PF) shall include all of the elements identified in the DDP Checklist (Appendix O1). The Preliminary Design Submittal shall include a DDP and PF Checklist identifying how each item will be submitted (e.g., report, plan sheet element, and Design Parameter element); the person responsible for the development of each DDP and PF item (e.g., WSDOT or the Design-Builder); and the status of each DDP and PF item (e.g., complete, in progress, or not started). The Design-Builder shall complete and submit the applicable portions of the DDP and PF checklist items with each RFC submittal for WSDOT review and comment.

The DDP Checklist shows that some of the DDP and PF items contain components of Work that were started by WSDOT, and that the Design-Builder shall complete or update the item. The Design-Builder shall obtain from WSDOT copies of the information that the Design-Builder needs in order to complete the DDP and PF items, as documented within Appendix O1.

The Design-Builder shall provide WSDOT with updates to the DDP and PF items throughout the design and construction of the Project. These updates shall be submitted to WSDOT as soon as any changes are made to related RFC Documents. The DDP and PF must be reviewed, all comments addressed, and approved by WSDOT and FHWA before Completion.

#### 2.2.3.3.3 Channelization Plan for Approval Package

The Design-Builder shall develop a Channelization Plan for Approval Package for the Project, and obtain WSDOT approval. The development of the package shall be completed before the last Pavement Marking Plans are stamped "Released For Construction." The Channelization Plan for Approval Package shall be updated for design changes during construction and re-submitted for review and signature prior to Substantial Completion. The approved package shall be included within the Project documentation and included in the DDP.

The Channelization Plan for Approval Package shall be prepared by, or under the direct supervision of, a Professional Engineer, licensed under Title 18 RCW. Each sheet of the Channelization Plan for Approval Package shall carry the Professional Engineer's stamp. The Channelization for Approval Package shall be submitted using the WSDOT standard format and shall follow the WSDOT Northwest Region Channelization Plan for Approval Checklist (Appendix O10).

The preliminary Channelization Plan for Approval Package submittals shall include two half-size (11 inches by 17 inches, horizontal scale one inch = 100 feet at half size) white paper copies of the plan sheets.

The final submittal of the Channelization Plan for Approval Package shall include one full-size (22 inches by 34 inches) set and two half-size sets on bond paper. Full-size plan sheets shall be prepared using a horizontal scale of one inch = 50 feet. Conceptual channelization plans can be found in the Conceptual Plans (Appendix M1).

#### 2.2.3.3.4 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 memorandum. 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; and
- Section 5 - Conclusions.

#### 2.2.3.3.5 Calculations

All calculations shall be prepared and checked in accordance with Section 2.28. The calculations shall be submitted for WSDOT review and comment.

#### 2.2.3.3.6 Design Deviations

The Design-Builder shall conduct all Work necessary to complete the design of the Project in accordance with the Mandatory Standards, the General Provisions, and the Technical Requirements. The Design-Builder shall identify all non-standard design options that will be in the design of the Project and shall provide the analysis and the justifications for the deviated elements. 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.

##### 2.2.3.3.6.1 Pre-Approved Deviations

Signed copies of the design deviations that have been prepared and approved based on the Conceptual Plans are listed below and are included in the Pre-Approved Design Deviations (Appendix O8):

- Design Deviation No. 1 – Deviations Associated with Connection to Existing West Approach Bridge (Vertical Stopping Sight Distance, Shoulder Width, Barrier Shy Distance).
- Design Deviation No. 2 – Deviations Associated with Shoulder Width and Shy Distance at Light Standard Foundations.

##### 2.2.3.3.6.2 Additional Deviations

The Design-Builder shall prepare and obtain WSDOT and FHWA approval as required for all design deviations incorporated into the Project within the Project limits, and not included in the Pre-Approved Design Deviations described in this section. Although additional 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 within the Conceptual Plans that have not been approved for this Project at the time of Contract award, the

Design-Builder shall prepare documentation for the design deviations that conforms to the WSDOT *Design Manual* (Appendix D3) and is in the same format as the Pre-Approved Design Deviations. The Design-Builder shall submit this documentation to WSDOT for review and comment. 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 after Contract award shall be addressed in accordance with Section 1-04 of the General Provisions.

#### 2.2.3.3.7 Project Development Approval

The Design-Builder shall update the Design Approval Package (Appendix O7) for revisions and additional information throughout development of the Project design to create the Project Development Approval Package. The Project Development Approval Package shall be updated for revisions during construction, and shall be submitted to WSDOT for review and comment prior to Substantial Completion. WSDOT and FHWA approval is required prior to Completion.

#### 2.2.3.3.8 Final Design Documents

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

- Design Documentation Package and Project File;
- Channelization Plan for Approval Package;
- Design calculations and documentation;
- Reports and technical memoranda;
- Approved Deviations;
- Project Development Approval Package; and
- Updated electronic MicroStation and InRoads files, including all RFC Documents, reference files and base mapping (topography) in accordance with Section 2.28 and the Mandatory Standards.

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) (refer to Section 2.28).

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.

### 2.2.3.4 CONSTRUCTION DOCUMENTATION

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* (Appendix D2) and these Technical Requirements. Throughout the course of the Project, the Design-Builder shall maintain in its construction office and make available for WSDOT review, at a minimum, one complete set of orderly hard copy files that include the following documents:

- Subcontracts;
- Change orders;
- Shop drawings;
- Pay invoices;
- Certified payrolls;
- Training and apprenticeship program participation;
- Field directive changes;
- Claims;
- Calculations;
- Reports;
- Tests; and
- As-Built shop drawings.

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

#### 2.2.3.4.1 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 in accordance with Section 2.28. 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* (Appendix D12), and shall include the WSDOT form used as the cover sheet for As-Built Plans. 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 two hard copies of the As-Built Plans and one complete electronic copy of the updated MicroStation and InRoads files on CD-ROM. The Design-Builder submittal shall be consistent with the WSDOT electronic filing system.

All revisions to the RFC Documents shall be prepared by, or under the direct supervision of, the Engineer of Record (EOR) for the documents. Each re-issued sheet of the revised RFC Documents, and the cover of each of the re-issued revised RFC Technical Specifications, shall include the Professional Engineer's stamp and signature, in accordance with Section 2.28.

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 in accordance with Section 2.28.

As-Built Plans shall reflect the same degree of detail as the RFC Documents. Underground features including, but not limited to, buried or abandoned structures shall be documented on the As-Built Plans 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* (Appendix D12). 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; and
  - An accompanying index and instructions.

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

Maintenance of Traffic (MOT) and Temporary Erosion and Sediment Control (TESC) Plans are exempt from the As-Built Plan submittals.

#### 2.2.3.4.2 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 in the order 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 (Control of Materials) 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-inch by 34-inch blackline prints. Each plan sheet shall have lettering or a stamp identifying it as As-Built Plans.
- Structures:
  - The Design-Builder shall complete the Pile Driving Record Book, WSDOT Form 450-004; and Test Pile Record, WSDOT Form 410-027, as outlined in Section 6-5.7C of the WSDOT *Construction Manual* (Appendix D2).
  - Post-Tensioning stressing records and thermal control (temperature senor readings) recoding records.
  - The Design-Builder shall complete the Post-Tensioning Records, WSDOT Form 450-005, as outlined in Section 6-2.8 of the WSDOT *Construction Manual* (Appendix D2).
- Test Reports for Storm Sewers, Sanitary Sewers and Water Mains:
  - The Design-Builder shall develop and complete a report for the testing of storm sewers, sanitary sewers and water mains. This report shall include the type of pipe, the location of the pipe, all of the calculated factors for the testing, the test results and whether the item passes or fails.
- 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. 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; and
    7) Falsework and formwork plans.

Refer to Section 10-3.1B of the WSDOT *Construction Manual* (Appendix D2*)* for additional requirements.

## 2.2.4 SUBMITTALS

### 2.2.4.1 DOCUMENT CONTROL WORK PLAN

The Design-Builder shall submit a Document Control Work Plan within 30 Calendar Days of NTP 1 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; and
- Submittal log in DCS.

### 2.2.4.2 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; and
- 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.

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 spreadsheet shall be in one of the following formats:

- Microsoft Access;
- Microsoft SQL; or
- 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.

At a minimum, all submittals shall include one hard copy and one electronic copy. WSDOT may also require the Design-Builder to send the file in other formats as requested by the WSDOT Engineer.

### 2.2.4.3 DESIGN DOCUMENT SUBMITTALS

The design document submittals shall include the following:

- Design Documentation Package and Project File;
- Channelization Plan for Approval Package;
- Design calculations and documentation;
- Reports and technical memoranda;
- Deviations;
- Project Development Approval Package; and
- Updated electronic MicroStation and InRoads files, including all RFC sheets, reference files and base mapping (topography, including survey updates).

### 2.2.4.4 CONSTRUCTION SUBMITTALS

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

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

### 2.2.4.5 PROJECT COMPLETION

Prior to 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 in which the electronic documents and databases were created.

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.

End of Section

# 2.3 RISK MANAGEMENT

## 2.3.1 GENERAL

Effective identification, management and mitigation of risks are essential to the successful delivery of this Project. Risk is defined as the combination of the probability of an uncertain event and its consequences. A positive consequence presents an opportunity; a negative consequence poses a risk. The Design-Builder shall identify, characterize, and manage potential risks to the delivery of this Project, including design, construction, delivery and assembly of the new bridge and maintenance facility and the subsequent demolition and disposal of the existing bridge.

## 2.3.2 PERFORMANCE REQUIREMENTS

WSDOT recognizes that there are significant risks that are not the direct responsibility of the Design-Builder but are necessary to identify, characterize and mitigate in order to meet overall SR 520 program delivery objectives. WSDOT is responsible for the overall completion of the SR 520 program through management, coordination and integration of the work of multiple related contracts. Accordingly, the Design-Builder shall advise WSDOT of such risks, as are known to the Design-Builder. WSDOT will be responsible to consider and communicate the management or disposition of such risks by mitigating, transferring, or accepting as appropriate.

The Design-Builder shall perform continuous risk management including: comprehensive risk identification, characterization and assessment; holding risk workshops; developing, managing and communicating an actionable risk register and; implementing specific risk mitigation actions.

Risks to be considered include, but are not limited to, risks to Project cost and schedule; health and safety; operational performance; quality of the Work; quality of life to the general public; local and regional commerce; and the local and regional transportation network which could be affected by the Project.

The Design-Builder is responsible for Risk Management of all risks specific to the Work. Management of these risks should be in accordance with current industry guidelines and be consistent with WSDOT's risk management policies, including:

- "WSDOT Project Risk Management" (Appendix Q1);
- "Risk Management - Principles and Guidelines" International Standard ISO/FDIS 31000, 2009; and
- "Chapter 11, Project Risk Management" in "A Guide to the Project Management Body of Knowledge," ***4th*** Edition 2004 or later, Project Management Institute, 14 Campus Boulevard, Newtown Square, PA 19073.

## 2.3.3 RISK MANAGER

The Design-Builder shall identify a Risk Manager for the Project.

The Risk Manager shall be available for the duration of the Project. If the Design-Builder replaces the Risk Manager, the Design-Builder shall provide an equally or more qualified replacement, contingent upon WSDOT's acceptance.

The Risk Manager shall be responsible for the following:

- Developing and updating the Project Risk Management Plan;
- Developing and updating the Project Risk Register;
- Facilitating risk management meetings;
- Facilitating the risk management workshops; and
- Providing on-going risk management training to Design-Builder's staff.

**Minimum Qualifications**

The Risk Manager shall be a licensed engineer with formal training in risk management, prior experience managing a construction risk program, and a minimum of 10 years of related experience in heavy construction with a record of assignments that establishes the candidate's experience as a risk manager for a contract of similar complexity, type and size.

## 2.3.4 RISK MANAGEMENT PLAN

The Design-Builder shall prepare and maintain a Risk Management Plan throughout the life of the project, which shall include the following:

1. Design-Builder's risk management policy.
2. Project team members' roles and responsibilities related to risk management and risk response.
3. Risk Identification – identify potential risk events and their characteristics .
4. Risk Analysis:
    a. Qualitative Risk Analysis – characterize identified risks for action by assessing their initial probability and consequence (relative scales) as appropriate, and/or:
    b. Quantitative Risk Analysis – perform a more detailed numerical analysis of the probabilities and consequences of the identified risks on overall project objectives.
5. Risk Response – develop, quantify and implement mitigation options and/or actions to reduce the probability consequence, or both for identified risks.
6. Risk Monitoring and Control – implement risk mitigation, track the identified risks and actions taken to mitigate those risks, monitor residual risks, identify new risks, re-quantify existing risks and evaluate the effectiveness of actions taken.
7. Risk management software used.
8. A schedule for planned risk workshops, training and updates.

The Design-Builder is responsible for determining, with WSDOT's concurrence, whether a qualitative or quantitative analysis is appropriate.

The Risk Management Plan shall be submitted to WSDOT within 60 Calendar Days of NTP 1, and shall be evaluated for updates and revisions at least quarterly. The Design-Builder's risk assessments shall be made continuously through the Project.

The Design-Builder shall provide WSDOT on a monthly basis, or upon request by WSDOT, a report on risk management status, activities, actions and planning. The report shall assess the effectiveness of Design-Builder's risk management and strategies to reduce specific risks. The Design-Builder shall prepare quarterly summary reports summarizing risk management and response actions for the period, plans for the next period, actions required by others and recommendations for improvement.

The Design-Builder shall be responsible for holding risk workshops semi-annually, or more often as needed, throughout the life of the Project. The initial risk workshop shall be held within 60 Calendar Days of NTP 1. The Design-Builder's Risk Manager will lead these workshops. WSDOT and other third parties, as requested by WSDOT, shall be invited to participate in these workshops. However, such participation will not in any way relieve the Design-Builder of full and complete risk management for all elements for which the Design-Builder is responsible.

### 2.3.5 PROJECT RISK REGISTER

WSDOT has conducted a comprehensive Cost Estimate Validation Process (CEVP) that addresses risks that relate to the SR 520 Program. A subset of this CEVP risk list pertains to the scope of the Project and is presented as the WSDOT Floating Bridge and Landings Risk Register (Appendix Q3).

The Design-Builder shall prepare a comprehensive list of risks termed the "Project Risk Register" which shall be segregated into two risk sets: 1) Risks applicable to this Work and, 2) Risks applicable to, or the responsibility of, other SR 520 Program contracts, work elements and/or interfaces.

The Project Risk Register shall include the following information:

1. Risk Identification
    - 1.1. Risk event number / ID; priority, active or inactive
    - 1.2. Summary description of risk event
    - 1.3. Detailed description of risk event
    - 1.4. Responsible party
2. Qualitative analysis results
    - 2.1. Relative probability (1 to 5)
    - 2.2. Relative impact or consequence (1 to 5)
    - 2.3. Risk Matrix (graphical representation, 5x5 matrix) with scores between 1 and 25.
3. Quantitative analysis results

3.1. Probability – usually a percentage (can have a distribution or be conditional)

3.2. Impact or consequence – cost, schedule, other (can have a distribution or be conditional)

4. Risk response plan

4.1. Owner of the risk / action

4.2. Mitigation strategy

4.3. Specific action to be taken

4.4. Related project activities affected or involved

4.5. Linkage to / impact to other risks or risk mitigation actions

4.6. Quantified reduction to the initial risk consequences (reduced probability and/or consequence)

5. Risk monitoring and control

5.1. Risk review dates, status, review comments

The Design-Builder shall identify specifically how the mitigation, if adopted, for each identified risk has been addressed. The Design-Builder shall identify and characterize residual risks which are the result of risk response strategies. In cases where the implementation of risk response strategies could lead to a significant delay, or could, in any way cause increased risk or potential loss to WSDOT, the potential delay or risk shall be identified to WSDOT prior to implementation. WSDOT will review and comment on the intended response strategy.

The Design-Builder shall classify risks and opportunities in accordance with WSDOT's Risk Breakdown Structure (RBS) and consistent with the WSDOT Risk Register Template (Appendix Q2).

The Design-Builder shall coordinate with WSDOT to ensure that appropriate information will be provided with risk register submittals. Submittals shall be in a software format that is compatible with WSDOT requirements for program risk management.

The Design-Builder's Risk Manager shall provide risk management training to all appropriate Design-Builder team members throughout the Project. WSDOT shall be invited to participate in all risk management training sessions.

## 2.3.6 SUBMITTALS

The Design-Builder shall submit the following documents to WSDOT as required by the technical requirements:

- Project Risk Management Plan and updates; and
- Project Risk Register and updates.

End of Section

## 2.4 INTENTIONALLY OMITTED

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, aquatic 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, moorage area surveys, design surveys, construction surveys, As-Built surveys, aquatic plat surveys, records of surveys, permits to destroy and remove monuments, Land Corner Records, and all other land surveying services necessary to complete the Project.

### 2.5.1.1 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

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 WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Highway Surveying Manual* (M22-97) (Appendix D23).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT Electronic Engineering Data Standards (M 3028) (Appendix D24).

### 2.5.1.2 EXISTING SURVEY DATA

A survey Base-map has been prepared for WSDOT. Primary and secondary survey horizontal control was established in 2004 using Trimble's 5700 Global system Receivers, with Trimble's Zephyr Antennas in North Zone, North American Datum of 1983, adjusted in 91, (NAD 83/91). Vertical control was established using a Digital Level and is referenced to North American Vertical Datum of 1988, (NAVD 88). The Base-map is referenced to the SR 520 project datum coordinate system (combined scale factor = 0.999974039). Refer to the Electronic Files (Appendix A2) for details.

WSDOT has included 2D and 3D Base-map MicroStation.dgn files comprised of High Definition Survey, traditional topographic data, horizontal and vertical survey control, alignment and Right-of-Way information, and Photogrammetry in Appendix A2. The existing Recorded Record of Survey is included in Appendix R6.

The primary Base-map, BR520_BP_FullCorridorTopoBase.dgn (Appendix A2), was surveyed using HD survey, and supplemented with traditional ground survey. The secondary Base-maps, BR520_BP_EX_WEST2.dgn and BR520_BP_EX_EAST1.dgn are comprised of Photogrammetry (Appendix A2).

Existing bathymetry information is included in BR520 BP Bathymetry Elevation.dgn and P520 Bathymetry Elevation InRdsXM.dtm (Appendix A2). This information is for reference use only. Lake Washington bottom geometry within the Project limits shall be surveyed and mapped by the Design-Builder and documented in the As-Built data as described in Section 2.2(Project Documentation).

SR 520 Survey control is documented in two volumes entitled “WSDOT – SR 520 Project” and “SR 520 Geometric Framework” (Appendix A3).

Existing primary and secondary control monumentation established by WSDOT, and primary and secondary control monuments established for WSDOT by others, are for informational purposes only and should be verified independently before use and acceptance by Design-Builder. Existing WSDOT geodetic primary survey monumentation can be found online at:

www.wsdot.wa.gov/monument

#### 2.5.1.3 STATE SUPPLIED SURVEY EQUIPMENT

WSDOT will make available, for the Design-Builder’s use, specialized survey equipment that may be useful for survey work needed on the pontoons and floating bridge. These instruments are a Leica TDM5000 and TDM5005. If the Design-Builder chooses to use this equipment a request for the equipment shall be supplied in writing to WSDOT 14 days prior to obtaining the equipment. If the Design-Builder chooses to use this equipment, the Design-Builder shall have the equipment calibrated by the Manufacturer prior to use on this Project. Documentation of the calibration shall be supplied to WSDOT at least one calendar month prior to use on this Project. After the Design-Builder has finished using the State-supplied equipment, the equipment shall be returned to WSDOT in the same condition as when it was first obtained.

### 2.5.2 PERFORMANCE REQUIREMENTS

#### 2.5.2.1 GENERAL

The Design-Builder shall be solely responsible for verifying the accuracy of content and completeness of all survey information to be used in the design and construction of the Project, including Base-map, and all information provided in these Technical Requirements.

The Design-Builder shall verify and spot check the location, accuracy and datum of survey data and survey information, regardless of the source. The Design-Builder shall document the verification of all of the data in accordance with the QMP requirements in Section 2.28 (Quality Management Plan) of these Technical Requirements. If any areas of survey are incomplete for use in design, it shall be the Design-Builder’s responsibility to supplement and verify the materials that were supplied by WSDOT.

Horizontal control shall be based on the North American Datum of 1983, adjusted in 1991. Vertical control shall be 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 datum. The conversion to project datum shall be completed according to the *WSDOT Highway Surveying Manual* (Appendix D23). Any conversion from Metric to English shall use the U.S. Survey foot definition: 1 foot = 1200/3937 meters exactly.

## 2.5.3 DESIGN REQUIREMENTS

### 2.5.3.1 GENERAL

The Design-Builder shall verify the existing survey work to confirm that it is suitable for preparation of design documents and Released For Construction Documents.

The Design-Builder shall obtain any DNR permits that may be required prior to beginning field work. Preparation of surveys shall conform to requirements referenced in the WSDOT *Highway Surveying Manual* (Appendix D23) including, but not limited to, procedures, record-keeping requirements, equipment use and safety precautions.

## 2.5.4 CONSTRUCTION REQUIREMENTS

### 2.5.4.1 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. A form similar to WSDOT's Surveyors Daily report form 237-010, located in Appendix F18, may be 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 have graphic notes depicting description, elevation, coordinates and location description. A data collector printout of the day's activities will not be considered an acceptable record. When requested, the Design-Builder shall provide a copy of any day's record to WSDOT within 5 Calendar Days after the request.

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

- Expanding secondary control by adding stakes and hubs as well as additional permanent survey control needed for the Project.
- Providing control sheets that describe permanent secondary control to WSDOT.
- Providing survey markers for Pontoons as described in Section 2.12(Floating Bridge).
- Surveying for the Pontoon construction and the floating bridge as described in Section 2.12.
- Staking as described in Section 2.24(Right-of-Way [ROW]).

All permanent secondary control points established by the Design-Builder shall be shown on a Report of Survey Mark form, similar to WSDOT's form (Appendix F18), 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* (Appendix D23).

For all types of construction, including, but not limited to, walls, bridges, Pontoons, floating bridge, Pontoon anchors, grading, drainage, channelization, pavement markings, illumination, signals, guardrails, barriers and signing, 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.

## 2.5.4.2 MONUMENTATION

### 2.5.4.2.1 General

Except for WSDOT Geodetic Primary Control monuments, the Design-Builder shall document all WSDOT, Public Lands Survey System (PLSS), governmental monumentation and private property corners that will be modified, disturbed, or destroyed during the Project. The Design-Builder shall follow the procedures as set forth in Chapter 16 of the WSDOT *Highway Surveying Manual* (Appendix D23) relating to the destruction and replacement of monumentation. Any monumentation work shall be performed under the supervision of a Professional Licensed Surveyor registered in the State of Washington.

As required by the Washington State Department of Natural Resources (DNR), in accordance with WAC 332-120, the Design-Builder shall complete an Application to Remove or Destroy a Survey Monument permit, together with an Exhibit Map, for each monument before it is removed or disturbed. WSDOT will review and comment on the forms. The Design-Builder shall submit the forms to the DNR as required by Washington State for any WSDOT Geodetic or Highway Alignment Monuments, local agency Roadway Alignment Monuments or private property corner monuments that are disturbed, destroyed or relocated during construction. An approved Application and Exhibit shall be provided to the WSDOT Engineer prior to the removal or disturbance of any monuments. Monuments removed or disturbed prior to submitting an approved Application and Exhibit Map will be replaced by WSDOT at the Design-Builder's cost.

### 2.5.4.2.2 WSDOT Monumentation

The Design-Builder shall note and document on an Exhibit Map all WSDOT Geodetic and Highway Alignment Monuments found within the Project limits. The Design-Builder shall notify WSDOT as soon as possible and no later than 14 Calendar Days prior to any Work that may cause WSDOT Geodetic or Highway Alignment Monuments to be disturbed or destroyed. The Design-Builder shall determine the monuments to be replaced. WSDOT Monuments removed or disturbed prior to notifying WSDOT will be replaced by WSDOT at the Design-Builder's cost.

WSDOT will replace any WSDOT Geodetic Monument or Federal control points within the Project that may be disturbed or destroyed. Highway alignment monuments are not required to be replaced. The Design-Builder shall label all monuments removed, replaced or set on the Post Construction Record of Survey described in this section, and a copy shall be sent to DNR to complete the permit process. The Design-Builder shall work with WSDOT to determine the best location, as near as possible to the original location, so that WSDOT may reset the geodetic monument.

#### 2.5.4.3 LAKE WASHINGTON MUDLINE SURVEY

The Lake Washington Mudline elevations are generally indicated as the interface between the earth and the water and are shown in Appendix M1, as the top of the "Fined-Grained Lacustrine Sediment". In the event of any discrepancies between Mudline elevations provided in Appendix M1, and the Mudline elevations determined pursuant to the underwater survey in accordance with this Section, the underwater survey shall prevail. See Section 1-04.7 for restrictions regarding Differing Site Conditions as related to Mudline elevations.

The Design-Builder shall determine Lake Washington Mudline elevations by special order hydrographic survey using side scan sonar in accordance with the requirements of International Hydrographic Organization IHO SP44. The limits of survey shall be 100-feet larger in every dimension than the plan limits of the Work. The vertical and horizontal accuracy of the survey shall be plus/minus one foot.

All underwater survey results shall be submitted to WSDOT within three working days after the end of survey shift. The Design-Builder shall compile the underwater survey data in an electronic Excel spreadsheet. The Design-Builder shall also produce and submit a CAD drawing (conforming to WSDOT CAD standards) of the Project Mudline contours at every two-foot contour line. The survey, data submittal, and drawing submittal shall be completed and approved before any removals or Mudline disturbance begins.

### 2.5.5 SUBMITTALS

#### 2.5.5.1 SURVEY RECORDS AND SUBMITTALS

The Design-Builder shall prepare and submit survey calculations to WSDOT 14 Calendar Days prior to construction for concurrence of project datum to be used.

The Design-Builder shall deliver a hard copy and an electronic file of the survey records to WSDOT within 30 Calendar Days of Physical Completion, unless an earlier delivery is requested by WSDOT. The electronic CAD file shall be prepared with Bentley's MicroStation version 8.09 (also known as XM) using the WSDOT Computer Aided Engineering (CAE) Expanded Level environment.

##### 2.5.5.1.1 Work Zone Traffic Control in WSDOT Right-of-Way

The Design-Builder shall prepare and submit to WSDOT for review and comment the Maintenance of Traffic Plan whenever a survey crew, or a survey crew's vehicle, will be working within any roadway clear zone or on city streets near highway ramp terminals. Submittal of the Maintenance of Traffic Plan for review and comment shall be in accordance with Section 2.22 (Maintenance of Traffic) of these Technical Requirements.

##### 2.5.5.1.2 Work Zone Traffic Control in Local City Right-of-Way

The Design-Builder shall prepare, submit and obtain acceptance of traffic control plans from the local agency whenever a survey crew, or a survey crew's vehicle, will be working within city streets. The traffic control plans shall be submitted directly to the local agency's Traffic Control Supervisor for approval.

No Work shall occur in city streets without first receiving approvals from the appropriate local jurisdictions.

### 2.5.5.2 AS-BUILTS

The Design-Builder shall produce reports documenting the location of the As-Built alignments (roadways, trails, accesses, parking facilities), profiles of all alignments, transit facility, maintenance facility and dock, walls and wall profiles, bridges, Pontoons, floating bridge, Pontoon anchors (see Section2.12 for further survey requirements), drainage facilities (structures, outfalls, stormwater treatment facilities), utilities, signs, transit facilities, transportation electronic infrastructure and placement of the survey control monuments. These reports shall include descriptive statements for the survey methods used to determine the As-Built location of the feature being surveyed. The As-Built data provided by the Design-Builder shall include the coordinate types (x, y, z) and feature codes in the same format as the preliminary construction data. Where WSDOT has provided data to the Design-Builder in 3D coordinate format, the Design-Builder shall provide WSDOT with data in 3D coordinate format. Where WSDOT has provided data to the Design-Builder in 2D coordinate format only, the Design-Builder shall provide WSDOT with data in 2D coordinate format only. All coordinates shall be in project datum. The Design-Builder shall provide WSDOT with a 3D As-Built survey. The electronic CAD file shall be prepared with Bentley's MicroStation version 8.09 (also known as XM) using the WSDOT Computer Aided Engineering (CAE) Expanded Level environment. The Design-Builder shall deliver all As-Built survey files to WSDOT within 30 Calendar Days of Physical Completion of the Project.

### 2.5.5.3 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 and comment 14 calendar days prior to recording with the county where the survey will be recorded. 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 CAD file shall be prepared with Bentley's MicroStation version 8.09 (also known as XM) using the WSDOT Computer Aided Engineering (CAE) Expanded Level environment. The Post-Construction Record of Survey shall include, but is not limited to, the following:

- The Right-of-Way centerline alignment shall be defined and recorded.
- All monuments that have been removed by construction activities, with an indication showing whether or not they have been replaced.
- 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 Project shall be 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 review the existing geotechnical information that includes the GBR (Appendix G1), the GDR (Appendix G2); and the Seismic Ground Motion Design Criteria (Appendix G5). Additional geotechnical information, including technical memoranda and geotechnical engineering reports, are included in Appendix G as Reference documents.
- The Design-Builder shall evaluate the requirements of the Work and perform geotechnical explorations, geotechnical analyses and laboratory testing supplement the existing data that, at a minimum, shall meet the requirements for final design in the WSDOT *Geotechnical Design Manual* and other Mandatory Standards. 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 related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Amendments to the WSDOT Standard Specifications (Appendix B1).
- Structures Minimum Standards (Appendix B2).
- Bridge Shaft Mandatory Standard (Appendix B5).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Geotechnical Design Manual* (M46-03) (GDM) (Appendix D5).
- WSDOT *Bridge Design Manual* (M23-50) (BDM) (Appendix D1).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Highway Runoff Manual* (M31-16) (Appendix D6).
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D13).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- International Building Code (IBC).

- AASHTO *Manual on Subsurface Investigations*.
- AASHTO *Guide Specifications for LRFD Seismic Bridge Design*.
- AASHTO *LRFD Bridge Design Specifications*.
- FHWA Publication FHWA-NHI -10-025, *Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes*.
- AASHTO *Standard Specifications for Transportation Materials and Methods of Sampling and Testing*.
- FHWA Publication FHWA-IF-03-017, *Geotechnical Engineering Circular No. 7, Soil Nail Walls*.
- AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

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

All references in the WSDOT GDM (Appendix D5) 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 for design issues only. Review and comment authority shall remain with WSDOT.

In some cases it may not be clear whether rights or responsibilities in the GDM (Appendix D5) 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 will make that determination in its sole discretion. WSDOT has identified the following provisions of the GDM that are not applicable to Design-Build contracts:

- Section 1.2.2 Geotechnical Functions Delegated to the Regions;
- Section 1.3 Geotechnical Support within the WSDOT Project Management Process;
- Section 1.6 Geotechnical Consultant Administration;
- Chapter 20 Unstable Slope Management;
- Chapter 21 Materials Source Investigation and Report; and
- Chapter 22 Geotechnical Baseline Reports Produced for Design-Build Projects.

#### 2.6.2.2 HISTORICAL AND RECENT GEOTECHNICAL DATA

Historical records for previous geotechnical studies along the Project alignment are provided in the Historical Geotechnical Data (Appendix G6). This information includes test boring logs related to the existing bridge and other projects in the vicinity of the Project. The Design-Builder may use this information at its discretion. WSDOT makes no warranty, either express or implied, as to the accuracy of this information. The recent geotechnical information collected for the Project is included in the GDR (Appendix G2).

## 2.6.3 PERFORMANCE REQUIREMENTS

### 2.6.3.1 PERSONNEL REQUIREMENTS

The Design-Builder shall provide a Geotechnical Group Manager with a minimum of 10 years of supervisory experience in geotechnical design and construction support of roadways, bridges, retaining walls and other highway-related elements. The Geotechnical Group Manager shall have at least five years of experience working on WSDOT projects and shall be familiar with the AASHTO *LRFD Bridge Design Specifications, the* AASHTO *Guide Specifications for LRFD Seismic Bridge Design,* and the IBC. The Geotechnical Group Manager shall be a Professional Engineer, licensed under Title 18 RCW, and shall be responsible for the geotechnical design elements of the Project.

The Design-Builder's personnel responsible for the installation and monitoring of geotechnical instrumentation shall have a minimum of two years of experience with the specific type of instrumentation they will be operating.

### 2.6.3.2 SUBSURFACE INVESTIGATION PLAN (SIP)

The Design-Builder shall perfom additional subsurface investigations as determined necessary by the Design-Builder and to meet Mandatory Standards to supplement information provided in Appendix G. For bridges, retaining walls, and other structures, the investigation shall be conducted in accordance with the GDM (Appendix D5). For stormwater facilities, the investigation shall be as specified in the WSDOT *Highway Runoff Manual* (Appendix D6). The Design-Builder shall create a Subsurface Investigation Plan (SIP) that includes the following:

- Proposed exploration type, location and depth;
- Proposed sampling and testing;
- Instrumentation to be installed in explorations and installation procedures;
- Maintenance of Traffic plan if required;
- Site access plans and right-of-entry permits;
- Environmental considerations and Best Management Practices plan;
- Schedule;
- Utility locate information; and
- Emergency procedures and contacts.

The investigation can be done in stages and the specific information for the field explorations, in addition to the SIP information listed above, can be provided in Field Exploration Work Plans. The SIP and/or Field Exploration Work Plans shall be submitted to WSDOT for review and comment prior to commencement of any field exploration program.

Instrumentation such as piezometers and slope inclinometers to be used for design and construction monitoring purposes shall also be included in the Geotechnical Instrumentation Plan (GIP) as described in Section 2.6.3.4. The submittal shall also include a Maintenance of Traffic Plan in accordance with Section 2.22 (Maintenance of Traffic) 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 or private property owners if required as described in Section 2.24 (Right-of-Way).

Soil properties shall be determined in accordance with the GDM (Appendix D5) based on the results of the field investigations, subsurface data included in Appendix G, and the GBR (Appendix G1). Field tests shall be conducted in accordance with appropriate AASHTO and WSDOT standards.

Following completion of exploratory Work, all exploration locations shall be surveyed. The survey shall determine station and offset, elevation, and State Plane coordinates, which shall be included on the exploration logs. Following drilling and laboratory activities, 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 (Appendix D5) and applicable WSDOT and AASHTO testing procedures. Laboratories conducting geotechnical testing shall be AASHTO accredited for the testing being performed. All test results shall be included in the Design-Builder's Geotechnical Report.

### 2.6.3.4 GEOTECHNICAL INSTRUMENTATION PLAN (GIP)

The Design-Builder shall develop, implement, and maintain a documented GIP to satisfy design and quality control requirements. The GIP shall be available to WSDOT for review throughout the Project.

The Design-Builder shall install geotechnical instrumentation where necessary to monitor parameters such as the following:

- Settlement and settlement rates of embankments and structures;
- Pore water pressures;
- Groundwater levels;
- Horizontal deformations;
- Stability of walls and slopes; and
- Ground vibration.

The Design-Builder shall be responsible for all damage caused by construction activities to structures and existing or proposed public facilities such as utilities, drainage facilities, streets and highways on or adjacent to the Right-of-Way.

Before commencing construction operations that may cause damage to sensitive facilities, the Design-Builder shall identify locations of sensitive facilities, zones of influence, instrumentation types, critical readings, and frequency of readings in a Settlement, Horizontal Deformation and Vibration Monitoring Plan. For buildings not owned by WSDOT, and other sensitive facilities including private residences, businesses, city streets and utilities within the Project area, the Design-Builder shall conduct a pre-condition survey. This survey shall include video or photographic documentation of internal and external building walls and foundations. The pre-condition survey shall be a part of the GIP and shall be submitted to WSDOT for review and comment prior to

commencement of construction activity that could impact existing structures, utilities and city streets.

Where impact or vibratory methods are employed for driving piles or installing shaft casings and where vibration-inducing ground improvement or other vibration-inducing activities are employed, vibration monitoring shall be conducted for structures or utilities that could be adversely affected by the construction operations. Construction-induced vibrations of ground adjacent to structures and utilities shall not exceed a maximum peak particle velocity (PPV) of two inches per second or a PPV determined by the structure or utility owner to cause damage to the structure or utility, whichever is smaller. The Design-Builder is required to cease all operations when vibration-recording equipment exceeds the predetermined maximum PPV at the location of structures and utilities in the vicinity of the construction activity. For additional pile driving criteria (e.g. noise limits), see the environmental commitments list in Appendix C1.

All instruments shall be calibrated to manufacturers' specifications and schedules or within one year prior to use on the Project, whichever is shorter, and shall have a traceable national lab certificate on site. Any instruments owned by the Design-Builder that are damaged during construction and require removal and/or recalibration shall be replaced and/or recalibrated by the Design-Builder.

The Design-Builder's Geotechnical Report shall include all instrumentation data collected for design- and construction-related purposes and shall be submitted to WSDOT for review and comment prior to its finalization.

### 2.6.3.5 BOREHOLE SITE CLEANUP

Backfilling of borings, test pits, cone penetration test (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 is responsible for decommissioning observation wells that they have installed. WSDOT is responsible for decommissioning observation wells that they installed.

The Design-Builder shall backfill all test holes it drills in a manner that protects persons, animals or equipment and ensures against subsequent settlement of the backfill. Upon completion of the field exploration 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 (Appendix D5). Final edited and drafted logs of all field explorations shall be included in the Design-Builder's Geotechnical Report.

### 2.6.3.7 GROUNDWATER MONITORING AND WELL DECOMMISSIONING

Collection of groundwater information from existing observation wells and vibrating wire piezometers listed in the GDR (Appendix G2) is the responsibility of the Design-Builder from NTP 1 to completion of the geotechnical design. When the Design-Builder determines that the geotechnical design is complete and the observation wells listed in the GDR (Appendix G2) can be abandoned, the Design-Builder shall decommission the observation wells before any excavation Work occurs. For all well decommissioning, the Design-Builder shall follow Department of Ecology (DOE)

requirements and the Washington Administrative Code (WAC 173-160). Copies of well decommissioning reports filed with DOE shall be provided to the State Materials Laboratory, Attn: Frank Curry PO Box 47365 Olympia WA 98504-7365.

In some areas along SR 520, the geotechnical information provided indicates that the groundwater elevation has been measured near the ground surface and locally above the existing grade. The conditions are described in the GBR (Appendix G1) and the GDR (Appendix G2).

### 2.6.3.8 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 exploration and laboratory testing programs; the results of engineering analyses, including information provided in the GBR (Appendix G1) and the GDR (Appendix G2).

### 2.6.3.9 GEOTECHNICAL REPORT

The Design-Builder shall prepare a Geotechnical Report in accordance with the GDM (Appendix D5) that summarizes the results of the field testing; all instrumentation data; laboratory investigation programs; engineering studies; and geotechnical design recommendations. The Geotechnical Report and supporting calculations shall be submitted to WSDOT for review and comment prior to finalization.

### 2.6.3.10 TEMPORARY DEWATERING PLAN

The Design-Builder shall develop, implement, and maintain dewatering and groundwater depressurization plan(s) as necessary to facilitate construction. The dewatering plans shall be prepared by a Washington State-licensed hydrogeologist with a minimum of 10 years of experience in construction dewatering, in each of the following areas:

- Dewatering in an urban environment;
- Development and successful implementation of contingencies to mitigate dewatering-induced drawdown and contaminant migration;
- Monitoring of groundwater elevations outside of the excavation to meet specific drawdown limitations; and
- Handling and discharge of water to meet specific discharge permit criteria limitations.

Dewatering plans shall be submitted to WSDOT for review and comment prior to construction in areas where dewatering is required.

Dewatering plans shall include:

- A description of the construction activities requiring dewatering;
- A description of dewatering and hydrostatic pressure relief methods;
- A description of the dewatering system and assumed drilling methods and equipment;
- All details, dimensions, quantities, and cross-sections necessary to construct the temporary dewatering and recharge systems with all computer output accompanied by supporting hand calculations detailing the calculation process;

- Projected water level drawdown and elevation in all existing and additional dewatering wells, well points, monitoring wells, piezometers, and recharge/injection wells;
- Plan view drawing showing the estimated zone of influence and resulting groundwater elevations for each aquifer during dewatering;
- Estimated discharge rates;
- Handling of water, including treatment and conveyance to discharge locations;
- Contingency plans if the dewatering system is unable to meet the performance requirements once in operation or if the dewatering system causes excessive drawdown and ground settlement;
- Contingency plans if the dewatering systems cause migration of existing groundwater contamination towards adjacent properties; and
- Groundwater monitoring plan.

#### 2.6.3.11 SHORING PLAN

The Design-Builder shall develop shoring plans in accordance with Division 2 of the WSDOT Standard Specifications (Appendix D18) for excavations requiring temporary shoring. Shoring plans and supporting calculations shall be submitted to WSDOT for review and comment prior to proceeding with excavations that require temporary shoring.

### 2.6.4 DESIGN CRITERIA

The Design-Builder shall perform appropriate design and construction of the Project elements as specified in the GDM (Appendix D5) and the BDM (Appendix D1).

#### 2.6.4.1 SEISMIC DESIGN CRITERIA

The Design-Builder shall meet the requirements described in Sections 2.13 (Bridges and Structures) and 2.30 (Bridge Maintenance Facility and Dock).

##### 2.6.4.1.1 Bridges, Docks and Retaining Walls

The seismic analyses and design for all new bridges, the maintenance dock, and retaining walls shall be in accordance with the requirements of the GDM (Appendix D5), the BDM (Appendix D1), the AASHTO *Guide Specifications for LRFD Seismic Bridge Design*, and the AASHTO *LRFD Bridge Design Specifications*. All new bridges, docks, and retaining walls shall be designed for a seismic hazard level of 7 percent probability of exceedance in 75 years. The structures shall be designed using the horizontal and vertical response spectra included in Appendix G5 with a PGA of 0.52g for a Site Class D.

##### 2.6.4.1.2 Bridge Maintenance Facility Building

The seismic analyses and design of the shoring and exterior building walls that will support permanent earth loads for the buried portion of the Bridge Maintenance Facility Building shall be in accordance with the requirements of the GDM (Appendix D5), the BDM (Appendix D1), the AASHTO *LRFD Bridge Design Specifications*, and the AASHTO *Guide Specifications for LRFD Seismic Bridge Design*. The seismic analyses and design of the remainder of the building shall be in accordance with the IBC.

#### 2.6.4.1.3 Biofiltration Swales

The analysis and design of biofiltration swales and other permanent cuts shall be performed in accordance with the GDM (Appendix D5). Swales and permanent cuts that have the potential to affect structures or other permanent works shall include seismic slope stability in accordance with the requirements of the GDM (Appendix D5) and the AASHTO *Guide Specifications for LRFD Seismic Bridge Design*. The swales and cuts shall be designed for a seismic hazard level of 7 percent probability of exceedance in 75 years using the seismic design criteria included in Appendix G5 with a PGA of 0.52g for a Site Class D.

#### 2.6.4.1.4 Floating Bridge Anchors

The floating bridge anchors shall be designed so that they are functional when subjected to a seismic hazard level of 7 percent probability of exceedance in 75 years using the seismic design criteria included in Appendix G5. The seismic design shall be performed in accordance with the following standards:

- Shaft anchors shall be designed in accordance with the AASHTO *Guide Specifications for LRFD Seismic Bridge Design* for shaft foundations.
- Gravity anchors shall be designed in accordance with the AASHTO *Guide Specifications for LRFD Seismic Bridge Design* for shallow foundations with respect to bearing, sliding, and eccentricity.

Anchor design shall be performed for the following seismic load and resistance cases:

1) Nominal anchor cable load of 60 tons with earthquake inertial loading of $k_h$=0.5PGA and $k_v$=0. Soil properties used in this analysis shall be selected to model static conditions of the soil.
2) Anchor cable load of 570 tons, with no earthquake inertial loading ($k_h$=0 and $k_v$=0). Soil properties used in this analysis shall be selected to model dynamic conditions of the soil, with due consideration of dynamic soil strength loss.

Anchor performance shall meet the following criteria:

- Global stability of gravity anchors and fluke anchors shall exceed a factor of safety of 1.1.
- Global translation of shaft anchors shall not be allowed.
- Rotation of shaft anchors shall be limited to 5 degrees.
- Anchors shall be demonstrated to resist anticipated loading and displacement imposed by seismic slope deformation/lateral spreading.

Analyses shall be performed to verify anchor performance both parallel to the loading direction of the anchor cable and in the critical downslope direction. For gravity anchors and fluke anchors, if a global stability factor of safety of 1.1 or greater cannot be achieved, the Design Builder may use displacement-based analyses to demonstrate that the following criterion is met: displacement of gravity and fluke anchors does not exceed 10 feet of absolute movement for the load and resistance cases listed in this section.

### 2.6.4.2 BRIDGE AND DOCK FOUNDATION DESIGN

All new bridge and dock foundations shall be designed using the load and resistance factor design (LRFD) specifications described in the GDM (Appendix D5), the BDM (Appendix D1), the AASHTO *LRFD Bridge Design Specifications*, and the AASHTO *Guide Specifications for LRFD Seismic Bridge Design*. The Design-Builder shall meet the requirements described in Sections 2.13 (Bridges and Structures) and 2.30 (Bridge Maintenance Facility and Dock).

### 2.6.4.3 WALL DESIGN

All retaining walls and wall foundations shall be designed using the LRFD specifications described in the GDM (Appendix D5), the BDM (Appendix D1), the AASHTO *LRFD Bridge Design Specifications*, and the AASHTO *Guide Specifications for LRFD Seismic Bridge Design,* except for soil nail walls, Structural Earth Walls (SEW), Geosynthetic Reinforced Walls, and noise barrier walls. The Design-Builder shall meet the requirements described in Sections 2.13 (Bridges and Structures), 2.15 (Landscape and Aesthetics Design) and 2.30 (Bridge Maintenance Facility and Dock).

Soil nail walls shall be designed using the Service Load Design (SLD) method as required in the GDM (Appendix D5) and FHWA Publication *FHWA-IF-03-017, Geotechnical Engineering Circular No. 7.*

SEWs and Geosynthetic Reinforced Walls shall be designed using either the SLD method or the LRFD method as required in the GDM (Appendix D5).

Noise barrier walls shall be designed using the Load Factor Design method as required in the GDM (Appendix D5).

#### 2.6.4.3.1 Static Global Stability of Retaining Walls

In accordance with the GDM (Appendix D5), walls considered critical shall be required to meet or exceed a factor of safety of 1.5 for static loading conditions. Non-critical walls shall be required to meet or exceed a factor of safety of 1.3 for static loading conditions. Critical and non-critical walls are defined in the GDM.

#### 2.6.4.3.2 Seismic Global Stability of Retaining Walls and Embankments

Global stability analyses for seismic loading conditions shall be performed in accordance with Chapter 6 of the GDM (Appendix D5). Deformation analyses shall be performed in accordance with Chapters 6 and 15 of the GDM.

### 2.6.4.4 FLOATING BRIDGE ANCHORS

All Floating Bridge Anchors shall be designed using the load and resistance factor design (LRFD) specifications described in the GDM (Appendix D5), the BDM (Appendix D1), and the AASHTO *LRFD Bridge Design Specifications*. If alternative design methods are used for the design of the fluke anchors, a description of the proposed method shall be provided to WSDOT for approval.

The anchors shall meet the following load and deflection criteria using appropriate resistance factors as described in the GDM (Appendix D5), the BDM (Appendix D1), and the AASHTO *LRFD Bridge Design Specifications*:

- Strength Limit State: The anchors shall resist an anchor cable load of 425 tons (75 percent of the minimum breaking strength of the production anchor cable).
- Service Limit State: Both of the following criteria shall be met:
  - The lateral deflection of the anchor shall be less than 6 inches under an anchor cable load of 280 tons (50 percent of the minimum breaking strength of the production anchor cable).
  - The lateral deflection of the anchor shall be less than 12 inches under an anchor cable load of 425 tons (75 percent of the minimum breaking strength of the production anchor cable).

The Design-Builder shall meet the requirements described in Section 2.12 (Floating Bridge). The Design-Builder shall perform verification tests, as described in Section 2.6.5.3.1, to confirm the final design of the anchors.

### 2.6.4.5 BRIDGE MAINTENANCE FACILITY BUILDING

The shoring and exterior building walls that will support permanent earth loads for the buried portion of the Bridge Maintenance Facility Building shall be designed using the load and resistance factor design (LRFD) specifications described in the GDM (Appendix D5), the BDM (Appendix D1), the AASHTO *LRFD Bridge Design Specifications*, and the AASHTO *Guide Specifications for LRFD Seismic Bridge Design*. The remainder of the structure shall be designed using the IBC. The Design-Builder shall meet the requirements described in Sections 2.13 (Bridges and Structures) and 2.30 (Bridge Maintenance Facility and Dock).

### 2.6.4.6 REINFORCED SOIL SLOPE DESIGN

All reinforced soil slopes shall be designed in accordance with the GDM (Appendix D5) and FHWA Publication FHWA-NHI -10-025, *Design and Construction of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes*.

### 2.6.4.7 FOUNDATION DESIGN FOR SIGNS AND LUMINAIRES

All standard foundations for new cantilevered signals, strain poles, cantilevered signs, sign bridges and luminaires shall be evaluated in accordance with the GDM (Appendix D5) and applicable Mandatory Standards. The standard foundation designs provided in the Standard Plans shall be used if the minimum applicable soil and slope conditions are present at the site. If soil/rock or ground conditions are such that the Standard Plans cannot be used, detailed analyses shall be conducted. The design of Type 1 (Shaft Foundations) shall be performed in accordance with the GDM (Appendix D5) and AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals*. All foundation types shall be designed in accordance with the GDM, BDM (Appendix D1) and the AASHTO *LRFD Bridge Design Specifications*.

### 2.6.4.8 STORMWATER FACILITIES

Stormwater facilities shall be evaluated in accordance with the BDM (Appendix D1), the GDM (Appendix D5), the Highway Runoff Manual, and other applicable Mandatory Standards. Stormwater facilities shall be designed for a minimum factor of safety of 1.2 against hydrostatic uplift. Stormwater pond slopes shall be designed for a minimum factor of safety of 1.1 for rapid drawdown. The Design-Builder shall meet the

requirements described in Sections 2.13 (Bridges and Structures) and 2.14 (Stormwater Management).

#### 2.6.4.9 GROUND IMPROVEMENT

Design of any ground improvement measures selected by the Design-Builder shall be accomplished in accordance with the design requirements of the GDM (Appendix D5), in particular Chapters 6 and 11. The ground improvement design must include a monitoring and testing program to be implemented during construction to confirm the design ground improvement results are achieved during construction.

### 2.6.5 CONSTRUCTION CRITERIA

The project shall be constructed in accordance with the Mandatory Standards.

#### 2.6.5.1 CONSTRUCTION TOLERANCES

Criteria for allowable settlement and horizontal deformation of retaining structures, hydraulic structures, bridge foundations/piers and other structures are provided in the GDM (Appendix D5) and BDM (Appendix D1).

#### 2.6.5.2 SLOPE STABILITY AND PROTECTION

The Design-Builder is responsible for slope stability throughout the Project, both within and adjacent to the Right-of-Way. If any landslides develop during construction, the Design-Builder shall cease all activities in the immediate area within and around the unstable ground until the situation is fully assessed by the Design-Builder. The Design-Builder shall immediately contact WSDOT and inform it of the situation. Before the Design-Builder returns to work in the immediate area of unstable ground, the Design-Builder shall implement temporary slope stabilization measures to ensure the safety of the public and Project personnel. Permanent slope stabilization measures shall be designed and constructed by the Design-Builder. WSDOT will review and comment on the temporary and permanent slope stabilization measures. Where necessary during construction, the Design-Builder shall be required to drain areas of observed or suspected groundwater seepage to avoid the risk of landslide and surface sloughing.

#### 2.6.5.3 FLOATING BRIDGE ANCHOR TESTING

The Design-Builder shall conduct verification, performance, and proof testing of the floating bridge anchors as described in the following sections. Prior to performing anchor testing, the Design-Builder shall create a Floating Bridge Anchor Testing Plan that includes the following:

- Proposed anchor configuration, locations and anchor installation methods for verification testing;
- Proposed anchor locations for performance testing;
- Description of test equipment and procedures;
- Descriptions of instrumentation used to monitor the testing;
- Environmental considerations and Best Management Practices plan;
- Proposed anchor dimensions, cable connections, and associated items affecting anchor performance (e.g. use of ballast – see Section 2.6.5.4); and

- Description of proposed methods for calculating anchor position and deflection during testing.

The Floating Bridge Anchor Testing Plan shall be submitted to WSDOT for review and comment prior to performing the anchor testing.

All anchor testing shall be performed during weather conditions in which the average wind speed is predicted not to exceed 15 miles per hour. All anchor load testing calculations shall take into account the effects of the measured average wind speed during the testing in determining the actual load being carried by the anchors and the actual anchor deflection.

#### 2.6.5.3.1 Verification Testing

The Design-Builder shall conduct verification testing on at least two anchors of each anchor type, at locations selected by the Design-Builder in consultation with WSDOT. The anchors shall be of the same size and configuration as the proposed production anchors (full-scale). The purpose of the verification testing is to confirm the final design of the anchors.

The verification tests shall be performed in soil conditions similar to those encountered at locations where the production anchor types will be used. Verification test anchors shall be installed a sufficient distance away from production anchor locations such that presence of the verification test anchors does not affect the installation of production anchors and such that soil strength within the zone of influence of the production anchors will not be adversely impacted by verification testing.

The verification tests shall not use the existing bridge and/or new bridge pontoons as a reaction point.

The Design-Builder shall perform the verification testing by incrementally loading the anchors in accordance with the following schedule:

| Load Increment(s) in Tons | Measurement Time(s) in Minutes for Each Load Increment |
|---|---|
| 30 | 1 |
| 140 | 1, 10 |
| 30 | 1 |
| 140 | 1,10 |
| 280 | 1, 2, 3, 4, 5, 6, 10, 20, 30, 60, 120, 240, 300, 360, 420, 480, 540, 600, 660, 720, 780, 840, 900, 960, 1020, 1080, 1140, 1200, 1260, 1320, 1380, 1440 |
| 140; 30 | 1 |
| 140; 280 | 1, 10 |
| 425 | 1, 2, 3, 4, 5, 6, 10, 20, 30, 60, 120, 240, 300, 360 |
| 280; 140; 30 | 1 |
| 140; 280; 425 | 1, 10 |
| 570 | 1, 2, 3, 4, 5, 6, 10, 20, 30, 60 |
| 425; 280; 140; 30 | 1 |

During the verification testing, the force in the cable shall be applied at a rate less than 2 tons per minute to achieve the target load and maintained at the target load for the measurement time specified for each load increment in the previous table. Load shall be measured to the nearest 5 tons. For each measurement time during each load increment schedule, the Design-Builder shall measure and record the jacking system position and total deflection and then use the measurements to calculate the anchor position and total anchor deflection. The precision of all measured and calculated values shall be to the nearest 0.2 inch. The Design-Builder shall submit the results of the verification tests including jack position, total jack deflection, anchor position, and total anchor deflection for each measurement time during each load increment for each anchor within 24 hours after completion of each test.

The Design-Builder shall provide a testing cable such that the maximum load applied during each verification test is less than 80 percent of the breaking strength of the testing cable. The anchor cable to anchor connections shall be the same type as the production anchors and shall have the same boundary conditions so that they demonstrate the suitability of the connections in the production anchors.

Portions of test anchors and associated test cables and connections that protrude above the mudline shall be removed from the lake and discarded by the Design-Builder after testing is complete. The verification test anchors may be re-used as production anchors provided that no damage has occurred to the anchor either during the verification testing or during relocation of the anchor to its final position.

The verification test will be accepted if the following criteria are met:

- The anchor shall not deflect laterally more than 6 inches during the hold of the 280-ton load increment.
- The anchor shall not deflect laterally more than 12 inches during hold of the 425-ton load increment.
- The creep rate measured during the hold of each of the 280-ton, 425-ton, and 570-ton load increments shall be decreasing over successive log increments of time. Creep is defined as continued deformation under a constant load. Creep rate is defined as deformation over time.

If the verification test for any specific anchor type does not meet the specified test criteria, the design for that anchor type is rejected. The Design-Builder shall revise the anchor design and submit the revised design to WSDOT for review. The Design-Builder shall perform additional full-scale verification tests (two of each re-designed anchor type) to demonstrate that the revised anchor design meets the specified test criteria.

If ballast is an integral part of the anchor design, ballast shall be placed and used for the verification test. If ballast is placed for a verification test anchor to meet the acceptance criteria, then all production anchors of that type shall be constructed with ballast unless the Design-Builder redesigns the anchor and completes a successful verification test for the revised anchor design.

#### 2.6.5.3.2 Performance Testing

The Design-Builder shall conduct performance testing on at least four production anchors of each anchor type. The purpose of the performance testing is to establish load-deformation behavior of the anchors.

The Design-Builder shall select the locations of the performance test anchors in consultation with WSDOT and in accordance with the following criteria:

- Shaft Anchors: All performance tests shall be performed on anchors at locations where the mudline elevation is between -10 feet and -160 feet. Two tests shall be performed near the west end of the proposed bridge and two tests shall be performed near the east end of the proposed bridge. Two tests shall be located north of the proposed bridge and two tests shall be located south of the proposed bridge.
- Gravity Anchors: All performance tests shall be performed on anchors at locations where the mudline elevation is between -10 feet and -160 feet. Two tests shall be performed near the west end of the proposed bridge and two tests shall be performed near the east end of the proposed bridge. Two tests shall be located north of the proposed bridge and two tests shall be located south of the proposed bridge.
- Fluke Anchors: All performance tests shall be performed on anchors at locations where the mudline is below elevation -170 feet. Two tests shall be located north of the proposed bridge and two tests shall be located south of the proposed bridge. The tests shall be at least 1,000 feet apart.

The performance tests shall not use the existing bridge and/or new bridge pontoons as a reaction point.

The Design-Builder shall conduct the performance testing by incrementally loading the anchors in accordance with the following schedule:

| Load Increment(s) in Tons | Measurement Time(s) in Minutes for Each Load Increment |
|---|---|
| 30 | 1 |
| 140 | 1, 10 |
| 30 | 1 |
| 140 | 1, 10 |
| 280 | 1, 2, 3, 4, 5, 6, 10, 20, 30, 60, 120 |
| 140; 30 | 1 |
| 140; 280 | 1, 10 |
| 425 | 1, 2, 3, 4, 5, 6, 10, 20, 30, 60, 120, 240, 300, 360 |
| 280; 140; 30 | 1 |

During the performance testing, the force in the cable shall be applied at a rate less than 2 tons per minute to achieve the target load and maintained at the target load for the measurement time specified for each load increment in the previous table. Load shall be measured to the nearest 5 tons. For each measurement time during each load increment schedule, the Design-Builder shall measure and record the jacking system position and total deflection and then use the measurements to calculate the anchor position and total deflection. The precision of all measured and calculated values shall be to the nearest 0.2 inch. The Design-Builder shall submit the results of the performance tests including jack position, total jack deflection, anchor position, and total anchor deflection for each measurement time during each load increment for each anchor within 24 hours after completion of each test.

The performance test will be accepted if the following criteria are met:

- The anchor shall not deflect laterally more than 12 inches during hold of the 425-ton load increment.
- The creep rate measured during the hold of each of the 280-ton and 425-ton load increments shall be decreasing over successive log increments of time. Creep is defined as continued deformation under a constant load. Creep rate is defined as deformation over time.
- For each specific anchor type, the creep rate measured at the 280-ton load increment between 1 and 120 minutes shall be less than or equal to the creep rate measured over the same time period at the 280-ton load increment during either of the two accepted verification tests (Section 2.6.5.3.1) performed on that anchor type.

If any anchor does not meet the specified test criteria, the anchor is rejected. The Design-Builder shall submit an anchor repair plan for the rejected anchor to WSDOT for approval. Once the repair plan is approved and the anchor repair has been completed, the Design-Builder shall perform an additional test to demonstrate that the repaired anchor meets the specified test criteria.

#### 2.6.5.3.3 Proof Testing

The Design-Builder shall perform proof testing on all production anchors that are not subjected to performance testing. The purpose of proof testing is to load the anchor beyond its service load to prove that the anchor will provide adequate resistance under service conditions.

The proof tests shall not use the existing bridge and/or new bridge pontoons as a reaction point.

The Design-Builder shall conduct the proof testing by incrementally loading the anchors in accordance with the following schedule:

| Load Increment(s) in Tons | Measurement Time(s) in Minutes for Each Load Increment |
|---|---|
| 30 | 1 |
| 140 | 1,10 |
| 280 | 1, 2, 3, 4, 5, 6, 10, 20, 30, 60, 120 |
| 425 | 1, 2, 3, 4, 5, 6, 10, 20, 30, 60, 120 |
| 280; 140; 30 | 1 |

During the proof testing, the force in the cable shall be applied at a rate less than 2 tons per minute to achieve the target load and maintained at the target load for the measurement time specified for each load increment in the previous table. Load shall be measured to the nearest 5 tons. For each measurement time during each load increment schedule, the Design-Builder shall measure and record the jacking system position and total deflection and then use the measurements to calculate the anchor position and total anchor deflection. The precision of all measured and calculated values shall be to the nearest 0.2 inch. The Design-Builder shall submit the results of the proof tests including jack position, total jack deflection, anchor position, and total anchor deflection for each

measurement time during each load increment for each anchor within 24 hours after completion of each test.

The proof test will be accepted if the following criteria are met:

- The lateral deflection of the anchor being tested shall be compared with load-deflection data from the four performance tests on that anchor type described in Section 2.6.5.3.2. The following equation shall be true:

  $a \leq b + 0.05\,(c)$

  Where

  $a$ = the cumulative deflection observed at the 120 minute measurement time at the 425-ton load increment during the proof test.

  $b$ = the largest cumulative deflection observed at the 120 minute measurement time at the 425-ton load increment during any of the four accepted performance tests.

  $c$ = the average of cumulative deflections observed at the 120 minute measurement time at the 425-ton load increment during the four accepted performance tests.

- The creep rate measured during the hold of each of the 280-ton and 425-ton load increments shall be decreasing over successive log increments of time. Creep is defined as continued deformation under a constant load. Creep rate is defined as deformation over time.".

If any anchor does not meet the specified test criteria, the anchor is rejected. The Design-Builder shall submit an anchor repair plan for the rejected anchor to WSDOT for approval. Once the repair plan is approved and the anchor repair has been completed, the Design-Builder shall perform an additional test to demonstrate that the repaired anchor meets the specified test criteria.

#### 2.6.5.4 ANCHOR BALLAST

If the Design-Builder elects to use ballast to increase the resistance of the proposed floating bridge anchors, the type of ballast, volumes and placement methods used shall be submitted to WSDOT for review and comment prior to use in the anchor construction. Anchor Ballast shall be Loose Riprap, Heavy Loose Riprap or Quarry Spalls in accordance with Division 9-13 of the WSDOT Standard Specifications (Appendix D18). Sack riprap shall not be used.

## 2.6.6 SUBMITTALS

### 2.6.6.1 GENERAL

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. Spreadsheets and math software used to perform 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. Example problems shall be developed by the

Design-Builder and the solutions from the spreadsheets and math software used to solve the problems shall be validated with hand calculations. All formulae used shall be documented with references (data sources).

The calculations verification submittal shall be developed during design, and 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 re-submitted 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;
- Field exploration work plan (if applicable);
- Temporary dewatering plan;
- Shoring plan;
- Technical memoranda;
- Geotechnical Instrumentation Plan;
- Settlement, horizontal deformation, and vibration monitoring plan;
- Geotechnical report;
- Calculations verification submittals;
- Pre-condition survey;
- Floating bridge anchor testing plan; and
- Floating bridge anchor verification, performance, and proof test results.

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, trails, private parking areas, 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), gravel courses, base, and sub-base material.

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

- New and reconstructed mainline pavement, private parking areas and driveways; and
- New pavement on RSUP and pedestrian path.

Existing pavements shall be maintained during construction in accordance with the requirements of Section 2.29 (Maintenance During Construction). The exact paving limits shall be determined by the Design-Builder, provided that they are consistent with paving limits in these Technical Requirements.

## 2.7.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT Draft Pavement Policy, January 2010 (Appendix J3).
- WSDOT *Pavement Surface Condition Field Rating Manual* (Appendix D11).
- 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 D17).
- AASHTO *A Policy on Geometric Design of Highways and Streets*, 5th Edition, 2004.

- AASHTO LRFD Bridge Design Specifications, Customary U.S. Units, 4th Edition, with 2008 Interim Revisions.
- AASHTO Standard Specifications for Highway Bridges, 17th Edition, 2002.
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D13).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- WSDOT *Local Agency Guidelines* (M36-63) (LAG) (Appendix D8).
- City of Medina, American Public Works Association Standard Specifications.

## 2.7.3 PERFORMANCE REQUIREMENTS

### 2.7.3.1 GENERAL

WSDOT has prepared two SR 520 Surfacing Reports titled "Surfacing Report" and "Pavement Design Addendum" (Appendix J1). These reports present the results of WSDOT's review of the existing roadway pavements. They also present the required pavement section depths which shall be used on the Project. These pavement sections are described further in this section.

In addition, the Design-Builder shall construct pavement sections that meet the following performance requirements:

- Provide new pavements that meet or exceed the pavement smoothness specified in this section. The ride quality specification shall also apply to pavement structure transition areas between the HMA, PCCP, approach slabs, and structures. Pavement smoothness pay incentives and disincentives shall be based on Section 1-08 of the General Provisions (Schedule 1).
- Provide new pavements with no identifiable distress. The Design-Builder shall evaluate the distress parameters on an as needed basis as determined by WSDOT. If corrective action needs to be taken, the Design-Builder shall coordinate all such activities so as to minimize disruption to traffic.

### 2.7.3.2 NEW AND RECONSTRUCTED PAVEMENT

The Design-Builder shall construct mainline pavement using the design pavement sections shown in these Technical Requirements.

The RSUP shall be constructed using the pavement design sections in these Technical Requirements.

Portions of the Project require construction of pavement in driveways, turnarounds and parking areas. This includes the maintenance facility access that intersects Evergreen Point Road and the parking area servicing the maintenance facility.

Transverse butt joints at a depth of 0.15 feet shall be provided at all HMA paving limits that tie-in to existing HMA pavement.

Any pavement outside of the shoulder shall be considered miscellaneous pavement (i.e. enforcement areas and maintenance pull-outs). All miscellaneous pavement sections on SR 520 shall match the adjacent shoulder pavement section.

The Design-Builder shall conduct a pre-condition survey of all existing improvements that are to remain when the project is complete, and that might be impacted by the

Design-Builder's Work. The Design-Builder shall restore any improvements, including but not limited to, city streets, sidewalks, private parking areas, and driveways damaged during construction of the Project to pre-construction condition or better.

## 2.7.3.3 PAVEMENT SMOOTHNESS

### 2.7.3.3.1 Portland Cement Concrete and Hot Mix Asphalt

**Surface Smoothness**

Sections 5-04.3(13), 5-05.3(12) and the last 4 paragraphs of Section 6-02.3(10)D of the WSDOT Standard Specifications (Appendix D18) are replaced with the following:

The completed surface of all HMA and PCCP wearing courses, Modified Concrete overlays on bridge structures, bridge approach slabs, and bridge decks shall be of uniform texture, smooth, uniform as to crown and grade, and free from defects of all kinds.

The Project shall utilize the value of International Roughness Index (IRI) calculated by averaging the left and right wheel path IRI as the basis for incentive and disincentive payments for the smoothness of the roadway surface. The entire length of each through lane, auxiliary lane, passing lane, transit lane, bridge approach slabs, and bridge deck paved or constructed shall be profiled from the beginning to the end of the Project. Ramps, shoulders, tapers, and city streets will not be profiled and will not be subject to the IRI incentive/disincentive adjustments. The IRI rating for the new pavements, bridge approach slabs, and bridge decks including intervening joints shall be evaluated, and payment shall be adjusted according to the methods outlined in Section 1-08.11(1) of the General Provisions.

IRI testing will be performed by WSDOT using a high speed inertial profiler with an area sensor (RoLine or equivalent technology).Upon completion of the paving operation, the Design-Builder shall notify the WSDOT Engineer when the roadway has been striped to final roadway configuration and can be driven at the posted speed limit. This notification shall occur after any and all corrective action has been completed. WSDOT will inspect the roadway to ensure that it can be driven safely at the posted speed limit. If requested by WSDOT, the Design-Builder shall sweep the roadway immediately prior to testing, at no additional expense to WSDOT.

Weather permitting; IRI testing will be completed within 30 Calendar Days of notification from the Design-Builder that the roadway is ready for testing. WSDOT will notify the Design-Builder of the results within seven Calendar Days after the test is completed. No testing will be done if the roadway contains standing water; if it is raining; or if other weather conditions exist that WSDOT determines to be inclement.

Any deviation in the completed surface of the pavement wearing course including joints between pavement and bridge approach slabs or between pavement and bridge decks shall not vary more than 1/8-inch from the lower edge of a 10-foot straightedge placed on the surface parallel to the centerline. The transverse slope of the completed surface of the pavement shall not vary more than 1/4-inch in 10 feet from the rate of transverse slope shown in the plans. When deviations in excess of the above tolerances are found that result from a high place in the pavement, the pavement surface shall be corrected by one of the following methods:

- Diamond grinding until the area meets the 1/8-inch in 10 feet and transverse requirements. Corrective actions or repairs shall not reduce the planned pavement thickness by more than 1/4 inch.
- Removal and replacement of the wearing course of HMA to a depth of 0.15 feet.
- By another method approved by the WSDOT Engineer.

After Modified Concrete overlays, bridge decks, and approach slabs have cured, their surface shall not vary more than 1/8-inch under a 10-foot straight edge placed parallel and perpendicular to centerline, including across expansion joints.

The Design-Builder shall cut high spots on Modified Concrete overlays, bridge decks, and approach slabs down with a diamond-faced, saw-type cutting machine. This machine shall cut through mortar and aggregate without breaking or dislodging the aggregate or causing spalls. Corrective action or repairs shall not reduce the reinforcing steel concrete clear cover by more than ¼ inch and shall be submitted to WSDOT for approval.

Low spots on Modified Concrete overlays, bridge decks, and approach slabs shall be built up utilizing a grout or concrete with a strength equal to or greater than the required 28-day strength of the deck/ slab. The method of build-up shall be submitted to WSDOT for approval.

Correction of defects shall be carried out until there are no deviations anywhere greater than the allowable tolerances. The exact limits for corrective action shall be determined by the Design-Builder and the location shall be marked on the roadway before corrective action commences. The area that is corrected shall be checked by the Design-Builder to ensure that the area meets the requirements of these Technical Requirements and the WSDOT Standard Specifications (Appendix D18). The locations and limits for corrective action determined by the Design-Builder shall be submitted to WSDOT for approval prior to correction of defects. A standard milling machine shall not be allowed for corrective action of areas that do not meet the parallel to centerline or transverse slope requirements.

## 2.7.4 DESIGN REQUIREMENTS

### 2.7.4.1 MAINLINE PAVEMENT

The compacted pavement depths for permanent SR 520 lanes and shoulders shall be as follows:

- HMA for mainline: The new HMA pavement shall begin on the mainline at the easternmost point where the required PCCP paving ends, and continue to the paving limits shown in Appendix M1. Where HMA paving is constructed it shall be full depth and match the limits shown in Appendix M1. . HMA paving shall consist of the following section:
    - 0.15 feet HMA Class 1/2-inch, PG 64-22
    - 0.15 feet HMA Class 1/2-inch, PG 64-22
    - 0.35 feet HMA Class 1/2-inch, PG 64-22
    - 0.35 feet HMA Class 1/2-inch, PG 64-22
    - 0.35 feet CSBC

- 1.35 feet Total

- PCCP for mainline paving shall extend from the eastern edge of the new East Approach Bridges approach slabs to at least 30 feet beyond the eastern portal of the Evergreen Point Road Lid. The PCCP paving shall extend the full width of the roadway section, and include all lanes, shoulders, transit entrance ramp lanes, gore areas and medians. PCCP paving shall consist of the following section:
  - 0.92 feet PCCP with Corrosion Resistant Dowel Bars
  - 0.30 feet HMA Class 1/2-inch, PG 64-22
  - 0.35 feet CSBC
  - 1.57 feet Total

#### 2.7.4.2 TEMPORARY CONSTRUCTION STAGING

If the HMA pavement placed under the PCCP paving section shown in section 2.7.4.1 is used for construction staging traffic, prior to the placement of PCCP, the following modified HMA thickness shall be used:

1. Up to 3 months:

- 0.35' HMA Class ½", PG 64-22
- 0.35' CSBC
- 0.70' Total

2. Up to 6 months:

- 0.40' HMA Class ½", PG 64-22
- 0.35' CSBC
- 0.75' Total

#### 2.7.4.3 SHARED USE PATHS

If soft subgrade areas are identified during design or construction of the paths, then 1.00 feet of the soft subgrade shall be over-excavated and replaced with quarry spalls and/or shoulder ballast separated from the subgrade with a layer of Geotextile in accordance with the WSDOT Standard Specifications (Appendix D18):

- 0.25 feet HMA Class 1/2-inch, PG 64-22 or Commercial HMA
- 0.35 feet CSBC
- 0.60 feet Total

#### 2.7.4.4 BRIDGE MAINTENANCE FACILITY ACCESS ROAD AND PARKING AREA

- 0.67 feet PCCP without dowel bars
- 0.35 feet CSBC

- 1.02 feet Total

#### 2.7.4.5 CITY STREETS, PARK AND RIDE, AND SIDEWALKS

The Design-Builder shall repair city streets, private sidewalks, parking areas and driveways damaged by the Project within 10 Calendar Days of damage occurrence, cessation of the Work, or WSDOT's notification to repair. All repairs shall be in accordance with the local jurisdiction's pavement design standards and Right-of-Way use requirements. If the Design-Builder proposes pavement designs that do not meet the requirements of the local jurisdiction, the designs shall be submitted to WSDOT for review and comment 14 Calendar Days in advance of submittal for review and approval by the local jurisdiction.

## 2.7.5 CONSTRUCTION REQUIREMENTS

### 2.7.5.1 PAVEMENT MATERIALS

The Design-Builder or HMA supplier shall develop the HMA mix design in accordance with Section 2.25 (Control of Materials); a 15-year calculated design of 10,700,000 ESALs shall be used in determining the mix design.

### 2.7.5.2 REMOVING EXISTING PAVEMENT

The Design-Builder shall remove all existing pavement that will not be required for the completed Project traffic lanes or shoulders to a depth that corresponds to the depth of the required pavement section thickness including sub-base. Refer to Appendix M1 for pavement limits as shown in the Conceptual Paving Plans.

### 2.7.5.3 NEXT GENERATION CONCRETE SURFACE

The Design-Builder shall apply a Next Generation Concrete Surface (NGCS) texture to all mainline PCCP driving lanes, bridge approach slabs, and bridge decks. The Next Generation Concrete Surface texture shall extend one foot into the shoulder beyond the edge stripe.

The construction of the NGCS test section can be accomplished as a single pass or two pass operation as determined by the Design-Builder.

The Design-Builder shall provide a single lane test grind of 500 feet in length to demonstrate that the equipment and procedures are capable of attaining the desired surface. The Design-Builder will not be allowed to proceed any further until the test grind has been approved in writing by WSDOT.

The finished NGCS surface shall be true to grade and uniform in appearance with a longitudinal grooved texture. The flush ground surface shall appear smooth and shall contain no ridges that exceed 0.03 inches. The longitudinal grooves shall be constructed parallel to the centerline.

**Single Pass Operation**

The construction operation will provide a flush ground surface that contains longitudinal grooves and shall be constructed in one single pass operation. The diamond blade stack shall consist of two types of diamond grinding blades arranged to provide a flush ground surface as well as those required to produce the longitudinal grooves. The diamond blade stack shall be mounted on a 4 foot grinding head, stacked with 0.125 inch blades separated by 0.03 inch spacers. The blades used to produce the flush grind surface

should be flat across with other flush grind blades (excluding grooving blades) when mounted. The complete head when stacked with all blades shall be straight across its length without bowing when mounted on the diamond grinding machine. The flush grind blades shall be stacked in a manner that leaves no resulting fin between them. The grinding shall eliminate joint or crack faults and provide lateral drainage by maintaining a constant cross slope between grinding passes in each lane. The cross slope of the pavement shall match the existing and shall have no depressions or misalignment of slope greater than 0.125 inches in 10 feet when measured with a 10-foot straightedge placed perpendicular to the centerline. Areas of deviation shall be reground. Straightedge requirements will not apply across longitudinal joints or outside the ground area. The minimum overlap between passes shall be one inch. The longitudinal grooves shall be 0.125 inches to 0.188 inches deep and spaced between 0.5 inches to 0.625 inches center to center. The grooves shall be constructed parallel to the centerline. The Design-Builder shall use a guide to ensure proper alignment of the grooves to centerline.

## Two Pass Operation

This construction method will allow for two separate operations to construct the NGCS section. The first operation will create the flush ground surface. The flush grind blades shall be mounted on a 4 foot grinding head, stacked with 0.125 inch blades separated by 0.03 inch spacers. The flush grind head shall be flat across the blades when mounted on the diamond grinding machine with no bowing of the head. The flush grind blades shall be stacked in a manner that leaves no resulting fin between them. The grinding shall eliminate joint or crack faults and provide lateral drainage by maintaining a constant cross slope between grinding extremities in each lane. The cross slope of the pavement shall match the existing and shall have no depressions or misalignment of slope greater than 0.125 inches in 10 feet when measured with a 10-foot straightedge placed perpendicular to the centerline. Areas of deviation shall be reground. Straightedge requirements will not apply across longitudinal joints or outside the ground area. The minimum overlap between passes shall be one inch. The second operation will provide the longitudinal grooves. The longitudinal grooves shall be 0.125 inches wide and will be 0.125 inches to 0.188 inches deep. The longitudinal grooves shall be spaced approximately 0.5 inches to 0.625 inches center to center. The grooves shall be constructed parallel to the centerline. The Design-Builder shall use a guide to ensure proper alignment of the grooves to centerline.

**Finishing**

Section 5-05.3(11) of the WSDOT Standard Specifications (Appendix D18) is supplemented with the following:

> All new PCCP shall receive a carpet drag finish as specified in Appendix B14.

Where the NGCS texture is called for on new pavement, the entire driving surface, including one foot into the shoulder beyond the edge stripe, shall be textured utilizing the NGCS. Where the NGCS texture abuts the adjacent finished shoulder, the finished vertical grade of the NGCS texture shall match the finished vertical grade of the adjacent shoulder.

**Concrete Placement, Finishing, and Texturing**

Section 6-02.3(10)D of the WSDOT Standard Specifications (Appendix D18) is supplemented with the following:

> Bridge decks and approach slabs constructed on this project shall be flush ground as specified for the NGCS construction required in this section. The entire roadway surface, including the shoulders, shall be flush ground.
>
> Where the NGCS texture is called for on bridge decks and approach slabs, the entire driving surface, including one foot into the shoulder beyond the edge stripe, shall be textured utilizing the NGCS. Where the NGCS texture abuts the adjacent flush ground shoulder, the finished vertical grade of the NGCS texture shall match the finished vertical grade of the adjacent shoulder.

Control of concrete slurry and grinding residue shall be in accordance with Section 5-01.3(11) of the WSDOT Standard Specifications (Appendix D18).

## 2.7.5.4 ACCEPTANCE SAMPLING AND TESTING

### 2.7.5.4.1 HMA Mixture

All acceptance testing for 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)A5 of the WSDOT Standard Specifications (Appenidx D18) is revised to read as follows:

> The results of all acceptance testing performed in the field and the Composite Pay Factor (CPF) of the lot after three sublots have been tested will be available to the Design-Builder or mix supplier through WSDOT's website.
>
> The Design-Builder may request that a sublot be retested. To request a retest, the Design-Builder shall submit a written request within 7 calendar days after the specific test results have been posted to the website. A split of the original acceptance sample will be sent for testing to either the Region Materials Laboratory or the State Materials Laboratory as determined by the WSDOT's Project Engineer. The split of the sample will not be tested with the same equipment or by the same tester that ran the original acceptance test. The sample will be tested for a complete gradation analysis, asphalt binder content and Va and the results of the retest will be used for the acceptance of the HMA in place of the original sublot sample test results. The cost of testing will be deducted from

any monies due or that may come due to the Design-Builder under the Contract at the rate of $250 per sample.

Section 5-04.3(10) B1 of the WSDOT Standard Specifications (Appendix D18) is revised to read as follows:

HMA used in traffic lanes, including lanes for ramps, truck climbing, weaving, speed change, and shoulders, and having a specified compacted course thickness greater than 0.10 foot, shall be compacted to a specified level of relative density. Low cyclic density areas will be evaluated by WSDOT in accordance with Section 5-04.3(10) B2 of the WSDOT Standard Specifications (Appendix D18). The credit for the price adjustment shall be made under the item "Cyclic Density Price Adjustment."

Longitudinal joint density will be evaluated by WSDOT in accordance with Section 5-04.3(10) B3 of the WSDOT Standard Specifications (Appendix D18). The credit for the price adjustment shall be made under the item "Longitudinal Joint Density Adjustment."

Section 5-04.3(10) B4 of the WSDOT Standard Specifications (Appendix D18) is revised to read as follows:

The nuclear moisture-density gauge results of all compaction acceptance testing and the CPF of the lot after three sublots have been tested will be available to the Design-Builder or the mix supplier through WSDOT's website. Determination of the relative density of the HMA with a nuclear moisture-density gauge requires a correlation factor and may require resolution after the correlation factor is known. Acceptance of HMA compaction will be based on the statistical evaluation and CPF so determined.

For a sublot that did not meet the minimum of 91.0 percent of the reference maximum density in a compaction lot with a CPF below 1.00 and thus subject to a price reduction or rejection, the Design-Builder may request that a core be used for determination of the relative density of the sublot. The relative density of the core will replace the relative density determined by the nuclear moisture-density gauge for the sublot, and will be used for calculation of the CPF and acceptance of HMA compaction lot. When cores are taken by WSDOT at the request of the Design-Builder, they shall be requested by noon of the next workday after the test results for the sublot have been provided, or made available to the Design-Builder or the mix supplier. The core will be taken at approximately the same location as the nuclear moisture-density gauge test in the compaction sublot being challenged. Traffic control shall be provided by the Design-Builder as requested by the Project Engineer. Failure by the Design-Builder to provide the requested traffic control will result in forfeiture of the request for cores. When the CPF for the lot based on the results of the HMA cores is less than 1.00, the cost for the coring will be deducted from any monies due or that may become due to the Design-Builder under the Contract at the rate of $200 per core.

## 2.7.6 SUBMITTALS

### 2.7.6.1 HMA MIX DESIGN

The Design-Builder or mix supplier shall submit a copy of the completed HMA mix design on DOT form 350-041 (appendix F12) or on DOT form 350-042 (appendix F13), and submit representative samples of the mineral materials to WSDOT in accordance with Section 2.25 (Control of Materials).

### 2.7.6.2. CONTAINMENT, COLLECTION AND DISPOSAL PLAN

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

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:

- Avoiding impacts to the community and to the environmental, historic, archaeological and cultural resources beyond what is indicated within the Environmental Project Description Narrative (Appendix E6) and the Environmental Commitments List (Appendix C1). The Environmental Project Description Narrative contains a summary of the current environmental assumptions and impacts which if modified by the Design-Builder may trigger the need to modify permits or other environmental documents including mitigation as described in this section.
- 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 permit violations.
- Working with WSDOT to seamlessly comply with all environmental requirements contained in this section. Specific instances where the Design-Builder and/or WSDOT bears full or partial responsibility for an environmental effort are set forth in this section.
- Working with WSDOT, and the appropriate permitting agencies as needed, to develop and implement an Environmental Compliance Plan and otherwise comply with the commitments and requirements of this.

### 2.8.1.2 SUSTAINABILITY

It is the policy of WSDOT to develop, implement, and refine sustainable practices on the SR-520 Program. Specifically, the SR 520 Bridge Replacement and HOV Program will demonstrate quality and innovation in supporting the sustainable transportation goal of the Department. Sustainability is an important interest in the community that this program will serve. The Design-Builder shall conduct Work to reflect that interest by incorporating the principles of sustainability into the project design, construction, operations and maintenance.

Specifically, principles of sustainability include the following:

- Support the protection of quality of life and community resources for this and future generations.
- Support the safety and reliability of the systems for all legal modes and users.

- Support and enhance economic growth without degradation to quality of life.
- Use design and construction methods and approaches:
  - Improve water quality;
  - Minimize the consumption of virgin (raw) material;
  - Reduce Green House Gas (GHG) emissions;
  - Maximize energy efficiency; and
  - Protects and enhances natural resources and fish and wildlife habitat.
- Support local economic, social, and resource management needs, or that reduce impacts during the construction of a capital project, and/or during the operations and maintenance of the physical transportation facility after construction.

## 2.8.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT *Environmental Procedures Manual* (M31-11) (Appendix D4).
- WSDOT *Environmental Compliance Assurance Procedure* (Appendix E13).
- WSDOT *Highway Runoff Manual* (M31-16) (Appendix D6).
- WSDOT *Hydraulics Manual* (HM) (M23-03) (Appendix D7).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).

### 2.8.2.1 ENVIRONMENTAL DOCUMENTS AND PERMITS

This Project, the SR 520 Evergreen Point Floating Bridge and Landings Project is a part of a larger corridor project. The environmental documentation that WSDOT is responsible for developing, including the National Environmental Policy Act (NEPA)/ State Environmental Policy Act (SEPA), Endangered Species Act (ESA), Section 106, and permitting, covers the full extent of this larger corridor project known as the I-5 to Medina: Bridge Replacement and HOV Project (I-5 to Medina Project). While these environmental documents will be included as appendixes to this RFP they contain information and commitments that are applicable to the corridor as a whole. The

Environmental Commitments List (Appendix C1) has been utilized to identify those commitments that apply specifically to this Project.

WSDOT has prepared a draft Environmental Impact Statement (DEIS) and supplemental draft Environmental Impact Statement (SDEIS) (Appendix E1) for the Project in compliance with NEPA/SEPA. WSDOT and the Federal Highway Administration (FHWA) plan to publish a final Environmental Impact Statement (FEIS) and Record of Decision (ROD) for the Project. The Design-Builder's Preliminary Design Submittal may trigger the need for additional environmental review, such as a NEPA re-evaluation or other supplemental environmental documents.

The NEPA/SEPA documentation, ESA consultations, and environmental permits for the Project will not be completed prior to the award of the Contract. Because the NEPA process will not be complete prior to Contract award, WSDOT will use a two-phased Notice to Proceed (NTP) to ensure no individual alternative being evaluated in the NEPA process is committed to and that the comparative merits of all alternatives presented in the NEPA document, including the no-build alternative, will be evaluated and fairly considered. See Section 4.2 of the Contract Form. Since federal regulations limit the amount and type of work that can be performed prior to the completion of the ROD, the Design-Builder shall be familiar with the NEPA regulations and limits, and shall comply with the intent of the law. Work that is authorized pursuant to NTP 1 will focus on preliminary design and design to support ongoing environmental processes, NTP 2 will be authorized after the ROD has been issued by the FHWA.

The NEPA process has evaluated multiple alternatives that meet the purpose and need of the I-5 to Medina Project, as well as a no-build alternative. A Preferred Alternative referenced as the "6-Lane Alternative" has been identified and has received FHWA concurrence. The identification of the 6-Lane Alternative as the Preferred Alternative does not represent a commitment to fully design or build that alternative and does not preclude WSDOT or FHWA from selecting a different alternative. The SDEIS compares the merits of, evaluates and fairly considers all alternatives, including the no-build alternative.

The ROD is the final NEPA document and will identify a selected alternative. Until the ROD is issued by FHWA, all of the alternatives currently under consideration, including the no-build, are still viable options for the Project. The Design-Builder shall not begin Final Design or construction until such time as FHWA has issued the ROD and WSDOT issues NTP 2, nor shall the Design-Builder take any other action during the NTP 1 period that would have an adverse environmental impact or that would materially affect WSDOT's or FHWA's objective consideration of alternatives under NEPA.

All known or currently anticipated preliminary environmental requirements and mitigation measures are described in the Environmental Commitments List (Appendix C1). The Design-Builder shall implement any additional environmental conditions or mitigation measures as required per the final NEPA/SEPA document and permits and approvals for the Project. The Design-Builder shall review the preliminary commitments included in the Environmental Commitments List to ensure its preliminary designs are consistent and reflect the minimum requirements of the Project.

As final permits and environmental documents are not complete, WSDOT reserves the right to prescribe potential changes to preliminary commitments that are currently included in the Environmental Commitments List. Additional details regarding the Environmental Commitment List are provided elsewhere in this Section.

A partial list of the permits to be obtained and additional permits required for this Project are provided elsewhere in this Section.

#### 2.8.2.2 INTERAGENCY AGREEMENTS AND MEMORANDA

WSDOT is negotiating or has entered into several interagency agreements with federal and State agencies and local jurisdictions that provide guidance and clarification for meeting regulatory requirements. Relevant agreements are included in the Appendix E series of appendices. The Design-Builder shall comply with those provisions of the implementing agreements, and memoranda of understanding or agreement included in the Environmental Commitments List (Appendix C1).

### 2.8.3 PERFORMANCE REQUIREMENTS

#### 2.8.3.1 DESIGN INNOVATION AND TECHNOLOGY

WSDOT recognizes that innovation during the 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 (Appendix C1). These commitments avoid and minimize Project-related impacts. Unless otherwise modified by permit modifications in accordance with this section, the Design-Builder shall ensure these commitments are reflected in the design submittals and the Released For Construction (RFC) Documents described in Section 2.28 (Quality Management Plan Requirements) of these Technical Requirements.

#### 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 review and comment on an Interim Environmental Compliance Plan (IECP) specific to any proposed field investigation work including, but not limited to, explorations included in the Subsurface Investigation Plan described in Section 2.6 (Geotechnical Design) of these Technical Requirements. The IECP shall include all applicable information for the locations where field investigation work will occur. The information provided in the IECP shall be incorporated and modified as necessary into the Draft ECP and Final ECP when submitted to WSDOT in accordance with this section. To fulfill the IECP requirements for proposed early work, the Design-Builder shall submit to WSDOT an IECP that includes the following plans and necessary reference documents for review and comment prior to early construction:

- Temporary Erosion and Sediment Control (TESC) Plan
- Spill Prevention, Control, and Countermeasures (SPCC) Plan
- Fugitive Dust Control Plan

- Unanticipated Discovery Plan (UDP)
- Archaeological Construction Methodologies Plan
- Environmental Communication Protocol

The Design-Builder shall provide WSDOT with a complete Draft ECP prior to, or with, the Preliminary Design Submittal. If the project is divided into multiple Design Submittals, a Draft ECP and Final ECP shall be submitted for all Work included in each Design Submittal. The Design-Builder's Environmental Manager (EM), whose responsibilities are defined in the following section, shall be responsible for submitting the Draft ECP. The Design-Builder shall provide WSDOT with the Final ECP 30 Calendar Days prior to the commencement of any ground disturbing 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 necessary regulatory agencies. The Design-Builder shall stamp the ECP "Released For Construction" prior to the Environmental Pre-Construction Meeting, referenced elsewhere in this section. The ECP shall be consistent with all other requirements of the Quality Management Plan (QMP) in accordance with Section 2.28.

The ECP shall consist of three parts:

- Part I: Environmental Personnel, Communications, and Training;
- Part II: Environmental Plans and Strategies; and
- Part III: Environmental Compliance, Monitoring and Reporting.

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 EM 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 Key Personnel: Environmental Manager

###### *2.8.3.2.2.1.1 Roles and Responsibilities*

The Design-Builder shall identify a single point of contact for all environmental issues. This role, identified as the Environmental Manager (EM), shall be responsible for the 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 EM. The ECP shall identify the roles and responsibilities of other staff in assuring environmental compliance. The ECP shall identify how the EM will interact with WSDOT's Project Environmental Compliance Staff, as they will be performing compliance audits and will be working closely with the EM.

The EM shall be assigned to the Project full-time through Completion of the Project. If the Design-Builder replaces the EM, the Design-Builder shall provide an equally- or more-qualified replacement, contingent upon WSDOT's acceptance. If, during the course of the Project, WSDOT finds that the EM is not ensuring implementation of the ECP, then WSDOT may require replacement of the EM in accordance with Section 1-05 of the General Provisions.

The EM must have at least five years of experience managing environmental design and construction compliance issues on projects. At least three of those five years must be specific to linear transportation projects. An EM with at least two years of experience managing permitting and environmental compliance issues in the Pacific Northwest region is preferred. The EM must have knowledge of the environmental regulations and permits relevant to the Project.

The EM shall also be responsible for the following:

- Developing the submittals described in this section necessary to support the efforts to obtain and comply with environmental permits. Acting as a point of contact between the Design-Builder and the WSDOT permitting team to provide design information, schedule details, quantities, etc.
- Integrating with the design team during plan preparation and advising how to avoid and minimize adverse effects to the natural environment and local communities.
- Coordinating with engineers early in the design stages to ensure they are aware of environmental commitments related to their discipline.
- Reviewing engineering plans to ensure the Project's design reflects environmental commitments and requirements.
- Facilitating weekly Environmental Task Force meetings to coordinate with WSDOT's Environmental Compliance Staff about critical permitting and compliance issues.
- Meeting with the Design-Builder's management staff on a weekly basis to ensure the Project schedule reflects timing restrictions identified within the permits and to provide notifications to WSDOT for upcoming Work in accordance with the timeframes listed in the Environmental Commitments List (Appendix C1), permits and approvals.
- Ensuring and providing documentation that the Work complies with all environmental commitments included in the environmental documents, permits, agreements, and approvals of the Project.
- Maintaining and updating the Environmental Commitment List (Appendix C1) and associated database with any new or modified permit conditions.
- Acting as a liaison between 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.
- Coordinating with WSDOT archaeologists and the Design-Builder's scheduling staff and construction staff to comply with archaeological monitoring requirements and protocols for unanticipated discoveries.
- Identifying when a non-compliance event is occurring or has occurred and ensuring the WSDOT *Environmental Compliance Assurance Procedure* (Appendix E13) is implemented.

- As appropriate, identifying wetland and sensitive environmental areas for protection and fencing in advance of construction activities.
- Preparing and implementing a monitoring plan to ensure erosion/sedimentation and spill control devices and Best Management Practices (BMPs) are effective and maintained per commitments and WSDOT environmental manuals.
- Conducting field inspections to verify water quality sampling is occurring, and to ensure that environmental compliance measures and BMPs are meeting environmental requirements.
- Developing and participating in the environmental protection training program required by this section.

#### 2.8.3.2.2.2 Key Personnel: Environmental Compliance Inspector

The Environmental Compliance Inspector (ECI) for the Project shall be a member of the Environmental Task Force and responsible for environmental inspection of project compliance with all environmental commitments. The ECI shall be assigned to the Project full time through Completion of the Project. The ECI and EM must be separate people.

The ECI shall also be responsible for the following:

- Coordinating with the construction team to plan and implement site measures minimizing adverse effects to environmental, historic, archaeological and cultural resources and the public.
- Performing field inspections and maintaining required logs to ensure the adequacy of existing erosion/sedimentation and spill control devices and BMPs.
- Assisting the EM with maintenance of the Environmental Commitments List and being aware of relevant commitments and all new or modified conditions.
- Being familiar with relevant submittals to ensure consistency with Project environmental commitments.
- Attending weekly Environmental Task Force meetings.
- Identifying when a non-compliance event is occurring or has occurred, and coordinating with appropriate staff to ensure appropriate environmental response is implemented.

#### 2.8.3.2.2.3 Environmental Communications Protocol

As part of the ECP, the EM shall develop, document and implement an Environmental Communications Protocol. The Environmental Communications Protocol shall describe the process to be used for non-compliance reporting; unanticipated archaeological discoveries; personnel's roles; procedures for internal and external communications; and communications with WSDOT. The Environmental Communications Protocol shall be consistent with the Project Communications Plan (Appendix Y2), the Design-Builders Public Involvement Plan and Community Construction Management Plan (CCMP) described in Section 2.9 (Public Information), the WSDOT *Environmental Compliance Assurance Procedure* (Appendix E13) and the UDP (Appendix E9).

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

#### *2.8.3.2.2.3.1 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 designated personnel, in addition to the EM, have the authority to stop Work on the Project to prevent a violation from occurring; and
- Describe the process for identifying and reacting to non-compliance events.

#### *2.8.3.2.2.3.2 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* (Appendix E13), the UDP (Appendix E9), the Public Involvement Plan, the CCMP and the Environmental Commitments List (Appendix C1). WSDOT will remain the main point of contact (unless the Design-Builder is otherwise directed by WSDOT) for environmental and permit coordination with tribes, local jurisdictions and regulatory agencies. The Design-Builder shall be responsible for external notification and reporting requirements associated with the permits they obtain and for which they are listed as the permittee, including reporting protocols identified within the Design-Builder's SPCC Plan.

#### *2.8.3.2.2.3.3 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 who 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* (Appendix E13) and the Environmental Commitments List (Appendix C1).
- Describe the Design-Builder's communication process with WSDOT when a design change and/or alternative construction technique may require a permit modification or new approval. This section shall describe key personnel who would be responsible for recognizing these design changes and a strategy for

managing design changes and proposed alternative construction methods that may require permit modifications or additional approvals.

#### 2.8.3.2.2.4 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 topics prior to the start of construction:

- All project staff have responsibilities for environmental compliance on the project;
- The overall importance of environmental compliance;
- Permit conditions, performance standards, environmental commitments and environmental regulations related to the Project;
- The specific environmental sensitivities of the Project;
- Communication protocols (internal/external/WSDOT communications);
- Erosion and sediment control procedures and certification;
- ECAP triggers for non-compliance reporting to WSDOT;
- Environmental compliance monitoring and reporting procedures;
- Management of known or suspected contamination;
- Unanticipated historic or archaeological discoveries; and
- Emergency response procedures.

The Design-Builder's EM shall notify the WSDOT Engineer of environmental training sessions and invite WSDOT to participate. This training shall include a field visit with WSDOT environmental staff 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 as necessary. The TESC Lead shall have, for the life of the Project, a current Certificate of Training in Construction Site Erosion and Sediment Control from a course approved by Washington State Department of Ecology (Ecology). The Design-Builder shall provide a copy of the course certificate or other documentation verifying completion of the certification course within 30 Calendar Days of NTP1 and shall make the Certificate of Training available to WSDOT upon request throughout the duration of the project.

The TESC Plan (narrative and plan sheets) shall be prepared and implemented in accordance with Section 2.14 (Stormwater Management), Chapter 6 of the WSDOT

*Highway Runoff Manual (Appendix D6),* and Division 8 of the WSDOT Standard Specifications (Appendix D18). The Design-Builder's TESC Plan shall accommodate all Project-specific permit conditions as described in the Environmental Commitments List (Appendix C1) and the requirements of Section 2.29 (Maintenance During Construction). The Design-Builder shall develop and implement a Construction Water Quality Protection and Monitoring (CWQPM) Plan as part of the TESC Plan. The CWQPM Plan shall address the minimum requirements identified in Chapter 6 of the WSDOT *Highway Runoff Manual* (Appendix D6) and the Environmental Commitments List (Appendix C1). The TESC Plan shall be submitted to WSDOT for review and comment.

Temporary drainage facility design shall consider traffic safety during construction including, but not limited to, consideration of gutter flows along the roadway shoulder. Gutter flow limits for the 10-year design event shall not extend into a highway traffic lane. A maintenance plan for existing drainage structures and new structures that will become active during the Project shall be included with the TESC Plan to ensure the drainage structures continue to function until Physical Completion.

The Design-Builder shall submit a TESC Plan that addresses early construction elements as a part of the IECP. Updated TESC Plans, including narrative and plan sheets, shall be submitted as part of the Preliminary and Final Design Submittals described in Section 2.28. Construction shall not proceed on any specific element of Work until the relevant TESC Plans, including narratives, are 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 mitigation sites, staging areas and other sites developed or used to support the construction of the Project), all Environmentally Sensitive Areas, mitigation areas, and the buffers of Environmentally Sensitive and mitigation areas shall be fenced with High Visibility Construction Fencing (HVF) prior to commencing construction activities which could affect them, including equipment staging, materials storage and parking of workers' vehicles. Installation of HVF is identified as a Hold Point in accordance with Section 2.28.

For those Environmentally Sensitive Areas, mitigation areas and buffers that are within the Impact Area Footprint, as described elsewhere in this section, the Design-Builder's EM may allow exceptions to the placement of HVF or limited equipment access beyond HVF limits, provided that such exceptions are consistent with the Environmental Commitments List (Appendix C1). The Design-Builder shall completely install HVF and other markings in the affected area before construction on any stage can begin.

- All field staff shall be trained to recognize HVF, understand its purpose and how to properly install the fence in the appropriate locations.
- HVF shall be maintained by the Design-Builder until all Work is completed for each stage of the Project.
- No equipment shall enter, operate, be stored or be parked within any Environmentally Sensitive Areas except as specifically provided for in permits issued for the Project.
- Where HVF is not appropriate (such as over water), the Environmentally Sensitive Areas shall be clearly marked by other means in order to ensure that these areas are protected.

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

Support posts shall be wood or steel in accordance with WSDOT Standard Plan I-10.10-01 (Appendix D17). The posts shall have sufficient strength and durability to support the fence through the life of the project.

Throughout the life of the Project, the Design-Builder shall preserve and protect the fenced areas, acting immediately to repair or restore any HVF that has been damaged or removed.

#### *2.8.3.2.3.1.2 Best Management Practices (BMPs)*

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 (*Appendix D6) and the Environmental Commitments List (Appendix C1). Monitoring activities and inspection protocols shall be described in Part III of the ECP.

Any chemical treatment BMP's (including Chitosan enhanced sand filtration) proposed by the Design-Builder must be approved by Ecology prior to their use. The Design-Builder shall show any chemical treatment and appropriate BMPs on their TESC Plan submitted to WSDOT for review and comment prior to submitting the request to Ecology. The Design-Builder shall review available information on Ecology's website regarding acceptable chemical treatment methods. The Design-Builder shall not use experimental BMPs unless they have been approved by Ecology in writing prior to their use.

The Design-Builder shall remove all temporary BMPs and associated hardware from the Right-of-Way once the EM has determined that the BMP is no longer required. When the materials are biodegradable the EM may approve leaving the temporary BMP in place. WSDOT will remove any temporary BMPs that are not removed from the Right-of-Way within the time frames designated in the permits. All costs associated with WSDOT's removal will be deducted from any payments due or coming due to the Design-Builder.

The Design-Builder shall permanently stabilize all bare and disturbed soil after removal of erosion and sediment control BMPs. If the installation and use of the erosion control BMPs have compacted or otherwise rendered the soil inhospitable to plant growth, such as construction entrances, the Design-Builder shall take measures to rehabilitate the soil to facilitate plant growth. This may include, but is not limited to, ripping the soil, incorporating soil amendments, or other horticultural practices.

#### *2.8.3.2.3.1.3 Construction Water Quality Monitoring*

As part of the TESC Plan, the Design-Builder shall prepare a Construction Water Quality Protection and Monitoring (CWQPM) Plan for all ground disturbing and in-water construction activities. Monitoring protocols and reporting frequencies shall be consistent with those listed in the WSDOT *Highway Runoff Manual* (Appendix D6) and the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit obtained by the Design-Builder and must adhere to all commitments in the Environmental Commitments List (Appendix C1).

If the Design-Builder discharges any groundwater sources including de-watering directly to surface waters or combines groundwater with stormwater consistent with the NPDES

Construction Stormwater General Permit, required monitoring protocols shall be included in the CWQPM Plan.

The CWQPM Plan shall incorporate notification triggers identified in the WSDOT *Environmental Compliance Assurance Procedure* (Appendix E19), and be consistent with the communication protocols identified in Part I of the ECP.

#### 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 WSDOT as part of the ECP in accordance with the requirements described in this section. On-site construction activities shall not commence until WSDOT reviews and comments on an SPCC Plan for the Project.

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.

Instructions for SPCC Plan preparation are available at the WSDOT Hazardous Materials Program Web site:

www.wsdot.wa.gov/Environment/HazMat/SpillPrevention.htm

##### *2.8.3.2.3.2.1 SPCC Plan 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 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; or
- Stockpiling contaminated materials.

The Environmental Commitments List (Appendix C1) includes a number of conditions regarding information that shall be addressed in the SPCC Plan. In addition to ensuring that all of the commitments pertaining to SPCC Plan requirements are fulfilled, the Design-Builder shall ensure the below elements are included in its SPCC Plan prior to submittal to WSDOT for review and comment.

##### *2.8.3.2.3.2.2 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 onsite 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 shall follow for each scenario listed below. Include a description of the actions the Design-Builder shall take and the specific onsite 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) the Design-Builder will use in the event of a release or spill.

#### 2.8.3.2.3.3 Water Management

Water or wastewater (non-stormwater) that is generated by construction activities on site shall be managed in accordance with applicable federal, State and local regulations, permit conditions, performance standards, the Project ECP and Environmental Commitments List in Appendix C1. This includes any water the Design-Builder supplies or draws from on-site sources (hydrants, water trucks, etc.) for use during work activities. For those areas of the Project covered by the NPDES Sand and Gravel General Permit, this includes any water defined as Process Water by the General Permit.

#### 2.8.3.2.3.4 Collection, Containment and Disposal Plan

Stormwater and groundwater that has come into contact with curing concrete, concrete pours and grindings, or cement-treated soils shall be managed in accordance with the Environmental Commitments List (Appendix C1) and any NPDES Permits obtained by the Design-Builder. The Design-Builder shall submit a Collection, Containment and Disposal Plan to WSDOT for review and comment prior to beginning any Work that could generate water that exceeds the pH parameters identified within the Commitments List. The Collection, Containment and Disposal Plan shall be consistent with the requirements of Section 2.7 (Pavement).

All concrete slurry and grinding residue shall be removed from the Roadway on a continual basis immediately behind the grinding or cutting operations. Slurry shall not be allowed to drain across open traffic lanes and Shoulders. Slurry shall not be allowed to drain into any waterway, placed on the Roadway slope within 200-feet of any waterway, or other areas as designated by the EM. The Collection Containment and Disposal Plan shall include plans to prevent contaminants, such as grinding slurry or concrete debris, from entering ditches, culverts, or other waterways, including wetlands or aquifers.

Concrete slurry shall be collected from the Roadway and disposed of by the Design-Builder off the Project site. The Design-Builder shall provide a copy to WSDOT of the permit for an approved waste site for the disposal of the slurry prior to the start of the grinding.

#### 2.8.3.2.3.5 Fugitive Dust Control Plan

Fugitive dust shall be controlled by the Design-Builder in accordance with the *Memorandum of Agreement—Fugitive Dust* between WSDOT and the Puget Sound Clean Air Agency regarding control of fugitive dust from construction projects (Appendix E12) and the Environmental Commitments List (Appendix C1). 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 comment 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.

#### 2.8.3.2.3.6 Operational Water Quality Monitoring

The Design-Builder shall develop and implement an Operational Water Quality Protection and Monitoring (OWQPM) Plan for any PCF utilized. The OWQPM shall be prepared in accordance with the conditions of the operational NPDES permit obtained by the Design-Builder and Appendix C1. The OWQPM Plan should be prepared separately from the CWQPM described elsewhere in this Section. The Design-Builder shall submit the OWQPM Plan to WSDOT for review and comment at least 30 Calendar Days prior to generating any effluent from the facilities covered under an operational NPDES Permit.

#### 2.8.3.2.3.7 Soil and Groundwater Management Plan

The Design-Builder shall develop a Soil and Groundwater Management Plan (SGMP) to address known and unknown contaminated soil and/or groundwater that may be encountered during construction of the Project. The SGMP shall include protocols for managing and disposing of Hazardous Material in accordance with applicable regulations and implementation of construction techniques that minimize disturbance to the subsurface and prevent the spread of contamination to surrounding areas. The Design-Builder's SGMP shall establish specific handling and disposal procedures to effectively manage Hazardous Material in order to minimize schedule delays and budget impacts.

At a minimum, the Design-Builder's SGMP shall include a review of available baseline environmental data, field screening methods, notification requirements, soil stockpile and/or groundwater management, and sampling and disposal requirements. The SGMP shall identify locations where Hazardous Materials can be safely stored or stockpiled and a list of off-site disposal locations that are permitted to accept various types of Hazardous Material. The Design-Builder shall obtain and include copies of the required permits and environmental approvals to demonstrate that the listed disposal sites are in compliance with federal, State and local regulations. In addition, the SGMP shall identify a protocol that requires the Design-Builder to provide WSDOT with copies of the shipping manifest or bill of lading indicating the amount of material hauled to disposal, and bearing the disposal site operator's confirmation for receipt of material. The SGMP shall be consistent with the Dewatering Plan required by Section 2.6.

The Hazardous Materials portion of this section contains information compiled by WSDOT on the potential for contamination.

### 2.8.3.2.4 Environmental Compliance, Monitoring and Reporting (Part III)

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 requirements of the following sections.

#### 2.8.3.2.4.1 Environmental Pre-Construction Meeting

The Design-Builder shall organize and participate in an environmental pre-construction meeting with WSDOT and any necessary regulatory agencies 30 Calendar Days prior to the start of construction activities authorized by NTP 2. During the environmental pre-construction 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 discuss its construction schedule and identify the early construction elements.

#### 2.8.3.2.4.2 Weekly Environmental Task Force Meetings

The Design-Builder's EM shall organize and implement 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 EM shall review BMPs at these meetings in order to avoid and minimize risk. The Design-Builder shall invite WSDOT and as necessary the Design-Builder's Quality Assurance staff to attend these meetings. The EM shall use the Environmental Commitments List (Appendix C1) and the construction schedules to identify environmental commitments pertaining to upcoming work activities.

#### 2.8.3.2.4.3 Temporary Erosion and Sediment Control (TESC) Monitoring

Any personnel conducting water quality and BMP monitoring shall have a current Certificate of Training in Construction Site and Erosion and Sediment Control from a course approved by the Ecology. The Design-Builder shall provide a copy of the course certificate or other material verifying completion of the certification course for applicable personnel prior to construction. The Design-Builder shall inspect and properly document 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. Inspections of temporarily stabilized, inactive sites may be reduced to once every calendar month. The Design-Builder shall correct damaged or inadequate TESC BMPs immediately, and a WSDOT Erosion and Sediment Control Inspection Form (Appendix F1) shall be completed for each inspection. A Site Log Book shall be maintained in accordance with the requirements of the NPDES permit to be obtained by the Design-Builder. The Design-Builder shall review the TESC Plan for compliance with relevant Environmental Commitments (Appendix C1), and make appropriate revisions within 7 Calendar Days of the inspection.

#### 2.8.3.2.4.4 Water Quality Monitoring

Water quality monitoring shall be performed in accordance with the Design-Builder's CWQPM and OWQPM Plans. Monitoring protocols and reporting frequencies shall be consistent with those listed in the WSDOT *Highway Runoff Manual* (Appendix D6), the NPDES Permits obtained by the Design-Builder and the Environmental Commitments List (Appendix C1).

##### *2.8.3.2.4.4.1 Dewatering Water*

Dewatering water quality monitoring shall be performed in accordance with the Design-Builder's CWQPM and OWQPM Plan and the monitoring requirements of the Underground Injection Control guidelines (if any). Monitoring protocols and reporting frequencies shall adhere to all permit conditions, performance standards and environmental commitments listed in Appendix C1, the Environmental Commitments List.

#### 2.8.3.2.4.5 Post-Construction Monitoring

Within 7 Calendar Days of Substantial Completion, the EM shall conduct final monitoring inspections to assess and document compliance with permitting

requirements and all remaining environmental commitments provided to the Design-Builder in the Environmental Commitments List (Appendix C1). Inspections should address the successes, failures and remedial actions for site restoration and compensatory mitigation sites.

#### *2.8.3.2.4.5.1 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 30 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.

## 2.8.3.3 SUSTAINABLE PRACTICES PLAN (SPP)

### 2.8.3.3.1 Documentation and Approval

The Design-Builder shall prepare and implement a Sustainable Practices Plan (SPP) that identifies roles and responsibilities of key personnel, procedures adopting sustainable practices, communications and monitoring procedures, and performance metrics for sustainable practices.

The Design-Builder shall provide WSDOT with a Draft SPP prior to, or with, the Preliminary Design Submittal. If the project is divided into multiple Design Submittals, a Draft SPP and Final SPP shall be submitted for all Work included in each Design Submittal. The Design-Builder's Sustainability Project Manager, whose responsibilities are defined in the following section, shall be responsible for submitting the SPP. The SPP shall be consistent with all other requirements of the Quality Management Plan (QMP) in accordance with Section 2.28.

The SPP shall consist of three parts:

- Part I: Sustainability Personnel, Communications, and Training
- Part II: Sustainability Plans and Strategies; and
- Part III: Sustainable Practices - Monitoring and Reporting.

The Design-Builder shall submit the SPP for WSDOT's approval. Once approved, the Design-Builder shall submit an amended final set of approved plans. The Design-Builder shall maintain a hard copy of the SPP.

## 2.8.3.3.2 Sustainability Personnel, Communications and Training (Part I)

### 2.8.3.3.2.1 Key Personnel: Sustainability Project Manager (SPM)

#### *2.8.3.3.2.1.1 Roles and Responsibilities*

The Design-Builder shall identify a single point of contact as the sustainability lead for the Project. This role, identified as the Sustainability Project Manager (SPM), shall be responsible for sustainability strategies, inclusion of practices and tactics within the Project, and implementation and measurement within the Project. The SPM leads and supervises all efforts in sustainability including (but not limited to) energy efficiency, resource conservation, sustainability, context sensitive solutions, livability and culture and other fields as designated. The SPP shall identify all critical roles, responsibilities and authorities of the SPM. The SPP shall further identify and clarify the roles and responsibilities of other staff, and in particular the relationship between Environmental Compliance and the Sustainability Program.

The SPP shall identify how the SPM will interact with WSDOT to assure tracking, measurement and field audits are timely, meaningful and validated.

The SPM shall be available for the duration of the Project. If the Design-Builder replaces the SPM, the Design-Builder shall provide an equally- or more-qualified replacement, contingent upon WSDOT's approval. If, during the course of the Project, WSDOT finds that the SPM is not ensuring implementation of the SPP, then WSDOT may require replacement of the SPM in accordance with Section 1-05 of the General Provisions.

The SPM shall also be responsible for the following:

- Working with the design engineer from the beginning of the design stages to advise and give input on context and sustainable solutions. Continually coordinating with the design team to ensure that sustainability considerations are incorporated. Reviewing engineering plans to ensure the Project's design reflects sustainability goals and commitments.
- Participating in Sustainability Task Force Meetings to coordinate with WSDOT about challenges, opportunities and milestones.
- Working with the design and construction teams (e.g., submitting reports, discussing changes to the Project, communicating compliance issues).
- Assuring accuracy of sustainability reporting, including training of employees and sub-contractors in data collection and input, exception and monthly reporting.

**Minimum Qualifications**

A bachelor's degree, master's degree preferred, in Sustainability, Environmental Management Systems or closely related field from a college or university accredited by an agency recognized by the U.S. Department of Education or equivalent.

A minimum of five years of increasingly responsible related professional experience in fields such as urban planning, sustainability, energy/GHG/utility tracking and use of tracking software; federal and state sustainability requirement is desirable. Desirable certifications: Certified Energy Master (CEM), Certified Sustainable Development

Professional (CSDP), Certified Carbon Reduction Manager (CRM), Certified Green Building Engineer (GBE), Leadership in Energy and Environmental Design (LEED).

#### 2.8.3.3.2.2 Sustainability Communications Protocol

As part of the SPP, the SPM shall develop, document and implement a Sustainability Communications Protocol. The Sustainability Communications Protocol shall:

- Describe the process to be used to identify, track and report the contractor's sustainability commitments to WSDOT; identify the SPM and other employee roles; and define procedures for identifying and communicating with external audiences with whom the Design-Builder and WSDOT will report sustainability successes.

#### 2.8.3.3.2.3 Sustainable Practices Training

The Design-Builder shall develop and implement a Sustainable Practices training program for the Design-Builder's design and construction staff, quality assurance personnel, subcontractors and vendors.

### 2.8.3.3.3 Sustainability Plans and Strategies (Part II)

#### 2.8.3.3.3.1 Intentionally Omitted

#### 2.8.3.3.3.2 Material Reuse/Recycling Plan

The Material Reuse/Recycling Plan shall include design solutions and construction practices that reduce the consumption of virgin material resources, increase the use of recycled materials, identify practices that require less construction of temporary infrastructure, and identify opportunities to increase durability and life of permanent infrastructure. Refer to WSDOT Report WA-RD 726.1 issued June 2009 on the potential "Use of Recycled Concrete Aggregate in PCCP" (Appendix E11).

#### 2.8.3.3.3.3 Use of Existing and Brownfield Facilities Plan

The Use of Existing and Brownfield Facilities Plan shall include the Design-Builder's plan for using existing facilities to gain sustainable efficiencies, using dormant sites near the Project site for staging in order to reduce transportation-related energy use, or to reclaim Brownfield sites.

#### 2.8.3.3.3.4 Energy Efficiency Plan

The Design-Builder shall prepare an Energy Efficiency Plan that outlines construction options and practices that reduce energy consumption, increases the long-term use of renewable energy sources, and includes permanent facilities that employ energy conservation measures and use alternative energy sources such as on-site solar energy.

### 2.8.3.3.4 Sustainable Practices – Monitoring and Reporting (Part III)

The Design-Builder shall propose a monitoring and reporting system to support the implementation of the Sustainable Practices Plan. The monitoring/reporting system shall show the relationship between expected Sustainable Outcomes, Performance Indicators, and Contractor Actions. The Sustainability Performance Relationships table (Appendix E7) shows the potential relations among these three components.

The monitoring and reporting system must be compatible with and accessible from WSDOT systems. If a unique dashboard or reporting system is developed or purchased by the Design-Builder and licenses or special permissions are required, such licenses and permissions will be provided by the Design-Builder. Necessary training on proprietary or licensed systems for tracking, monitoring and reporting shall be provided by the Design-Builder.

Certifications used for monitoring and reporting (e.g. certified recycled materials) must be provided by organizations, companies or authorities using validated certification processes and the approaches, processes and methods used must be transparent, public and available for review.

## 2.8.4 DESIGN AND CONSTRUCTION REQUIREMENTS (ENVIRONMENTAL COMMITMENTS)

WSDOT is in the process of making commitments in the Project environmental documentation. The Project environmental documents include, but are not limited to, the documents prepared under NEPA/SEPA, Section 106, ESA and permits. These environmental documents contain a number of specific design and construction assumptions and requirements. WSDOT has documented these assumptions and requirements in the Environmental Project Description Narrative (Appendix E6) and the Environmental Commitments List (Appendix C1).

The Environmental Project Description Narrative (Appendix E6) contains a summary of Project elements, activities, impacts and avoidance and minimization measures that have been discussed with the resource agencies during early coordination efforts and is the basis for environmental documentation, permit applications and mitigation plans. If the Design-Builder proposes any design that would modify the information in the Environmental Project Description Narrative (Appendix E6), it may require modifications to permits and environmental documents. Said changes will be addressed in accordance with Section 1-04.4 of the General Provisions. The interaction between the Environmental Project Description Narrative and the various environmental disciplines is discussed below.

### 2.8.4.1 ENVIRONMENTAL COMMITMENT LIST

Based on coordination with regulatory agencies and past similar projects, WSDOT has compiled an Environmental Commitments List (Appendix C1) of likely conditions, performance standards and commitments expected to be contained in Project environmental documentation and permits. All known or currently anticipated preliminary environmental requirements and mitigation measures are described in the Environmental Commitments List (Appendix C1). As final permits and environmental documents are not complete, WSDOT reserves the right to allow for potential changes to preliminary commitments that are currently included in the Environmental Commitments List (Appendix C1). Changes to the preliminary commitments in the Environmental Commitment List will be addressed in accordance with Section 1-04.4 of the General Provisions.

The Design-Builder shall update the Environmental Commitments List as the Project progresses to reflect any future commitments resulting from permits or approvals obtained by WSDOT or the Design-Builder for the Project. The Environmental Task Force Meetings described elsewhere in this Section shall be utilized to review modifications and additions to the Environmental Commitment List. Conditions of all

newly obtained permits or new or modified commitments from other sources will be reviewed in the Environmental Task Force Meetings for inclusion in the Environmental Commitment List and assignment of responsibility. The Design-Builder shall then make proposed modifications to the Environmental Commitments List within one week of the meeting and submit the revised list to WSDOT for review and comment. The Design-Builder shall incorporate all existing and future commitments into the Final Design Submittal for this Project. The Design-Builder shall implement any additional environmental conditions or mitigation measures as required in accordance with the final NEPA/SEPA document and permits and approvals for the Project.

#### 2.8.4.1.1 Commitment Tracking System

Environmental commitments listed in Appendix C1 have been tailored to better define compliance roles and responsibilities for the Project. WSDOT maintains an internet based Commitment Tracking System (CTS) to track commitments and to ensure fulfillment throughout the various stages of Project delivery. The CTS is used by WSDOT to create the Environmental Commitments List (Appendix C1) with those database items that apply to the Design-Builder. The Design-Builder shall utilize the WSDOT CTS during the Project to help track commitments and to verify fulfillment of those commitments that are the responsibility of the Design-Builder throughout the various stages of Project delivery. The Design-Builder shall fulfill and report on the implementation status of these commitments on a monthly basis and through the Environmental Commitment Close-out Report.

WSDOT staff will be concurrently utilizing the CTS to track Project commitments which are the responsibility of WSDOT to implement.

### 2.8.4.2 IMPACT AREA FOOTPRINT

The Impact Area Footprint depicted in the Conceptual Plans (Appendix M1) was established to quantify environmental impacts and corresponding mitigation needs. If the Design-Builder proposes to make changes to the level or amount of impacts to Environmentally Sensitive Areas contained in the Impact Area Footprint and described in the Environmental Project Description Narrative (Appendix E6) and the Environmental Commitments List (Appendix C1) it may require modifications to permits and environmental documents as described elsewhere in this section.

### 2.8.4.3 NEPA/SEPA DOCUMENTATION

WSDOT has prepared a DEIS and SDEIS (Appendix E1) for the Project in compliance with NEPA and SEPA. WSDOT and FHWA plan to publish a FEIS and ROD for the Project. The Design-Builder's design may trigger the need for additional environmental review, such as a NEPA re-evaluation or other supplemental environmental documents.

If the Design-Builder modifies the Project from the Conceptual Design and/or what is described in the Environmental Project Description Narrative (Appendix E6) and the Environmental Commitments List (Appendix C1) it may cause additional impacts to the environment and/or surrounding communities and a NEPA re-evaluation or other supplemental environmental documents may be required. Said changes will be addressed in accordance with Section 1-04.4 of the General Provisions.

If required, the environmental re-evaluation or other supplemental environmental documents shall follow the WSDOT *Environmental Procedures Manual* (Appendix D4) and the Code of Federal Regulations, Title 23, Part 771. WSDOT will coordinate with all

previously involved agencies as part of any re-evaluation process. Final determination regarding the necessity of environmental re-evaluations will be made by WSDOT and FHWA at their sole discretion.

### 2.8.4.4 PERMITS AND APPROVALS

WSDOT will be applying for several permits from federal, State and local agencies as detailed in Section 2.8.4.4.1. WSDOT anticipates receiving all permits it is applying for by April 1, 2012. In the event that the permits for which WSDOT will be applying are provided later than April 1, 2012, impacts to Contract Price and/or Contract Time, if any, will be evaluated in accordance with Sections 1-07.6 and 1-04.4 of the General Provisions. These permits will be added to the Project documents as appropriate, including updates to the Environmental Commitments List (Appendix C1) once they are available. The Design-Builder shall obtain all other permits and approvals required to complete the Project including, but not limited to, those identified below.

#### 2.8.4.4.1 Permit Acquisition

WSDOT will be applying for the following permits and approvals:

- Section 404 Individual Permit– U.S. Army Corps of Engineers;
- General Bridge Act Permit – U.S. Coast Guard;
- Section 401 Water Quality Certification – Ecology;
- Coastal Zone Management Act Consistency Determination – Ecology;
- Hydraulic Project Approval – Washington State Department of Fish and Wildlife (WDFW);
- Aquatic Lands Use Authorization – Department of Natural Resources;
- Shoreline Substantial Development Conditional Use (Bridge) – City of Medina;
- Shoreline Substantial Development Conditional Use (Maintenance Facility and Dock) – City of Medina;
- Shoreline Substantial Development Conditional Use – City of Seattle; and
- Critical Areas Approvals/Permits – Cities of Medina and Seattle.

The Design-Builder shall acquire all other appropriate permits and approvals including the following (if necessary) and comply with all associated environmental requirements:

- Private Aids to Navigation (PATON) Permit – U.S. Coast Guard;
- Local Notice to Mariners – U.S. Coast Guard;
  - Notices to the Coast Guard should be coordinated as part of Project communication plans, the requirements of Section 2.12.3.5, and the Lake Washington Marine Transport Plan detailed in Section 2.21 of the Technical Requirements.
- Federal and State Discharge Permits – Ecology;
  - Discharge Permits may be needed for various discharges to surface or ground water including discharge of temporary ballast water from pontoons.
- Section 402 NPDES Construction Stormwater General Permit –Ecology;

- Separate coverage under the Construction Stormwater General Permit may be needed for each project site including the bridge construction site and any PCFs utilized.

- Section 402 NPDES Sand and Gravel General Permit- Ecology;
  - Through coordination with Ecology it has been determined that the Sand and Gravel General Permit is applicable to cover operational stormwater at any PCF that includes a concrete batch plant. WSDOT is in the process of receiving coverage under this general permit for the Grays Harbor PCF as part of a separate contract and will transfer coverage to the Design-Builder if this site is utilized.
  - For PCF's utilized by the Design-Builder other than the Grays Harbor PCF, the Design-Builder shall apply for coverage under the NPDES Sand and Gravel General Permit if a concrete batch plant is on-site. If a concrete batch plant is not utilized at other PCFs, a separate NPDES operational permit shall be obtained by the Design-Builder.
- Right-of-Way Use Permits – Local Jurisdictions;
- Building/Demolition Permits – Local Jurisdictions;
- Noise Variances and Construction Hour Exemptions - Local Jurisdictions;
- Wastewater Discharge Approvals – King County and City of Bellevue;;
- Notice of Intent for demolition activities – Puget Sound Clean Air Agency;
- Notice of Intent for geotechnical borings – Ecology;
- Notice of Intent for installing, modifying or removing piezometers – Ecology;
- Notice of Intent for installing, modifying or decommissioning wells – Ecology; and
- Request for Chemical Treatment (if necessary) – Ecology.

#### 2.8.4.4.2 Permit Compliance, Modifications, and Additional Approvals

The Design-Builder shall follow the requirements and conditions of the Environmental Commitments List (Appendix C1) including all commitments that are added as a result of additional permit obtained by WSDOT or the Design-Builder. The Design-Builder shall provide WSDOT with timely notice of its intent to propose an alternative construction method or a design change that differs from the Environmental Project Description Narrative (Appendix E6) or is inconsistent with a particular permit, environmental requirement or commitment, including those preliminary commitments contained in the Environmental Commitments List (Appendix C1). If a modification to a permit obtained by WSDOT is needed, it will be addressed in accordance with Section 1-04.4 of the General Provisions.

If requested, the Design-Builder's EM shall attend environmental coordination meetings between WSDOT and the regulatory agencies.

#### 2.8.4.4.3 Fieldwork Permits

The permits listed above do not cover any preliminary field investigation activities proposed by the Design-Builder. The Design-Builder shall coordinate with WSDOT to

identify any permits necessary for proposed field investigations. The responsibility for applying for these permits, and the costs associated thereto, shall be divided between WSDOT and the Design-Builder consistent with the permit acquisition list in Section 2.8.4.4.1 unless otherwise directed by WSDOT. The Design-Builder shall provide WSDOT with any application materials or other information requested in order to prepare the relevant applications. The Design-Builder shall coordinate with WSDOT in identifying appropriate submittal and investigation schedules.

#### 2.8.4.4.4 Geographic Scope

Those permits and other environmental documents that WSDOT is preparing or obtaining apply to a specific geographic scope, which are: (1) the bridge construction limited to the Impact Area Footprint; (2) the Grays Harbor PCF; (3) Moorage Facility; and (4) limited development at Concrete Technology Corporation Site as identified in Section 2.33. If the Design-Builder proposes activities at a site or area not currently contemplated by the Environmental Project Description Narrative (Appendix E6) it may require modifications to permits and environmental documents as described elsewhere in Section 2.8. Such other sites may include alternate pontoon casting, moorage or outfitting sites proposed by the Design-Builder. If such alternate sites require permits, the Design-Builder shall be responsible for all costs and time needed to obtain and implement such permits, and shall coordinate with WSDOT to identify the appropriate applicant, submittal requirements and schedule.

#### 2.8.4.4.5 Permits for Pontoon Construction Facilities

The permits and environmental documentation required for activities at a PCF will depend on the location and need for site modifications. In general, existing or separate (from the corridor) permits will be required for any PCF. However, the overall Project NEPA/SEPA, Section 106 and ESA documents will need to include activities at any PCF used. Once a PCF is covered by these Project environmental documents and separate permits have been obtained, site development and Pontoon manufacturing can occur before the corridor permits are received. The potential PCF sites and need for site modification are discussed in more detail in Section 2.33 of the Technical Requirements.

For Grays Harbor PCF, WSDOT has obtained permits for the site construction and operation including the manufacturing of the PFS. These permits are in Appendix P1. If the Design-Builder proposes to use this PCF or moorage area, they shall do so under the conditions of these permits. Additional environmental documentation, including permit extensions, will be required for continued operation of the site including fish handling during gate openings and any necessary maintenance dredging.

For the Concrete Technology Corporation (CTC) PCF, Project environmental documents including permits assume use of the site's existing configuration. Any modifications to the CTC PCF below the waterline, to the gate system, to the dock, to the shoreline, or modifications which impact stormwater or water quality will require additional environmental documentation and permits. If the Design-Builder proposes to use the CTC PCF without modification, its operation has been included in Project NEPA/SEPA, Section 106, and ESA documentation and site activities may commence subject to any lease agreement and any local jurisdiction or utility approvals that are needed. If the Design-Builder proposes to modify the CTC PCF, additional permits will be required.

Project environmental documents and permits do not cover the use of any alternative PCFs. If the Design-Builder proposes the use of any other PCF sites it will require modification of the NEPA/SEPA, Section 106 and ESA documents. Alternate existing

PCFs shall be used under the conditions of any existing operational permits. If modifications to an existing PCF or development of a new alternate PCF are proposed, additional permits will be required.

If the Design-Builder proposes to modify the CTC PCF or modify or develop an alternate PCF, the Design-Builder shall coordinate with WSDOT to identify any additional environmental documentation and permits necessary. The responsibility for applying for permits shall be divided between WSDOT and the Design-Builder consistent with the permit acquisition list in Section 2.8.4.4.1. The Design-Builder shall be fully responsible for all costs and time needed to obtain and implement such permits. The Design-Builder shall provide WSDOT with any application materials or other information requested in order to prepare the relevant environmental documents and applications. The Design-Builder shall coordinate with WSDOT to identify appropriate submittal and investigation schedules.

### 2.8.4.5 THREATENED AND ENDANGERED SPECIES

WSDOT is conducting early coordination with the Services (National Oceanic and Atmospheric Administration's National Marine Fisheries Service [NOAA Fisheries or NMFS] and the U.S. Fish and Wildlife Service [USFWS]) to facilitate a thorough and efficient review of the Biological Assessment (BA) prepared by WSDOT for the Project. The purpose of this early coordination period is to explore the ramifications of project design, various construction methods and operations on listed species. WSDOT has prepared a BA for this Project and submitted it to the Services.

The Environmental Project Description Narrative (Appendix E6) and the Environmental Commitments List (Appendix C1) contain design assumptions and anticipated commitments resulting from this early coordination with the Services. 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 any of these commitments or assumptions. Any changes to these assumptions and commitments may require modification to the BA or if the Letters of Concurrence or Biological Opinions have been issued, ESA consultation may need to be re-initiated. If this occurs, the Design-Builder shall work through WSDOT to provide the necessary information required for ESA consultation. WSDOT will take the lead in coordinating with NOAA Fisheries and the USFWS. This process will be addressed in accordance with Section 1-04.4 of the General Provisions including the distribution of any cost or schedule implications.

If the Design-Builder proposes to conduct in-water impact pile driving, the Design-Builder shall prepare an Underwater Noise Monitoring Plan consistent with the Environmental Project Description Narrative (Appendix E6) and the Environmental Commitments List (Appendix C1).

The Design-Builder shall be responsible for ensuring that any environmental commitments identified in the BA and the associated Biological Opinions or Concurrence Letters are reflected in its Final Design Submittal and implemented during construction of the Project.

### 2.8.4.6 OTHER AGREEMENTS AND COMMITMENTS

The environmental documents and permits listed in Appendices E and P contain commitments for the completion of the Work. Many of these documents have not been finalized and therefore preliminary commitments have been included in the Environmental Commitments List (Appendix C1). Final environmental documents and

permits will be added to the contract through addenda or change orders as they become available. The Design-Builder shall ensure that these commitments, as identified in the Environmental Commitments List (Appendix C1) are adhered to and implemented.

#### 2.8.4.6.1 Wetlands

WSDOT has conducted surveys for wetlands with the Project area and has identified that no wetlands occur within the Project limits. The Design-Builder is not required to conduct new surveys of wetlands. However, if the Design-Builder identifies an area within the Project limits that may qualify as a wetland, the Design-Builder shall notify WSDOT for further coordination and appropriate modifications to permits or other environmental documents. This effort will be considered a Differing Site Condition (DSC) in accordance with Section 1-04 of the General Provisions.

#### 2.8.4.6.2 Water Bodies and Streams

As part of the SDEIS process WSDOT has completed surveys of water bodies and streams within the Project area. Information on these existing conditions can be found in the Ecosystems Discipline Report (Appendix E2) and the Water Resources Discipline Report (Appendix E3) of the SDEIS. This information has been used to characterize the Project environmental impacts for environmental documents and permit applications.

The Design-Builder is not required to conduct new surveys of water bodies or streams previously identified. However, if the Design-Builder identifies a change in condition or other conflict with this information, the Design-Builder shall notify WSDOT for further coordination and appropriate modifications to permits or other environmental documents. This effort will be considered a DSC in accordance with Section 1-04 of the General Provisions.

##### 2.8.4.6.2.1 In-Water Work Windows

WSDOT has developed a Conceptual Schedule for In-Water Work (Appendix E8) and has used this schedule in early coordination efforts with the resource agencies. This conceptual schedule includes in-water work windows including exemptions to the standard windows that have been discussed with the resource agencies and will be included in the application for the Hydraulic Project Approval.

#### 2.8.4.6.3 Mitigation for Aquatic Impacts

The majority of aquatic mitigation will be conducted as part of a separate contract and are not the responsibility of the Design-Builder. However, the Design-Builder shall conduct the following mitigation activities along the east shoreline of Lake Washington:

- Removal of the existing wood bulkhead and adjacent boulder-sized riprap.
- Re-grading of the area behind the existing bulkhead. The shoreline area below the high lake level (0.5 acres) shall be graded to between 10 and 13 percent to match existing conditions and supplemented with gravel. The area above the high lake level (0.5 acres) shall be graded to approximately 30 percent and landscaped.
- Supplement the nearshore spawning area (approximately 0.75 acres) with a gravel and cobble mix distributed equally throughout the nearshore spawning area, yielding an average depth of approximately one foot. The gravel mix shall not interfere with the maintenance dock berth or increase the lakebed elevation

at the end of the dock. Placement of the gravel shall take place during the in-water work window.

Gravel mixes shall be a uniform blend of washed, round, naturally occurring rock. Gravels for the shoreline area shall ½" to 2" in size. Gravels and cobbles for the nearshore spawning area shall be ½" to 4" in size. The Design-Builder shall provide final gravel mixes to WSDOT for approval.

#### 2.8.4.6.4 Additional Aquatic Impacts

If the Design-Builder proposes changes that will result in impacts to water bodies, wetlands, streams or their associated buffers that are either: 1) outside of the permitted Impact Area Footprint; or 2) of a different duration or intensity than those impacts described in the Environmental Commitments List (Appendix C1) and the Environmental Project Description Narrative (Appendix E6); then the Design-Builder shall provide WSDOT with all information necessary to modify environmental documents and permits consistent with Section 2.8. Said changes will be addressed in accordance with Section 1-04.4 of the General Provisions. The Design-Builder shall not increase impacts to waterbodies, wetlands and streams without written authorization from WSDOT. The Design-Builder shall strive to include all additional impacts in a single submittal.

#### 2.8.4.6.5 Noise

##### 2.8.4.6.5.1 Construction Noise

The Design-Builder shall comply with all local jurisdictional, county and State limitations on maximum noise levels and construction hours. The Design-Builder shall obtain any noise variances and/or work hour extensions required to facilitate the Design-Builder's schedule. The Design-Builder shall implement all noise minimization measures required by the agencies granting the variances or extensions.

##### 2.8.4.6.5.2 Noise Barrier Walls

WSDOT has included the number, location, length and top elevation of noise barrier walls in the Basic Configuration. The details of the noise barrier walls are shown in the Conceptual Plans (Appendix M1) and the top elevations are shown in a tabular (X, Y, Z) format in Appendix E18. These noise barrier walls represent environmental commitments and shall be constructed as shown unless otherwise approved in writing by WSDOT. These noise barrier wall locations are being used by WSDOT in preparing a Noise Discipline Report as part of the development of the FEIS. An excerpt of the draft Noise Discipline Report is provided in Appendix E10 in order to document the Project noise reduction goals. Because changes to the highway horizontal and vertical alignment or to the locations of noise walls could affect the performance of the Basic Configuration noise barrier walls, it may be necessary to revise the noise barrier wall locations, heights, and top elevations. If the Design-Builder adjusts the highway horizontal alignment by more than 10 feet, and/or the highway vertical profile by more than 2 feet, the Design-Builder shall prepare and submit a Supplemental Noise Analysis Report. The Supplemental Noise Analysis Report shall confirm that the Design-Builder's recommended wall locations, heights, and top elevations achieve the decibel targets for the "Preferred Alternative Noise Levels with Noise Wall" at each receptor shown in Exhibits 25 and 41 in Appendix E10. The noise barrier walls shall not be reduced in size or number regardless of modeling results unless otherwise approved by WSDOT.

The Supplemental Noise Analysis Report shall be in compliance with the current WSDOT Traffic Noise Analysis Abatement Policy and Procedures. The Supplemental Noise Analysis Report shall not model the noise barrier walls using absorptive properties. The Traffic Noise Model (TNM) Version 2.5 noise analysis computer program was used to develop the location and height of the noise barrier walls. The electronic input file used in the TNM Version 2.5 analysis will be furnished by WSDOT upon request.

Refer to Section 2.13 for additional noise wall design criteria. Refer to Section 2.15 for details on the preferred aesthetic treatment of noise barrier walls.

## 2.8.4.6.6 Hazardous Materials

### 2.8.4.6.6.1 Potential Soil and/or Groundwater Contamination

As part of the NEPA process, WSDOT has conducted an initial survey of potential soil and groundwater contamination. WSDOT has not identified any areas within the Project limits with known or anticipated contamination. See the Hazardous Material Discipline Report (Appendix E4) for additional details.

If any previously unidentified Hazardous Material is encountered during construction it will be considered a DSC in accordance with Section 1-04 of the General Provisions.

The Design-Builder's Soil and Groundwater Management Plan and the Worker and Public Health and Safety Plan, described in this section, shall include procedures to follow if unidentified Hazardous Materials are encountered.

### 2.8.4.6.6.2 Underground Storage Tanks (UST)

To date, no Underground Storage Tanks (USTs) have been identified within the Project construction limits. If the Design-Builder encounters a previously unidentified UST, the Design-Builder shall immediately notify WSDOT prior to initiating their SPCC Plan outlining appropriate steps to decommission and remove the Tank and document the finding. This effort will be considered a DSC in accordance with Section 1-04 of the General Provisions. If a UST is encountered, the Design-Builder shall coordinate with WSDOT in following all applicable rules and regulations associated with UST removal activities including, but not limited to:

- Resource Conservation and Recovery Act (RCRA) (42 U.S.C. Sec. 6901, et. seq.).
- Underground Storage Tank Regulations (RCW 90.76, WAC 173-360-375).
- Model Toxics Control Act (RCW 70.105D, WAC 173-340-450).
- Hazardous Waste Management (RCW 70.105).

### 2.8.4.6.6.3 Asbestos, Lead-Based Paint, and other Hazardous Material.

WSDOT has identified an existing asbestos-lined sanitary sewer line which will be removed and replaced in accordance to Section 2.10 (Utilities and Relocation Agreements). WSDOT has also provided a baseline of known Hazardous Materials contained in the existing floating bridge. This baseline is shown in Section 2.26 (Removal of Existing Bridge). Prior to construction, the Design-Builder shall perform a thorough Hazardous Materials survey including, but not limited to, Asbestos Containing Materials and Lead-Based Paint (ACM/LBP), completed by a certified Asbestos Hazard

Emergency Response Act (AHERA) inspector on all structures and utilities that will be disturbed or demolished for the construction of the Project. The Design-Builder shall also develop a related abatement specification or like document stipulating proper removal, handling and disposal requirements for all hazardous materials identified in the survey for WSDOT review and comment. The Design-Builder shall be responsible for filing a Notice of Intent with the Puget Sound Clean Air Agency prior to asbestos abatement or demolition of any structures. The Design-Builder shall ensure notification is received by the Washington State Department of Labor and Industries no later than 14 Calendar Days prior to the asbestos and Lead-Based Paint removal start date. The Design-Builder shall inspect, remove and dispose of all Hazardous Materials including, but not limited to, ACM/LBP identified in the survey. The costs for testing, removal and disposal of ACM/LBP identified in Sections 2.10 and 2.26 shall be the responsibility of the Design-Builder. Testing, removal and disposal of ACM/LBP which are not identified in these two sections will be considered a DSC in accordance with Section 1-04.7 of the General Provisions.

Prior to commencing asbestos-related Work, the Design-Builder shall provide WSDOT with copies of approvals and notifications that have been given and/or obtained from the required jurisdictional and environmental agencies. The Design-Builder shall designate a Washington State Certified Asbestos Supervisor to personally supervise the asbestos removal, and to ensure that the handling and removal of asbestos is accomplished by certified workers, pursuant to Washington State Department of Labor and Industries Standards.

#### 2.8.4.6.6.4 Worker and Public Health and Safety Plan

The Design-Builder shall prepare a Worker Health and Safety Plan to minimize the effects from encountering any unidentified Hazardous Materials from contaminated environmental media and construction activities. The plan shall address proper employee training, the use of personal protection equipment, contingency planning and secondary containment for Hazardous Materials encountered, generated or stored at the site.

The Design-Builder's plan shall comply with the following regulations and agreements and meet the minimum requirements identified for a Worker Health and Safety Plan:

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

### 2.8.4.6.7 Historic, Archaeological and Cultural Preservation

No known, eligible archaeological or cultural sites have been identified within the construction limits as described in the Cultural Resources Discipline Report (Appendix E5). The existing floating bridge is eligible for listing in the National Register of Historic

Places and WSDOT is in the process of documenting it according to Historic American Engineering Record (HAER) standards. WSDOT does not expect removal of the existing bridge to be subject to further cultural resource mitigation requirements.

WSDOT is coordinating with the Washington Department of Historical Preservation (DAHP), potentially affected Indian Tribes and other interested parties (Concurring Parties) to develop a Programmatic Agreement (PA) under Section 106 of the National Historic Preservation Act. The PA for the SR 520 I-5 to Medina: Bridge Replacement and HOV Project has been included as Appendix E19. Those commitments from the draft PA that will be the responsibility of the Design-Builder have been included in the Environmental Commitments List (Appendix C1) including the preparation of the Community Construction Management Plan (CCMP) as described in Section 2.9 (Public Information) of these Technical Requirements.

#### 2.8.4.6.7.1 Investigation and Monitoring

As part of the Section 106 coordination, WSDOT is working with the Concurring Parties to identify the need for additional cultural archeological investigations and appropriate monitoring during construction activities. These investigation and monitoring commitments will be added to the Environmental Commitments List (Appendix C1) once available.

WSDOT Cultural Resource Specialists along with consultant archaeologists on contract with WSDOT will coordinate with the Design-Builder in implementing these commitments. The consultant archaeologists will perform investigations and monitoring during the operations of the Design-Builder in order to document and preserve archaeological resources. It is anticipated that certain areas of the Project will be targeted for on-site monitoring by an archaeologist during excavation and other ground-disturbing activities. The extent and the duration of monitoring will vary for different activities and locations; any excavation greater than 3 feet below ground surface may be subject to review by WSDOT for archaeological monitoring. Evaluation of changes to the Commitments List (Appendix C1) as provided in this Section 2.8.4.6.7.1 shall be addressed in accordance with Section 1-04.4 of the General Provisions.

The Design-Builder shall prepare an Archaeological Construction Methodologies Plan as part of the ECP to document how construction activities will be coordinated with monitoring requirements.

#### 2.8.4.6.7.2 Unanticipated Discovery

WSDOT has prepared a UDP (Appendix E9), pursuant to Section 106 of the National Historic Preservation Act of 1966 which addresses unanticipated discovery of any skeletal remains or significant artifacts within the Project limits. The UDP applies to all ground-disturbing work within the entire Project limits including all staging areas used by the Project, regardless of whether they are monitored by an archaeologist. Appropriate contacts for the UDP shall be identified in coordination with WSDOT, and the Design-Builder shall incorporate the UDP as part of the ECP. The Design-Builder shall keep a reference copy of the UDP on site at all times while ground-disturbing activities are underway, and shall comply with all notification procedures and other requirements of the UDP.

If any skeletal remains or significant artifacts are encountered by the Design-Builder, ground-disturbing activities shall immediately stop, and the remains shall not be further disturbed. The Design-Builder shall immediately cease all Work in the excavation and adjacent to the discovery in an area WSDOT deems adequate to provide for the total

security and protection of the integrity of the skeletal remains. The area shall be marked with HVF and added to TESC and other appropriate plans as necessary to identify the restricted access area. Other items to be considered potentially significant include:

- Areas of charcoal or charcoal-stained or fire-reddened soil and stones
- Stone tools or waste flakes (for example, arrowhead or stone chips)
- Animal bones, other food remains, and/or burned rocks in association with stone or bone tools and/or stone chips
- Clusters of tin cans or bottles, industrial or agricultural artifacts and/or equipment, that may be older than 50 years
- Structural remains

Any historic, archaeological, or cultural objects encountered by the Design-Builder as identified above or those identified by WSDOT's consultant archaeologist during ground disturbing activities shall not be further disturbed in accordance with Section 1-07 of the General Provisions and the UDP.

#### 2.8.4.6.7.3 Modification and Additional Coordination

If the Design-Builder elects to propose a design change that would impact areas not previously analyzed in the Cultural Resources Discipline Report, including geotechnical borings greater than four inches in diameter, or revisions to the UDP or the monitoring and investigation commitments in Appendix C1, additional subsurface archeological investigation and consultation with DAHP and affected and interested tribes may be necessary. Said changes will be addressed in accordance with Section 1-04.4 of the General Provisions.

### 2.8.4.6.8 Migratory Bird Treaty Act

If demolition of existing structures, removal of existing pontoons or other activities that may affect bird nesting is planned between March 15 and September 15 of any year, the Design-Builder shall exclude protected migratory bird species from the structures between these dates. State and Federal regulations protect all birds except for rock doves (common pigeons), starlings and English sparrows.

The Design-Builder shall prepare a Bird Protection Plan to be used for the duration of the Project. The plan shall be prepared and managed by personnel qualified to identify migratory birds and familiar with the nesting habits and nest identification. The Plan shall be submitted to WSDOT for review and comment a minimum of 30 Calendar Days prior to the commencement of any on-site construction activities. The Design-Builder shall maintain a copy of the Plan at the work site, including any necessary updates as the Work progresses.

The Bird Protection Plan shall address the following Project-specific information:

1. Identification of the qualified personnel responsible for managing and implementing the Plan.
2. Identification of qualified standby or back-up personnel responsible for managing and implementing the Plan if the primary personnel are not available to perform the Work.
3. Methods to remove any debris and empty nest material prior to the nesting season.

4. The methods of exclusion of protected species.

5. The method of humanely removing and disposing of nests, eggs and young of non-protected species.

6. The equipment and materials the Design-Builder will maintain on site to access the work area and carry out the bird protection measures.

If the exclusion methods fail and protected migratory birds are found to be nesting on the structures, the Design-Builder shall stop work on that structure and contact WSDOT for identification of appropriate removal actions. No delay claims will be allowed should protected species' nests or eggs be discovered on the structures after the Design-Builder's exclusion methods have been deployed.

Prior to towing of PFS, the Design-Builder shall inspect the Pontoons and moorage system for accumulation of debris and/or bird nesting activities. For all Pontoons Furnished by the Design-Builder that are temporarily moored the Design-Builder shall inspect them on an at least monthly basis for bird activities. The Design-Builder shall remove all debris and empty nests. If active nests (containing eggs or live young) or eggs are observed, the Design-Builder shall not disturb the nests or eggs, shall notify WSDOT of their presence within 24 hours of observance, and shall stop work on the affected Pontoon until otherwise directed by WSDOT. If directed by WSDOT, the Design-Builder shall remove the active nests and eggs.

## 2.8.5 SUBMITTALS

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

- Interim Environmental Compliance Plan (IECP) including:
  - Environmental Communications Protocol;
  - Temporary Erosion and Sediment Control (TESC) Plan;
  - Spill Prevention, Control and Countermeasures (SPCC) Plan;
  - Fugitive Dust Control Plan;
  - Unanticipated Discovery Plan (UDP); and
  - Archaeological Construction Methodologies Plan.
- Environmental Compliance Plan (ECP) including:
  - Environmental Communications Protocol;
  - Temporary Erosion and Sediment Control (TESC) Plan, including a Construction Water Quality Protection and Monitoring (CWQPM) Plan;
  - Spill Prevention, Control and Countermeasures (SPCC) Plan;
  - Collection, Containment and Disposal Plan;
  - Fugitive Dust Control Plan;
  - Operational Water Quality Protection and Monitoring Plan;
  - Soil and Groundwater Management Plan;
  - Archaeological Construction Methodologies Plan; and

- Unanticipated Discovery Plan (UDP).
- Environmental Commitment Close-Out Report.
- Underwater Noise Monitoring Plan.
- Supplemental Noise Analysis Report (if necessary).
- Worker Health and Safety Plan.
- Asbestos Containing Materials/Lead Based Paint (ACM/LBP) Surveys.
- Copies of all permit applications and permits received by the Design-Builder.
- Copies of approvals and notifications pertaining to asbestos-related Work.
- Various Construction Monitoring Reports as required in the Permits and Sustainable Practices Plan
- Bird Protection Plan.
- Sustainable Practices Plan (SPP) including:
  - Sustainability Communications Protocol;
  - Aquatic Resources Plan;
  - Material Reuse/Recycling Plan;
  - Use of Existing and Brownfield Facilities Plan; and
  - Energy Efficiency Plan.

End of Section

# 2.9 PUBLIC INFORMATION

## 2.9.1 GENERAL

The Design-Builder shall coordinate with WSDOT to develop and maintain a consistent level of public communication while encouraging broad public awareness and understanding of the Project. All Design-Builder personnel involved with the Project shall meet or exceed WSDOT's communications standards as outlined in the current WSDOT *Communications Manual* (Appendix D22). The Design-Builder shall demonstrate a commitment to sharing accurate, open, consistent, clear, concise and timely information with WSDOT and partnering agency staff. The Design-Builder shall coordinate with WSDOT to develop and maintain consistent internal communications protocols and to keep the public informed about the Project.

The Design-Builder shall develop and implement a strong communication and outreach strategy. Providing clear, consistent and timely messaging is an essential element to successful Project delivery. The Design-Builder shall coordinate with WSDOT to maintain strong relationships with external stakeholders and government entities. Project information shall be shared with a variety of external stakeholders and government entities.

The Design-Builder's public information role includes coordinating all types of public outreach, including but not limited to preparing for and participating in public meetings and open houses; responding to public inquiries and complaints; assisting with media coordination; preparing regular construction updates, press releases, Project Web page updates, and photo and video documentation; and coordinating with external stakeholders and government entities. All external communication with stakeholders and government entities shall be coordinated with WSDOT.

External stakeholders may include, but are not limited to, the general public, environmental justice populations, neighborhoods and property owners, community leaders and organizations, concurring parties to the Section 106 Programmatic Agreement, individual businesses and business organizations, media, labor unions and trade associations, community college training programs, employment agencies and WorkSource offices, universities and colleges (e.g., the University of Washington, Seattle Community Colleges and Bellevue College), environmental interest groups, truckers and freight interest groups, the boating community, commercial and recreational fishers, emergency services, public and private utilities, social service agencies, transit agencies (e.g., King County Metro and Sound Transit), employee transportation coordinators and commuters.

Government entities may include, but are not limited to, elected officials, federal and state regulatory agencies, local jurisdictions and tribal nations.

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

- Support the successful delivery of the Project.
- Provide clear, accurate, timely and consistent information about the Project, its activities and its impacts.
- Educate external stakeholders and government entities about the benefits and improvements associated with the Project.

- Reinforce positive WSDOT relationships with all external stakeholders and government entities.
- Coordinate with WSDOT to resolve issues of concern for external stakeholders and government entities.
- Engage external stakeholders in identifying and addressing potential Project impacts.
- Promptly respond to questions, concerns and information requests from external stakeholders and government entities.

The Design-Builder shall comply with WSDOT communications and public information guidelines described in this section and in the applicable Mandatory Standards.

## 2.9.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the most current version of the publication as of the RFP publication date shall be used.

- Amendments to the Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M 41-10) (Appendix D18).
- WSDOT *Communications Manual* (Appendix D22).
- Community Construction Management Plan: Working Draft Outline (Appendix Y7).

## 2.9.3 ROLES AND RESPONSIBILITIES

### 2.9.3.1 WSDOT'S COMMUNICATIONS RESPONSIBILITIES

WSDOT retains responsibility for ensuring consistency of messaging within the SR 520 Bridge Replacement and HOV Program, for communications related to the overall SR 520 Bridge Replacement and HOV Program, for developing and maintaining key messaging for the SR 520 Evergreen Point Bridge Floating Bridge and Landings Project, and for certain specific communications tasks of the Project. The following list is a summary of the communications tasks for which WSDOT's communications staff will retain primary responsibility. Refer to subsequent sections of this chapter for additional detail.

- Maintaining the SR 520 Bridge Replacement and HOV Program Communications Plan and the Project Communications Plan.
- Creating and updating Project key messages, including maintaining message consistency with the SR 520 Bridge Replacement and HOV Program. The Design-Builder shall assist with updating Project key messages.

- Participating in regular team meetings between WSDOT communications staff and the Design-Builder's public information staff.
- Coordinating and supporting internal communications for the Project environmental and permitting staff.
- Communications regarding the Project environmental analysis, including the environmental impact statement, agency coordination and mitigation.
- Communications with concurring parties to the Section 106 Programmatic Agreement. The Design-Builder shall partner with WSDOT to provide opportunities for concurring party and public input into the development and implementation of the Community Construction Management Plan (CCMP). WSDOT will coordinate meetings with the concurring parties to the Section 106 Programmatic Agreement. WSDOT will provide direction to the Design-Builder based on input from the concurring parties and the public regarding development and implementation of the plan. WSDOT will retain responsibility for dispute resolution with the concurring parties.
- Coordinating major public events, such as ground-breaking and ribbon-cutting events. The Design-Builder shall assist with these activities.
- Communications with elected officials, including State legislators, city and town mayors and council members.
- Communications with tribes. The Design-Builder shall assist with these activities.
- Media relations activities, including media interviews and briefings. The Design-Builder shall assist with these activities and shall have primary responsibility for preparing press releases for WSDOT review, comment and approval..
- Communications related to the SR 520 Bridge Replacement and HOV Program, including cross-project coordination. The Design-Builder shall assist with these activities.
- Maintaining the Project Web page. The Design-Builder shall assist with developing Web page content.
- Developing Project-related materials including folios, fact sheets and e-mail announcements to the Project database contacts. The Design-Builder shall assist with these activities.
- Preparing press releases regarding the Project. The Design-Builder shall assist with developing press release content.
- Reviewing and approving responses to public comments regarding the Project. The Design-Builder shall research and draft responses.
- Responding to public comments regarding the SR 520 Bridge Replacement and HOV Program.
- Monitoring Project communications to meet WSDOT standards for format, graphic design, content and messaging.
- Planning and implementing outreach with eligible property owners to assist with determining whether or not to construct noise walls.

### 2.9.3.2 DESIGN-BUILDER'S ROLE IN PUBLIC INFORMATION EFFORTS

The Design-Builder shall identify and implement methods of informing external stakeholders about design and construction activities that directly affect them. Such information shall be clear, consistent and comprehensive, and shall meet WSDOT graphic and writing standards. All information shall be subject to ongoing review and comment by WSDOT before distribution.

The Design-Builder's public information staff shall participate with WSDOT communications staff in the Design-Builder's weekly construction meeting.

The Design-Builder shall participate in Project communications meetings between WSDOT and the Design-Builder weekly, and more often if determined necessary by WSDOT to maintain regular coordination on all public information goals and activities. The Design-Builder shall participate in additional WSDOT communications meetings as determined by WSDOT.

The Design Builder shall accept primary responsibility for the day to day communications effort of the Project. The following list is a summary of the communications tasks for which the Design Builder shall retain primary responsibility, with WSDOT oversight.

- Creating and implementing a Public Involvement Plan, including environmental justice outreach. WSDOT will review and comment on the plan at the communications planning workshop hosted by the Design Builder. WSDOT will also provide final review and approval. The Design Builder shall review this plan regularly and update it as needed.
- Developing and implementing emergency response procedures, including a Crisis Communication Plan and emergency contact list. The Crisis Communication Plan shall detail information dissemination protocols and spokesperson responsibilities. WSDOT will review and comment on the plan at the crisis communications workshop. WSDOT will also provide final review and approval. The Design-Builder shall regularly review and update this plan quarterly or more often as needed.
- Providing regular construction updates to WSDOT for use in public information activities, including weekly construction activity reports, weekly schedule updates, monthly progress reports, and quarterly employment goal updates for apprenticeships, training and Disadvantaged Business Enterprises (DBE). The Design-Builder shall provide construction activity reports and schedule updates weekly or more frequently if plans and schedules change.
- Distributing updates on construction activities.
- Coordinating internal Project communications, including regular team meetings between WSDOT communications staff and the Design-Builder's public information staff.
- Creating and implementing a CCMP based on the Section 106 Programmatic Agreement and the CCMP outline provided by WSDOT. WSDOT will review and comment on the plan at the communications planning workshop hosted by the Design-Builder. The Design-Builder shall partner with WSDOT to provide opportunities for concurring party and public input into the development and implementation of the CCMP. The Design-Builder shall support and attend meetings with the concurring parties to the Section 106 Programmatic

Agreement as stipulated in the agreement. The Design-Builder shall respond to WSDOT direction based on input from the concurring parties and the public regarding development and implementation of the plan. WSDOT will also provide final review and approval. The Design-Builder shall regularly review and update this plan every six months or more often as needed.

- Providing ample notification to external stakeholders regarding construction activities, including fieldwork investigations and street, trail and waterways closures.
- Maintaining document control compliance for communications materials. All Design-Builder communications submittals shall comply with WSDOT document control standards (see Sections 2.1 [General Information] and 2.28 [Quality Management Plan]). WSDOT will maintain the official record of all public materials.
- Shooting video and photos for communications materials.
- Coordinating and conducting public events such as public meetings, open houses, fairs and festival information tables, and Project briefings with business and community groups and government entities. The Design-Builder shall prepare event plans for these activities. WSDOT will assist in these activities, and review and comment on all plans and materials used in these activities.
- Managing Project signage at the construction site, including construction updates and materials distribution (refer to this section, Section 2.19 [Signing], Section 2.22 [Maintenance of Traffic] and Appendix Y5).
- Managing Subcontractor outreach to Disadvantaged Business Enterprises (DBE) firms. WSDOT will assist in these activities.
- Managing employment outreach to the local community, such as coordination with labor unions, trade associations, community college training programs and WorkSource. WSDOT will assist in these activities.
- Managing the Project telephone construction hotline, including updating Project status messages and recording comments in the Project public contact database.
- Managing the Project public contact database, including requests for information. Public comments and questions may be received via mail, e-mail, telephone construction hotline or other telephone line, public meetings and community briefings. The Design-Builder shall update this database with Project-specific information requests and responses. The Design-Builder shall analyze and report trends, and provide a weekly status report to WSDOT. WSDOT will provide the database, including existing Project contacts, in a Web-based format to provide access for both WSDOT and the Design-Builder.
- Responding to public comments regarding the Project within 10 Calendar Days of the receipt of comments, unless the comments are forwarded to the Project from WSDOT headquarters, in which case the comments shall be responded to within 5 Calendar Days. WSDOT will review and comment on all responses before distribution.
- Developing Web page content. WSDOT will review, comment, and approve all Web page content and will maintain the Project Web page.

- Coordinating Project tours, including guidelines and protocols for visitors, safety, scheduling and staffing. The Design-Builder shall draft event plans for these activities. WSDOT will co-lead these activities, and review and comment on all materials used in these activities.
- Using social media to target specific audiences. WSDOT will review and comment on all social media content.
- In addition to primary responsibilities, the Design-Builder shall assist WSDOT with the following communications tasks for which WSDOT will have primary responsibility:
    - Creating and updating Project key messages.
    - Coordinating major public events such as ground-breaking and ribbon-cutting events.
    - Communications with tribes.
    - Communications related to the SR 520 Bridge Replacement and HOV Program, including cross-project coordination.
    - Media relations activities, including press releases and media interviews and briefings.
    - Reviewing and approving responses to public comments regarding the Project.

#### 2.9.3.2.1 Public Information Staff

The Design-Builder shall provide public information staff to support the Project. This staff shall 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 staff shall consult with WSDOT's communications staff. The public information staff shall coordinate with WSDOT's communications staff to maintain public satisfaction with the Project. The Design-Builder shall work in partnership with WSDOT to ensure that WSDOT's public information and communications goals and objectives are met.

The public information staff shall be co-located at the Project construction office. The public information staff shall be available for meetings and be readily available by telephone during all business hours with immediate computer and e-mail access. During critical construction activities and emergencies, the public information staff shall be available as necessary outside of regular business hours.

The Public Information Manager shall have at least five years of recent experience coordinating information on large public construction projects. The public information staff's professional experience shall include the following:

- Strong writing skills, including writing for the public, news media and Internet. Knowledge of WSDOT's Reader-Friendly Toolkit and "plain talk" communications is preferred (see Appendix D22–WSDOT *Communications Manual*).
- Experience coordinating public events and media outreach.
- Strong public speaking skills, including presenting information to external stakeholders.

- Developing, implementing and measuring the results of communication plans and strategic messaging.
- Developing and producing maps, charts, graphs, diagrams and other visual images, preferably using InDesign, Adobe Photoshop and WSDOT design templates to meet WSDOT graphics standards (see Appendix D22–WSDOT *Communications Manual*). These tasks may be performed by other Design-Build support staff.
- Developing and implementing public involvement and community relations programs.
- Taking photographs and video. Experience with Photoshop and other visual editing software.
- Use of social media such as Twitter, YouTube and Facebook as tools to target specific audiences.
- Ability to work successfully in a fast-paced environment under pressure.
- Strong analytical, research and organizational skills.
- Creative problem-solving skills.

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

#### 2.9.3.2.2 Project Contact Call List

The Design-Builder shall provide WSDOT with a prioritized after-hours call list within 15 Calendar Days after NTP 1 and at least 10 Calendar Days prior to commencement of construction activities. The call list shall include the contact information for the Design-Builder's public information staff and key WSDOT project staff, including home and mobile phone numbers, and e-mail addresses. The call list shall be updated quarterly or more often as needed to reflect any changes.

## 2.9.4 PERFORMANCE REQUIREMENTS

### 2.9.4.1 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 proactively inform the public, establish expectations and play a significant role in delivering a successful Project.

The Design-Builder shall coordinate construction closures, detours and communications with other projects being constructed near the Project location and within the region (refer to Section 2.1). The Design-Builder shall maintain ongoing communication with transit agencies and impacted residents within the Project area regarding upcoming construction activities and planned roadway closures or detours.

## 2.9.4.2 COMMUNICATIONS PLAN AND COMMUNICATIONS PLANNING WORKSHOP

### 2.9.4.2.1 Communications Planning

WSDOT has developed the Evergreen Point Floating Bridge and Landings Communications Plan (Appendix Y2) to define the communications goals, objectives, and strategies for the Project. This document identifies risks and opportunities, roles and responsibilities, key messages, key dates, desired outcomes and target audiences. It is updated annually and as needed to meet the changing needs of the Project.

The Design-Builder shall submit a Draft Public Involvement Plan that defines the Design-Builder's outreach strategy for the Project and how their outreach shall operate within the framework established by the Project Communications Plan (Appendix Y2). This document shall describe a strategic plan for successful public outreach that shall include the Design-Builder's approach to community involvement, public outreach and environmental justice, including communications goals and objectives, significant communications risks and how those risks will be mitigated, communications opportunities, key dates, outreach activities and desired outcomes.

The Public Involvement Plan shall describe the Design-Builder's strategy for communicating and disseminating information, and responding to public inquiries, comments and requests. It shall include a thorough list of all external stakeholders and government entities affected by the Project as well as strategies to reach each of these groups. The Public Involvement Plan shall outline a plan to coordinate with these external stakeholders and government entities.

The Public Involvement Plan shall describe the roles and responsibilities of the Design-Builder's Project Manager and public information staff, and how these staff members shall interact with WSDOT's Project personnel and communications staff.

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

The Design-Builder shall submit the Draft Public Involvement Plan for WSDOT review and comment within 30 Calendar Days after NTP 1. WSDOT and the Design-Builder shall agree to the content of the Final Public Involvement Plan during the communications planning workshop. WSDOT will review and approve the Final Public Involvement Plan after the Design-Builder has incorporated final edits.

As the Project progresses, the Design-Builder shall regularly review the Public Involvement Plan and update as needed. All changes to the Public Involvement Plan shall be coordinated with WSDOT for additional review and comment.

### 2.9.4.2.2 Community Construction Management Planning

WSDOT has developed the Community Construction Management Plan: Working Draft Outline (Appendix Y7) to define the approach, roles and responsibilities for the development and implementation of the CCMP in compliance with the National Historic Preservation Act Section 106 Programmatic Agreement. The plan will guide the actions of the Design-Builder and provide opportunities for WSDOT and the Design-Builder to keep the general public and concurring parties to the Section 106 Programmatic Agreement informed. WSDOT will be responsible for communications with the concurring parties.

The Design-Builder shall submit a First Draft CCMP based on the outline (Appendix Y7) that defines the Design-Builder's strategy to avoid, minimize or mitigate the effects of construction activities on local communities and historic properties. This document shall describe how the Design-Builder will meet the commitments made in the Section 106 Programmatic Agreement.

The Design-Builder shall provide ongoing opportunities for members of the public to have input into construction management and communication efforts that can help to avoid, minimize or mitigate construction effects. The CCMP shall describe the Design-Builder's public outreach approach and methods to inform plan development and implementation. It shall clearly describe how the public should use the plan and its tools. This document shall describe the mechanisms for modifying and improving the plan over the life of the Project.

The CCMP shall describe the Project purpose, schedule, and the roles and responsibilities of those involved in construction. This document shall provide a context for the plan and clearly identify the plan goals and objectives. It shall identify the tools available for the public to stay informed and involved related to project construction. The plan shall include a thorough list of all topics of concern, describing for each what the public can expect, the regulations that the Design-Builder must comply with, the Design-Builder's strategy for avoiding, minimizing and mitigating effects, and specific communication tools to address each topic of concern.

The CCMP shall acknowledge WSDOT's development of a web-based interpretive site on the history of the project area. The content of this interpretive site will be structured to appeal to the general public and to be useful for education purposes. WSDOT will offer concurring parties the opportunity to review and comment on content for the website as it is developed. WSDOT will continue to host the website throughout the I-5 to Medina Project construction period. Once I-5 to Medina Project construction is completed, appropriate content from the website will be made available to interested historical and education organizations, including the Seattle Yacht Club, for use on other websites, and printed, archivally stable versions of the website will be offered to appropriate community archives.

The CCMP shall include performance-monitoring processes and tools to be used by WSDOT and the Design-Builder to assess the progress and measure the success of the Design-Builder's overall community construction management efforts.

The Design-Builder shall submit the First Draft CCMP for WSDOT review and comment within 30 Calendar Days after NTP 1. WSDOT and the Design Builder shall agree to the content of the Second Draft CCMP during the communications planning workshop. The Design-Builder shall submit the Second Draft CCMP to WSDOT within 14 Calendar Days after the communications planning workshop.

WSDOT will host a meeting with the concurring parties to the Section 106 Programmatic Agreement within 30 Calendar Days after the communications planning workshop. This meeting will be facilitated by WSDOT staff and will discuss development and implementation of the CCMP. WSDOT will provide the concurring parties with the Second Draft CCMP 7 Calendar Days in before this meeting. The Design-Builder's staff shall assist with organizing and implementing this meeting, which shall include participation of the Design-Builder's Project Manager. The Design-Builder shall provide space, assist in set up and require staff to attend.

The Design-Builder shall participate in additional WSDOT-hosted public outreach events within 30-45 Calendar Days after the communications planning workshop to support

development and implementation of the CCMP. The Design-Builder shall assist with organizing and implementing these public outreach events. The Design-Builder shall provide space, assist in set-up and require staff to attend.

WSDOT will provide direction to the Design-Builder for the Final CCMP based on input from the concurring parties and the public regarding development and implementation of the Second Draft CCMP within 14 Calendar Days after the concurring parties meeting and public outreach events. WSDOT will resolve disputes with concurring parties.

The Design-Builder shall submit a Final CCMP to WSDOT within 14 Calendar Days after receiving direction from WSDOT regarding input from the concurring parties and the public. The Design-Builder shall be responsible for implementing any changes required by WSDOT. WSDOT will review and approve the Final Draft CCMP after the Design-Builder has incorporated these edits.

The Design-Builder shall implement the CCMP. The Design-Builder shall provide regular updates to WSDOT regarding CCMP performance. WSDOT will provide the Design-Builder with periodic input and suggestions for improvement. All changes to the CCMP shall be coordinated with WSDOT for review and approval. The Design-Builder shall be responsible for implementing any changes required by WSDOT.

#### 2.9.4.2.3 Communications Planning Workshop

The Design-Builder shall hold a communications planning workshop within 30 Calendar Days of submittal of the Draft Public Involvement Plan and the Draft CCMP. The workshop participants shall include the Design-Builder's Project Manager and public information staff, and WSDOT's Project management team and communications staff. The communications planning workshop shall clarify and document the Project communication roles of the workshop participants.

The Design-Builder shall develop a draft format and agenda for the workshop and submit it to WSDOT for review at least 7 Calendar Days before the workshop. The location of the workshop shall be determined jointly by WSDOT and the Design-Builder. The Design-Builder shall reserve a space for the workshop and pay for rental fees, if applicable.

### 2.9.4.3 COMMUNICATIONS TRAINING NO SURPRISES WORKSHOP AND MEDIA TRAINING

WSDOT will host a "No Surprises" Construction Kick-off Workshop for key staff within 30 - 45 Calendar Days before the start of construction. This meeting will be facilitated by WSDOT communications staff and will discuss WSDOT's "No Surprises" philosophy, WSDOT communications standards and expectations, long-range communications planning, internal and external communications, emergency protocols and contacts, media protocols, regular construction updates, public outreach events, graphics, Project access and other issues.

The Design-Builder's public information staff shall assist with organizing and implementing the workshop, which shall include the participation of the Design-Builder's Project Manager, field and office staff. The Design-Builder shall provide space, assist in set-up and require staff to attend. The Design-Builder shall participate in additional WSDOT-hosted "No Surprises" meetings if determined necessary by WSDOT.

WSDOT will also host a Media Training for key staff within 30 – 45 Calendar Days before the start of construction. This meeting will be facilitated by WSDOT

communications staff. The Design-Builder's public information staff shall assist with organizing and implementing the training, which shall include the participation of the Design-Builder's Project Manager, field and office staff. The Design-Builder shall provide space, assist in setup and require staff to attend. The Design-Builder shall participate in additional WSDOT-hosted media trainings if determined necessary by WSDOT.

The Design-Builder shall mandate that all new staff shall be made aware of media protocols and public information contacts within 3 Calendar Days after being assigned to the Project. This training may be provided jointly with other training for new staff, such as construction safety, quality assurance and quality control (for more information, refer to Section 2.28).

## 2.9.5 DESIGN-BUILDER PUBLIC INFORMATION SPECIFICATIONS

### 2.9.5.1 MEETINGS

The Design-Builder's public information staff shall work closely with WSDOT communications staff to maintain regular coordination and communication with WSDOT on all public information goals and activities.

WSDOT communications staff will coordinate between the Design-Builder's public information staff and the public information staff for other SR 520 projects.

The Design-Builder shall coordinate community meetings or other public events that will enhance outreach for the public, including those meetings held to ensure that the public is informed about Project activities.

As the Project progresses, WSDOT will host meetings with the concurring parties every six months, or more frequently as determined necessary by WSDOT. The Design-Builder shall assist with organizing and implementing these meetings. The Design-Builder shall provide space, assist in set-up and shall provide staff to attend. The meetings will be facilitated by WSDOT staff and will review implementation of the CCMP and performance under the terms of the Section 106 Programmatic Agreement. At these meetings, the concurring parties will provide input about enhancements or modifications to the plan to best meet the concerns of the concurring parties and the public to minimize construction effects. WSDOT will resolve disputes with concurring parties. WSDOT will provide direction to the Design-Builder based on input from the concurring parties and the public regarding changes to the plan. The Design-Builder shall be responsible for implementing any changes required by WSDOT.

### 2.9.5.2 MONTHLY PROGRESS REPORTS

The Design-Builder's public information staff shall provide a Monthly Progress Report to WSDOT (refer to Chapter 1, General Provisions). The Report shall summarize the previous month's communications activities and outline the next month's communications activities, including outreach events and public comment tracking and response.

### 2.9.5.3 CONSTRUCTION INFORMATION DISSEMINATION

The Design-Builder's public information staff shall coordinate with WSDOT to collect, write, edit and disseminate design and construction information to the Project Web page, SR 520 Bridge Replacement and HOV Program Web page, 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 provide WSDOT with reader-friendly, clear and concise information.

The Design-Builder shall communicate with WSDOT weekly, and more frequently when requested by WSDOT, regarding planned and current construction activities. The Design-Builder shall collect and maintain an up-to-date schedule of planned and current construction activities, such as location, estimated duration of activity, type of Work being performed, physical impacts (e.g., lane closures, noise, light, traffic), and planned construction detours.

The Design-Builder shall coordinate with WSDOT to keep the public, local government entities and transit agencies informed of construction activities. A minimum notice of 14 Calendar Days shall be provided to the public and government entities prior to construction activities that may affect the public, including preliminary fieldwork investigations, physical impacts, and road, trail, or waterway closures or detours. The Public Involvement Plan shall include a description of notification methods such as:

- VMS;
- Printed notices; and/or
- Announcements to the Project database contact list (refer to this section).

The Community Construction Management Plan shall include a description of tools available for the public to stay informed and involved related to construction information such as:

- Project construction website;
- Telephone construction hotline;
- Project email address;
- HAR;
- VMS;
- ATM;
- Project identification and hotline signs;
- Topic-specific tools; and
- Other public involvement tools defined by the Design-Builder.

#### 2.9.5.3.1 Construction Schedule

The Design-Builder shall notify WSDOT of upcoming construction activities, traffic impacts and the anticipated construction schedule at least 30 Calendar Days prior to commencement of construction activities in any area of the Project. The Design-Builder shall provide construction updates to WSDOT on a weekly basis. 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 construction activities and road, trail, or waterway closures or detours, Project status and other information relevant to the public.

The Design-Builder's public information staff shall provide a summary of the upcoming construction activities and associated impacts to the public. A current construction activity report shall be submitted to WSDOT on a weekly basis.

#### 2.9.5.3.2 Construction Traffic Mitigation

The Design-Builder shall coordinate with WSDOT on opportunities to work with external stakeholders and government entities, including transportation coordinators, transit agencies, local chambers of commerce, nearby businesses and communities to encourage more efficient use of highways and roadways. The Design-Builder shall coordinate with WSDOT to keep these entities informed of construction activities and the Design-Builder shall participate in meetings with WSDOT as requested.

#### 2.9.5.3.3 Utility Shut-Offs

The Design-Builder shall conduct regular communication with external stakeholders and government entities, including residents and businesses affected by Utility shut-offs. The Design-Builder shall provide written notification to all residents and affected businesses 5 Calendar Days 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. Notices shall meet WSDOT's communications style, and be reviewed by WSDOT before dissemination.

In the event of an emergency involving a Utility shut-off, the Design-Builder shall notify the Utility Owner in accordance with Utility company standards and local emergency services.

A contact list of representatives for Utility companies with facilities within the Project area is shown in Appendix U4, Utility Owner Contact Information.

### 2.9.5.4 CRISIS COMMUNICATIONS PLAN

Within 60 Calendar Days after NTP 1, the Design-Builder shall provide a Crisis Communications Plan (emergency response protocol) for responding to emergencies and incidents during the Project.

The Design-Builder's Crisis Communications Plan shall address the following:

- Communications approaches to emergencies such as fire, gas line strikes, injured employees and non-employees, deaths, accidents in a Work zone, environmental spills and natural disasters.
- Communications approaches to inadvertent discovery of cultural resources and hazardous materials, in accordance with WSDOT policies and protocols. See Section 2.8 (Environmental) for additional requirements.
- Staff designated to respond to the emergency, including an emergency contact list.
- The cause of specific disruptions such as construction-related disruptions and weather.
- Actions that may be taken to mitigate the crisis.
- Procedures for notifying WSDOT and the Design-Builder.
- Procedures for notifying the public, including media spokesperson responsibilities.
- Process for developing 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.
- Sample media releases for the following example incidents:
    - On-site emergency;
    - Traffic disruption or accident;
    - Active traffic management or tolling system outage;
    - Damage to pontoons or existing bridge;
    - Cultural resources discovery; and
    - Natural disaster (such as an earthquake, flood, tsunami or windstorm).

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 1 Calendar Day of the crisis.

Within 30 Calendar Days before the start of construction, the Design-Builder shall organize, implement and participate in a crisis communications workshop with WSDOT to discuss protocols and potential emergency situations. Staff from the local jurisdictions and emergency service providers may participate in the workshop. Follow-up workshops shall be held annually, and following any crisis situations.

#### 2.9.5.4.1 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;
- Northwest Region Traffic Management Center;
- 24/7 On-call Communications Cell Phone;
- WSDOT Emergency Dispatch Radio; and
- SR 520 Bridge Replacement and HOV Program Communications Manager.

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

- Project Manager;
- Work Zone Traffic Engineering Manager;
- Environmental Compliance Manager; and
- Public Information Manager.

The personnel on the call list shall be agreed upon at the crisis communications workshop between WSDOT and the Design-Builder. The Design-Builder shall regularly review and update this plan quarterly, or more often as needed. 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.

### 2.9.5.5 COORDINATION WITH TRANSPORTATION MANAGEMENT PLAN

The Design-Builder shall develop the Public Information Plan portion of the Transportation Management Plan in accordance with Section 2.22 and the WSDOT *Design Manual* Chapter 1010.05 (Appendix D3). The Design-Builder's public information staff shall coordinate with Project staff and WSDOT communications staff to communicate construction traffic information to the public, government entities 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 Sections 2.22 and 2.29 (Maintenance During Construction) for additional traffic coordination requirements.

#### 2.9.5.5.1 Maintenance of Traffic and Access

The Design-Builder shall provide both maintenance of traffic and maintenance of access information to external stakeholders and government entities – including affected commuters, residents and businesses – at least 14 Calendar Days prior to any Work. WSDOT will review and comment on all notifications with external stakeholders.

Notifications shall include the following information:

- Purpose of the change;
- Area affected and dates;
- Alternate routes and detours; and
- Design-Builder contact person.

##### 2.9.5.5.1.1 Traffic Conditions

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

##### 2.9.5.5.1.2 Commercial Vehicle Access and Restriction Information

The Design-Builder shall provide information regarding commercial vehicle access and restrictions to WSDOT, external stakeholders and government entities – including affected commuters, residents and businesses – at least 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.

##### 2.9.5.5.1.3 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 Public Involvement Plan.

##### 2.9.5.5.1.4 Bicycle, Pedestrian, and Disabled Mobility Access

The Design-Builder shall clearly define and communicate to WSDOT, external stakeholders and government entities – including commuters, residents and businesses

that are affected – at least 14 Calendar Days prior to beginning any activity that may restrict or impede access routes for bicycles, pedestrians and disabled persons, including alternate routes and detours.

#### 2.9.5.5.1.5 Transit Routes and Access

The Design-Builder shall notify WSDOT, transit agencies and transit users at least 14 Calendar Days prior to beginning any activity that may restrict or impede access to transit stops, passenger drop-off areas or park and rides due to transit route modifications or project impacts.

## 2.9.6 METHODS AND TOOLS FOR DISSEMINATION OF INFORMATION

Refer to Section 2.22 for additional requirements regarding the Transportation Management Plan and the use of methods and tools described in this section.

### 2.9.6.1 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. WSDOT will review and comment on the messages prior to HAR broadcasts.

### 2.9.6.2 VARIABLE MESSAGE SIGNS (VMS)

The Design-Builder shall prepare draft messages for advance notice of traffic restrictions due to planned construction activities. WSDOT will review and comment on the messages prior to posting on VMS.

### 2.9.6.3 ACTIVE TRAFFIC MANAGEMENT SIGNS (ATM)

The Design-Builder shall prepare draft messages for ATM signage. WSDOT will review and comment on the messages prior to posting on ATM signs.

### 2.9.6.4 PROJECT IDENTIFICATION AND HOTLINE SIGNS

The Design-Builder shall install and manage Project identification signage at the construction site. A sample Project identification and hotline sign is included in Appendix Y5, Project Construction Site Signage Detail. WSDOT will review and comment on the exact wording to be included on these signs. WSDOT will review and comment on the placement of the Project identification and hotline signs. All signs must meet WSDOT signing design specifications.

### 2.9.6.5 TELEPHONE HOTLINE

The Design-Builder shall establish and manage a telephone construction hotline for the Project. The Design-Builder shall provide frequent recorded updates of the Project status and current construction activities and impacts. The Design-Builder shall respond to any inquiries from the hotline within 1 Calendar Day. The Design-Builder shall answer and respond to after-hours calls forwarded from the hotline. The Design-Builder shall ensure that all staff members responding to inquiries are trained, friendly, responsive and informed about Project construction activities and 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 in the Project public contact database, analyzing and reporting trends, and providing a weekly status report file to WSDOT.

### 2.9.6.6 PROJECT WEB PAGE

WSDOT will be responsible for maintaining the Project Web page. The Design-Builder shall develop and submit content for the Project Web page to WSDOT communications staff regarding Project updates and construction activities and impacts. The Design-Builder shall provide content on lane closures, detour routes, road, trail and waterway conditions, and other construction-related activities relevant to the public. The information, including graphics and photos, shall be updated on a regular basis, as determined by WSDOT and the Design-Builder. WSDOT will review and comment on all Web page content.

### 2.9.6.7 COLLATERAL MATERIALS

In addition to the dissemination of construction information discussed in this section, the Design-Builder shall produce and disseminate written materials regarding Project status and Project construction activities. Information may include, but is not limited to, schedule, traffic, noise, lights and fugitive dust. WSDOT will review and comment on all Project materials prior to dissemination. Materials shall be made available to the public as requested via mail, e-mail, WSDOT's Web page, and at individual and group meetings. The Design-Builder shall coordinate with WSDOT to determine when materials will be distributed to businesses and neighborhoods, the size of the distribution area, and the content of the materials.

### 2.9.6.8 CORRESPONDENCE, E-MAIL AND NON-HOTLINE PHONE CALLS

Project-related correspondence shall include communications with the external stakeholders and government entities affected by the Project, and other communications required in these Technical Requirements.

The Design-Builder shall respond to all public comments, questions and requests for information regarding the Project. WSDOT will forward e-mail, letters and other forms of correspondence from the public regarding design and construction issues to the Design-Builder for response. The Project Web page includes an e-mail contact function; inquiries received via the Web page will be forwarded to the Design-Builder for response.

The Design-Builder shall provide WSDOT with a contact name, postal address and e-mail address for all responses to public correspondence.

The Design-Builder shall answer all correspondence in accordance with the WSDOT *Communications Manual* (Appendix D22) and other requirements described in this section. WSDOT will review and comment on all responses before distribution.

The Design-Builder shall respond to phone calls that are received from sources other than the construction telephone hotline within 1 business day, and to e-mails and letters within 10 Calendar Days of the receipt of comments, unless the comments are forwarded to the Project from WSDOT headquarters, in which case the Design-Builder shall respond within 5 Calendar Days.

The Design-Builder shall provide copies of all correspondence regarding design and construction to WSDOT within 1 Calendar Day of sending the response. For e-mail

responses, WSDOT shall be copied on the Design-Builder's response to the original e-mail inquiry, and on any follow-up responses.

The Design-Builder shall record all correspondence, e-mails and telephone calls using the Project public contact database. The Design-Builder shall update this database with all Project-related correspondence and shall track responses, analyze and report trends, and provide a weekly status report to WSDOT.

The Design-Builder shall maintain the public contact database. WSDOT will use this database to develop email lists to inform communities of upcoming construction information.

The Design-Builder shall furnish to WSDOT written documentation of all Project-related correspondence within one week of the communication.

## 2.9.6.9 PUBLIC ENGAGEMENT ACTIVITIES

### 2.9.6.9.1 Public Meetings and Briefings

The Design-Builder shall coordinate outreach to external stakeholders to inform the public of the Project's status and to answer questions related to the Project, except that WSDOT will coordinate outreach targeted to elected officials and tribes. The Design-Builder shall coordinate and attend public meetings and community briefings, including open houses. The first public meeting and/or an open house shall be scheduled to occur prior to the start of construction activities.

The Design-Builder shall take a lead role in coordinating and presenting information at public meetings or community briefings for the duration of the Project. The Public Involvement Plan shall identify the outreach methods that shall be used to target specific audiences. The Design-Builder shall provide staffing and displays, and shall be available to make additional presentations at WSDOT's request.

In order to meet the communications goals identified above, public engagement activities shall be accessible, recurring and responsive to the needs of external stakeholders.

WSDOT will review and comment on all public engagement activity plans and materials.

### 2.9.6.9.2 Employment Outreach

In addition to other types of outreach, the Design-Builder shall conduct employment outreach to the local community, including coordination with labor unions, trade associations, community college training programs and WorkSource.

### 2.9.6.9.3 WSDOT-Hosted Special Events

The Design-Builder shall assist WSDOT with, and participate in, WSDOT-hosted special events, such as a groundbreaking when construction begins and ribbon cuttings at key Project milestones.

### 2.9.6.9.4 WSDOT-Coordinated Tribal Outreach

The Design-Builder shall support WSDOT by assisting with outreach to affected tribes, including providing regular construction updates, preparing meeting exhibits and project documents, and participating in meetings and presentations as requested.

#### 2.9.6.9.5 Open Houses

The Design-Builder shall convene two public open house events 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. WSDOT will review and comment on all open house plans and materials.

### 2.9.6.10 PHOTOGRAPHS AND VIDEO

The Design-Builder shall document construction, public outreach and other Project-related events using photographs and video. The Design-Builder shall place cameras where they can view construction activity. Cameras shall be placed at both the SR 520 site and at facilities used for the construction of Pontoons (PPDB). The Design-Builder shall determine the location of the cameras so that they will provide the best views of construction activities and progress at these locations. WSDOT will review and comment on the placement of the cameras. The cameras shall be used throughout the life of the Project and provide still photos, videos and time-lapse videos in broadcast quality. The Design-Builder shall download the camera data as often as daily but not less often than weekly, and images shall be provided to WSDOT in an electronic format. The Design-Builder shall establish and maintain throughout the life of construction a website for the public viewing of still images and time-lapse videos of both the SR 520 site and pontoon construction facilities of the ongoing construction progress.

The Design-Builder shall provide to WSDOT in an electronic format aerial photographs of the entire SR 520 project site and facilities used for the construction of Pontoons (PPDB). Aerial photographs of the SR 520 site shall be oblique images taken in both directions of roadway travel and shall include at least fifty images total each flight. Photographs at pontoon construction sites shall be taken from multiple angles and shall include at least twenty five images at each site, each flight. Flights shall be taken before any physical work starts, at six month intervals, and at the completion of all Work. Images shall be available to WSDOT within one week of each flight.

The documentation shall be used for public communications, media relations and WSDOT archival purposes. The Design-Builder shall comply with the following standards:

- Produce and distribute photos and videos to document construction progress;
- Track and file photos and videos using the Project's documentation system; and
- Provide or obtain accompanying information such as use permissions and publication rights.

All photographs, audio and video materials produced by the Design-Builder's staff for public dissemination shall comply with WSDOT's standards as defined in the WSDOT *Communications Manual* (Appendix D22), and shall be the shared property of the Design-Builder and WSDOT. WSDOT will review and comment on any video production planning materials. WSDOT will review and comment on the final produced versions of materials before release.

### 2.9.6.11 COMMUNITY EVENT CONSTRUCTION COORDINATION

The Design-Builder shall coordinate, communicate, and provide a plan to minimize construction impacts for community events held by public and private entities. The Design-Builder shall develop and maintain a list of community events near the Project

location. WSDOT will work with local jurisdictions to coordinate construction activities with events that affect local travel conditions, and will provide the list to the Design-Builder. A list of community events is included in Section 2.22. The Design-Builder shall notify WSDOT of planned events that may be affected by construction 14 Calendar Days before the event takes place, and shall submit weekly updates to the special events listing. Refer to Section 2.22 for additional requirements.

#### 2.9.6.12 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 support WSDOT in preparing press releases.

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

The Design-Builder shall provide information and materials that meet local broadcast and print media requirements and deadlines. WSDOT will provide review and approval of all information released to the news media prior to release.

#### 2.9.6.13 CONSTRUCTION SITE TOURS

At WSDOT's request, the Design-Builder shall coordinate tours of the Project site for media, government entities, WSDOT management and the public. The Design-Builder shall draft event plans for these activities, including visitor guidelines, protocols and safety standards. WSDOT will assist in these activities, and review and comment on all plans and materials used in these activities. The Design-Builder shall coordinate with WSDOT to determine acceptable tour frequencies and other parameters. All tours shall be conducted in accordance with these guidelines and protocols.

### 2.9.7 DOCUMENT 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 (in accordance with Section 2.28) for all public information. The Public Involvement Plan 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 will provide the Design-Builder with periodic input and suggestions for improvement. The Design-Builder shall be responsible for implementing any changes required by WSDOT. (For more information, refer to Sections 2.1 and 2.28.)

### 2.9.8 SUBMITTALS

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

- Project contact call lists, including after hours contact information.

Require WSDOT review and approval:

- Public Involvement Plan.
- Content for the Project Web site.
- Materials for Project media relations, including press releases and traffic advisories.

Require WSDOT Review and comment:

- CCMP.
- Communications planning workshop agenda and materials.
- Construction information as requested by WSDOT, including but not limited to weekly construction activity reports, weekly schedule updates, monthly progress reports and quarterly employment goal updates. Format to be established within 30 Calendar Days of NTP 1, with reporting beginning immediately thereafter.
- Construction notifications.
- Written notification of Utility shut-offs.
- Crisis Communication Plan.
- Crisis communications workshop.
- Crisis communications call list.
- Highway Advisory Radio messages.
- Variable Message Sign messages.
- Project identification signs at the construction site.
- Telephone construction hotline information.
- Collateral materials, such as fact sheets and folios, and distribution list.
- Project public contact database weekly tracking reports and Project correspondence.
- Public engagement activities plans and materials, including plans and materials for public meetings, briefings, and open house events.
- Photos and videos.
- Community events list.
- Construction site tour event plans.

End of Section

# 2.10 UTILITIES AND RELOCATION AGREEMENTS

## 2.10.1 GENERAL

### 2.10.1.1 SCOPE

WSDOT has identified possible Utility conflicts that may require Relocation and/or coordination with respective Utility Owners. In addition to Utilities identified by WSDOT as potentially requiring Relocation, the Work may require Relocation of other Utilities. Refer to the Utility Plan Sheets in Appendix M1 for existing Utilities and their approximate locations. Unless expressly stated otherwise, the specific descriptions in this subsection (2.10.1.1) and Appendix M1 do not limit or replace the general requirements of this section. Except as otherwise specified in this section, the Design-Builder shall be responsible for determining the Utility Adjustments that will be required in order to accommodate the Project.

The following provides a brief description of the known Utilities in the Project area. This is not a complete description of all known Utilities in the area; refer to the Utility Plan Sheets in Appendix M1 and the Utility Conflict Matrix and Utility Contacts List in Appendices U3 and U4, respectively, for additional information.

Utility Owners:

1. The City of Bellevue has a sanitary sewer line along the waterfront as shown on plan sheets EU01 and EU02. This utility is a Public Utility.
2. Puget Sound Energy has buried natural gas lines and buried and aerial electrical lines throughout the Project area as shown on plan sheets EU02 and EU03.
3. Comcast Corporation has communications lines within the Project area.
4. WSDOT shares a private easement with property owners on the north side of SR 520 Right-of-Way for a sanitary sewer line. The easement is on WSDOT property.

Except as otherwise stipulated in Section 1-07.17 of the General Provisions or in this section: (a) the Design-Builder will be responsible for the coordination and resolution of all Utility Relocation issues relating to the Project as set forth in the Contract Documents, and (b) the Design-Builder's services shall include the following:

- Identification and verification of all Utilities located within or near the Project's Right-of-Way or otherwise impacted by the Project.
- Identification of any Utility Easements or other rights or interests in real property inside or outside the Project's Right-of-Way that may require quitclaim or other release.
- Notifications to Utility Owners with respect to Relocation of their Utilities.
- Drafting and negotiation of Relocation Agreements with Utility Owners.
- Coordination of design and construction efforts for all Relocations.

- Design development for those Relocations for which responsibility to furnish design is assigned to the Design-Builder in accordance with Section 1-07.17(3) of the General Provisions.
- Construction of Relocations, for those Relocations for which construction responsibility is assigned to the Design-Builder pursuant to Section 1-07.17(3) of the General Provisions.
- Reimbursement of Utility Owners' Relocation Costs, for Category #2 Utilities only.
- Verification that each Relocated Utility, as designed and constructed, is compatible with the Project and interfaces properly with it.
- All Incidental Utility Work.
- Confirmation that all appropriate Governmental Approvals have been obtained by, or on behalf of, each person who is performing Relocation construction; obtaining and paying the cost of such Governmental Approvals where required in accordance with this section; and verification that all construction Relocation Work (whether performed by, or on behalf of, the Design-Builder or any Utility Owner) complies with the requirements of the applicable Government Approvals.

## 2.10.2 MANDATORY STANDARDS

### 2.10.2.1 GENERAL

***General***. All Relocation Work (whether performed by the Design-Builder or by the Utility Owner) shall comply with all applicable Governmental Rules and any applicable permits or franchises, in addition to the Mandatory Standards as specified in the list below and those standards required by the appropriate Utility Owner (whether or not they are included in the *COB Utility Standards,* Appendix U7). The Design-Builder's performance of the Utility Work shall comply with all applicable requirements of the Contract. The list below is not a comprehensive list; other technical publications may also be required for design and construction of Utility Relocations for the Project. The Design-Builder shall be responsible for obtaining all Utility Standards from the Utility Owners, and for obtaining all other Mandatory Standards relating to the Relocation Work that will impact the Utility facilities.

***Ambiguity.*** If there is any unresolved ambiguity in the Mandatory Standards, the Design-Builder shall obtain clarification from WSDOT before proceeding with design or construction.

***Version and Date.*** If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

***Conflicts and Priority.*** If there is any conflict in the Mandatory Standards, the Design-Builder shall adhere to the Mandatory Standard with the highest priority. However, if the Design-Builder's Proposal has a higher standard than all of the listed Mandatory Standards, the Design-Builder shall adhere to that higher standard identified in the Design-Builder's Proposal.

- City of Bellevue Utilities Department Engineering Standards (Appendix U7).

- Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards – Title 49 Code of Federal Regulations, Part 192.
- Amendments to the WSDOT Standard Specifications (M41-10) (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Utilities Manual* (M22-87) (Appendix D21).
- WSDOT Utilities Accomodation Policy (M22-86) (Appendix D20).
- WSDOT *Local Agency Guidelines* (M36-63) (Appendix D8).
- WSDOT Standard Plans (M21-01) (Appendix D17).

## 2.10.3 PERFORMANCE REQUIREMENTS

### 2.10.3.1 REIMBURSEMENT OF AND COLLECTION FROM UTILITY OWNERS

#### 2.10.3.1.1 Reimbursement of Utility Owners - General

The Design-Builder shall promptly deliver to WSDOT copies of all invoices received from Utility Owners. If the Design-Builder fails to make any payment to a Utility Owner as specified in Section 1-07.17 of the General Provisions (or elsewhere in the Contract) on or before the deadline stated in the applicable Relocation Agreement – or if no deadline is stated, then within 30 Calendar Days after receipt of the Utility Owner's invoice – then WSDOT will have the right to pay the Utility Owner the amount legally due, including any interest and/or penalties. If WSDOT pays a Utility Owner the overdue amount as documented on received invoices, the Design-Builder shall reimburse WSDOT for such payment within 14 Calendar Days after receipt of WSDOT's invoice; or WSDOT, at its discretion, may deduct the amount of reimbursement due from payments due to the Design-Builder under the Contract.

#### 2.10.3.1.2 Collection from Utility Owners

The Design-Builder shall promptly deliver to WSDOT copies of all invoices sent to Utility Owners. If the Utility Owner fails to make any payment to the Design-Builder for Relocation Costs consistent with the applicable franchise, permit and Governmental Rules, the Design-Builder shall notify WSDOT within 30 Calendar Days.

The Relocation Agreements shall stipulate that eligibility of the Design-Builder's relocation costs for reimbursement shall be consistent with the applicable franchise or permit and the applicable Governmental Rules.

### 2.10.3.2 MAINTENANCE AND CARE DURING CONSTRUCTION

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, the Design-Builder shall notify the affected Utility Owners in writing at least 30 Calendar Days prior to commencement of construction in that area. 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.

The Design-Builder shall support, secure, and exercise care with respect to Utilities to avoid damage to them. The Design-Builder shall ensure continuity of all existing Utility

services to all users except when the Utility Owner determines that temporary interruption is necessary and acceptable. The Design-Builder shall not move or remove any Utility without the written consent of the Utility Owner, unless otherwise directed by WSDOT. All costs required to protect Utilities during the course of the Work shall be the Design-Builder's responsibility.

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 be responsible for all costs associated with damage caused by the Design-Builder, including Utility downtime, all reconstruction, all remediation of hazards, litigation, loss of product, and Utility start-up and delay resulting from the damages to Utilities caused by the Design-Builder. 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. If the Design-Builder causes any damage, the Design-Builder shall pay any reimbursement due to the Utility Owner within 30 Calendar Days after receipt of the Utility Owner's invoice, unless otherwise provided in the applicable Relocation Agreement.

#### 2.10.3.3 GOVERNMENT APPROVALS

The Design-Builder shall obtain all required Governmental Approvals prior to commencing any Utility Relocation. The Design-Builder shall ensure and verify that the Utility Relocation performed (whether by the Design-Builder or by or on behalf of the Utility Owner) complies with the requirements of all applicable Governmental Approvals.

#### 2.10.3.4 ACCESS TO EXISTING UTILITIES

Any authorized agent of WSDOT or a Utility Owner or the Utility Owner's representative may enter the Project's 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 those doing such work.

If the Design-Builder or a Utility Owner determines that a Utility Owner representative must be onsite during a Utility Relocation or while other construction occurs in the vicinity of their facility, the Design-Builder shall provide at least 7 Calendar Days advance notice to the Utility Owner.

#### 2.10.3.5 BEST MANAGEMENT PRACTICES AND TEMPORARY EROSION AND SEDIMENTATION CONTROL

The Design-Builder shall ensure that appropriate Best Management Practices (BMP) and Temporary Erosion and Sediment Control (TESC) measures are followed in the performance of Utility Work. Refer to Section 2.8 (Environmental) for BMP and TESC requirements.

### 2.10.4 RELOCATION AGREEMENTS, FRANCHISES AND PERMITS

#### 2.10.4.1 ASSIGNMENT/DELEGATION OF UTILITY PERMIT/FRANCHISE RIGHTS AND OBLIGATIONS

For all Franchise/Permit Utilities within the Project's Right-of-Way determined by the Design-Builder to require Relocation in order to accommodate the Project, the Design-

Builder shall prepare an Assignment/Delegation of Utility Permit/Franchise Rights and Obligations document in a form substantially similar to the example Assignment Form provided in Appendix U6. The Design-Builder shall submit the completed document to WSDOT for review and comment. If the Design-Builder encounters a Utility that has not been properly permitted in the Project Site, the Design-Builder shall work with the permitting authority to properly permit the Utility.

With the new permits in place, the Assignment/Delegation of Utility Permit/Franchise Rights and Obligations document can be completed as needed. The Design-Builder may begin working with a Utility Owner prior to execution of the Assignment/Delegation document by WSDOT, provided that the document shall be submitted to WSDOT no later than the Design-Builder's submittal of the first draft of a Relocation Agreement.

If the Design-Builder determines that it will be unable to successfully negotiate a reasonable Relocation Agreement with the Utility Owner for a particular Franchise/Permit Utility, the Design-Builder shall notify the Utility Owner and WSDOT of such determination. The Design-Builder may, in addition to requesting assistance from WSDOT as provided in Section 1-07.17 of the General Provisions, exercise the rights that have been assigned to it pursuant to the applicable Assignment/Delegation document. However, WSDOT makes no representation or warranty as to the Design-Builder's ability under the Assignment/Delegation document to enforce those rights in a manner that satisfies the Design-Builder's Project requirements, or at all.

## 2.10.4.2 RELOCATION AGREEMENTS

### 2.10.4.2.1 Requirements

Each Relocation of a Utility (other than Prior Relocations and any temporary Protections in Place) shall be addressed in a Relocation Agreement entered into between the Design-Builder and the Utility Owner. The Design-Builder shall prepare and negotiate each Relocation Agreement and shall prepare and provide all Project information (e.g., reports, plans and surveys) necessary to negotiate the Relocation Agreement. For each Relocation, the Design-Builder shall initiate contact with the Utility Owner at the earliest possible time in order to begin working with the Utility Owner to develop a Relocation Agreement and a Relocation plan that meet the Project design and schedule.

The Design-Builder shall comply with Section 1-07.17 of the General Provisions and Chapter 2 of the WSDOT *Utilities Manual* (Appendix D21) for guidance in preparing Relocation Agreements. At a minimum, each Relocation Agreement shall set forth the specific details of the work, which typically include the following:

- The nature and location of relocated facilities;
- Allocation of responsibility for design, construction and other Relocation tasks;
- Applicable standards;
- Cost responsibility, cost estimates and eligibility of costs for reimbursement;
- Reimbursement procedures where appropriate;
- Schedules;
- Joint use issue resolution; and
- Procedures for design review and approval, inspection of construction, and acceptance of the Relocation Work.

Cost responsibility for each Relocation shall be as determined pursuant to Section 1-07.17 of the General Provisions unless otherwise directed by WSDOT in accordance with Section 1-07.17. Each Relocation Agreement shall designate WSDOT as a third-party beneficiary thereof. Schedules for completion of the tasks specified in each Relocation Agreement shall conform to the Contract Schedule prepared by the Design-Builder, which shall provide reasonable and adequate time for each task.

The Design-Builder shall coordinate with WSDOT when negotiating Relocation Agreements with Utility Owners as required by Section 1-07.17 of the General Provisions. Accordingly, the Design-Builder shall give WSDOT at least 7 Calendar Days advance notice of negotiation sessions. The Design-Builder shall submit draft minutes of each negotiation session to WSDOT within 4 Calendar Days after the meeting, and final minutes incorporating any WSDOT comments within 4 Calendar Days after WSDOT's approval or comment.

No material modifications to the Work or terms of a fully executed Relocation Agreement shall be made without processing a revision to the Relocation Agreement using the procedures specified in this section.

#### 2.10.4.2.2 Process for WSDOT Review

##### 2.10.4.2.2.1 Draft Relocation Agreement

The Design-Builder shall submit a draft of each Relocation Agreement and exhibits to WSDOT for review and comment. The submittal shall also include the most current copy of the sections of the Design Documents that identify the Utility facilities subject to the Relocation Agreement. WSDOT will review and deliver comments or approval within 7 Calendar Days from receipt of the draft document. WSDOT's failure to respond within this time frame does not constitute an approval of the terms or form of the submittal. The Design-Builder shall incorporate all WSDOT comments into the draft Relocation Agreement (or provide a response to any comments not incorporated), and resubmit the revised draft to WSDOT in accordance with the foregoing provisions. This process shall be repeated until WSDOT approves the draft; the Design-Builder shall receive WSDOT approval of each draft Relocation Agreement prior to submitting it to the Utility Owner.

##### 2.10.4.2.2.2 Final Relocation Agreement

The final Relocation Agreement shall be submitted to WSDOT for review and comment at least 20 Calendar Days prior to the date scheduled for its full execution. A Relocation Agreement shall be considered final and ready for execution when all of its provisions have been reviewed and commented on by WSDOT through the review process described in this section.

### 2.10.4.3 NEW FRANCHISES AND PERMITS

A franchise or permit is required for any Utility Work within the Project's Right-of-Way in which the Utility Owner has not established a property right. The Design-Builder shall ensure that the Utility Owner submits an application for a new or amended franchise or permit to WSDOT as far in advance of construction as possible, but not later than 30 Calendar Days prior to the date scheduled for construction. The application and Relocation Agreement shall be revised as necessary to obtain WSDOT approval of the franchise or permit. Any such revision of the Relocation Agreement shall be subject to the review, comment and approval process described in this section.

The Design-Builder shall ensure that a new or amended permit or franchise has been issued by WSDOT prior to beginning construction of any Relocation, except where not required pursuant to applicable Governmental Rules. A new or amended permit or franchise is required for the deactivation, abandonment or removal of an existing Utility from within WSDOT's Right-of-Way.

## 2.10.5 IDENTIFICATION OF UTILITIES

### 2.10.5.1 INFORMATION SUPPLIED BY WSDOT

As specified in Section 1-07.17 of the General Provisions, WSDOT has performed certain investigations of existing Utilities located within or in the vicinity of the Project's Right-of-Way. These investigations are preliminary, and the results may be inaccurate and/or incomplete. The results of these investigations are provided in the Conceptual Plans (Appendix M1) and the Utility As-Builts (Appendix U1). The Design-Builder is advised of the following:

- WSDOT's investigations have included requesting As-Builts from Utility Owners listed in the WSDOT records database as having Franchise/Permit Utilities located within the Project's Right-of-Way, and visually locating above-ground Utility objects including, but not limited to, poles, pedestals, cabinets, vents, manholes, valve boxes and vaults.
- WSDOT generally has not identified any Service Lines for this Project; and
- The information in the Conceptual Plans (Appendix M1) may be used to identify Utility ownership only (although it is not guaranteed to be accurate) and shall not be utilized for determining Utility location.

The Utility Information is preliminary and shall not be relied upon, except as provided in Section 1-07.17 of the General Provisions.

### 2.10.5.2 UTILITY EASEMENTS

All Utility Easements identified by WSDOT after a review of title reports and coordination with Utility Owners are shown on the Right-of-Way plans in Appendix R2. All new Utility Easements within the Project's Right-of-Way are subject to prior review, comment and approval by WSDOT. All Utility Easements shall be identified and described by the Design-Builder in the Final Design Documents.

#### 2.10.5.2.1 Existing Utility Easements

The City of Bellevue has an easement within the Project area. The private property owners north of the Project (in Medina) and WSDOT also have an easement within the Project area.

#### 2.10.5.2.2 New Utility Easements

WSDOT does not typically obtain easements for Utilities outside of State-owned Rights-of-Way. Utility Owners are entitled to reimbursement for their costs of acquiring such easements only if WSDOT determines that they held a pre-existing compensable property right entitling them to such reimbursement.

### 2.10.5.3 DESIGN-BUILDER'S INVESTIGATIONS

The Design-Builder shall be solely responsible for verifying the exact horizontal and vertical location, size, type, and all other relevant characteristics of all Utilities located within the Project's Right-of-Way or otherwise potentially impacted by the Project (including any Utilities located on private property and the WSDOT existing floating bridge facilities), whether or not such Utilities are shown in the Utility Information. Such actions shall include making diligent inquiry at the offices of the Utility Owners, consulting public records, and conducting field studies. The Design-Builder shall be aware that the Utility Information and the information provided by Utility Owners may be inaccurate and incomplete.

Refer to Section 1-07.17 of the General Provisions for the Design-Builder's obligations upon determining that any Major Underground Utility was not identified in the Utility Information with Reasonable Accuracy, or identifying any other Utilities not described in the Utility Information.

### 2.10.5.4 UTILITY MANAGEMENT PLAN

The Design-Builder shall maintain a Utility Management Plan to be submitted to WSDOT in tabular form, in both electronic and hard copy formats. The Design-Builder shall submit the Utility Management Plan to WSDOT within 90 Calendar Days after receipt of NTP 1, and shall also update and deliver the Utility Management Plan to WSDOT on a monthly basis unless otherwise directed by WSDOT. The Utility Management Plan shall list each existing and proposed Utility located within the Project's Right-of-Way or otherwise potentially impacted by the Project. At a minimum, the Utility Management Plan shall include the following information for each listed Utility:

- The name of the Utility Owner;
- A brief description of the Utility by size and type;
- The location of the Utility;
- The proposed disposition (e.g., relocation, Protection in Place) for the Utility;
- The determination as to whether the Utility is a Category #1 Utility or a Category #2 Utility, based on information provided by WSDOT;
- The nature of the Utility Owner's right of occupancy of the Right-of-Way for such Utility (e.g., franchise, permit, easement) based upon information provided by WSDOT and the Utility Owner;
- The status of the applicable Relocation Agreement;
- Scheduled start and completion dates for design and construction of modifications to Utilities;
- The party responsible for Relocation design and construction;
- The status of Utility design and construction activities; and
- Such additional information as WSDOT shall request.

The Design-Builder shall update the Utility Management Plan to reflect revisions to Utility Information and status as new information is received, without regard to the submittal schedule described above. The first Utility Management Plan submitted to

WSDOT shall identify all changes from the Utility Information (including deletions). Each subsequent version of the Utility Management Plan submitted to WSDOT shall identify all changes (including deletions) from the previously submitted version.

## 2.10.6 SCHEDULING, COORDINATION AND CORRESPONDENCE

### 2.10.6.1 SCHEDULING

The Design-Builder shall develop a Contract Schedule that identifies all Utility Work and Relocation Work to be performed by Utility Owners, and allows sufficient time for completion of all such Work. The Contract Schedule shall include, at a minimum, activities for design coordination, review, and response times for WSDOT and Utility Owners, seasonal restrictions on interruptions of Utility service, material procurement, permitting activities and performance of Utility Work.

### 2.10.6.2 COORDINATION RESPONSIBILITIES

The Design-Builder shall be responsible for all coordination with each affected Utility Owner that is necessary to accomplish Relocation Work. Such responsibilities shall include, as appropriate to the specific Utility Owner: obtaining information from and providing information to Utility Owners; keeping WSDOT informed of the progress of Utility matters on a continuous basis; coordination and scheduling of design review; inspections; Utility permit or franchise applications, approvals and acceptances; and coordination and scheduling of construction work. The Design-Builder is responsible for monitoring the progress of Work by Utility Owners and for resolving any scheduling difficulties with the Utility Owners.

The Design-Builder shall keep Utility Owners informed of the Design-Builder's construction schedules and of changes that affect their Utilities. The Design-Builder shall also provide Utility Owners with sufficient time to notify their customers of any potential impacts to service.

The Design-Builder shall cooperate with the Utility Owners in a manner consistent with the Design-Builder's obligations pursuant to the Contract Documents. The Design-Builder shall act diligently in maintaining a positive relationship with the Utility Owners.

Some Utility Owners have utilized another Utility Owner's franchise rights or are utilizing their own franchise rights on another Utility Owner's Right-of-Way or in conjunction with another Utility Owner's facilities, which may be affected as part of this Project. The Design-Builder shall coordinate necessary Relocation Agreements and Relocation Work between these Utility Owners when applicable.

#### 2.10.6.2.1 Coordination of Service Interruptions

The Design-Builder shall coordinate any service interruptions with the Utility Owners. The Design-Builder shall comply with all requirements for advance notice and notification of affected customers.

### 2.10.6.3 NOTICES AND CORRESPONDENCE BETWEEN THE DESIGN-BUILDER AND UTILITY OWNERS

All notices to Utility Owners from the Design-Builder shall be in writing unless otherwise specified in the Contract. The Design-Builder shall deliver to WSDOT copies of all

correspondence between the Design-Builder and any Utility Owners within 6 Calendar Days of receipt or sending.

### 2.10.6.4 MEETINGS WITH UTILITY OWNERS

The Design-Builder shall implement a schedule of periodic meetings with each affected Utility Owner for coordination purposes. Such meetings shall commence as early as possible in the Project design process and shall continue until completion of the Project (or of the Utility Owner's Relocations, if earlier). Such meetings shall include a preliminary design meeting for the Design-Builder and affected Utility Owners to meet and familiarize themselves with design elements, Utility facilities, and general features of the Project. Thereafter, the frequency of meetings between the Design-Builder and each affected Utility Owner shall be appropriate to the matters under discussion.

It is anticipated that subsequent meetings shall include design concept meetings to discuss potential Utility impacts and suggestions for cooperative solutions pending more detailed design; intermediate design meetings to track the progress of ongoing design processes and any necessary Right-of-Way acquisition; and final design and initial construction coordination meetings to finalize the plans, specifications and estimates for Relocation of the Utilities impacted by the Project. After Relocation plans and specifications are finalized, additional meetings are anticipated to coordinate the construction of Relocations and to establish a forum for the regular exchange of information during construction to minimize delays and provide for proper inspection. The Design-Builder shall notify WSDOT at least 7 Calendar Days in advance of each meeting, and shall allow WSDOT the opportunity to participate in each meeting.

### 2.10.6.5 MEETINGS BETWEEN WSDOT AND THE DESIGN-BUILDER

WSDOT and Design-Builder representatives shall be available to meet at the request of either party to discuss and resolve matters relating to Relocation Work. The Design-Builder shall schedule such meetings at the reasonable convenience of WSDOT's representatives and shall provide WSDOT with a minimum of 6 Calendar Days prior notice of such meetings.

### 2.10.6.6 MEETING MINUTES

The Design-Builder shall record and maintain objective minutes of all meetings with Utility Owners and/or WSDOT with respect to Relocation Work. The Design-Builder shall deliver copies of these meeting minutes to the meeting attendees and make them available to WSDOT within 4 Calendar Days after each meeting.

### 2.10.6.7 CONTACT INFORMATION

Utility Owners with known Utilities potentially affected by the Project are listed in Appendix U4. The information provided for those Utility Owners includes contact names, phone numbers, e-mail addresses and mailing addresses. The contact information is current as of the date of issuance of this RFP. The Design-Builder shall be responsible for verifying the accuracy of the contact information and maintaining current contacts for all Utilities affected by the Project, whether or not such Utility Owners are listed in the Utility Owner Contact Information (Appendix U4).

## 2.10.7 DESIGN REQUIREMENTS

The allocation of responsibility for furnishing Relocation designs shall be determined in accordance with Section 1-07.17 of the General Provisions.

### 2.10.7.1 GENERAL DESIGN CRITERIA

The Design-Builder shall be responsible for verifying that all design plans for Relocation Work, whether furnished by the Design-Builder or by the Utility Owner, are consistent and compatible with the following:

- The requirements of the applicable Utility Agreements;
- The Design-Builder's design and construction of the Project;
- Any other Utilities being installed in the same vicinity;
- The terms and conditions of all applicable new and/or amended permits and franchises;
- All applicable Mandatory Standards; and
- Any other applicable requirements specified in this section.

The Design-Builder shall ensure and confirm that all Relocations to be installed within the WSDOT Right-of-Way meet WSDOT's requirements as set forth in the Policy on Accommodation of Utilities on Highway Rights of Way (WAC 468-34-100) (included in Appendix D20 as the WSDOT Utilities Accomodation Policy).

### 2.10.7.2 RELOCATION DESIGN FURNISHED BY THE DESIGN-BUILDER

Where the Design-Builder is responsible for furnishing a Relocation design, the Design-Builder shall submit its design to WSDOT and the Utility Owner for review and comment. The Design-Builder shall coordinate any necessary modifications and re-submittals with WSDOT and the Utility Owner, and shall obtain written approval of the design from WSDOT and the Utility Owner prior to commencing construction of the Relocation. All subsequent changes to Relocation designs shall be subject to the same review and comment process.

The Design-Builder is advised that Category #2 Utility Owners are generally entitled to reimbursement of their design review costs as Relocation Costs.

### 2.10.7.3 RELOCATION DESIGN FURNISHED BY THE UTILITY OWNER

The Design-Builder shall coordinate the delivery of each Relocation design to be furnished by the Utility Owner. The Design-Builder shall review each design for compliance with the requirements of this section, and shall provide comments to the Utility Owner as appropriate. The Design-Builder shall submit the Relocation design to WSDOT for review and comment, transmit WSDOT comments to the Utility Owner, and coordinate modification and re-submittal as necessary to obtain WSDOT approval of the design.

### 2.10.7.4 ADDITIONAL UTILITY REQUIREMENTS

The Design-Builder shall incorporate the following in the final design for the Project:

- Provide for boat access by the City of Bellevue Utilities Department for the maintenance of the sanitary sewer along the shore of Lake Washington. The Design-Builder shall coordinate with the City of Bellevue Utilities Department to determine needs.

## 2.10.8 CONSTRUCTION REQUIREMENTS

The allocation of responsibility for performing Relocation construction shall be determined in accordance with Section 1-07.17 of the General Provisions.

### 2.10.8.1 GENERAL CONSTRUCTION CRITERIA

All Utility Relocation construction performed by the Design-Builder shall conform to the requirements listed below. In addition, the Design-Builder is responsible for verifying that all construction Relocation Work performed by each Utility Owner complies with the requirements listed below. In case of nonconformance, the Design-Builder shall require the Utility Owner (and/or its contractors, as applicable) to complete all necessary corrective work, or to otherwise take such steps as are necessary to conform to the following requirements:

- The WSDOT Utilities Accommodation Policy (M22-86) (Appendix D20);
- The requirements of the applicable Utility Agreements;
- The approved plans for such construction;
- The Design-Builder's design and construction of the Project;
- Any other Utilities being installed in the same vicinity;
- The terms and conditions of all applicable new and/or amended permits and franchises; and
- Any other applicable requirements specified in this section.

The Design-Builder shall cooperate with the Utility Owner to obtain all necessary permits, and assure that Utility Owners meet all Project safety and environmental requirements.

### 2.10.8.2 SPECIAL QUALIFICATIONS

For any construction Relocation Work for which the Design-Builder is assigned responsibility, and for which special qualifications are required by the Utility Owner, the Design-Builder shall utilize (or require its Subcontractors to utilize) qualified personnel acceptable to the Utility Owner to perform such Relocation Work.

### 2.10.8.3 INSPECTION

The Design-Builder shall perform all inspection, sampling and testing of the Utility Owners' and the Design-Builder's Relocation Work necessary to comply with its obligations under the Contract, Utility Agreements and Section 2.28 (Quality Management Plan). The Design-Builder shall immediately notify WSDOT and the Utility Owners regarding any noncompliance.

Each Utility Owner shall have the right to inspect construction performed on its Utilities by the Design-Builder. The Design-Builder shall not refuse the inspection requests, and shall coordinate a mutually agreeable schedule and scope with the Utility Owner for the

inspections. Any deficiencies determined in the field shall be reported to the Design-Builder's QA Manager for resolution. The Design-Builder shall inform the Utility Owner in writing, prior to commencing any Work, so that the Utility Owner may schedule inspection of the Work at the Utility Owner's Discretion.

The Design-Builder shall obtain the Utility Owner's written acceptance of each Utility for which the Design-Builder performs construction Relocation Work, promptly upon completion of such work. The Design-Builder shall submit the original document of each written acceptance to WSDOT.

## 2.10.8.4 UTILITY RELOCATION BY THE DESIGN-BUILDER

### 2.10.8.4.1 Private Sanitary Sewer Line

The sanitary sewer in the private easement, as shown in the Utility As-builts (Appendix U1) along the north side of the SR 520 in Medina shall be replaced in its entirety with new construction and relocated where necessary; this requirement includes replacing the connection to the Bellevue sanitary sewer near the shoreline and reconnecting all active service laterals. The replacement facility shall be designed in accordance with the Medina City Code and current applicable City of Bellevue (COB) engineering standards. Tolerances, inspections, submittals and As-Builts shall be performed in accordance with the applicable city code and engineering standards.

The replacement facility shall remain within WSDOT Right-of-Way. The easement shall remain as defined: three feet on either side of the center of the pipe.

The replacement facility shall be constructed in accordance with the WSDOT Standard Specifications (Appendix D18), the Medina City Code and current applicable City of Bellevue (COB) engineering standards.

Appendix U3 lists the existing pipe material as Asbestos Concrete Pipe. The Design-Builder shall be responsible for the costs associated with the Hazardous Materials testing and disposal of these materials in accordance with all applicable local, State, and Federal regulatory requirements and laws.

Refer to Appendix U1 for plans and exhibits of the private sanitary sewer line.

### 2.10.8.4.2 City of Bellevue Sanitary Sewer

In coordination with the City of Bellevue, the Design-Builder shall design and construct all modifications needed to avoid, protect or relocate the sewer line along the shore of Lake Washington.

The Design-Builder shall ensure continuity of sanitary sewer service to all users at all times during construction of the Project.

If modification or relocation is necessary, the Design-Builder shall maintain the following conditions in the ultimate sewer line:

- Be Ductile Iron Schedule 54 with Protecto 401 ceramic lining.;
- Be continuous from manhole to manhole;
- Have watertight connections between the pipe and the manholes;
- Be constructed to avoid bends if possible. Pipe deflections should be used. In instances where bends cannot be avoided, they shall not exceed 22 ½ degrees; and

- Be constructed with a minimum of one foot depth of cover.

### 2.10.8.5 ABANDONMENT AND REMOVAL

Any permanently out-of-service Utility facility (whether taken out of service prior to or after NTP 1) shall be removed from the Project's Right-of-Way unless WSDOT approves abandonment of the facility in place. Abandonment in place shall mean allowing elements of the Utility facility to remain in place and performing any flushing, capping, grouting, and other work required to meet Utility Standards and/or Applicable Law (whichever is more stringent).

Any Utility located outside the Project's Right-of-Way that is taken out of service as part of a Relocation shall be removed or abandoned in accordance with the Utility Owner's Utility Standards and any applicable permits or franchises issued by the city with jurisdiction.

The Relocation Work for each abandonment shall include making all arrangements and performing all work necessary to accomplish the proposed abandonment including design, construction, and in each instance obtaining consent from any affected landowner(s) (and from the Utility Owner, if the Design-Builder is performing the work). The Design-Builder shall also obtain any necessary Governmental Approvals and WSDOT approvals and/or permits, or the Design-Builder shall confirm that the Utility Owner has obtained the same.

The Design-Builder is advised that certain Utilities may be composed of, contain, or be insulated with materials containing asbestos. Any removal of such pipe shall be performed in compliance with all applicable Governmental Rules and Environmental Laws (refer to Section 2.8).

For each Utility that will be abandoned or removed, the Design-Builder shall notify WSDOT at least 7 Calendar Days prior to commencement of such action.

### 2.10.8.6 PROTECTION IN PLACE

The Design-Builder shall Protect in Place (or require the Utility Owners to Protect in Place) all Utilities impacted by the Project (including any Utilities remaining in place, any Utilities installed during the course of the Work and any Prior Relocations), as necessary to ensure their continued safe operation and structural integrity, in accordance with the requirements of this section. WSDOT's prior written approval shall be required for any Utilities proposed to remain in their existing locations other than Prior Relocations.

Protection in Place may be permanent or temporary, depending upon the types of measures that are necessary to satisfy the specific requirements for a particular Utility.

#### 2.10.8.6.1 Utilities That Shall Not Be Relocated

##### 2.10.8.6.1.1 Utilities Relocated by the SR 520 Eastside Transit and HOV Design-Build Project

Utilities relocated by the State's Design-Builder for the SR 520 Eastside Transit and HOV Project shall not be relocated except for those Utilities that may be on temporary relocations during construction.

#### 2.10.8.6.2 Intentionally Omitted

### 2.10.8.7 PRIOR RELOCATIONS

The following Utilities, if any, were determined by WSDOT to be in conflict with the Project area and are classified as Prior Relocations. The Design-Builder is required to develop a design that does not require Relocation of Utilities identified as "Prior Relocations", except as provided in this subsection.

All Utilities listed in the Conflict Matrix for WSDOT Contract 7963, SR 520 Eastside Transit and HOV Project can be found at:

ftp://ftp.wsdot.wa.gov/contracts/Medina%20RFP%20add%2017/Appendix_U3_Eastside_Utility_Conflict_Matrix/

Corresponding existing utility plans for the Eastside Project Conflict Matrix can be found at:

ftp://ftp.wsdot.wa.gov/contracts/medina%20rfp%20appendices/Appendicies/Appendix%20M/Appendix%20M1/Volume%201%20of%203/

The Eastside Project Conflict Matrix and Existing Utility Plans show the current location of existing Utilities. It is the responsibility of WSDOT's Design-Builder for the Eastside Project to relocate the Utilities during construction of the Eastside Project such that the relocated Utilities will be placed to accommodate the Project and the Work. The Design-Builder shall coordinate with the State's Design-Builder for the Eastside Project to obtain final design and/or As-Built information and schedule information pertaining to relocation and/or modification of Utilities at the Evergreen Point Road Lid and its vicinity and all Utilities east of the Evergreen Point Road Lid. The Design-Builder shall also provide final design information to the State's Design-Builder for the Eastside Project and coordinate the relocation of the existing Utilities so that after initial Relocation these Utilities are not in conflict with the Project or the Work.

### 2.10.8.8 MAINTENANCE OF SERVICE

All Utilities shall remain operational during all phases of construction, except as specifically allowed and approved in writing by the Utility Owner. The Design-Builder shall obtain the Utility Owner's approval in writing prior to any temporary diversion or interruption of service of affected Utility facilities.

### 2.10.8.9 MAINTENANCE OF TRAFFIC

The Design-Builder shall be responsible for all traffic control to ensure safe and efficient traffic flow during the Utility Work. Refer to Section 2.22 (Maintenance of Traffic) for requirements.

### 2.10.8.10 STREET RESTORATION

The Design-Builder shall ensure that resurfacing, restoration and re-striping of all streets, roadside features or other affected areas are constructed in compliance with the standards of the local agency with jurisdiction over the affected facilities.

### 2.10.8.11 ENVIRONMENTAL COMPLIANCE PERTAINING TO UTILITY WORK

The Design-Builder shall comply with all applicable Environmental Laws during performance of Utility Work. Refer to Section 2.8 for environmental requirements.

## 2.10.8.12 MAINTENANCE OF RECORDS

### 2.10.8.12.1 Construction and Inspection Records

The Design-Builder shall maintain construction and inspection records in order to ascertain that the Relocation Work proposed in a Relocation Agreement is accomplished in accordance with the terms and in the manner proposed on the approved plans and the requirements of the Contract Documents.

### 2.10.8.12.2 Utility As-Built Plans

Upon Physical Completion of the Project (or upon completion of the Utility Relocations, if earlier), the Design-Builder shall deliver to WSDOT a complete set of Utility As-Built Plans and design files that incorporate all changes and details of the Relocation Work. All As-Built Plans shall be of a quality and format acceptable to WSDOT, showing the location of all Utilities within the Project's Right-of-Way and any Utilities located outside of the Project's Right-of-Way that were part of the Relocation Work. The As-Built plans shall be provided on reproductions of WSDOT Right-of-Way plan sheets.

Refer to Section 2.2 (Project Documentation) for final project documentation requirements.

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.

## 2.11.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the most current version of the publication as of the RFP publication date shall be used.

- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT *Plans Preparation Manual* (M22-31) (Appendix D12).
- WSDOT *Roadside Manual* (M25-30) (Appendix D16).
- WSDOT *Local Agency Guidelines* (M36-63) (LAG) (Appendix D8).
- WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1).
- *Manual on Uniform Traffic Control Devices (MUTCD) – Washington State Modifications* (M24-01) (Appendix D25).
- FHWA *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD), 2003 Edition.
- AASHTO *A Policy on Design Standards – Interstate System*, January 2005.
- 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.
- Federal Register Title 36 CFR Part 1195, Part II Architectural and Transportation Barriers Compliance Board, June 20, 2007.
- ADA Accessibility Guidelines (ADAAG), U.S. 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.
- Pedestrian Facilities Guidebook (Appendix D30).
- FHWA *Flexibility in Highway Design*, 1997.
- City of Seattle Code.
- City of Medina Municipal Code.
- Hunts Point Town Code.
- Yarrow Point Municipal Code.
- City of Clyde Hill Municipal Code Chapter 12.04, Street Improvement and Construction Specifications.
- City of Bellevue *Transportation Department Design Manual,* February 12, 2009 (Appendix D32).

## 2.11.3 INTENTIONALLY OMITTED

## 2.11.4 DESIGN REQUIREMENTS

### 2.11.4.1 MANDATORY DESIGN CRITERIA

The project shall be designed in accordance with the design parameters, which is Appendix F of the Design Approval Package, which is found in RFP Appendix O7.

### 2.11.4.2 CORRIDOR ANALYSIS

The Corridor Analysis Mainline Design Speed and Vertical Curve Design Report, SR 520 Milepost (MP) 0.00 to 6.50 (Appendix O2), documents the selection of the 60 mph mainline design speed for SR 520 as well as the use of comfort criteria for sag vertical curve and two-foot object height for crest vertical curve. The Design-Builder shall comply with the recommendations of this Corridor Analysis.

The Corridor Analysis Addendum for Mainline General Purpose Lane Width, Shoulder Width, and Shy Distance MP 0.28 to MP 4.08 (Appendix O3), documents the selection of the mainline roadway cross section. The Design-Builder shall comply with the recommendations of this Corridor Analysis Addendum.

### 2.11.4.3 INTENTIONALLY OMITTED

### 2.11.4.4 ROADSIDE BARRIER SELECTION

All traffic barriers incorporated into the Project shall be in accordance with the WSDOT Standard Plans (Appendix D17) and shall be high performance single-slope concrete type barrier unless otherwise specified in these Technical Requirements. Traffic barriers shall be cast-in-place concrete. Traffic barriers may be pre-cast for temporary use or where the roadway will be matched to adjacent construction projects. The Design-Builder shall provide transition section in accordance with the WSDOT Standard Plans (Appendix D17) to match the height and shape of the existing barriers to remain.

Within the Project limits, existing guardrail and precast concrete barriers shall be evaluated for need and condition and shall be removed where not required or not suitable for future use. Existing guardrail shall also be evaluated to determine if it meets the current WSDOT design standards. Where it does not meet the current WSDOT design standards, it shall be replaced by the Design-Builder. Existing guardrail and precast concrete barriers that are removed shall become the property of the Design-Builder.

### 2.11.4.5 NON-STANDARD ROADSIDE BARRIER DESIGN FOR LIGHT STANDARD AND SIGN STRUCTURE FOUNDATIONS

The Design-Builder shall design roadside barriers to accommodate light standard and sign structure foundations when such foundations cannot be placed behind a concrete barrier, in accordance with WSDOT Standard Plan C-14h ( Appendix D-17). The Design-Builder shall avoid the encroachment of sign and light standard foundations into shoulders. Where this cannot be avoided, the Design-Builder shall refer to the approved design deviation in Section 2.2 (Project Documentation), Design Deviation Number 2, Deviations Associated with Shoulder Width at Light Standard and Sign Structure Foundations. The Design-Builder shall follow the prescribed approach in Design Deviation Number 2 in providing non-standard barrier design to accommodate light standard and sign structure foundations.

### 2.11.4.6 IMPACT ATTENUATORS

All impact attenuators shall be Quadguard (standard or Elite), TAU II or REACT350, and shall be designed according to the WSDOT *Design Manual* (Appendix D3).

If the Design-Builder determines that none of the systems referenced above meet the design requirements for a proposed application, the Design-Builder shall submit an Impact Attenuator Technical Memorandum for WSDOT review and comment.

### 2.11.4.7 FENCING

Right-of-Way fencing shall be installed along the limited access line and around WSDOT property except in Lake Washington. Where noise walls are placed less than eight feet from a limited access fence line, the fence shall be attached to the ends of the noise wall. Where newly installed fencing and/or walls will create a landlocked area, the Design-Builder shall install a gate that is accessible from the public Right-of-Way. Existing fencing along the limited access line which is not disturbed or displaced by construction of the Project may remain, and will not need to be replaced. Gates and breaks in the Right-of-Way fencing shall conform to the WSDOT *Design Manual* (Appendix D3), the WSDOT Standard Plans (Appendix D17) and the WSDOT Standard Specifications (Appendix D18). The Design-Builder shall show limits of fencing and gates on the construction drawings for WSDOT review and comment.

Fall-protection fencing shall be provided in accordance with the WSDOT *Design Manual* (Appendix D3).

### 2.11.4.8 SIDE SLOPES

Side slopes shall be in accordance with the Mandatory Standards and Section 2.15.

For locations where steeper slopes are necessary due to Right-of-Way constraints, environmental constraints or other constraints, the Design-Builder shall submit a design deviation in accordance with Section 2.2 (Project Documentation).

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

### 2.11.4.9 MAINTENANCE ACCESS

Maintenance access roads and road approaches to the access roads shall be designed according to the WSDOT *Design Manual* (Appendix D3).

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

The Design-Builder shall design and construct a driveway to the Bridge Maintenance Facility as shown in the Conceptual Plans (Appendix M1). The driveway shall be 30' wide minimum for the first 50' from Evergreen Point Road and 20' wide minimum beyond that point with a maximum grade of 15%. It shall provide for emergency vehicle turnarounds as specified in the City of Bellevue Transportation Department *Design Manual,* February 12, 2009 (Appendix D32).

The Design-Builder shall design and construct drainage structures such as manholes and catchbasins, culverts, and landscaped areas inside the Right-of-Way to be accessible directly from roadway shoulders. The drainage structures and landscape areas shall not require a ladder or lift bucket to gain maintenance access to the access area or the cover/lid for drainage structures. If direct maintenance from the roadway shoulder cannot be provided, the Design-Builder shall design and construct an alternate access route that meets the requirements of the WSDOT *Design Manual* (Appendix D3).

At locations where Closed Circuit Television (CCTV) camera poles, Active Traffic Management (ATM) sign structures, and toll structures, the Design-Builder shall design and construct shoulder widening or off-shoulder access to accommodate a maintenance vehicle with outriggers extended (12 feet wide, as measured from the edge of the traveled way, by 50 feet long).The shoulder widening or off-shoulder access shall provide a minimum two-foot clear zone from the edge of the nearest travel lane to the edge of the vehicle and outriggers. The total minimum width of the widened shoulder, including the two-foot clear zone, is 14 feet from the edge of the traveled way to the barrier. Where the shoulder width is eight feet or greater, the taper leading into the widened area shall be 2:1, and the taper out of the widened area shall be 10:1. Where the shoulder width is less than eight feet, the tapers shall be provided in accordance with the Type 2 Maintenance Pullout included in WSDOT Northwest Region ITS Design Guide Supplement (Appendix I8). The parking surface outside of the roadway shoulder shall not have a slope greater than six percent in any direction. The Design-Builder shall design and construct a minimum three-foot level work zone clear of obstacles on all sides of ITS roadside equipment in accordance with the Mandatory Standards.

For ITS roadside equipment installed on the floating bridge, a maintenance pullout is not required.

### 2.11.4.10 LOCAL AGENCY DESIGN STANDARDS

The Design-Builder shall design local streets, collector streets and arterial streets that lie within the proposed Limited Access Line in accordance with the WSDOT *Design Manual*

(Appendix D3). Streets to be reconstructed that lie outside the Limited Access Line shall be designed according to the appropriate local jurisdiction standards.

#### 2.11.4.11 GEOMETRIC DESIGN COMPLIANCE

The Design-Builder shall refer to Chapter 1 for the geometric design elements that comprise the Basic Configuration.

The Design-Builder shall design and construct the Project such that no reconstruction and demolition will be required for the transition spans and the floating bridge when the WCB is constructed as shown in Appendix M1.

The Design-Builder shall design and construct the Project such that no reconstruction and demolition will be required for the transition spans and the floating bridge when the West Approach Bridge is constructed as shown in Appendix M6.

At the extended length zero percent grade of the finished roadway surface on the floating bridge between mainline STA 152+95.00 and STA 198+55.00, the top of the south side barrier shall not be any higher than 21.00 feet from the water.

### 2.11.5 CONSTRUCTION REQUIREMENTS

#### 2.11.5.1 DISPOSAL OF SURPLUS MATERIAL

Section 2-03.3(7)C of the WSDOT Standard Specifications (Appendix D18) 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 and any areas determined by WSDOT to be Environmentally Sensitive Areas. Disposing of soils of any kind directly to a topsoil manufacturer is prohibited.

### 2.11.6 SUBMITTALS

#### 2.11.6.1 FUTURE GEOMETRY WITH 6+2 HCT

Appendix M2 shows a concept plan that incorporates the High Capacity Transit (HCT) in the median of SR 520.

The Design-Builder shall develop a set of conceptual channelization plans that incorporates the High Capacity Transit (HCT) in the median of SR 520 between the West Transition Spans and Evergreen Point Road. The Design-Builder shall submit the future conceptual channelization plans to WSDOT for review and comment.

#### 2.11.6.2 DESIGN PARAMETER TABLES

The Design-Builder shall develop design parameter tables that include all of the design criteria shown on the design parameter tables in the Design Parameter Forms (Appendix F9). The Design-Builder shall revise the design parameter tables to reflect the current design at the time of each submittal. The design parameter tables shall be checked according to Section 2.28 (Quality Management Plan) and shall be submitted as part of the Project Development Approval Package, in accordance with Section 2.2.

### 2.11.6.3 ROADSIDE BARRIER TECHNICAL MEMORANDUM

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

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

### 2.11.6.4 IMPACT ATTENUATOR TECHNICAL MEMORANDUM

The Design-Builder shall prepare and submit a technical memorandum when using a system other than Quadguard (standard or Elite), TAU II or REACT350.

Approved systems shall meet standardized testing defined in NCHRP Report 350 or the AASHTO *Manual for Assessing Safety Hardware* (MASH). In addition, these devices shall have an acceptance letter from FHWA that documents that this device meets the appropriate crash test criteria and can be used on the National Highway System (NHS).

At a minimum, the technical memorandum shall include the following:

- Attenuator location;
- Proposed substitution, including justification describing the attributes of the proposed attenuator and the reason it is the best product for the intended application;
- Specific design rationale describing why one of the systems referenced above is not applicable; and
- Copy of the documentation for the approved system.

### 2.11.6.5 CLEAR ZONE INVENTORY

The Clear Zone Inventory shall be completed prior to the start of construction and updated to reflect all changes from the Project. The Clear Zone Inventory shall be included within the Design Documentation Package in accordance with Section 2.2.

End of Section

# 2.12 FLOATING BRIDGE

## 2.12.1 GENERAL

The Design-Builder shall conduct all Work necessary to complete design and construction of the Floating Bridge.

### 2.12.1.1 NOMENCLATURE

Anchor Gallery Hardware: Anchor gallery components required to connect the anchor cable to the Pontoons.

Cross Pontoon: Types 3 & 3A, located at the ends of the Floating Bridge.

Elevated Structure: All structural elements above the Pontoon deck required to support vehicular and pedestrian traffic (including, but not limited to: columns, crossbeams, truss, girders, bridge deck, expansion joints and barriers).

Floating Bridge: all elements of the Pontoon supported bridge including Pontoons, Elevated Structure, anchors and Transition Spans.

High Capacity Transit (HCT): Includes both Light Rail Transit (LRT) and Bus Rapid Transit (BRT).

Longitudinal Pontoon: Types 1 & 1A, connected along a longitudinal axis between Cross Pontoons.

Pontoon Ancillary Items: Includes Pontoon geometry control points for the geometry control plan and As-Built requirements; bridge control system; cell lighting and leak detection system; navigation lights; ballast ports; deck access hatches; internal watertight doors; Pontoon railings; safety cables; safety ladders; maintenance access system; maintenance, control and substation sheds; temporary and permanent plugs; channel markers; waterline indicators; signage; security CCTV pole foundations; pipe supports; pump receptacle supports; conduit supports; anode cable guards and anode support brackets; fire protection pump supports; and fenders.

Pontoon Handling: Any operation that results in loads applied to the Pontoons, prior to the final condition at time of Physical Completion.

Pontoon System: The Pontoons Furnished by the State (PFS), the Pontoons Provided by the Design-Builder (PPDB), and their assembly. See Section 1-01.3 of the General Provisions for Definitions.

Supplemental Stability Pontoon (SSP): Types 2, 4, 4A, 5 & 6, attached to the sides of the Longitudinal Pontoons.

Transition Span: The bridge structure element that spans between the Elevated Structure and the fixed bridge approach structures.

Winter Storm Period: Period of time from October 1st of one year through March 31st of the following year.

### 2.12.1.2 SCOPE OF WORK

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

- Construction of PPDB, including:

- 24 Type 2 (50-foot wide SSP with well);
- 18 Type 5 (60-foot wide SSP with well); and
- Two Type 6 (60-foot wide SSP without well).

- Design and construction of a PPDB casting system.
- Design and implementation of a PPDB launch system.
- Outfitting of PFS and PPDB, including:
  - Design and construction of Pontoon Ancillary Items; and
  - Construction of Anchor Gallery Hardware.
- Design and construction of permanent and temporary anchors and anchor cables.
- Assembly of PFS and PPDB.
- Design and construction of Elevated Structure, including provisions to accommodate Future Six-Lane Plus Two HCT Configuration.
- Design and construction of Transition Spans, and adjacent deck expansion joints, including provisions to accommodate Future Six-Lane Plus Two HCT Configuration.
- Design and construction of a bridge drainage system in accordance with Section 2.14 (Stormwater Management).
- Design and construction of sign structures.
- Design and construction of a floating bridge electrical system.
- Design and construction of lighting structures and luminaires.
- Design and construction of security CCTV camera poles.
- Construction of Pontoon fendering system.
- Maintenance of traffic on the existing bridge during the construction of the new bridge in Lake Washington.
- Removal and disposal of the existing floating bridge in accordance with Section 2.26 (Removal of Existing Floating Bridge).
- Control and safety of all marine construction-related equipment to protect the existing and new floating bridge and approach spans during the construction of the new bridges and demolition of the existing bridge.

#### 2.12.1.3 PONTOONS FURNISHED BY THE STATE (PFS)

Under the PCP Contract, 33 PFS will be designed and constructed by others. These PFS will be furnished by WSDOT to the Design-Builder for incorporation into this Project and shall correspond to Pontoons A through W, BNW, BSW, GNW, GSW, QNW, QSW, UNW, USW, VNW and VSW as shown in Conceptual Plans (Appendix M1), State Furnished Pontoon Minimum Technical Requirements (Appendix M11), Floating Bridge Construction Sequence (Appendix M12), and Outfitting and Assembly Minimum Technical Requirements (Appendix M23). As-Built Plans, material test reports and tendon jacking records of these PFS shall be made available. All visible dimensions and

sizes, both above and below the waterline, shall be field measured and verified by the Design-Builder.

The following Pontoon Ancillary Items for the PFS will be attached and furnished with the PFS:

- Pontoon geometry control points
- Ballast ports
- Deck access hatches
- Internal watertight doors
- Interior Pontoon cell maintenance access system
- Temporary and permanent plugs
- Cast-in-place inserts as shown in State Furnished Pontoon Minimum Technical Requirements (Appendix M11)

#### 2.12.1.4 PONTOON SYSTEM DESIGN RESPONSIBILITIES

The Design-Builder shall be responsible for the means and methods of Pontoon Handling so that Pontoons will not be damaged, and the Pontoon internal stresses do not exceed the limits specified in this section. The Design-Builder shall not change or remove any concrete or reinforcing, including post-tensioning in the Pontoons, without written approval by WSDOT. Any unapproved change by the Design-Builder to the Pontoons may invalidate the engineering certification by WSDOT, for which the Design-Builder shall bear all additional expenses and delays. The Design-Builder shall bear all additional expenses and delays for any damage incurred by the Pontoons as a result of the Design-Builder's actions.

The Design-Builder shall design Pontoon Ancillary Items to conform to the requirements of this section.

The Design-Builder shall prepare and submit Design Documents for all Work for which it has design responsibility.

#### 2.12.1.5 STRUCTURES TASK FORCE AND MEETINGS

The Design-Builder shall establish and chair a Structures Task Force in accordance with Section 2.1 (General Information) and Section 2.13 (Bridges and Structures).

### 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 any ambiguities or conflicts relating in any way to the Mandatory Standards are discovered, the Design-Builder shall notify WSDOT immediately, so that WSDOT may resolve them. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date, including the supplemental interim revisions, shall be used.

- SR 520 Design Criteria for Essential Bridges (Appendix S2).

- WSDOT Criteria for Bridges Subjected to Light Rail Transit Loading (Appendix S11).
- WSDOT Bridge & Structures Office Design Memorandums ("BSODM") (Appendix B4), as modified for Design-Build.
- WSDOT *Bridge Design Manual* (M 23-50) (BDM) (Appendix D1).
- Structures Minimum Standards (Appendix B2).
- Bridge Shaft Mandatory Standard (Appendix B5).
- Amendments to WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M 41-10) (Appendix D18).
- WSDOT *Geotechnical Design Manual* (M 46-03) (GDM) (Appendix D5).
- AASHTO *Guide Specifications for LRFD Seismic Bridge Design*.
- AASHTO *LRFD Bridge Design Specifications*.
- *Sound Transit Link Light Rail North/South Link Design Criteria Manual*, Draft Chapter 8 (Appendix S10).
- WSDOT *Design Manual* (M 22-01) (Appendix D3).
- WSDOT *Plans Preparation Manual* (M 22-31) (Appendix D12).
- WSDOT *Construction Manual* (M 41-01) (Appendix D2).
- WSDOT *Materials Manual* (M 46-01) (Appendix D10).
- WSDOT Standard Plans (M 21-01) (Appendix D17).
- WSDOT Qualified Products List (M 46-02) (QPL) (Appendix D13).
- AASHTO *LRFD Bridge Construction Specifications*.
- State of Washington, Washington State Building Code.
- IBC 2009 International Building Code (except where municipal statute references an antecedent edition).
- Bridge Welding Code: ANSI/AASHTO/AWS D1.5M/D1.5, 2008.
- Structural Welding Code: ANSI/AWS D1.1/D1.1M: 2010, 22nd Edition.
- Structural Welding Code – Reinforcing Steel: AWS D1.4/D1.4M.
- American Petroleum Institute, API Specification 2B.ACI 357.2R-10 Report on Floating and Float-In Concrete Structures, published by the American Concrete Institute.
- ACI 224R Control of Cracking in Concrete Structures, published by the American Concrete Institute.
- PCI MNL-116 Quality Control for Plants and Productions of Precast Prestressed Concrete Products.
- FIP Guides to Good Practice, "Grouting of Vertical Ducts," FIP/2/4.
- *Wire Rope User's Manual*, Wire Rope Technical Board.

- AASHTO *Standard Specifications for Highway Bridges*, 17th Edition, 2002.
- American Bureau of Shipping *Rules for Building and Classing Mobile Offshore Drilling Units*.
- United States Army Corps of Engineers, *Shore Protection Manual*.
- Unified Facilities Guide Specification, UFGS - 35 59 13.16 *Marine Fenders*.
- World Association for Waterborne Transport Infrastructure (PIANC), Guidelines for the Design of Fender Systems: 2002, MarCom Report of WT 2002.
- Department of Defense, UFC 4-152-01, *Design: Piers and Wharves*.
- United States Code of Federal Regulations, 33 CFR Part 118, *Bridge Lighting and Other Signals*.

#### 2.12.2.1 MODIFICATIONS TO WSDOT BRIDGE DESIGN MANUAL (BDM)

The BSODM (Appendix B4) shall apply to the Project, except that the references to the Project advertisement dates shall not apply.

The BDM (Appendix D1), as modified by the BSODM (Appendix B4), shall be further modified for Design-Build as follows:

- Rights and Responsibilities - The following clarifies which rights and responsibilities discussed in the BDM (Appendix D1) are applicable to the Design-Builder:
  - The Design-Builder shall complete all analyses, evaluations, load ratings, plans and specifications discussed in the BDM (Appendix D1).
  - 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 written approval for all proposed deviations from the provisions of the BDM (Appendix D1).
- For the Future Six-Lane Plus Two HCT Configuration, the analyses and evaluations shall be completed to a level sufficient to demonstrate to the satisfaction of WSDOT that this future configuration can be accommodated, but shall not require final design plans, specifications or load ratings discussed in the BDM (Appendix D1). The Design-Builder shall obtain WSDOT's written approval for the Future Six-Lane Plus Two HCT Configuration design.

The Design-Builder shall follow the guidelines established in 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 (Appendix D1).

#### 2.12.2.2 ADDITIONAL REFERENCES

The Design-Builder shall incorporate the appropriate lessons learned in the below-listed Additional References in the design and construction of the Floating Bridge.

- *Okanagan Lake Floating Bridge – Stage IV Investigation, Evaluation of Potential for Pontoon Crack Water Ingress Under Static and Dynamic*

*Loading*, (2001) published by Levelton Engineering Ltd., Richmond, B.C. (Appendix S7).

- *Lacey V. Murrow Floating Bridge Replacement, Task Force Report, (1993) published by WSDOT (Appendix S1).*
- *Investigation into the Sinking of the I-90 Lacey V. Murrow Bridge, (1991) published by WSDOT (Appendix S1).*
- *SR – 520 ACME Project Final Report* (Appendix S4).

## 2.12.3 PERFORMANCE REQUIREMENTS

### 2.12.3.1 INTENTIONALLY OMITTED

### 2.12.3.2 FUNCTIONALITY

The Design-Builder shall design and construct the Floating Bridge as necessary to provide a complete, functional, and reliable highway system that meets the performance requirements in this section.

### 2.12.3.3 FUTURE BRIDGE WIDENING FOR HCT

The Design-Builder shall design and construct the Floating Bridge to accommodate the Future Six-Lane Plus Two HCT Configuration (Appendix M2).

The Design-Builder shall design the Floating Bridge to conform to the requirements of Chapter 8 of the *Sound Transit Link Light Rail North/South Link Design Criteria Manual* (Appendix S10) and the WSDOT Criteria for Bridges Subjected to Light Rail Transit Loading (Appendix S11).

The Design-Builder shall connect all steel reinforcing bars, prestressing tendons and structural steel in the Floating Bridge so that they will be electrically continuous in accordance with the requirements of this section.

The future widened Elevated Structure shall be of the same type as the Elevated Structure constructed for this Project.

The anchors installed for this Project shall be designed for the Future Six-Lane Plus Two HCT Configuration so that they will not need to be added to, modified, strengthened or retrofitted in the future.

The Design-Builder shall furnish a written narrative together with preliminary design plans and calculations, including staging plans, to demonstrate that the Floating Bridge including Elevated Structure, Transition Spans and anchors can accommodate the Future Six-Lane Plus Two HCT Configuration described herein. Plans and calculations shall include those elements that affect future widening, maintenance access, anchor cable replacement, sail area, mass, aesthetics, and utility distribution. Elements to be included shall be, but not limited to:

- Deck design
- Girder design and framing plan
- Column design

The Design-Builder shall design the Elevated Structure and Transition Spans so that the future widening may be constructed by others. The design of bridge deck slabs, girders and pier crossbeams shall be in accordance with the requirements of Section 2.13.4.6. The Design-Builder shall design the Elevated Structure columns so that they need not be modified, strengthened, shored or retrofitted in the future. It is anticipated that future widening by others will be done by adding an additional row of columns under the widening as required. However, in the future it will not be permitted to remove, replace or strengthen the columns near the center of the bridge to accommodate the future HCT loading. Columns shall be provided that will resist the loadings from both current and future requirements.

### 2.12.3.4 DURABILITY

The Design-Builder shall design and construct the Floating Bridge so that it will achieve the required Design Life of at least 75 years. See Section 1-01.3 of the General Provisions for Definitions. See Section 2.13 for concrete performance requirements for the Elevated Structure.

### 2.12.3.5 NAVIGATION CHANNEL REQUIREMENTS

The navigation channel at the west side shall be located between Pier 35 and Pontoon A, with one branch between Pier 35 and Pier 36, and the other branch under the West Transition Span (Pier 36 to Pontoon A). Each branch of the navigation channel shall be a minimum of 140 feet wide by a minimum of 44 feet high above Project Lake Level as defined in Section 2.1

Clear navigation channel under the East Transition Span shall be 70 feet high minimum by 190 feet wide minimum.

All channel vertical clearances shall be taken above Project Lake Level. See Section 2.1 (General Information) for Project Lake Level definition.

The final bridge design shall not introduce any underwater hazards to navigation.

The Design-Builder shall maintain navigation channels at the Floating Bridge in accordance with the following requirements:

- At no time shall the existing east and west navigation channels be closed or blocked simultaneously.
- Prior to blocking the existing center channel drawspan, the Design-Builder shall establish the east channel construction opening in accordance with the minimum clearance requirements shown on the Conceptual Plans (Appendix M1).
- The Design-Builder shall establish the permanent vertical clearance for the navigation channel under the East Transition Span as specified in this section no later than 720 Calendar Days after blocking the existing center channel draw span, and no later than 90 Calendar Days after Substantial Completion, whichever comes first.
- The Design-Builder shall coordinate with the United States Coast Guard regarding permits, Local Notice to Mariners, PATON (Private Aids to Navigation not installed or maintained by the U.S. Coast Guard), and permissible waterway obstructions/closures.

- A closure shall be defined as a channel obstructed with an impediment or hazard to navigation that can be readily cleared to allow unrestricted vessel passage on demand, within 90 minutes notice, or on a predetermined schedule. A blocked channel shall be defined as a channel obstructed with an immovable impediment or hazard to navigation that cannot be cleared for vessel passage.
- The blockage of a channel will require a Local Notice to Mariners. The Design-Builder shall be responsible for providing all necessary data to the U.S. Coast Guard as required for the issuance of said notice.

The Design-Builder shall design, provide, and install navigation lighting in accordance with the requirements of 33 CFR Part 118, *Bridge Lighting and Other Signals* and Section 2.17.

The Design-Builder shall install marine fendering systems as required by this section and the United States Coast Guard and according to the design requirements of UFGS- 35 59 13.16, *Marine Fenders* and UFC 4-152-01, *Design: Piers and Wharves*.

The Design-Builder shall design, provide and install PATON buoys above anchor cables ASW and WNE marking the plan location where these anchor cables cross a horizontal plane that is 22 feet below Project Lake Level. These buoys shall conform to the requirements of 33 CFR Part 66, *Private Aids to Navigation*.

#### 2.12.3.6 ENVIRONMENTAL AND OTHER REQUIREMENTS

The Design-Builder shall design and construct the Floating Bridge in accordance with the environmental commitments as listed in Section 2.8 (Environmental). The Design-Builder shall particularly note the commitment of the distance allowed between the top of railing and the Project Lake Level (21 feet maximum).

### 2.12.4 DESIGN CRITERIA

#### 2.12.4.1 DESIGN PERSONNEL REQUIREMENTS

The Design-Builder shall provide a Structural Lead Engineer with 15 years minimum experience in the design and construction of precast, prestressed and post-tensioned concrete and steel bridges; and off-shore marine 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.

The Design-Builder shall secure the services of a Marine Lead Engineer with experience in marine construction practices. The Marine Lead Engineer shall perform the following tasks, at a minimum:

- Perform mooring, towing, and Pontoon Handling analyses;
- Perform ballasting analyses;
- Review and approve the Design-Builder's proposed methods of performing the work in, on and around the Pontoons;
- Prepare submittals for WSDOT;
- Perform required ongoing surveillance;

- Report on construction activities; and
- Recommend immediate correction of operations that may lead to any Pontoon hull damage or damage to the Pontoon monitoring system.

The Marine Lead Engineer shall have 15 years minimum experience in marine design and applicable experience in developing wind and wave loads, hydrodynamic analysis, moorage and handling for large floating structures, and shipboard damage control experience. The Marine Lead Engineer shall be a Professional Engineer in Naval Architecture and Marine Engineering, licensed under Title 18 RCW, and shall be in responsible charge of the marine design elements of the Project.

## 2.12.4.2 GENERAL STRUCTURE DESIGN CRITERIA

### 2.12.4.2.1 Design-Builder's Responsibilities

The Design-Builder shall apply the criteria specified in this section to the design of the Elevated Structure, Transition Spans, anchors, and Pontoon Ancillary Items.

The Design-Builder shall apply the criteria specified in this section and in Section 2.27 for the design for Pontoon Handling.

WSDOT has applied the criteria in this section, as applicable, to the design of the Pontoon System, the analysis of the anchor cable forces, and the design of the anchor cables, including consideration for the Future Six-Lane Plus Two HCT Configuration.

### 2.12.4.2.2 Design Conditions

The Design-Builder shall design the Elevated Structure and Transition Spans, including the adjacent deck expansion joints, for the Change in Lake Level Condition as well as for the Potential Damage Condition.

#### 2.12.4.2.2.1 Change in Lake Level Condition

A rise of 0.8 feet and a drop of 3.8 feet from the Project Lake Level shall be included in the Transition Span, expansion joint and anchor design. The differential settlement requirements of the Sound Transit Link Light Rail North/South Link Design Criteria Manual, Chapter 8 Draft (Appendix S10) shall not apply to the Change in Lake Level Condition.

#### 2.12.4.2.2.2 Potential Damage Condition

The anchors shall have sufficient capacity to resist the loads due to the damage conditions analyzed, including loads resulting from severed anchor cables.

### 2.12.4.2.3 Loads

The following loads shall be considered in addition to the loads specified in the AASHTO *LRFD Bridge Design Specifications*:

| | |
|---|---|
| BL | = ballast loads |
| MA | = maintenance access load |
| $WS_{100}$ | = wind force on the Elevated Structure for the 100-year return period (YRP) storm |

$WWS_{100}$ = steady state wind and wave force on the Floating Bridge for the 100 YRP storm

$WWD_{100}$ = dynamic wind and wave force on the Floating Bridge for the 100 YRP storm

$IN_{100}$ = inertial forces acting on the Elevated Structure due to dynamic movement of Floating Bridge during the 100 YRP storm

$WS_{20}$ = wind force on the Elevated Structure for the 20 YRP storm

$WWS_{20}$ = steady state wind and wave force on the Floating Bridge for the 20 YRP storm

$WWD_{20}$ = dynamic wind and wave force on the Floating Bridge for the 20 YRP storm

$IN_{20}$ = inertial forces acting on the Elevated Structure due to dynamic movement of Floating Bridge during the 20 YRP storm

$WS_1$ = wind force on the Elevated Structure for the one YRP storm

$WWS_1$ = steady state wind and wave force on the Floating Bridge for the one YRP storm

$WWD_1$ = dynamic wind and wave force on the Floating Bridge for the one YRP storm

$IN_1$ = inertial forces acting on the Elevated Structure due to dynamic movement of the Floating Bridge during the one YRP storm

$WS_T$ = wind and wave force on the Pontoon and Elevated Structure during Pontoon transport

$IN_T$ = inertial forces in the Elevated Structure due to dynamic movement of a floating Pontoon during transport

#### 2.12.4.2.3.1 Dead Load of Structural Components (DC)

The unit weight of reinforced concrete shall be in accordance with the BDM (Appendix D1) and BSODM (Appendix B4) unless actual reinforced concrete unit weight is determined by testing.

The HCT dead load allowance shall be included in the Future Six-Lane Plus Two HCT Configuration. The minimum HCT dead load allowance per lane shall include, but not be limited to:

- Rail section and fasteners of 50 pounds per linear foot (plf), two required per lane.
- Emergency guardrails and fasteners of 45 plf, two required per lane.
- Concrete rail plinth of 235 plf, two required per lane.
- Overhead control system (OCS) of 40 plf.
- Walkway/cable tray of 60 plf.
- Miscellaneous load of 40 plf.
- Traffic barrier separating HCT lanes from vehicular lanes.

#### 2.12.4.2.3.2 Dead Load of Wearing Surface and Utilities (DW)

A future wearing surface shall be included in the design in accordance with the BDM (Appendix D1).

#### 2.12.4.2.3.3 Static Water Load (WA)

Water load shall include hydrostatic pressure and buoyancy loads.

The unit weight of fresh water shall be assumed to be 62.4 pounds per cubic foot (pcf).

The unit weight of seawater shall be assumed to be 64 pcf.

#### 2.12.4.2.3.4 Ballast Load (BL)

Washed dry-surface gravel ballast shall be assumed to have a unit weight of 110 pcf.

#### 2.12.4.2.3.5 Vehicular Live Load (LL)

The Elevated Structure shall be designed in accordance with the live load requirements of the BDM (Appendix D1) and AASHTO *LRFD Bridge Design Specifications*. Bicycle/pedestrian paths shall be designed for the greater of AASHTO HL93 vehicular live loads or AASHTO pedestrian loads.

The HCT live load shall be included in the Future Six-Lane Plus Two HCT Configuration. The live load applied to the HCT lanes shall be the greater of an AASHTO HL93 Live Load or the light rail loading as specified by Chapter 8 of the *Sound Transit Link Light Rail North/South Link Design Criteria Manual,* Draft (Appendix S10).

The use of a multiple presence factor to reduce the intensity of HCT loading will not be permitted. The multiple presence factor shall be computed based on the number of loaded vehicular lanes only, and shall apply only to those lanes.

#### 2.12.4.2.3.6 Vehicular Dynamic Load Allowance (IM)

The dynamic load allowance shall be used in design of the Elevated Structure.

#### 2.12.4.2.3.7 Vehicular Braking Force (BR)

In addition to the design of the Elevated Structure, vehicular braking forces shall be included when designing the Pontoon longitudinal anchors.

#### 2.12.4.2.3.8 Maintenance Access Loads (MA)

The following loads applied to deck hatches, platforms and catwalks, staircases, and ladders shall be considered live loads:

- Catwalks, walkways and platforms shall be designed for 100 pounds per square foot (psf) plus 2,000 lb. concentrated load, positioned to create maximum stress, though these loads need not be applied simultaneously.
- Railing design loads shall be in accordance with the AASHTO *LRFD Bridge Design Specifications*.
- Staircases shall be designed for 100 psf.
- Ladders shall be designed for a 300-lb. concentrated load, positioned to create maximum stress. The number and position of additional concentrated live load

units of 300 lb. each expected on each ladder shall be considered in the ladder design.

- Deck hatches in the horizontal closed position shall be designed for water head pressure load described in this section and 500-lb. concentrated load, though these loads need not be applied simultaneously. Deck hatches in the vertical open position shall be designed to remain locked open for winds from a 100-YRP storm.

#### 2.12.4.2.3.9 Wind ($WS_n$) on the Elevated Structure

Wind on the Elevated Structure shall be considered a steady state load. For design of the Elevated Structure on Lake Washington the following shall apply:

- Wind velocities from the south shall be as follows:
  - 100 YRP Storm = 98 mph
  - 20 YRP Storm = 80 mph
  - 1 YRP Storm = 45 mph
- Wind velocities from the north shall be as follows:
  - 100 YRP Storm = 79 mph
  - 20 YRP Storm = 59 mph
  - 1 YRP Storm = 25 mph

The above wind velocities shall be used as the $V_{30}$ term in Section 3.8 of the AASHTO *LRFD Bridge Design Specifications*. "Open Country" shall be assumed when calculating $V_o$ and $Z_o$ in equation 3.8.1.1-1 of the AASHTO *LRFD Bridge Design Specifications*.

#### 2.12.4.2.3.10 Steady State Wind/Wave ($WWS_n$) and Dynamic Wind/Wave ($WWD_n$) on Structure

Steady state and dynamic wind and wave forces shall be as shown in Wind/Wave Analysis (Appendix S15).

#### 2.12.4.2.3.11 Inertial Loads ($IN_n$) on Structure

Inertial loads on structure are dynamic loads. Inertial loads shall be applied to the Elevated Structure. Accelerations along the length of the Floating Bridge used to calculate the inertial loads shall be as listed in Wind/Wave Analysis (Appendix S15).

#### 2.12.4.2.3.12 Transportation Wind/Wave ($WW_T$) and Inertial Loads ($IN_T$) on Structure

Wind and wave loads developed for transport to Lake Washington shall be based on a significant wave height associated with the wave spectrum assumed to be present during transportation as determined by the Marine Lead Engineer.

If the Elevated Structure is present during Pontoon transportation, dynamic inertial effects shall be included.

Refer to Section 2.27 (Moorage and Towing) for more information on Pontoon transportation requirements.

#### 2.12.4.2.3.13 Force Effects due to Temperature (TU and TG)

Design of the Elevated Structure including all expansion joints for the force and movement effects due to uniform temperature (TU) shall utilize the temperature ranges listed in the BDM (Appendix D1). In addition, force and movement effects due to Pontoon deformation associated with Pontoon temperature changes shall be included for the design of the Elevated Structure. A uniform temperature change of plus/minus 15° F shall be assumed for deformation of the Pontoons. The temperature rise of the Pontoons shall be applied in combination with temperature rise of the Elevated Structure. The temperature fall of the Pontoons shall be applied in combination with the temperature fall of the Elevated Structure.

Design of the Elevated Structure including all expansion joints shall include the force and movement effects due to a temperature differential/gradient (TG) of plus/minus 25° F between the roadway deck of the Elevated Structure and the floating bridge substructure. The floating bridge substructure shall include all structural elements used to support the Elevated Structure roadway deck (e.g. crossbeams, columns) and the top deck slab of the Pontoons.

#### 2.12.4.2.3.14 Earthquake (EQ)

The Elevated Structure need not be designed for seismic forces except for those forces transferred by the Transition Spans.

Expansion joints and Transition Span bearings at each end of the Elevated Structure shall be designed for movements due to wind/wave loads, vehicular braking forces, temperature changes, creep and shrinkage, and earthquake loads and displacements.

#### 2.12.4.2.3.15 Vessel Collision Force (CV)

See Section 2.13 for vessel collision requirements.

#### 2.12.4.2.3.16 Lake Level Lowering

The Design-Builder shall design the Transition Span to accommodate a 20-foot lowering of the Project Lake Level. The Transition Span bearings, bearing supports, longitudinal restrainers and electrical connections shall have sufficient displacement capacity to sustain this lowering without necessitating repair. The Transition Span modular joints, barriers, railings, drainage elements and longitudinal stops will be permitted to sustain damage from this displacement. The Transition Span modular joints shall be designed to accommodate this displacement without necessitating repair, notwithstanding the elastomeric strip seal elements.

### 2.12.4.2.4 Load Combinations

Load combinations and load factors for design of the Elevated Structure, Transition Spans and anchors shall be as specified in the AASHTO *LRFD Bridge Design Specifications* with the additional limit states as specified below.

#### 2.12.4.2.4.1 Limit States

Strength IA – Basic load combination for normal vehicular use of the bridge without wind or wave when live load is included.

Strength IIIA –Load combination relating to bridge exposed to the 100 YRP storm.

Strength VA –Load combination relating to normal traffic use of the bridge exposed to a 20 YRP storm.

Extreme Event IIA – Load combination for potential damage during the 100 YRP storm, load combination for anchor load testing

Service IA – Load combination relating to the normal operational use of the bridge with a 20 YRP and all loads taken at their nominal values.

Service IB – Load combination for service check of anchorage design during the 1 YRP storm.

Service V – Load combination used to determine freeboard.

Service VI – Load combination relating to Pontoon stability during the 20 YRP storm.

Service VII – Load combination relating to Pontoon stability during the 100 YRP storm.

Service VIII – Load combination for service check of Pontoon transportation.

For Project specific load factors, see Tables 1 and 2 in this section.

**Table 1. Project Specific Load Combinations and Load Factors**

| Load Combination Limit State | DC DW WA BL EL CR SH PS | LL IM BR PL MA | $WS_{100}$ $WWS_{100}$ | $WWD_{100}$ $IN_{100}$ | $WS_{20}$ $WWS_{20}$ | $WWD_{20}$ $IN_{20}$ | $WS_{1}$ $WWS_{1}$ | $WWD_{1}$ $IN_{1}$ | $WW_{T}$ $IN_{T}$ | WL | TU | TG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Strength IA | $\gamma_p$ | 1.75 | — | — | — | — | — | — | — | — | 0.50/ 1.20 | $\gamma_{TG}$ |
| Strength IIIA | $\gamma_p$ | — | 1.20 | 1.40 | — | — | — | — | — | — | 0.50/ 1.20 | $\gamma_{TG}$ |
| Strength VA | $\gamma_p$ | 1.35 | — | — | 1.20 | 1.40 | — | — | — | 1.00 | 0.50/ 1.20 | $\gamma_{TG}$ |
| Extreme Event IIA | 1.00 | — | 1.00 | 1.20 | — | — | — | — | — | — | — | — |
| Service IA | 1.00 | 1.00 | — | — | 1.00 | 1.20 | — | — | — | 1.00 | 1.00/ 1.20 | $\gamma_{TG}$ |
| Service IB | 1.00 | 1.00 | — | — | — | — | 1.00 | 1.20 | — | 1.00 | — | — |
| Service V | 1.00 | — | — | — | — | — | — | — | — | — | — | — |
| Service VI | 1.00 | 1.00 | — | — | 1.00 | 1.20 | — | — | — | 1.00 | — | — |
| Service VII | 1.00 | 0.60 | 1.00 | 1.20 | — | — | — | — | — | 0.60 | — | — |
| Service VIII | 1.00 | — | — | — | — | — | — | — | 1.00 | — | — | — |

**Table 2. Load Factors for Permanent Loads, $\gamma_p$**

| Type of Load | Load Factor, $Y_p$ | |
|---|---|---|
| | Maximum | Minimum |
| BL: Ballast | 1.00 | 1.00 |
| WA: Static Water | 1.00 | 1.00 |

$\gamma_{TG}$ shall be determined in accordance with the AASHTO *LRFD Bridge Design Specifications*.

#### 2.12.4.2.4.2 Design and Detailing Software

The Design-Builder shall use the following software for the Floating Bridge design:

- SAP2000 (by CSI) for structural analysis (the same version WSDOT is using at the time of NTP 1).
- PGSUPER (by WSDOT) for prestressed concrete girder design (the same version WSDOT is using at the time of NTP 1).
- AutoCAD (by Autodesk) for all Pontoon and structure design drawings (the same version WSDOT is using at the time of NTP 1).

### 2.12.4.2.5 Cathodic Protection and Stray Current Mitigation

The Design-Builder shall provide corrosion protection for the anchor system in accordance with Section 2.17 (Electrical Bridge and Services). The Design-Builder shall design, detail, and construct a stray current mitigation system for the Floating Bridge.

### 2.12.4.2.6 Aesthetic Criteria

The Design-Builder shall design and construct all Work in accordance with Section 2.15 (Landscape and Aesthetics Design).

### 2.12.4.2.7 Design and Construction of the Pontoon Ancillary Items

#### 2.12.4.2.7.1 General

The Design-Builder shall design, furnish, and install all the Pontoon Ancillary Items for the Project, except for those items attached and furnished with the PFS as listed in Section 2.12.1.3.

The design and construction of the Pontoon Ancillary Items shall be provided by the Design-Builder and shall be in accordance with State Furnished Pontoon Minimum Technical Requirements (Appendix M11), Pontoon Minimum Technical Requirements (Appendix M22), and Outfitting and Assembly Minimum Technical Requirements (Appendix M23).

Hardware and parts fabricated for the Pontoon Ancillary Items shall be interchangeable with similar hardware and parts from the PCP Contract as specified below. Interchangeability shall mean that the parts are so nearly identical in size, specification, and functionality that they are capable of replacing the other parts, without any accommodation or custom fitting.

#### 2.12.4.2.7.2 Pontoon Cell Access, Cell-to-Cell Openings and Penetrations

The Design-Builder shall not install any openings or penetrations through walls or slabs (temporary or permanent) other than those expressly shown in State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22).

### 2.12.4.2.7.3 Freeboard

All Longitudinal Pontoons and Cross Pontoons shall have a design freeboard of 7.00 feet at the edge of the Pontoons. All SSPs shall have a design freeboard of 6.25 feet at the outboard edge of the SSPs. The freeboard shall be measured from the top of the top slab at the edge of the Pontoon to the static water level. The static water level shall be clearly marked with waterline indicators as required in this section. Since the Design-Builder is responsible for the design of the Elevated Structure, they will also be responsible for achieving the design freeboard specified, including the Future Six-Lane Plus Two HCT Configuration. Freeboard shall be calculated based on the following loading criteria:

- Structure dead load as defined in this section.
- No live load shall be considered.
- Vertical component of the anchor cable pretension force.
- Weight of attachments such as catwalk, ladders, hatches and other hardware shall be included.
- Weight of significant miscellaneous items such as sign structures or maintenance, control and substation sheds on the Pontoons.
- Pontoon joints.
- Construction tolerance allowance of four percent. A lower construction tolerance may be used if calculations are done based on construction tolerances for specific elements provided in this section.
- Weight of permanent ballast, including reserve ballast as defined below.
- Future wearing surface.
- HCT dead load allowance.
- Architectural features.

The Pontoon freeboard computations which shall be included in the Ballasting Plan, shall be independently checked by another engineer to within two inches.

The Design-Builder shall provide reserve ballast equivalent to three inches of freeboard to account for potential increases in Pontoon draft (loss of freeboard) due to unforeseen weight being added by WSDOT to the Pontoons. The reserve ballast may be considered to be removed for the Future Six-Lane Plus Two HCT Configuration. The final Pontoon freeboard at the completion of construction of the Floating Bridge shall be within one inch of the design freeboard.

The Design-Builder shall prepare a Pontoon Assembly Plan, including a Ballasting Plan, that shall include an analysis of the design freeboard starting from the time of float out of PPDB and from time of acceptance of PFS until completion of construction of the Floating Bridge. The Design-Builder shall take special care to restrict the weight of the Elevated Structure in order to fulfill the reserve ballast requirement and achieve the design freeboard.

### 2.12.4.2.7.4 Electrical and Control Systems

Refer to Sections 2.16 and 2.17 for bridge control system, cell lighting and leak detection, and navigation lighting requirements.

#### 2.12.4.2.7.5 Inserts and Mechanical Splices

Mechanical splices connecting to reinforcement above the Pontoon deck for future construction shall be threaded.

Threaded inserts shall be cast into the exterior surfaces of the Pontoon deck slabs and walls for installation of exterior features including, but not limited to: safety ladders, safety cable supports, Pontoon railing post base plates, waterline indicators, cathodic protection cable guards, anode support brackets, marine fenders, moorage cleats at work boat moorage areas, submerged cable warning signs above each hawse pipe, restricted area signs and drainage pipe supports.

Details and locations of these inserts are shown on the drawings in State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22).

The Design-Builder shall determine the location and size of anchorage connections for components inside Pontoon cells, including catwalks, platforms, interior ladders and electrical conduit supports.

#### 2.12.4.2.7.6 Ballast Ports

Permanent ballast ports shall be provided to allow placement of temporary and permanent ballast into each of the Pontoon cells. Deck hatches may be used as ballast ports. Ballast ports shall be sized and located as indicated on the drawings in Pontoon Minimum Technical Requirements (Appendix M22).

Each ballast port opening other than a deck hatch shall be a circular deck penetration with an embedded steel pipe liner and a top steel mounting ring. The top mounting ring shall be welded to the pipe liner. Each port shall have a minimum inside clear opening of 13 inches in diameter. The outside edge of the pipe liner shall be located a horizontal clearance of two inches minimum to the edge of any post-tensioning duct and 1½ inches to the edge of any deck reinforcement steel. The lower end of the pipe liner shall not extend more than two inches below the bottom of the deck slab.

Each port shall be covered with a watertight steel cover plate. The top of cover plate shall be flush with the top of deck slab when bolted down. Each galvanized cover shall not weigh more than 40 lbs. For watertightness, a neoprene gasket of 40 durometer hardness shall be bonded to the top of the mounting ring. The cover shall be fastened to the top of the mounting ring with a minimum of four ¾-inch diameter bolts. The center of each cover shall accommodate attaching a lifting eyebolt. Hatch lids, seals and other miscellaneous hardware shall be interchangeable with the ballast ports supplied in the PCP Contract.

#### 2.12.4.2.7.7 Maintenance Access Systems

Pontoon interior access components shall be designed, furnished and installed using fiberglass reinforced plastic (FRP) materials and shall include all catwalks, platforms, railings, and ladders. Pontoon interior access components shall be sized and located as indicated on the drawings in Pontoon Minimum Technical Requirements (Appendix M22), and shall provide seven feet minimum headroom beneath the top slab to top of grating. Ladders, grating, and other miscellaneous components shall be interchangeable with the Maintenance Access System supplied in the PCP Contract.

The Design-Builder shall design, furnish, test and install FRP Pontoon Access and Walkway systems. The Design-Builder shall design items with sufficient strength for handling stresses with a minimum factor of safety of four.

The FRP design shall meet the requirements of the latest applicable revision, as of the RFP date, of the publications listed below, to the extent referenced herein.

- ANSI/ASCE/ACMA Fiberglass Grating Manual (ASCE Prestandard Draft)
- ASTM D635 Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position
- ASTM D638 Tensile Properties of Plastics
- ASTM D790-Flexural Properties of Unreinforced and Reinforced Plastics
- ASTM D2344-Apparent Interlaminar Shear Strength of Parallel Fiber Composites by Short Beam Method
- ASTM D495-High Voltage, Low-Current, Dry Arc Resistance of Solid Electrical Insulation
- ASTM D696-Coefficient of Linear Thermal Expansion for Plastics
- ASTM E84-Surface Burning Characteristics of Building Materials
- OSHA Federal Register, Volume 39, No. 125, Section 1920.23 and Section 1910.27c
- IBC, 2009
- WAC, Title 296 and Chapter 51-50

Ladders for deck hatches shall provide a top section of fixed ladder that is jointed to allow fold-up of the ladder in a stowed position so as not to interfere with the closing of the deck hatch. When the deck hatch is open, the jointed top section shall rotate and lock into a vertical position. The lower portion of fixed ladder for deck hatches shall be bolted to a catwalk grating or anchor gallery floor slab, depending on the location of the hatch. Fixed ladders attached to walls adjacent to catwalks and platforms shall have ladder support brackets anchored to Pontoon walls.

Handrail top and bottom rails shall be continuous between posts with no splices. All shop and field-cut edges shall be sealed in accordance with the manufacturer's written instructions.

All hardware for FRP components shall be Type 316L stainless steel with nylon-insert type locknuts. All hardware shall have anti-seizing compound applied to hardware threads in accordance with the manufacturer's written instructions.

Pontoon interior access components shall be capable of supporting loads without exceeding the maximum allowable deflection recommended by the manufacturer. The maximum maintenance access (MA) load deflections shall not exceed L/240. Catwalks shall not be supported with hanger rods from overhead slabs. Platforms and catwalks along walls shall be supported with anchored connections to the Pontoon walls. Access systems shall be supported only by Pontoon walls, except for ladders. Ladders shall not be attached to walls and slabs containing post-tensioning, unless unavoidable. Anchor connections to concrete walls and slabs shall use Type 316L stainless steel embedded concrete inserts or drilled-in resin bonded anchors, except that resin bonded anchors

will not be allowed in walls or slabs containing post-tensioning. Expansion or mechanical type anchors will not be allowed.

#### 2.12.4.2.7.8 Deck Access Hatches

The Design-Builder shall design, furnish, test and install the watertight deck hatches for the deck slab openings based on the opening access sizes and locations shown on the drawings in Pontoon Minimum Technical Requirements (Appendix M22). All watertight hatches shall be tested as specified in this section. All components of the hatches shall be interchangeable with the hatches supplied in the PCP Contract.

Deck hatches in a horizontal closed position shall be designed as specified in this section.

The lifting force required to fully open each hatch lid shall not exceed 40 lbs. Each hatch assembly shall not use springs or shocks to assist in opening or closing the hatch lid. Deck hatches shall incorporate a bonded gasket for fully watertight construction.

Hatch assemblies shall be made from aluminum castings conforming to either ASTM B26 or ASTM B179, of either 512 or 535 alloy; or aluminum bars, plates and shapes conforming to ASTM B209, of alloy 5086 or alloy 6061-T6. All aluminum components shall be hard-coat anodized to 0.002-inches thick minimum after welding, in accordance with MIL-A8625 Type III Class I, and shall have a uniform finish.

For each deck hatch, the Design-Builder shall furnish and install a padlock securing system that includes one padlock and one hasp and eye for padlocks. The Design-Builder shall coordinate with WSDOT Northwest Region Bridge Maintenance to determine the type of padlock and key core.

The Design-Builder shall incorporate an integral hatch stop system into the deck hatch to hold the hatch in the vertical open position against a maximum 100-year wind speed. The Design-Builder shall incorporate into the hatch design drop bolts with wing nuts for positive lockdown of the hatch in the horizontal closed position. The drop bolt assembly shall be made of material compatible with hatch material, with anti-seizing compound used on threaded bolt.

Neoprene shall be durometer 40 and bonded with approved adhesive sealant. Neoprene gaskets shall be bonded to hatches for watertightness. Neoprene pads shall be bonded to sides of hatch concrete curb and to metal components anchored into side of curb.

Deck access hatches shall have signage conforming to this section and Outfitting and Assembly Minimum Technical Requirements (Appendix M23) and Pontoon Reference Details (Appendix M24).

#### 2.12.4.2.7.9 Internal Watertight Doors

The Design-Builder shall design, furnish, test and install watertight doors for the Pontoon walls. Watertight doors shall be sized and located as indicated on the drawings in Pontoon Minimum Technical Requirements (Appendix M22). All components of the watertight doors shall be interchangeable with the watertight doors supplied in the PCP Contract.

The Design-Builder shall submit details to WSDOT for review and approval.

Watertight doors and frames shall be steel doors with six dogs. Each door shall have a minimum 3/8-inch bronze ball valve installed in the door plate near the door threshold, and where it will not interfere with movement of the dogs or interfere with railings when the door is fully opened. Doors, frames and hardware shall be galvanized after

fabrication. All hinge pins, bushings, and miscellaneous hardware shall be corrosion resistant and compatible in a marine environment.

Dog handles shall be adjusted to a horizontal position when the door is closed and locked. One removable dog handle extension shall be furnished within each Pontoon cell for each catwalk level and each platform with a door.

Doors shall be hinged to open in the direction shown in the Pontoon Minimum Technical Requirements (Appendix M22), and shall not block access to side ladders when the door is fully opened.

#### 2.12.4.2.7.10 Pontoon Railing

Pontoon railing shall include end and intermediate posts with post base plates electrically isolated from deck slab reinforcement. Pontoon railing shall be sized and located as indicated on the drawings in State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22). Each base plate shall have identical hole patterns to accommodate the same bolt and insert pattern. Each base plate shall have a one-inch minimum grout leveling pad. Each anchorage shall have a minimum ¾-inch diameter cast-in-place insert internally tapped for U.N.C. thread machine bolt and have a plate washer base for attaching to the form. Each insert shall have a minimum ultimate capacity of 15 kips in shear and 18 kips in tension.

Railing posts shall accommodate top mounting of a navigational light.

Each end post shall be steel pipe with a four-inch diameter minimum and intermediate posts shall be 3½-inches minimum in diameter.

Three wire ropes shall be equally spaced vertically over a vertical distance of 3.5 feet between the top of the deck slab and the centerline of the top wire rope. Each wire rope shall be a minimum 5/8-inch diameter with a minimum breaking strength of ten tons.

Each intermediate post shall have a small steel pipe inserted through the post for each wire rope to go through without chafing. Each pipe insert shall be 1/8 inch greater in diameter than the wire rope diameter, and the pipe insert shall be welded in place to the intermediate post. Each wire rope shall go through a pipe insert at each intermediate post before connecting to a minimum ¾-inch diameter steel retaining loop welded to each end post.

Each wire rope shall be continuous and each end shall include a closed spelter socket, a minimum ¾-inch jaw and jaw end turnbuckle with a minimum breaking strength of ten tons to connect to the retaining loop on each end post. Spelter sockets and the socketing procedure shall be in accordance with wire rope manufacturer's written instructions. The wire rope product shall be Phillystran® Shipboard Ropes for Marine Applications Kevlar Aramid Rope by Phillystran, Inc.

Each wire rope shall be tensioned to an initial tension load of a minimum of 400 lbs. (two percent of ultimate breaking strength), leaving six inches of take-up still available in each turnbuckle. Turnbuckles shall be locked after initial tensioning.

The Pontoon railing system shall not be used for towing or mooring.

A minimum of two chains shall connect between end posts across Pontoon joints, at safety ladder openings, at vertical support members for superstructure, and at removable railing locations. Chain shall be a ¼-inch minimum diameter link, galvanized, and incorporate a snap connector system at each end of the chain with a three-inch

maximum sag at the midlength of the chain. The chain connector system shall be capable of resisting a minimum load of 800 lbs. in any direction.

A removable railing system shall be located at each jib crane location. Each system shall consist of two railing posts on each side of the jib crane with continuous link chain connecting posts together. Each post shall be removable such that the bottom one-foot maximum of each post and base plate remains anchored to the Pontoon deck while the remaining upper portion of each post can be separated easily from the bottom portion.

See Outfitting and Assembly Minimum Technical Requirements (Appendix M23) and Pontoon Reference Details (Appendix M24) for railing details.

#### 2.12.4.2.7.11 Safety Cables

See State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22) for centerline locations of cables above bottom of keel slabs, as well as spacing of centerline of cable support brackets and bolt/insert patterns.

Safety cables shall be located along the sides of the Pontoons above the static water line. A lower safety cable shall be located approximately one foot above the water line, and an upper safety cable shall be located approximately four feet above the lower cable. An additional lower safety cable shall be located on each wall of the drainage wells located at approximately one foot above the water line. Each cable shall include provisions for end support brackets that accommodate interior corners between Pontoon walls, and also corner softeners that accommodate exterior corners and prevent chafing of cables. Intermediate cable support brackets shall be spaced accordingly to meet loading conditions.

Each support bracket shall have identical hole patterns, when possible, to accommodate the same bolt and insert pattern. Brackets shall be sized to support cables five inches minimum to six inches maximum from exterior faces of Pontoon walls. See Pontoon Reference Details (Appendix M24) for bracket details. Each anchorage shall have a minimum one-inch diameter cast-in-place insert internally tapped for U.N.C. thread machine bolt and have a plate washer base for attaching to the form. Each insert shall have a minimum ultimate capacity of 24 kips in shear and 25 kips in tension.

Each cable shall consist of a minimum ¾-inch diameter EIP I.W.R.C. galvanized wire rope with minimum breaking strength of 25 tons, and continuous in length. One end of each wire rope shall include a minimum ¾-inch closed spelter socket, minimum one-inch jaw and jaw end turnbuckle with a minimum breaking strength of 25 tons to connect to each cable support bracket. The other end of the same wire rope shall include a minimum ¾-inch screw pin anchor shackle, heavy wire rope thimble, and four ¾-inch heavy wire rope clips.

Spelter sockets and the socketing procedure shall be in accordance with the wire rope manufacturer's written instructions. Clip installation procedure shall also be in accordance with manufacturer's written instructions.

Each cable shall be stretched taut to present a maximum vertical deflection of 12 inches for upper cable, and maximum vertical deflection of six inches for lower cable, with a vertical load of 500 lbs. applied mid-length between support brackets. Turnbuckle take-up body length shall be as required to produce taut cable condition.

Allowable tolerance for vertical placement of cables shall be plus/minus six inches in order to minimize conflicts with post-tensioning in Pontoon walls.

#### 2.12.4.2.7.12 Safety Ladders

Each safety ladder and associated brackets shall be constructed of structural steel. The ladders shall provide provisions for supporting the safety cables, connecting to the end posts of the Pontoon railing, and for removable chains across the opening for the ladder. The ladder brackets shall support the safety cables four inches minimum to five inches maximum from exterior face of Pontoon walls. The bottom rung of each ladder shall be located 3.5-feet minimum below static water level. Ladders shall be sized and located as indicated on the drawings in State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22). See Pontoon Reference Details (Appendix M24) for ladder details.

Safety ladder systems need not be designed for vessel impact, but shall be designed to resist failure of support brackets and permanent deformation up to one inch for rungs and rails when subjected to a 1,000-lb. floating debris impact.

#### 2.12.4.2.7.13 Temporary and Permanent Plugs

Temporary plugs shall be used to fill all exterior wall, slab and bulkhead openings until the opening is utilized in the final bridge configuration. The temporary plugs shall have a design life of 10 years. The Design-Builder shall submit representative samples of the temporary plugs to WSDOT for review and approval.

Permanent plugs shall conform to State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22).

#### 2.12.4.2.7.14 Maintenance, Control, and Substation Sheds

The Design-Builder shall design and construct sheds as indicated below:

- Shed – Type 1 (Maintenance Shed)
    - Number, size, location, and room layout as shown in Outfitting and Assembly Minimum Technical Requirements (Appendix M23).
- Shed – Types 2 and 3 (Control Shed with Substation, and Control Shed)
    - Approximate number, size, location, and room layout as shown in Conceptual Plans (Appendix M1).
    - Sheds shall be sized and designed to enclose equipment and provide adequate access and safety clearances in accordance with these Technical Requirements.
    - Sheds shall be located on the Longitudinal Pontoons -- not on the Cross Pontoons, nor SSP's.

##### *2.12.4.2.7.14.1 General*

Shed design and construction shall meet the requirements of this section and Section 2.30 (Bridge Maintenance Facility and Dock).

Equipment and enclosures shall meet the requirements of Section 2.16 (Illumination and Roadway Electrical Systems), Section 2.17, Section 2.18 (Intelligent Transportation Systems), and Section 2.32.

Light-gage steel framing shall be galvanized and shall have the following minimum thicknesses:

- Exterior Walls – 16 gage.
- Interior Walls – 20 gage.
- Roof Framing – 14 gage.

Interior wall surfaces and ceilings shall be sheathed with 5/8-inch thick cement board. Cement board shall be non-combustible, water durable, suitable for interior use, and shall be one of the following products, or an approved equal:

1) Durock® by USG Corporation
2) PermaBase® by National Gypsum Co.
3) ProTEC™ Concrete Backer Board by T. Clear Corp. and Fin Pan, Inc.

Fasteners shall be Type 316L stainless steel screws. Joints and field shall be prefilled with tile-setting mortar, and then joints taped. Installation shall be done in accordance with manufacturer's requirements.

#### *2.12.4.2.7.14.2 Exterior Walls*

All exterior shed walls shall utilize galvanized steel framing and exterior metal siding supported on 2.5-foot high concrete parapet wall above the Pontoon deck. All exterior walls shall be designed to resist wind/waves generated by a 100 YRP storm.

Metal siding shall be 20-gage minimum thickness, installed with corrugations running horizontally, factory galvanized, and factory painted with an oven-cured epoxy coating system. Siding fasteners shall be Type 316L stainless steel screws with EPDM washers.

All galvanized steel-framed exterior walls shall be insulated with a minimum R-13 batt insulation with continuous vapor barrier installed on the inside face of studs under the cement board. Perimeter insulation at the concrete curbs is not required.

The Design-Builder shall install ¾-inch thick fire retardant treated (FRT) plywood to the inside surface of Type 1 shed exterior walls over the cement board sheathing for a nailing surface. Plywood shall be attached to the walls with light-gage galvanized steel furring strips. Plywood coverage shall be from three feet to seven feet above the finished floor and continuous along the interior of all exterior walls. Plywood and fasteners shall conform to IBC requirements.

#### *2.12.4.2.7.14.3 Interior Walls*

All interior shed walls shall utilize galvanized steel framing and be supported on six-inch high concrete curbs above the Pontoon deck.

The Design-Builder shall install ¾-inch thick fire retardant treated (FRT) plywood to the surfaces of Type 1 shed walls over the cement board sheathing for a nailing surface. Plywood shall be attached to the walls with light-gage galvanized steel furring strips. Plywood coverage shall be from three feet to seven feet above the finished floor, and continuous along all interior. Plywood and fasteners shall conform to IBC requirements.

All interior walls shall be insulated with a minimum R-13 batt insulation with continuous vapor barrier. The vapor barrier shall be installed on the inside face of studs under the cement board adjacent to the warmer space (based on winter design conditions in accordance with Section 2.32.). At the shed at Pontoon 'G': The Vestibule, Transformer Room, Electrical, ITS/Lighting, and Wireless are all semi-heated spaces; the Shop is unheated. At the shed at Pontoon 'Q': The Vestibule, Transformer Room, Electrical, and ITS/Lighting are all semi-heated spaces; the Crew Room and restroom are heated spaces; the Shop is unheated.

#### *2.12.4.2.7.14.4 Painting*

All interior and exterior concrete, masonry and cement board surfaces shall be painted in accordance with the requirements of this section.

#### *2.12.4.2.7.14.5 Roofs and Ceilings*

The Design-Builder shall design sheds for a 10-foot exterior building height and shall install roofs on sheds to meet this requirement.

Shed roofs shall utilize galvanized steel framing, metal roofing and cement board ceiling sheathing. Roofs shall be sloped to drain at ¼-inch per foot minimum. Metal roofing shall be 20-gage minimum thickness, through-fastened, factory galvanized, and factory painted with an oven-cured epoxy coating system. Roofing fasteners shall be Type 316L stainless steel screws with EPDM washers.

If the shed is located under the Elevated Structure where the overhead clearance is less than or equal to 10 feet, then the Elevated Structure shall function as the shed roof. Ceilings shall be suspended with light-gage steel framing and shall be positioned as high as is practical to give the maximum overhead clearance in the Crew Room, restroom, and Vestibule of the shed at Pontoon 'G' and at the Vestibule and the ITS/Wireless Room of the shed at Pontoon 'Q'. The Design-Builder shall provide continuous galvanized steel angles between the top of exterior walls and the bottom of the Elevated Structure. The gap between the bottom of the Elevated Structure and the top of the wall framing shall not be less than two inches and shall be filled with resilient, compressible foam. The top of the wall shall be designed to accommodate superstructure deflections with a weathertight slip-joint system.

Ceilings shall be insulated with a minimum of two inches of rigid insulation with continuous vapor barrier installed on the inside face of ceiling framing under the cement board sheathing. The insulation shall provide the greatest R-value and sound isolation and dampening possible for the type of installation. Acoustical criteria shall be in accordance with that listed in Section 2.30 for the Crew Room, Vestibule, and Communications (ITS/wireless) room. The restroom shall have the same acoustical requirements as the Crew Room.

### 2.12.4.2.7.15 Channel Markers

Channel clearance markers shall be furnished and installed in accordance with the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). The markers shall be attached to the UHMW-PE fender panels at the ends of Pontoons A and W. Each marker position shall represent the minimum actual vertical clearance below the bottom of Transition Span to the water surface within the defined navigational channel adjacent to the Pontoon. The markers shall be attached to the Pontoons after construction and final ballasting of the Pontoons, and after the construction of the Transition Spans is complete.

### 2.12.4.2.7.16 Waterline Indicators

Permanent waterline indicators attached to sides of the Pontoons shall be in accordance with the layouts shown in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). The assemblies shall be galvanized after fabrication, and either painted or powder-coated in accordance with WSDOT Standard Specification 6-07.3(11) (Appendix D18). The color of the finish coat, when dry, shall match Federal Standard 595 color number 13655.

The Design-Builder shall also provide temporary waterline indicators until construction and ballasting of Pontoons is complete. The Design-Builder may use the inserts shown in the State Furnished Pontoon Minimum Technical Requirements (Appendix M11) associated with the permanent indicators for attaching temporary waterline indicators, but the inserts shall be undamaged when permanent indicators are attached.

#### 2.12.4.2.7.17 Signage

Pontoon signage shall include metal signs attached to the embedded inserts in the sides of the Pontoons, as well as identification (ID) signs painted on the concrete deck access hatch curbs and concrete walls inside and outside of the Pontoons.

See Outfitting and Assembly Minimum Technical Requirements (Appendix M23) for the Global Cell and Wall Naming Scheme with the Cell Number layout for the different types of Pontoons, and for Pontoon/Anchor Cable IDs.

See the Outfitting and Assembly Minimum Technical Requirements (Appendix M23) for the layouts of the "RESTRICTED AREA" and "WARNING" metal signs to be attached to the sides of the Pontoons. See State Furnished Pontoon Minimum Technical Requirements (Appendix M11) for inserts labeled SR and SW for attaching the metal signs.

Pontoon Cell Address ID signs shall be painted on the concrete hatch curbs and on the concrete interior Pontoon walls. Pontoon/Anchor Cable ID signs shall be painted on the concrete exterior Pontoon walls above the "WARNING" signs. Paint on concrete surfaces shall conform to requirements in this section. See Outfitting and Assembly Minimum Technical Requirements (Appendix M23) for ID sign locations and ID information to be painted on each concrete surface. See Pontoon Reference Details (Appendix M24) for the ID layouts. ID layouts shall have a white colored (Federal Standard 595 color number 17295) background with black colored (Federal Standard 595 color number 27038) upper case letters/numbers stenciled over and centered within the background. The letters/numbers shall be GOTHIC style and true. The background shall extend one inch minimum beyond edge of letters/numbers.

Cell ID layouts painted on the concrete hatch curbs shall be centered between the drop bolt assemblies, as well as centered between the hatch hinges on opposite curb face. The ID background shall be 24 inches wide by six inches minimum to eight inches maximum high. The letters/numbers shall be three inches minimum to four inches maximum high, with minimum ¾ inch stroke width.

Cell ID layouts painted on the concrete interior Pontoon walls shall be along side wall openings (five feet minimum to six feet maximum above top of anchor gallery floor slab, and six inches minimum to 12 inches maximum side clearance), above wall openings (six inches minimum to 12 inches maximum to bottom of ID layout), and above fixed ladders (four feet minimum to five feet maximum above top of adjacent catwalk grating, and 12 inches minimum above top rung of fixed ladder). The ID background shall be 24 inches minimum to 36 inches maximum wide by eight inches minimum to 12 inches maximum high. The letters/numbers shall be four inches minimum to six inches maximum high, with minimum ¾-inch stroke width. Pontoon/Anchor Cable ID layouts painted on the concrete exterior Pontoon walls shall have bottom of layout three inches minimum to six inches maximum above the top of metal "WARNING" signs. The ID background shall be 24 inches minimum to 36 inches maximum wide by 12 inches minimum to 18 inches maximum high. The letters/numbers shall be eight inches minimum to 12 inches maximum high, with minimum two inch stroke width.

The cell ID text shall consist of two parts: Pontoon Name and Cell Number.

- Cells on Pontoons A to W shall have cell IDs starting with a single letter from A to W for the Pontoon Name followed by a dash "-", then a Cell Number from 1A to 3L for Pontoons A and W, or Cell Number from 1E to 13H for Pontoons B to V.
- Cells on Pontoons SSP NW shall have cell IDs starting with a single letter from B to V for the main Pontoon that it's attached to, then the two-letter location NW, followed by a dash "-", then a Cell Number from 3B to 5D.
- Cells on Pontoons SSP SW shall have cell IDs starting with a single letter from B to V for the main Pontoon that it's attached to, then the two-letter location SW, followed by a dash "-", then a Cell Number from 3I to 5K.
- Cells on Pontoons SSP NE shall have cell IDs starting with a single letter from B to V for the main Pontoon that it's attached to, then the two-letter location NE, followed by a dash "-", then a Cell Number from 9B to 11D.
- Cells on Pontoons SSP SE shall have cell IDs starting with a single letter from B to V for the main Pontoon that it's attached to, then the two-letter location SE, followed by a dash "-", then a Cell Number from 9I to 11K.

#### 2.12.4.2.7.18 Security CCTV Pole Foundations

Refer to the State Furnished Pontoon Minimum Technical Requirements (Appendix M11) for deck penetrations available for mounting security CCTV poles to Pontoon decks. Refer to Outfitting and Assembly Minimum Technical Requirements (Appendix M23) for locations of security CCTV poles. Refer to the Conceptual Plans (Appendix M1) for electrical plans. Refer to the Pontoon Reference Details (Appendix M24) for conceptual details for anchoring security CCTV pole foundations to Pontoon deck penetrations. The Design-Builder shall design sufficient anchorage to resist loads as specified in the design criteria of this section.

#### 2.12.4.2.7.19 Conduit Supports on Pontoons

The Design-Builder shall design supports and required anchorage to support conduits. Except where indicated in Section 2.17 and shown in Pontoon Reference Details (Appendix M24), conduits shall not be placed on top of the Pontoon decks. The Design-Builder shall locate conduits and supports so that they will not impede clear access on top of Pontoons nor encroach within the clearance envelopes as defined in this section.

The Design-Builder shall design, furnish, and install cast-in-place embedments in the PPDB for conduit support anchorages. Drilling into the PPDB will not be permitted.

Drilling into the Pontoons to route conduits through slabs or walls will not be permitted.

#### 2.12.4.2.7.20 Pipe Supports on Pontoons

The Design-Builder shall design supports and required anchorage to support drainage and fire protection pipes. Except near the drainage wells, drainage pipes shall not be placed on top of the Pontoon decks. The Design-Builder shall locate pipes and supports so that they will not impede clear access on top of Pontoons nor encroach within the clearance envelopes.

The Design-Builder may drill into the top slab of the PFS to install pipe support anchorages, but shall locate such anchorages as defined in this section.

The Design-Builder shall design, furnish, and install cast-in-place embedments in the PPDB for pipe support anchorages. Drilling into the PPDB will not be permitted.

Drilling into the Pontoons to route piping through slabs or walls will not be permitted.

#### 2.12.4.2.7.21 Pump Receptacle Supports

See Conceptual Plans (Appendix M1) for electrical details of pump receptacles and plan locations for each type of Pontoon. The Design-Builder shall design and install support connections compatible with each type of Elevated Structure vertical support member. Concrete support members with square or rectangular dimensions may use resin bonded anchors at the time of installation of receptacles, otherwise the Design-Builder shall coordinate embedment of stainless steel inserts sized and spaced as designed. Steel tube support members shall use Type 316L stainless steel straps with neoprene pads, or approved equal, between the support member and the strap.

#### 2.12.4.2.7.22 Anode Cable Guards and Anode Support Brackets

The Design-Builder shall coordinate the installation of anode cable guards and support brackets with installation of cathodic protection components and safety cables at exterior Pontoon walls. Cable guards shall be sized to provide one inch minimum horizontal clearance to accommodate lifting and lowering of anode cable assembly, as well as one inch minimum horizontal clearance to safety cables. Bottom of cable guards shall extend 12 inches minimum to 18 inches maximum below static water level. Top of cable guards shall extend six inches minimum to 12 inches maximum above exterior wall penetration for cathodic protection conduit. See State Furnished Pontoon Minimum Technical Requirements (Appendix M11) for insert sizes and locations for attaching cable guards and support brackets to Pontoons, as well as locations of wall penetrations for cathodic protection conduit. See Outfitting and Assembly Minimum Technical Requirements (Appendix M23) and Pontoon Reference Details (Appendix M24) for cable guard and bracket details.

#### 2.12.4.2.7.23 Fire Protection Pump Supports

The Design-Builder shall design, furnish and install fire protection pump supports. Refer to the Pontoon Reference Details (Appendix M24) for a schematic layout. Adequate area around the pumps shall be provided for maintenance access. Safety railings and screens shall be provided as needed.

All materials shall be galvanized steel, stainless steel conforming to ASTM A240 Type 316L, or FRP. All attachments of the pump support framing to the Pontoons shall be cast-in-place during Pontoon fabrication. Drilled-in anchors in the Pontoons shall not be permitted.

Loadings for the fire protection pump equipment shall be computed by the Design-Builder. The stiffness of the pump support framing shall be proportioned to prevent damaging harmonic vibrations during pump operations. Any maintenance access areas surrounding the pumps shall be designed for 150-psf. minimum live loading.

### 2.12.4.2.8 Anchor Design

The Design-Builder shall design the anchors. The anchors shall be designed to facilitate future anchor cable replacements. During the preliminary design phase, the Design-Builder shall submit a report for WSDOT review and comment of how their anchor design meets this requirement.

Anchors shall be located as shown in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23).

All permanent anchors shall be one of the following types (as shown conceptually in Conceptual Anchor Drawings, Appendix M16):

- Fluke
- Gravity
- Drilled Shaft

Anchors shall be designed to accommodate the anchor cable size and anchor forces as specified in this section.

#### 2.12.4.2.8.1 General Anchor Requirements

Except for eyebars and connecting hardware, anchors shall be constructed of reinforced concrete.

Steel reinforcing bars shall conform to Sections 9-07.3 and 6-02.3(24)H of the WSDOT Standard Specifications (Appendix D18).

Eyebars shall be either fabricated structural steel, a steel forging, or a combination weldment of the two. Structural steel for eyebars shall conform to ASTM A709 Grade HPS 70W or ASTM A709 Grade HPS 100W with supplemental requirements S8 and S60. Steel forging for eyebars shall conform to Section 9-06.11 of the WSDOT Standard Specifications (Appendix D18), and shall be Class G with supplementary requirements S1, S4, S7 and S8. All plates and forgings shall have a 3:1 minimum thickness reduction during rolling or forging. All edges shall have a surface roughness no greater than 250 micro-inches, except that the pin hole shall have a surface roughness no greater than 125 micro-inches, as defined by ANSI B 46.1 Surface Texture.

Eyebars shall be considered a fracture critical main load carrying tension member. The eyebar fabricator shall be certified under the AISC Quality Certification Program, Major Steel Bridges Category, Endorsement F, Fracture Critical.

The eyebar shall be designed to connect to a spelter socket and pin without reduction in the rated capacity of the socket or pin. The anchor and eyebar assembly shall be designed and placed so that all connecting pins lay horizontal within plus/minus five degrees. The eyebar and anchor connection shall be oversized by 1/8-inch minimum on all surfaces to allow for section loss due to corrosion. The pin shall be designed with a center hole for a 3/4-inch minimum diameter bolt and associated keeper plates as shown in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). The keeper plates shall be 1/2-inch minimum thickness.

The pin and eyebar shall be designed for a 1/8-inch maximum oversize hole for the socket pin hole, and associated offsets between the eyebar face and the inside face of the socket ears. The eyebar shall be centered on the pin. Gaps between the eyebar and socket ears greater than 1/8-inch shall be filled with structural steel fill rings on each side of the eyebar to leave no gaps greater than 1/8-inch.

All other structural steel shall conform to ASTM A570, Grade 50.

All welding and repair welding shall comply with the ANSI/AASHTO/AWS D1.5M/D1.5:2008 Bridge Welding Code.

Concrete for anchors shall conform, at a minimum, to Class 4000 concrete in accordance with Section 6-02.3 of the WSDOT Standard Specifications (Appendix D18). Air-entrainment will not be permitted.

Anchor ballast shall be:

- Precast concrete blocks.
- Cast-in-place concrete, Class 4000W.
- Ballast material as specified in Section 2.6.

Other ballast material as approved by the Structural Lead Engineer.

One anchor shall be used per anchor cable. Anchors shall not be used in tandem or series at any location.

Anchor cable attachment points to the eyebar shall remain four feet minimum above the mudline or ballast surface, whichever is higher.

Chain shall not be used to connect anchors to anchor cables.

The Design-Builder shall coordinate with the U.S. Coast Guard to ensure the anchors do not create a navigation hazard.

#### 2.12.4.2.8.2 Anchor System Design

For geotechnical design requirements for the anchors, refer to Section 2.6 (Geotechnical Design).

The anchor, eyebar, and eyebar attachment to the anchor shall be designed to accommodate, without structural distress, the range of design anchor movements indicated in Section 2.6. The eyebars (or similar attachments) shall be designed to accommodate replacement of the anchor cables.

The structural strength capacity of the eyebar, and the eyebar attachment to the anchor shall be greater than 1.5 times the minimum breaking strength of the anchor cable to which it is attached.

The design load for structural design of the anchor shall be equal to 1.25 times the minimum breaking strength of the anchor cable to which it is attached.

#### 2.12.4.2.8.3 Shaft Anchor Design

Shaft anchors shall be designed and detailed in accordance with the BDM (Appendix D1).

#### 2.12.4.2.8.4 Anchor Cable Clearance

Except as permitted in Section 2.12.4.2.8.7, the clearance between any anchor cable and a Pontoon, or between two anchor cables measured at either the temporary condition during construction or the permanent condition, shall be a minimum of two feet at all lake levels in the Change in Lake Level Condition specified in this section. This shall include existing anchor cables, new anchor cables, Pontoons, and existing Pontoons.

#### 2.12.4.2.8.5 Anchor Cable Corrosion Protection

A corrosion protection system consisting of cathodic protection shall be designed and incorporated into the anchor system in accordance with Section 2.17.

#### 2.12.4.2.8.6 Temporary Anchor Cables

Temporary anchor cables required during construction of the Floating Bridge shall be designed for Strength Limit State load combination VA of Table 1 in this section. The Design-Builder shall design and construct temporary anchor cable connections to the

Pontoons as required. The Design-Builder shall submit design calculations and details to WSDOT for review and approval.

#### 2.12.4.2.8.7 Existing Anchor Cable Conflicts

Anchor cables exiting the north side of the existing bridge may conflict with SSP's RSE, SSE, TSE, USE, and VSE. The Design-Builder shall design a system to facilitate placement of SSP's RSE, SSE, TSE, USE, and VSE.

The Design-Builder's system may consist of, but is not limited to:

- Deviation saddles temporarily attached to the SSP's.
- New anchors and cables attached to the existing bridge.

The existing bridge shall not be anchored to the new bridge.

The design developed by the Design-Builder shall:

- Result in the same static anchor cable pre-tension present at the time of construction of the existing bridge.
- Have sufficient ultimate capacity to resist the 20-YRP storm loads specified in the 1993 Analysis of the Evergreen Point Floating Bridge, provided in Appendix S1.
- Result in a maximum Pontoon heave displacement of plus/minus two feet.
- Result in a maximum sway displacement of one foot.
- Not diminish the capacity of the existing anchor cables.
- Not damage or otherwise reduce the structural capacity of the existing Pontoons.

Anchor cables shall be aligned such that a minimum bend radius of 25 times the diameter of the cable shall be maintained at all times, unless recommended otherwise by the manufacturer.

Any new anchor cable used in the design shall have the same properties as the existing anchor cables, unless otherwise approved by WSDOT.

If deviation saddles are to be attached to any new Pontoons, details shall be submitted to the WSDOT for review and approval.

The existing anchoring system shall not remain in a modified condition for more than one month without the adjacent new bridge Pontoons in place. The aforementioned one month shall not occur during the Winter Storm Period.

#### 2.12.4.2.8.8 New Anchor Cable Conflicts

New anchor cables on the south side of Pontoon W may conflict with the existing bridge Pontoons. The Design-Builder shall design a temporary anchorage system to resist the loads from the 20-YRP storm, as reported in Wind/Wave Analysis (Appendix S15).

The Design-Builder shall not use permanent anchor cables for temporary anchorages.

#### 2.12.4.2.8.9 Underwater Clearances for Anchors

The top of all permanent anchors (including any required ballast, but excluding eyebar extensions and anchor cables) shall be placed not less than 32 feet below Project Lake Level. The top of all temporary anchors (including any required ballast, but excluding

eyebar extensions and anchor cables) shall be placed not less than 22 feet below Project Lake Level.

#### 2.12.4.2.8.10 New Anchor Cable Position Adjustments

The new anchor cable clearances are close to the minimum clearances required in Section 2.12.4.2.8.4 at these locations:

1. Anchor Cable VLN under SSP UNE.
2. Anchor Cable VLS under SSP USE.
3. Anchor Cable BN crossing Anchor Cable BLN.

Depending on the actual bathymetry soundings, the position of these and/or other new anchor cables may need to be adjusted to satisfy the minimum clearance requirements. The Design-Builder shall adjust the new anchor cable clearance as required by modifying the height of the anchor cable attachment point to the eyebar at the anchor (and lengthening the eyebar), but not lower than the minimum height required in Section 2.12.4.2.8.1.

### 2.12.4.2.9 Design of the Elevated Structure and Transition Spans

The Pontoon System has been designed by the State to support an Elevated Structure and Transition Spans within specific bounds, including sail area, structure height and freeboard as shown in the Conceptual Plans (Appendix M1) and Wind/Wave Analysis (Appendix S15). The Design-Builder shall design an Elevated Structure and Transition Spans to fit within these bounds.

The Design-Builder shall design the Elevated Structure and Transition Spans to account for all loads imposed by the Floating Bridge deformations specified in Wind/Wave Analysis (Appendix S15). The Design-Builder shall take due consideration of the relative stiffness of the Elevated Structure compared to the Pontoon System when considering the loading effects of Pontoon System deformations. A 3D finite element analysis of the composite interaction between the Elevated Structure and the Pontoon System shall be performed assuming the Floating Bridge is supported as a beam on an elastic foundation with buoyant pressure of the lake water surrounding the Pontoons accurately modeled. The Design-Builder shall design the Elevated Structure and Transition Spans in accordance with Section 2.13 and the additional requirements of this section.

The Design-Builder shall design the Elevated Structure and Transition Spans with support locations and maximum support loadings as shown in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). The Elevated Structure and Transition Spans shall be designed to accommodate widening for Future Six-Lane Plus Two HCT Configuration as described in this section.

Eastbound and westbound traffic shall be carried on separate Transition Span structures.

To ensure fire resistance and minimize long-term maintenance costs, steel elements will not be allowed for the main structural elements of the Elevated Structure, unless otherwise specifically permitted in this section and in the Conceptual Plans (Appendix M1).

#### 2.12.4.2.9.1 Steel Truss Requirements

All steel truss members shall be designed in accordance with the requirements of the *Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms – Load and Resistance Factor Design*, First Edition, May 2003, American Petroleum Institute and the AASHTO *LRFD Bridge Design Specifications*.

The steel truss shown in the Conceptual Plans (Appendix M1) and similar types of construction shall conform to the following requirements:

- Concrete-filled steel tubes and associated member connections shall be designed in accordance with this section and the AASHTO *LRFD Bridge Design Specifications*, including all applicable fatigue specifications.
- All steel members shall be sloped to allow for drainage.
- All steel member connections shall be welded. The welds shall completely seal the steel tubes at the connections so that water intrusion will not occur. Bolted connections will not be allowed for permanent connections. Bolts may be used for temporary connections for erection purposes only.
- All connections between the concrete-filled tubes and the Pontoon below and the Elevated Structure above shall be encased in concrete. The steel / concrete interface shall be sealed with caulk. Sufficient reinforced concrete shall be provided at Pontoon and Elevated Structure connections to prevent bursting, cracking, separation of steel from concrete, and separation of concrete layers at construction joints. Connections to Pontoons shall be encased in concrete plinths elevated above the Pontoon deck by one foot minimum. The upper edge beam supporting the Elevated Structure bridge deck shall have sufficient welded shear studs and reinforcing bar stirrups to provide for proper encasement and connection to the bridge deck.
- All non-structural connections to the concrete-filled steel tubes shall be electrically isolated with neoprene, nylon, or UHMW-PE pads(1/4-inch minimum thickness). All clamp-type connections shall use only neoprene pads. All baseplate type connections shall use only nylon or UHMW-PE pads.
- All trusses shall be configured such that no fracture critical members exist.
- Trusses shall not be post-tensioned.
- The Design-Builder shall provide shop drawings of the mockups required for the tubular connection welding requirements as specified in the Structures Minimum Requirements (Appendix B2).

#### 2.12.4.2.9.2 Expansion Joints

All expansion joints shall be watertight. Steel finger joints will not be allowed. Longitudinal expansion joints will not be allowed.

Expansion joints within the Elevated Structure shall be elastomeric strip seal-type joints, at a maximum spacing of 360 feet and a minimum spacing of 180 feet. The Design-Builder shall design and install a sufficient number of expansion joints to limit the forces induced in the Elevated Structure by the Pontoon deformations.

Expansion joints at each end of the Transition Spans shall be modular expansion joint systems. See this section and the Structures Minimum Standards (Appendix B2) for

additional modular expansion joint design, fabrication, installation, and testing requirements.

In addition to the requirements specified in the Structures Minimum Standards, the modular expansion joint system manufacturer shall demonstrate that the system selected has a minimum five year performance record satisfactorily accommodating the types, magnitude, and combinations of movements that are experienced in similar floating bridge applications.

#### *2.12.4.2.9.2.1 Modular Expansion Joint Systems*

See Conceptual Plans (Appendix M1) for modular expansion joint system locations. See shop drawings dated 7/21/08 in Appendix M17 as an example of a modular expansion joint system. Modular expansion joints at both ends of the Transition Spans shall be designed to accommodate the following:

- All Service IX, Service X, and Extreme IIA load combination limit state movements as determined by detailed engineering analysis. These wind and wave related load combination limit states shall be as defined in Table 3. Displacements of the Floating Bridge imposed by wind and wave loading shall be as defined in the Wind/Wave Analysis (Appendix S15). Both perpendicular and oblique wind loading results contained in the Wind/Wave Analysis shall be used to determine expansion joint movement requirements. Static and directionally varying dynamic sways, rolls, heaves, and surges shall be included in the analysis. Appendix M23 summarizes the Cross Pontoon translations and roll angles determined from the Wind/Wave Analysis.
- AASHTO LRFD Extreme Event I load combination limit state movements associated with seismic displacements of the fixed approach spans.
- Displacement of the Pontoons resulting from the Changes in Lake Level Condition. These movements shall be additive with all load combination limit state movements identified above.
- The modular expansion joints shall be required to sustain the movements from an extreme 20-foot lake level lowering without necessitating repair, notwithstanding the elastomeric strip seal elements.
- Installation of HCT expansion joints in the future with minimum disruption to vehicular traffic.
- Adequate block out dimensions to accommodate the installation of larger modular expansion joint systems if required for the Future Six-Lane Plus Two HCT Configuration.

While analysis of the final design may require a larger capacity modular expansion joint, the modular expansion joint at the lower end of each Transition Span shall have a minimum nominal opening and closing capacity no less than 48 inches (plus 24 inches; minus24 inches). This minimum opening and closing capacity requires that the longitudinal restrainer at the Pontoon end of each Transition Span be installed to provide an initial gap of 18 inches at Project Lake Level after all time dependent effects of shrinkage and creep have been fully accounted for. Similarly, the modular expansion joint at the approach end of each Transition span shall have a minimum nominal opening and closing capacity no less than 18 inches (plus nine inches; minus nine inches). These stated nominal opening and closing capacities shall be associated with a three-inch opening and closing capacity for each elastomeric strip seal element. In

addition to these minimal opening and closing capacities, each modular expansion joint shall be designed, detailed, and installed to accommodate all imposed movements parallel to the joint and all rotations. Each modular expansion joint shall be fabricated and installed as a single assembly. Centerbeam field splices will not be allowed.

**Table 3. Load Combinations for Designing Modular Expansion Joints**

| Load Combination Limit State | DC DW WA BL EL CR SH PS | LL IM BR PL MA | $WS_{100}$ $WWS_{100}$ | $WWD_{100}$ $IN_{100}$ | $WS_{20}$ $WWS_{20}$ | $WWD_{20}$ $IN_{20}$ | $WS_1$ $WWS_1$ | $WWD_1$ $IN_1$ | $WW_T$ $IN_T$ | WL | TU | TG |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Service IX | 1.00 | 1.00 | — | — | 1.00 | 1.20 | — | — | — | 1.00 | 1.00 | — |
| Service X | 1.00 | --- | 1.00 | 1.20 | --- | --- | — | — | — | === | 1.00 | — |
| Extreme IIA | 1.00 | — | 1.00 | 1.20 | — | — | — | — | --- | — | 1.00 | — |

Service IX – Load combination relating to the 20 YRP storm, in both the perpendicular and oblique directions.

Serivce X – Load combination relating to the 100 YRP storm, in both the perpendicular and oblique directions.

Extreme IIA – Load combination corresponding to one transverse mooring failure at the cross pontoon for the 100 YRP perpendicular storm or one longitudinal mooring failure for the 100 YRP oblique storm.

Uniform thermal effects of expansion and contraction shall be included for Pontoons, Elevated Structure, Transition Spans, and approach structures per Section 2.12.4.2.3.13.

Time-dependent effects of shrinkage and creep of the approach structures shall be included to the extent that these effects impact modular expansion joint movements. Modular expansion joints shall either be designed and fabricated to accommodate these additional long-term movements or be installed at a correspondingly narrower gap setting than would otherwise be required if these effects were not present. Pontoon creep and shrinkage occurring after the modular expansion joints are installed may be assumed negligible in sizing the modular expansion joints.

The modular expansion joints for the East Transition Span / North Bridge shall be sized, designed, and fabricated to accommodate movements of the Future Six-Lane Plus Two HCT Configuration without need for replacement.

Under service level conditions, modular expansion joints shall be designed so that each elastomeric strip seal element accommodates a three-inch range of opening and closing movement (minus 1.5 inches; plus 1.5 inches from mid-opening position). All movements associated with load combinations other than the Service IX 20 YRP perpendicular storm, including Extreme Event I (seismic), shall be accommodated with an average five-inch opening and closing movement (minus 2.5 inches; plus 2.5 inches from mid-opening position) of each elastomeric strip seal element provided that support bars and support boxes are sized and detailed to accommodate the larger cumulative movement without structurally damaging the modular expansion joint or detaching any elastomeric strip seal elements. Additionally, each modular expansion joint shall be adequately sized to fully accommodate all movements tending to close the joint without

actually achieving full closure at any location while assuring that the average elastomeric strip seal opening gab does not exceed three inches at any location along the modular expansion joint during the Service IX 20 YRP perpendicular storm. Average strip seal opening gap shall be defined as the cumulative gap between all centerbeams and edge beams at any location along the modular expansion joint divided by the total number of elastomeric strip seal elements.

The bottom and all sides of each modular expansion joint shall be contained in a complete concrete enclosure, full length and width of each joint, to mitigate traffic noise from the modular expansion joint. At the opening between median barriers, the concrete enclosure shall include a concrete roof canopy supported by outside enclosure walls and interior support columns. The canopy design shall prevent water, debris, and vermin from entering inside the enclosure. Maintenance access into the enclosure shall be from the Pontoon deck and Elevated Structure roadway deck level as shown in the Conceptual Plans (Appendix M1).

At centerline of each enclosure there shall be a minimum of 5.00-feet wide by 6.67-feet high clearance envelope as a working egress that extends the full length of the enclosure, as shown in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). The clearance envelope below overhead utilities inside the enclosure shall be a minimum of 5.00-feet wide by 5.00-feet high to top of walking surface.

Structural steel shall conform to ASTM A570 Grade 50 or ASTM A588. Aluminum components shall not be used.

Stainless steel shall conform to ASTM A240 Type 316L.

Bolts and other hardware shall conform to AASHTO M 164 Type 1 or 2, and shall be galvanized after fabrication in accordance with AASHTO M 232 and Section 9-06.5(3) of the WSDOT Standard Specifications (Appendix D18).

PTFE shall be 100 percent virgin polytetrafluoroethylene, woven PTFE fabric, or dimpled PTFE conforming to the AASHTO *LRFD Bridge Construction Specifications*.

Expansion joint strip seals shall conform to the requirements of Table 3:

**Table 3. Expansion Joint Strip Seal Properties**

| Property | Test Method | Range of Values |
|---|---|---|
| Hardness, Durometer A | ASTM D2240 | 55-70 |
| Minimum Tensile Strength | ASTM D412 | 2,000 psi. |
| Elongation at Break | ASTM D412 | 250 percent |
| Compression Set at 72 hours at 212 °F | ASTM D395 | 40 percent |

The maximum size of each expansion joint strip seal gland shall be three inches. Box-type seals or seals utilizing double webs will not be allowed. Expansion joint strip seal glands shall be continuous without splices.

#### *2.12.4.2.9.2.2 Strip Seal Expansion Joint Systems*

See Structures Minimum Standards (Appendix B2) for strip seal expansion joint systems.

The metal components shall conform to ASTM A36, ASTM A992 or ASTM A572, and shall either be galvanized after fabrication in accordance with AASHTO M 111 or painted in accordance with Section 6-07.3(9) of the WSDOT Standard Specifications (Appendix D18), with the surfaces embedded in concrete painted only with a shop primer coat conforming to Section 9-08.1(2)C of the WSDOT Standard Specifications (Appendix D18), and with the color of the top coat on all exposed surfaces, when dry, matching the color Washington Gray.

The strip seal gland shall be removable and replaceable, and continuous for the full length of the joint with no splices. The strip seal gland shall be removable and replaceable.

Threaded studs used for the purpose of construction adjustment may be welded to the strip seal steel extrusion, provided that they are fully removed after use and that the attachment area is repaired by a WSDOT-approved corrosion protection system.

If the opening between the strip seal steel extrusions is anticipated to be less than 1½ inches at the time of strip seal gland installation, the strip seal gland may be installed prior to encasement of the strip seal expansion joint assembly in concrete.

After the strip seal expansion joint system is installed, the Design-Builder shall test the joint for leakage in a manner approved by WSDOT. If leakage is observed, the Design-Builder shall repair the joint as recommended by the strip seal expansion joint system manufacturer.

#### 2.12.4.2.9.3 Elevated Structure to Pontoon Connections

The Elevated Structure shall be connected to the Pontoon deck at the indicated locations as shown in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). The Design-Builder shall compute the loads from the Elevated Structure at these connection locations shall submit them to WSDOT for review and approval in accordance with this section.

#### 2.12.4.2.9.4 Elevated Structure Bridge Deck

The Design-Builder shall design the bridge deck using cast-in-place and/or precast concrete. Use of concrete-filled steel grid deck or stay-in-place precast concrete form panels will not be permitted. The finished roadway surface, including the Future Six-Lane Plus Two HCT Configuration, shall be no less than 11.4-feet above the closest point on the deck of Pontoons Type 1 and 1A.

If cast-in-place concrete is used, then the bridge deck shall be a System 1 bridge deck protective system of 2½-inch concrete top cover with epoxy-coated steel reinforcing bars, as defined in the BDM (Appendix D1). The concrete deck shall be placed with an additional 1/2-inch of concrete cover over the top reinforcing to provide an allowance for NGCS texturing/grooving.

If precast concrete is used, the joints between precast elements shall conform to one of the following alternatives:

- Precast elements shall utilize post-tensioning reinforcement across the joint, and adjacent precast panels shall be match cast and bonded with epoxy bonding agent for the full depth of the joint. The post-tensioning reinforcement shall be designed such that no net tension stress exists across the joint when loaded in accordance with AASHTO service load combinations.

- Precast elements shall be joined with full depth cast-in-place closures, with fully-developed AASHTO Class C lap splices of epoxy-coated reinforcing steel extending from the adjacent precast panels. The closures shall use structural concrete. Unreinforced or grouted joints will not be allowed.

If precast concrete is used, a modified concrete overlay shall be applied in accordance with Section 6-09 of the WSDOT Standard Specifications (Appendix D18) and these Technical Requirements after erection of the precast concrete deck panels. The precast concrete deck panels shall be cast with an additional ¼-inch of concrete clear cover on the top surface to accommodate the scarification of the concrete surface prior to modified concrete overlay application. The concrete overlay shall be placed with an additional ½-inch thickness to provide an allowance for NGCS texturing/grooving.

Elevated Structure bridge deck cantilever overhangs, including the Future Six-Lane Plus Two HCT Configuration, with lengths in excess of six feet shall be post-tensioned in the cantilevered direction.

Bituminous overlays of any kind will not be allowed.

A future wearing surface over both the cast-in-place concrete deck or the precast concrete deck with the modified concrete overlay (whichever is used) shall be included in the design in accordance with the BDM (Appendix D1). The design shall assume that the modified concrete overlay over the precast concrete deck will not be removed before placing a future wearing surface.

#### 2.12.4.2.9.5 Overhead and Side Clearances

The Design-Builder shall provide vertical and horizontal clearances for adequate maintenance access on the Pontoon deck to hatches, sheds, Pontoons, anchor galleries, transformer platforms and cabinets, electrical equipment, overhead utilities, and drainage structures. The desired vertical clearance under the superstructure shall be 10.0 feet minimum at all locations.

The Design-Builder shall provide clear travel paths on the Pontoon deck that will permit passage of vehicles, supplies and equipment on the Pontoon deck. These travel paths shall be a 12 feet minimum width measured horizontally by 7.5 feet minimum height measured vertically above the Pontoon deck. The travel paths may be located over ballast port hatches, but shall not be located over deck access hatches. Travel path locations and dimensions shall be as follows:

- Two continuous longitudinal travel paths shall be provided along the longitudinal Pontoons, one each on the left and right sides of the longitudinal centerline. Each travel path shall be continuous for the full length of the Floating Bridge Pontoon deck. Cross travel paths shall be provided at 360-feet maximum spacing to permit crossing from the left to the right or from the right to the left longitudinal travel paths. In addition, along each travel path at 360-feet maximum spacing, the path shall be increased in width to 22 feet over a length of 45 feet to permit maintenance equipment to pass one another.
- Each SSP shall be accessible via travel paths from the Longitudinal Pontoons.

Additional clearance requirements follow:

- At all locations on the Pontoon deck, 7.0 feet minimum vertical clearance below all Access Obstructions shall be provided for personnel safety. Access

Obstructions shall include, but not be limited to, superstructure, utilities, pipes, hangers, conduits, drains, light fixtures, lifting eyes or hooks, and signs.

- At each deck access hatch and at each ballast port hatch, adequate space shall be provided around and above the hatches to conform to WISHA and WAC requirements, consistent with the rescue equipment being used by the Seattle, Kirkland and Bellevue Fire Departments, but not less than a 7.5 feet minimum vertical clearance.
- At each deck access hatch and each ballast port hatch, adequate space shall be provided around and above the hatches to install and remove all items installed in the Pontoons and replace it in kind, including, but not limited to, equipment, machines, material, and the equipment necessary to maintain them. Adequate space shall include an allowance for lifting said items with hoisting gear and rigging.
- At each anchor gallery location, adequate space shall be provided to safely conduct emergency and routine anchor cable replacements.
- Roll up doors shall be provided wherever possible. Shed doors and hatch doors shall not swing into travel paths or clear zones.
- At jib crane locations, provide 14.0 feet minimum vertical clearance above top of deck slab to bottom of jib crane boom, and one foot maximum from top of roadway barrier to top of jib crane boom.
- All vertical clearances stated above shall be increased as required to provide for Pontoon hogging and construction tolerances so that the minimum vertical clearances will be achieved in the final as-built condition.

The Design-Builder shall prepare a Maintenance Access Plan and a Cable Replacement Plan, and shall submit both plans to WSDOT for review and approval. Both plans shall take due account of Access Obstructions as defined above.

See Floating Bridge Clearance Requirements (Appendix M25) for clearance dimensions and other requirements.

#### 2.12.4.2.9.6 Deflection Criteria

Deflection criteria for Transition Spans shall be the more stringent of the requirements from the BDM (Appendix D1), AASHTO *LRFD Bridge Design Specifications* and Chapter 8 of the *Sound Transit Link Light Rail North/South Link Design Criteria Manual* (Appendix S10).

#### 2.12.4.2.9.7 Bearings

The Design-Builder shall determine the number and locations of all bearings to sufficiently transfer loads and accommodate all bridge movements. The Design-Builder shall design and install the location and orientation of bearings to accommodate the necessary articulation of the Transition Span determined by kinematic analysis of all load cases.

All Transition Span bearings shall be initially positioned to accommodate future widening to the Future Six-Lane Plus Two HCT Configuration without the need to relocate bearings. All bearings and girders shall be detailed to accommodate jacking operations required for the future repair and / or replacement of the bearings.

The Design-Builder shall design and install a central bearing at the fixed approach end of each Transition Span. This bearing shall function as the center of rotation of the Transition Span and shall be designed to transfer all horizontal (longitudinal and transverse) loads from the Transition Span to the fixed approach structure. This bearing shall allow unrestrained horizontal (about z-axis) and vertical (about y-axis) rotations and shall include a vertical restraint mechanism to prevent separation of bearing components caused by uplift. See drawing (Bridge Sheet No. L2; Sheet 291 of 334 Sheets) in Appendix M17 as an example of a Transition Span central bearing.

All other Transition Span bearings shall be spherical bearings with PTFE-stainless steel interfaces to accommodate horizontal translation and PTFE-stainless steel spherical interfaces to accommodate rotations. PTFE-stainless steel interfaces shall be fabricated with sufficient travel length to accommodate movements associated with all load cases including a extreme 20 foot lake water level drop as described in the next section containing requirements for longitudinal restrainers.

Upon completion and delivery onsite of all Pontoons, the Design-Builder shall perform an as-built survey of all Pontoon elements to predict the cumulative length of the fully completed Pontoon assemblage. The Design-Builder shall submit, for approval, a plan for reconciling deviations in the length of the fully completed Pontoon assemblage as it relates to the fabrication and construction of the Elevated Structure and Transition Spans, and the installation of all associated Transition Span bearings, longitudinal stops and expansion joints.

#### 2.12.4.2.9.8 Restrainers

The Design-Builder shall design and install longitudinal and transverse restrainers at the Pontoon end of each Transition Span.

##### *2.12.4.2.9.8.1 Longitudinal Restrainers*

Each Transition Span shall be longitudinally restrained at the Pontoon end of the Transition Span girder in closest proximity to the central bearing at the fixed approach end of the Transition Span. The longitudinal restrainer shall be installed to provide an initial gap of 18 inches at Project Lake Level after all time dependent effects of shrinkage and creep have been accounted for. Each longitudinal restrainer and its anchorage shall be designed to transfer 400 Tons. Additionally, each Transition Span superstructure and central bearing shall be designed to transfer this load to the approach structure. See drawing (Bridge Sheet No. L4; Sheet 293 of 334 Sheets) in Appendix M17 as an example of a Transition Span longitudinal restrainer.

In order to accommodate the additional joint opening at the lower Transition Span modular expansion joints resulting from an extreme 20-foot lake level lowering, the longitudinal restrainers shall be designed and fabricated so they can be removed and reinstalled to provide an initial gap of 24 inches at Project Lake Level.

##### *2.12.4.2.9.8.2 Transverse Restrainers*

Each Transition Span shall be transversely restrained at the Pontoon end of the Transition Span girder in closest proximity to the central bearing at the fixed approach end of the Transition Span. The transverse restrainer shall be designed and detailed to resist all transverse loads while accommodating all longitudinal movements and girder rotations about the central bearing. See drawing (Bridge Sheet No. B32; Sheet 139 of 334 Sheets) in Appendix M17 as an example of a Transition Span transverse restrainer.

#### 2.12.4.2.9.9 Screening

Screening to keep out birds shall be provided at enclosed locations that require maintenance or inspection access. Screening shall be installed over drain pipe and joint openings that may provide access for animals to enter the modular expansion joint concrete enclosure. Screening material between and around girders shall be placed so it will not be damaged by movement of the girders and hanging utilities between the girders. Screening material shall be welded Type 316L stainless steel hardware cloth and shall have opening sizes no larger than ½ inch by ½ inch. The hardware cloth shall be made up of 0.063-inch diameter wire.

#### 2.12.4.2.9.10 Architectural Elements

The Design-Builder shall design and construct architectural elements in accordance with Section 2.15.

#### 2.12.4.2.9.11 Conduits and Pipe Supports

All conduit and pipe supports shall be designed in accordance with the BDM (Appendix D1), AASHTO LRFD Bridge Design Specification, and the AASHTO Guide Specifications for LRFD Seismic Bridge Design to resist Strength and Extreme Event Limit State loadings. Designs shall provide vertical, longitudinal and transverse support for gravity, earthquake, wind, expansion, surge, temperature, and inertia loads, etc. The Design-Builder shall provide transverse and longitudinal support for single rod and other similar inserts that cannot resist moment. Conduit and pipe supports shall be designed so that any loads imposed by these installations do not overstress the pipes, conduits, supports, bridge structure or bridge members. The conduit and pipe supports shall be designed with a suitable expansion system as required to prevent longitudinal forces from being transferred to bridge members.

All conduits and pipes shall be supported from the Elevated Structure deck soffit. The clear distance between deck soffit and conduits and pipes shall not exceed two inches. Conduits and pipes running from the bridge deck down to the Pontoon deck shall be attached to Elevated Structure vertical support columns. The Design-Builder shall design the systems and supports so that they will be outside of clear zones and travelled ways to avoid interference with maintenance/inspection activities, and away from highly visible locations that detract architecturally from the structure.

The Design-Builder shall design, furnish, and install embedded inserts to support all conduits and pipes. All inserts shall be cast-in-place embedments, and shall be stainless steel. Drill-in, after-set, expansion, mechanical, or resin-bonded anchors will not be allowed.

At Pontoons A and W, support columns shall be box columns with stainless steel inserts embedded in the face of the columns. The Design-Builder shall coordinate the size and spacing of the inserts required to support conduit run supports. At Pontoons B to V, support columns shall be either steel tube or concrete, depending on the Pontoon location.

Conduits and pipes shall not be embedded in structural concrete elements, except conduits shall be installed in the barriers in accordance with the requirements of Section 2.13.

#### 2.12.4.2.9.12 Traffic Barrier and Pedestrian Barrier

The traffic barriers and pedestrian barrier shall be fixed-form cast-in-place concrete barriers in accordance with Sections 6-02.3(11)A and 6-10.3(2) of the WSDOT Standard Specifications (Appendix D18). Slip-form barriers will not be allowed. Concrete barrier sections shall have open construction joints at 24-foot maximum spacing. The lower six-inches of the construction joint shall be sealed with a rapid cure silicone joint sealant. For all lane configurations, barrier designs at each end of the Transition Spans shall accommodate 100-YRP storm motions from the Floating Bridge.

#### 2.12.4.2.9.13 Superstructure Maintenance Access at Pontoons A and W

##### *2.12.4.2.9.13.1 General*

Maintenance access shall be incorporated into the design of the Elevated Structure at Pontoons A and W from the Pontoon deck level and from the Elevated Structure deck level. Exterior access doors shall be located at the Pontoon deck level and at the ends of the modular expansion joint concrete enclosures.

Access within the box columns shall be comprised of an interior spiral stairway with intermediate landings that extend from the Pontoon deck level along the interior faces of the box columns up to a top platform with fixed vertical ladder. The landings and platform shall accommodate minimum 6.67-feet vertical clearance at all locations above top of walking surface. The stairway system and fixed ladders shall be either galvanized steel or FRP material. Stainless steel inserts shall be embedded in the box column walls for attaching the stairway system with stainless steel hardware.

The fixed ladder shall be connected to the top landing and extend up through the floor slab opening within the concrete enclosure, and terminate minimum 3.5-feet above the top of floor slab. The ladder termination shall be attached to a stub concrete wall. The slab opening clear dimensions shall be minimum 2.5 feet by 2.5 feet and covered with FRP grating with solid top plate. Railing shall be located along the sides of the opening with removable chains on one of the sides. The Design-Builder shall coordinate design and installation of access system from the Elevated Structure roadway deck to the access doors at the ends of the modular expansion joint enclosures. The access system shall incorporate provisions to prevent public access from the pedestrian path.

Maintenance access design and construction shall meet the requirements of Section 2.30 (Bridge Maintenance Facility and Dock).

##### *2.12.4.2.9.13.2 Exterior Access Doors*

The Design-Builder shall design, furnish, and install exterior access doors, including at the modular expansion joint enclosures and box columns.

Exterior access doors shall conform to WAC Title 51, and to the requirements of Exterior Doors and Door Hardware of Section 2.30.

#### 2.12.4.2.9.14 West Transition Span and Pier 36N&S

Pier 36N&S has been conceptually designed to vertically and laterally support the fixed end of the West Transition Spans (eastbound and westbound) as shown in the Conceptual Plans (Appendix M1), the east end of the WCB and the RSUP superstructures as shown in the West Connection Bridge Drawings (Appendix M3), and the Wind/Wave Analysis (Appendix S15). The Design-Builder shall perform the final design of Pier 36N&S in accordance with the requirements of this section and Section 2.13. The Design-Builder shall be responsible for coordinating, with the State, the design of the fixed end

of the West Transition Spans with the design of the WCB and RSUP (by others) so that all required interface features are accounted for, such as, but not limited to:

- Bearing heights, pedestals, grout pads, and anchor bolts/sleeves.
- Modular expansion joint blockouts and attachments.
- Adequate space provided for all Transition Span movements.
- Traffic barrier, pedestrian barrier, and railing joint covers.
- Longitudinal and transverse restrainer connection points.
- Design loads from WCB superstructure onto Pier 36S and the RSUP superstructure onto Pier 36N.

The Design-Builder shall be responsible for the final design of elements at Pier 36N&S as shown on the Conceptual Plans (Appendix M1) and the West Connection Bridge Drawings (Appendix M3).

The Design-Builder shall design all connections of the WCB superstructure to Pier 36S and the RSUP superstructure to Pier 36N utilizing embedded anchor bolts or anchor bolt sleeves and reinforcing steel. These anchor bolts or anchor bolt sleeves and reinforcing steel, including the construction joint surface preparation, shall be furnished and installed in Pier 36N&S by the Design-Builder.

#### 2.12.4.2.9.15 3D Building Information Modeling (BIM) Model

The Design-Builder shall create a 3D BIM model to check interferences on the Floating Bridge Elevated Structure to verify vertical and horizontal clearances between the Pontoons, Pontoon deck hatches, sheds, transformer platforms and cabinets, electrical equipment, overhead utilities, power and communication conduits, fire protection piping and drainage structures.

The model shall longitudinally include the entire length of the Floating Bridge Elevated Structure and vertically include from the Pontoon deck to the top of barrier. The vertical clearance shall include Pontoon hogging and construction tolerances as required.

The 3D model shall be dimensionally accurate, created from the two dimensional CAD data. The model shall be organized and color coded by discipline, i.e. Civil, Structural, Electrical and others, and then aggregated into one integrated 3D model where the checking for interferences shall be applied.

The model shall contain the Elevated Structure, Pontoon features, utilities, pipes, hangers, conduits, drains, light fixtures, lifting eyes or hooks, and signs. The level of detail for the 3D model shall be adequate for running interference detection reports and clearance checks.

The 3D model shall validate in three-dimensional space the following:

- Clear paths on the Pontoon that will permit the passage of vehicles, supplies and equipment on the Pontoons
- Longitudinal travel paths
- Cross travel paths
- SSP Access

- 7.0 feet clearance below all access obstructions at all locations on the Pontoon deck
- Clearance at each deck access hatch and at each ballast port hatch
- Adequate space has been provided at each anchor gallery location
- Shed doors and hatch doors do not swing into paths or clear zones
- 14.0 feet minimum vertical clearance above top of deck slab to bottom of jib crane boom, and one foot maximum from top of roadway barrier to top of jib boom crane

The final interference report generated from the coordinated 3D model shall demonstrate that all the required clearances shall be achieved.

## 2.12.5 CONSTRUCTION CRITERIA

### 2.12.5.1 GENERAL

Construction shall meet the requirements of this section, the Structures Minimum Standards (Appendix B2), and the Bridge Shaft Mandatory Standard (Appendix B5).

### 2.12.5.2 ELECTRICAL ISOLATION AND ELECTRICAL CONTINUITY

All exposed embedments and their anchor bolts shall be electrically isolated from reinforcing steel, both conventional and prestressed, and other metallic embedments that are required to be electrically continuous with the reinforcing steel. The minimum distance between all such exposed embedments and the reinforcing steel shall be 1½ inches. Cast-in-anchor bolts and other embedments shall be held in place with external steel jigs and template system. Prior to drilling holes for resin-bonded anchors (only as expressly permitted by this section), the embedded wall reinforcement shall be located to ensure that the drilled holes provide the specified clearance.

All reinforcing steel, both conventional and prestressed in the Pontoons and Elevated Structures shall form one continuous electrical system. Wire tying of reinforcement will not be acceptable for establishing electrical continuity. In each rebar mat, one bar in each direction shall be bonded to all bars in the other direction. Rebar splices shall be bonded as necessary to ensure electrical continuity of all reinforcing steel and post-tensioning systems in the Pontoons. All mats in the walls and slabs shall be bonded to each other to form one continuous electrical system. At all intersections of walls and/or slabs, the reinforcement in both elements shall be made continuous to each other by bonding two reinforcing bars in each element to two reinforcing bars in the other element. All isolated steel reinforcing bars, such as post-tensioning bursting reinforcement and other secondary reinforcing bars, shall be bonded as necessary to provide electrical continuity through adjacent transverse and longitudinal steel reinforcing bars as required. Post-tensioning tendon anchorages and metal ducts shall be bonded as necessary to provide electrical continuity through adjacent transverse and longitudinal steel reinforcing bars as required.

All embedments for columns of the Elevated Structure installed in the Pontoon and the frames on the end walls for securing the Pontoons together shall be made continuous with the reinforcing steel.

The Design-Builder shall execute bonding of reinforcing steel by either fillet welds in accordance with AWS D 1.4 or molded fusion exothermic welds. Fillet welds shall be one-

inch long. Exothermic welds shall be molded fusion type, with molds as required. Where physical limitations prevent exothermic welding, NEC approved pressure crimps shall be installed.

All metallic components of the anchor assembly, including the hawse pipe in each Pontoon, shall be electrically isolated from the electrically continuous reinforcing steel in the walls and the slabs of the Pontoon. The isolation shall be accomplished by using non-conductive membranes between the metallic components and the reinforced concrete elements supporting them by encapsulating the metallic embedments in the supporting reinforced concrete elements in non-conductive epoxy or resin.

All Pontoon Ancillary Items with metallic baseplates and anchors shall be electrically isolated from the Pontoons by use of nylon or UHMW-PE pads (1/4-inch minimum thickness), and flanged bushings and washers (1/8-inch minimum thickness) and Type 316L stainless steel bolts.

See Section 2.17 for electrical continuity, bonding, grounding, and testing requirements.

### 2.12.5.3 DRILLING INTO PONTOONS

#### 2.12.5.3.1 Pontoons Furnished by the State

The Design-Builder shall accurately locate all post-tensioning ducts, steel reinforcing bars and other embedded items in the vicinity of all holes that require drilling in the slabs and walls of the PFS in accordance with the Locating Embedded Items Plan. Core drilling will not be permitted in any Pontoon. All permissible concrete drilling shall be done with a rotary-hammer drill.

The Design-Builder shall utilize non-destructive methods to locate embedded items and shall not compromise the integrity of the existing concrete or the embedded item.

The Design-Builder shall determine the specific location of all holes shown in the Hole Location and Drilling Plan in accordance with the following clearance criteria:

- Holes shall clear all existing conduits and post-tensioning ducts by four inches minimum.
- Holes shall clear all steel reinforcing bars by two-inch minimum.

For all holes of partial depth, the Design-Builder's equipment shall include a positive depth stop mechanism preventing drilling beyond the specified maximum depth.

The Design-Builder shall conduct a demonstration, witnessed by WSDOT, of the methods for locating embedded items following the procedure outlined in the Locating Embedded Items Plan. The Design-Builder shall conduct the demonstration on test panels furnished by WSDOT. The Design-Builder's method for locating embedded items will be evaluated by WSDOT on its ability to accurately locate and describe embedded items in the test panels.

The Design-Builder shall not begin locating embedded items until receiving WSDOT's approval of the Locating Embedded Items Plan and the successful demonstration of the method.

The Design-Builder shall not begin drilling holes until receiving WSDOT's approval of the Hole Location and Drilling Plan.

#### 2.12.5.3.2 Pontoons Provided by the Design-Builder

The Design-Builder will not be permitted to drill or core holes in the PPDB.

### 2.12.5.4 MATERIAL REQUIREMENTS

#### 2.12.5.4.1 Metal Fabrications

Steel pipes shall conform to ASTM A53 Grade B Type E or S, except they will not be permitted for use as steel tubular members carrying superstructure highway traffic loading.

Steel rectangular, square, or round tubing shall be steel hollow structural sections (HSS) and shall conform to ASTM A500, Grade B, except they will not be permitted for use as steel tubular members carrying superstructure highway traffic loading.

Steel Bars, plates and shapes shall conform to the requirements of ASTM A588, unless otherwise indicated.

All non-stainless steel parts, except wire rope, shall be hot dip galvanized in accordance with AASHTO M 111 after fabrication.

All concrete inserts and anchors shall be Type 316L stainless steel unless otherwise indicated.

All bolts, nuts, washers and studs shall be galvanized after fabrication in accordance with AASHTO M 232.

Paint colors specified in this section shall match Federal Standard 595, latest edition.

Bronze shall conform to ASTM B 584 Alloy C86500.

Aluminum plate for Pontoon signs and channel markers shall conform to ASTM B209.

Brass plate for anchor gallery plaques shall conform to ASTM B36.

All steel tubular members carrying superstructure highway traffic loading shall conform to API Specification 5L "Specification for Line Pipe," 44th Edition, with the following additional requirements:

- The pipe grade shall be X42, X46 or X52.
- The product specification level shall be PSL-2.
- The process of manufacturing the pipe shall be either seamless, longitudinal seam SAW, GMAW, or combination, double seam, or helical (spiral) seam SAW.
- Helical (spiral) seam SAW pipe shall not be used for joint cans (i.e., pipe sections used to fabricate joint intersections).
- The pipe ends shall be plain ends with internal root matching, in accordance with API 5L Section 7.9.3.
- The full section bend test and hydrostatic test shall not apply.
- The wall thickness shall be greater than or equal to 1/2-inch, and less than or equal to two-inches.
- Charpy V-Notch (CVN) minimum energy shall be 15 foot-pounds at 40°F for non-fracture critical members, and shall be 25 foot-pounds at 40°F for

fracture critical members. CVN testing shall conform to ASTM A673 with (H) frequency of testing.

- Skelp splices shall not be located within 12 inches of a girth shop or field weld.
- Radiographic or Ultrasonic inspection shall be performed on 100-percent of all skelp splices in accordance with either API 5L Annex E Section E.4 or E.5, or Table 6.2 and Section 6 Part E, F or G in AWS D1.1/D1.1M, Structural Welding Code. Additionally, at least five-percent of the pipe seam at each end, and one pipe diameter length of seam centered on any skelp splice intersection, shall be inspected as specified above.
- Repairs shall conform to Section 5.26 of the AWS D1.1/D1.1M, Structural Welding Code, using approved repair and weld procedures.
- All seams and splices shall be 100 percent visually inspected in accordance with the acceptance criteria in Table 6.1 of the AWS D1.1/D1.1M, Structural Welding Code.
- All Radiographic, Ultrasonic, and visual inspections shall be documented and logged with the following information:
  - Date
  - Type of Inspection
  - Structural Member and location of inspection
  - Temperature and Weather Conditions
  - Name and qualifications of inspector
  - Summary of inspection findings
  - Notification/action plan for flaws discovered during inspection

#### 2.12.5.4.2 Polymer Materials

Ultra-high molecular weight polyethylene (UHMW-PE) blocks, panels, and pads shall conform to ASTM D4020, shall be composed of 100 percent virgin UHMW-PE material, 100 percent cross-linked for abrasion resistance, fully ultraviolet (UV) stabilized, and shall conform to the following requirements:

| | | |
|---|---|---|
| Density | ASTM D 792 | 58.3 to 59.0 pcf. |
| Hardness | ASTM D 785 | 63 to 69 Shore D |
| Elongation at break | ASTM D 638 | 350 to 450 percent |
| Impact | ASTM D 256 | No break |
| Abrasion Wear | Sand Slurry | 7 to 16 |
| Coefficient of Friction | ASTM D 1894 | 0.11 to 0.20 |
| Ultimate Tensile Strength | ASTM D 638 | 5,600 to 6,900 psi. |

Nylon pads shall be manufactured from Type 6 castable nylon polyamide resin conforming to ASTM D 5989 and having a minimum compressive stress of 10,000 psi. at one percent deformation at 73 °F in accordance with ASTM D 695.

Neoprene pads shall conform to the requirements of Section 9-31 of the WSDOT Standard Specifications (Appendix D18).

### 2.12.5.5 FRP FABRICATIONS

The FRP fabricator shall be a company specializing in FRP fabrication and having 10 years minimum of documented experience and three similar FRP installations within the last five years. The FRP installer shall be a company specializing in performing FRP installation with three years minimum of documented experience.

The Design-Builder shall verify all dimensions prior to FRP fabrication. The Design-Builder shall maintain the FRP manufacturer's published fabrication tolerances to ensure proper fit in accordance with the approved shop drawings. Hardware shall be installed at the quantity and spacing in accordance with manufacturer's written instructions, approved shop drawings and General Access Notes in the State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and the Pontoon Minimum Technical Requirements (Appendix M22).

The Design-Builder shall verify available interior Pontoon cell clearances to determine the extent of shop and field assembly before transporting assembled access systems into final cell locations. The Design-Builder shall provide all accessories, anchors, inserts and other items required for a complete installation of all systems and components in accordance with approved shop/erection and assembly drawings.

FRP elements shall not be delivered until subsurfaces are ready to accept them and installation is ready to begin. FRP materials shall be delivered in original, unbroken pallets, packages, containers or bundles bearing the label of the manufacturer. Adhesives, resins and their catalysts and hardeners shall be packaged and delivered separately. FRP elements shall be stored in accordance with manufacturer's written instructions. FRP elements shall be protected from damage during delivery. FRP elements shall be marked in accordance with Erection and Assembly drawings prior to shipment.

The Design-Builder shall construct an FRP mock-up consisting of one complete ladder system, handrail system and catwalk system, including grating, at a location to be specified by WSDOT prior to installing the FRP in the Pontoons in order to demonstrate conformance with the approved Shop and Working Drawings.

The Design-Builder shall erect all FRP elements in accordance with approved Working Drawings. All field cut edges shall be sealed in accordance with the manufacturer's written instructions. Hardware shall be installed at the quantity and spacing in accordance with the manufacturer's written instructions and approved Shop and Working Drawings.

Pultruded structural shapes of FRP shall conform to the minimum longitudinal mechanical properties listed in Table 4.

**Table 4. FRP Mechanical Properties**

| Property | ASTM Method | Value | Units |
|---|---|---|---|
| Tensile Strength | D-638 | 30,000 | psi. |
| Tensile Modulus | D-638 | $2.5 \times 10^6$ | psi. |
| Flexural Strength | D-790 | 30,000 | psi. |
| Flexural Modulus | D-790 | $1.8 \times 10^6$ | psi. |

| | | | |
|---|---|---|---|
| Flexural Modulus (Full Section) | N/A | $2.8 \times 10^6$ | psi. |
| Short Beam Shear (Transverse) | D-2344 | 4,500 | psi. |
| Shear Modulus (Transverse) | N/A | $4.5 \times 10^5$ | psi. |
| Coefficient of Thermal Expansion | D-696 | $4.4 \times 10^{-6}$ | in./in./ °F |
| Flame Spread | E-84 | 25 or less | N/A |

FRP grating shall be manufactured of one-piece molded rectangular mesh pattern construction with tops and bottoms of bearing bars and cross bars in the same plane, with a maximum grid opening of 1½-inches square. FRP grating shall be made of a resin chemical formulation as required to provide the corrosion resistance, strength and other physical properties required by code or standard. FRP grating shall be fabricated resin-rich, free of voids and without spots, cracks, crazes or unreinforced areas. FRP grating shall include course grit finish bonded into the surface for slip resistance.

The resin for all FRP shall be a fire-retardant vinyl ester with the chemical formulation necessary to provide corrosion resistance, strength and other physical properties required. All FRP shall conform to a flame spread rating of 25 or less in accordance with ASTM E-84, and shall conform to the self-extinguishing requirements of ASTM D635.

All FRP surfaces shall be smooth, resin-rich, free of voids and without dry spots, cracks, crazes or unreinforced areas. All glass fibers shall be well-covered with resin to protect against exposure to wear or weathering.

The color of all FRP elements shall be yellow.

All FRP elements shall be protected from ultra-violet damage with integral UV inhibitors in the resin and a synthetic surfacing veil to produce a resin-rich surface.

Two physical samples manufactured by the same fabrication process as for production FRP (12 inches by 12 inches in size for grating and 12 inches long for all other components) shall be submitted to WSDOT for review and comment, illustrating color, texture, and finish.

### 2.12.5.6 PAINTING CONCRETE, MASONRY AND CEMENTITIOUS SURFACES

The Design-Builder shall paint concrete, masonry and cementitous surfaces of sheds, deck access hatch curbs, the area surrounding luminaires inside Pontoon cells, and Pontoon walls for signs. Both PFS and PPDB shall be painted as specified.

The Design-Builder shall paint in accordance with Section 6-07 of the WSDOT Standard Specifications (Appendix D18) and as follows:

- Apply a hardening treatment to the surfaces consisting of two coats of a solution made by dissolving two pounds of magnesium fluorosilicate or zinc sulfate crystals in one gallon of water, allowing each coat to dry at least 48 hours before the next application.
- After the second coat has dried, brush the surfaces clean of all crystals and thoroughly wash with clean water. Before applying paint, surfaces shall be dry and clean, and have an instrument measured moisture content not exceeding eight percent, or based on the paint manufacturer's application guidelines, whichever is more restrictive. Concrete surfaces shall be free of grease, oil, and

organic matter prior to painting. Paint shall be applied in a consistent manner and be free of runs, discontinuities, and defects. One coat of concrete primer followed by one coat of white masonry paint shall be applied over the final coat of hardening treatment. Thin the first top coat of paint by adding ¾ quart of spar varnish and 1/3 quart of turpentine to each one gallon of paint, then apply second top coat of paint without thinning.

- Where applicable, letters/numbers shall be painted black enamel (Color No. 37030) over the top coat of white paint after the top coat has cured sufficiently so that paint edges are sharp and well defined.
- Design-Builder shall take precautions to prevent all types of coatings from covering threaded inserts embedded in concrete surfaces.
- Paint all areas around luminaires and ID signs with two top coats of white paint (Color No. 37925). See Outfitting and Assembly Minimum Technical Requirements (Appendix M23) for Paint Limits around luminaires and ID signs. Paint all interior shed walls with two top coats of white paint (Color No. 37925). Paint all exterior shed walls with two top coats of gray paint (color WSDOT Washington Gray).
- Paint coatings for interior shed surfaces only shall be interior grade and suitable for normally dry areas, but also suitable for infrequently wet conditions and potential chemical exposure where applicable. All other paint coatings shall be exterior grade and suitable for frequent exposure to fresh water.

### 2.12.5.7 PONTOON FENDERS

Pontoon fenders shall be furnished and installed in accordance with Outfitting and Assembly Minimum Technical Requirements (Appendix M23). The fender systems shall be attached to Pontoons using inserts located in the State Furnished Pontoon Minimum Technical Requirements (Appendix M11).

Extruded fenders shall be a rubber, weather-resistant compound, homogenous and free from any defects, impurities, pores, or cracks, and have SC cross-section (square exterior with circular bore interior) with outer dimensions to fit within the mounting frame assembly indicated in the fender details in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). Extruded fenders shall be supplied by one of the following manufacturers, or an approved equal: Trelleborg Marine Systems, Blueway Marine, or QuayQuip. Extruded fenders shall meet the following performance requirements:

1. Minimum Energy Absorbed Rating of 10,000 ft-lbs/ft.
2. Maximum Reaction at Rated Energy of 44,000 lbs/ft plus/minus 10 percent.
3. Deflection at Rated Energy of 50 percent plus/minus 10 percent.

### 2.12.5.8 WIRE ROPES

Wire ropes (except not including anchor cables and Pontoon railing cables) shall conform to Federal Specification RR-W-410F, Type 1, Class 2, IWRC, extra improved plow steel, prestretched, hot-dip galvanized.

Turnbuckles shall be hot-dip galvanized forged steel conforming to Federal Specification FF-T-791b Type 1 Form 1.

Wire rope clips shall be hot-dip galvanized forged steel conforming to Federal Specification FF-C-450D Type 1 Class 1.

Wire rope thimbles shall be hot-dip galvanized extra heavy duty conforming to Federal Specification FF-T-276b Type III

### 2.12.5.9 SPARE PARTS

The Design-Builder shall furnish the following spare parts:

- Five ballast port covers, including mounting hardware and gaskets.
- Five watertight deck hatch assemblies, including mounting hardware and gaskets.
- Ten posts of each type of Pontoon railing, including mounting hardware.
- Five brackets of each type of safety cable brackets, including mounting hardware.
- Two FRP access ladder assemblies, including mounting hardware, for each length of ladder fabricated and installed.
- Two safety ladder assemblies, including mounting hardware.
- Six anchor cable guide bushings, including mounting hardware.
- Two hydraulic rams and two electric pumps for the anchor gallery.

Spare parts shall be packaged in sealed wooden crates and boxes suitable for long-term storage in a moist environment. All gaskets shall be stored in their fully-extended flat position in an airtight package.

Containers shall be limited in size so they are not too bulky, and similar items shall be packaged in the same container. The contents of all containers shall be appropriately identified by quantity and description on a typed list affixed to the exterior under a sealed plastic cover.

After inspection, all containers shall be completely sealed with shrink-wrap plastic for long-term storage.

Spare parts shall be delivered to the WSDOT Bridge Maintenance Facility and Dock for storage.

### 2.12.5.10 PONTOONS

#### 2.12.5.10.1 Pontoon Casting Systems and Test Sections

The PPDB slabs and walls shall be cast-in-place concrete construction.

The PPDB interior walls (i.e., walls whose surface is not in continuous contact with water) may be cast-in-place concrete or precast concrete construction, at the Design-Builder's option. The Design-Builder shall develop a casting system for producing watertight Pontoons, including:

- A precision forming system;
- Concrete mix analysis;
- A thermal monitoring and control system;

- Concrete placement plans and systems;
- Concrete consolidation systems;
- Concrete cure plans; and
- Precast concrete component fabrication and handling systems, if precast concrete is used.

The Design-Builder shall construct a test section to demonstrate that the casting system conforms to the following criteria:

- Meets the concrete surface finish requirements.
- Meets the concrete crack acceptance criteria.
- Meets the Pontoon fabrication tolerance.
- Exhibits no signs of concrete segregation.
- Is free of rock pockets and cold joints.
- All construction joints in the lower 20 feet of the test sections shall be watertight when tested for 24 hours with 20 feet of pressure head without repair.

Pontoon test sections shall be the size and scale of those constructed under WSDOT Contract 7812 (Appendix B6) and shall be constructed utilizing the materials and procedures the Design-Builder selects to use for the Pontoon construction. The Design-Builder may adopt the Pontoon construction system processes developed under WSDOT Contract 7812 (Appendix B6) and the findings from the *SR – 520 ACME Project Final Report* (Appendix S4). If the Design-Builder's submittals in Sections 2.12.6.3 and 2.12.6.4 conform to the successfully tested Pontoon construction system processes of WSDOT Contract 7812 (Appendix B6) and incorporate the findings and recommendations from the *SR – 520 ACME Project Final Report* (Appendix S4), then the test section scope shall be reduced to constructing and successfully testing Stages 1, 2 and 3 of the Test Walls and Slab portion of WSDOT Contract 7812 (Appendix B6). Otherwise, both the Pontoon and Pontoon Test Walls and Slab Procedures shall be successfully constructed and tested as outlined in WSDOT Contract 7812 (Appendix B6).

The Design-Builder shall not begin construction of Pontoons until successful completion of the Pontoon test sections, including successful demonstration of the Design-Builder's Pontoon construction processes, as reviewed by WSDOT.

All Pontoon test sections shall remain the property of the Design-Builder. The Design-Builder shall demolish and dispose of all Pontoon test sections and mockups in accordance with Section 2-02.3 of the WSDOT Standard Specifications (Appendix D18).

If the Design-Builder elects to construct PPDB interior walls with precast concrete, then the following requirements apply:

- Precast walls shall be the same size, and have the same reinforcing and inserts as the cast-in-place concrete walls indicated on the drawings.
- Design-Builder shall submit details of proposed precast concrete segment joints for WSDOT review and approval.

- Design-Builder shall submit complete precast shop drawings showing all design elements, reinforcing steel, joint details, reinforcing inserts, and handling devices for WSDOT review and approval.
- The Design-Builder shall be responsible for producing panel handling calculations and providing additional reinforcing as required to resist handling stresses.

### 2.12.5.10.2 Concrete for Pontoons

Concrete shall be either Design-Builder Performance Concrete or Concrete Class FS 7500, as defined below. Except as otherwise noted in this section, all mixes shall have a cured density in the range of 150 to 154 pcf. Except as otherwise noted in this section, the use of lightweight aggregate will not be allowed.

The Design-Builder shall produce concrete of maximum density and ensure the completed Work is watertight and without defect.

All concrete mix designs shall be submitted, tested, and approved in accordance with the requirements of this section and Section 2.25 (Control of Materials). The Design-Builder shall perform the following tests as part of the concrete mix design submittal:

- Compressive strength at one, two, seven, 14, 28 and 56 days in accordance with AASHTO T22.
- Rapid chloride permeability at 28 and 56 days in accordance with AASHTO T277.
- Creep and shrinkage in accordance with ASTM C512.
- Modulus of elasticity at three and 28 days in accordance with ASTM C469.
- Freeze-thaw in accordance with ASTM C666 (300 cycles, durability factor minimum).
- Heat of hydration in a semi-adiabatic chamber (used for thermal modeling by Design-Builder only).
- Shrinkage in accordance with AASHTO T 160.
- Ring shrinkage in accordance with ASTM C1581.
- Splitting tensile strength at 28 days in accordance with ASTM C496.
- Large batch in accordance with AASHTO R39.
- Static segregation of Self Consolidating Concrete (SCC) by column method in accordance with ASTM C1610.
- Passing ability of SCC by J-ring in accordance with ASTM C1621.
- Permeability test in accordance with AASHTO T 277
- Maximum slump and maximum slump spread in accordance with ASTM C1611.
- Visual Stability Index (VSI) in accordance with the Appendix to ASTM C1611.

At least 50 percent of the surface area of the coarse aggregate shall be naturally rounded (not crushed or angular). Aggregates shall originate from sources as listed in the WSDOT Aggregate Source Approval (ASA) Database.

Aggregates shall have an expansion less than or equal to 0.20 percent when tested in accordance with Section 9-03.1(1) of the WSDOT Standard Specifications (Appendix D18). Use of aggregates with expansion rates exceeding these specified amounts, with or without mitigation measures, will not be allowed. The WSDOT State Materials Laboratory will perform the validation testing of aggregates.

The maximum water-cementitous materials ratio shall be 0.36. The delivered water-cement ratio shall be within plus or minus 0.01 of the tested design mix chosen by the Design-Builder.

The concrete shall exhibit no indications of aggregate or paste segregation.

Slump retention and setting time shall be controlled using a retarding or hydration-stabilizing admixture.

The concrete shall not be air-entrained.

The concrete shall have a 28-day minimum compressive strength of 7,500 pounds per square inch (psi.) and a minimum modulus of elasticity of 5,400,000 psi.

Shrinkage shall be less than 350 microstrain.

The maximum permeability shall be 1,000 coulombs at 56 days. The permeability test results shall be submitted to WSDOT at least 30 Calendar Days prior to the first scheduled placement of concrete in the Pontoon test section as required by this section. This permeability test is required for the mix design only, and will not be a requirement for acceptance of production concrete.

Unless otherwise specified by WSDOT, the maximum slump shall be 10 inches.

Unless otherwise specified by WSDOT, the maximum slump spread shall be 28 inches.

Concrete shall have a Visual Stability Index (VSI) equal to zero or one.

The Design-Builder shall submit a mix design for the Pontoon concrete to WSDOT for review and approval in accordance with the requirements of Section 2.25.

#### 2.12.5.10.2.1 Design-Builder Performance Concrete

A separate class of performance concrete may be developed and proposed for use in constructing Pontoons. The performance concrete shall be tested in the lab and in the field to the same level as completed in WSDOT Contract 7812 (Appendix B6). Successful elements of the mix design and analysis performed in WSDOT Contract 7812 (Appendix B6) may be adopted. The performance concrete shall conform to Table 5 requirements:

**Table 5. Design-Builder Performance Concrete**

| Material | Material Specification |
|---|---|
| Type I-II low alkali cement | Std. Spec. Sect. 9-01.2(1) and 9-01.2(3) |
| Microsilica | Std. Spec. Sect. 9-23.11 |
| Fly Ash | Std. Spec. Sect. 9-23.9 |
| Granulated Slag | Std. Spec. Sect. 9-23.10 |
| Coarse Aggregate | Std. Spec. Sect. 9-03.1(4) Grading No. 8 |
| Fine Aggregate | Std. Spec. Sect. 9-03.1(2), with a fineness modulus in |

| | |
|---|---|
| | the range of 2.7 to 3.1 |
| Water | Std. Spec. Sect. 9-25.1 |
| Retarding/Hydration-Stabilizing Admixture | Std. Spec. Sect. 9-23.6(5)[1] |
| High-Range Water-Reducing Admixture | Std. Spec. Sect. 9-23.6(7)[2] or Std. Spec. Sect. 9-23.6(8)[2] |
| Viscosity Modifying Admixture | Std. Spec. Sect. 9-23.6(9)[3] |

**Notes**:

[1] Retarding/hydration stabilizing admixture dosage shall be based on the slump life and/or setting time requirements.

[2] High-range water-reducing admixture dosage shall be based on the slump requirement.

[3] Viscosity-modifying admixture shall be based on the slump/slump flow requirements.

### 2.12.5.10.2.2 Concrete Class FS 7500

Concrete Class FS 7500 may be used, conforming to the following mix specifications and all WSDOT-approved modifications made to the mix specifications during WSDOT Contract 7812 (Appendix B6). Concrete Class FS 7500 shall conform to Table 6 requirements:

**Table 6. Concrete Class FS 7500**

| Material | Material Specification | Weight, Pounds per cubic yard |
|---|---|---|
| Type I-II low alkali cement | Std. Spec. Sect. 9-01.2(1) and 9-01.2(3) | 560 |
| Microsilica | Std. Spec. Sect. 9-23.11 | 50 |
| Fly Ash | Std. Spec. Sect. 9-23.9 | 145 |
| Coarse Aggregate | Std. Spec. Sect. 9-03.1(4) Grading No. 8 | 1,680[1] |
| Fine Aggregate | Std. Spec. Sect. 9-03.1(2) Class 2 Fines[5] | 1,340[1] |
| Water | Std. Spec. Sect. 9-25.1 | 260 maximum |
| Retarding/Hydration-Stabilizing Admixture | Std. Spec. Sect. 9-23.6(5) | Note 2 |
| High-Range Water-Reducing Admixture | Std. Spec. Sect. 9-23.6(7) or 9-23.6(8) | Note 3 |
| Viscosity Modifying Admixture | Std. Spec. Sect. 9-23.6(9) | Note 4 |

**Notes**:

[1] Aggregate weights based on specific gravity values of 2.68 for coarse aggregate and 2.65 for fine aggregate.

[2] Retarding/hydration stabilizing admixture dosage shall be based on the slump life and/or setting time requirements.

[3] High-range water-reducing admixture dosage shall be based on the slump requirement.

[4] Viscosity-modifying admixture shall be based on the slump/slump flow requirements.

[5] Class 2 Fines shall have a Fineness Modulus in the range of 2.70 to 3.10 as defined by the Class 1 specifications.

### 2.12.5.10.2.3 Pontoon Reinforcing Steel Cover and Clearances

A gap of 2½ inches minimum shall be provided between interior mats of reinforcing steel in vertical walls to facilitate concrete placement through a tremie. The minimum cover from the face of concrete to any reinforcing bar shall be as follows:

- Exterior surfaces of Pontoons, two inches.
- Interior surfaces of Pontoons, one inch.

### 2.12.5.10.3 Pontoon Formwork

Forms shall be constructed and supported during concrete placement so that all completed Pontoons conform to the design dimensions within the specified tolerances. Form deflection shall not exceed 1/8 inch, including deflection of forms for both faces and elongation of the form ties, and shall not exceed L/1000 for each face.

Any variation in wall or slab thickness will result in changing the computed position the Pontoon will occupy in the water, and may also result in dead load stresses in the completed structure that have not been accounted for in the design. The Design-Builder shall exercise special care in this matter and shall take such measures as required to ensure conformance with this requirement.

Forms shall be constructed of lumber, steel, aluminum or a combination of the three, subject to review and approval by WSDOT. Forms that are reused shall be thoroughly cleaned of all concrete. Forms with surface defects shall be replaced or repaired as required, and shall be recoated with an approved release agent before being used again. All release agents shall be non-toxic so that a hazardous condition will not be created within the confined space of the Pontoons throughout their service life.

Side forms for walls shall be capable of being removed or loosened prior to post-tensioning.

All forms and debris shall be removed from the interior cells of the Pontoons. Stay-in-place forms for Pontoon construction will not be allowed.

Form removal shall conform to Section 6-02.3(17)N of the WSDOT Standard Specifications (Appendix D18). Forms supporting the Pontoon top slab shall not be removed until five days minimum after the placement of the concrete, and until they have attained a minimum of 4,500 psi. compressive strength.

Drilling, coring and sawcutting holes in the PPDB will be prohibited. Drilling and sawcutting holes in the PFS without written approval by WSDOT will be prohibited.

Exposed concrete inserts shall be Type 316L stainless steel. There shall be no exposed inserts on the keel slab or the bottom three-quarters of any exterior walls (in contact with the marine environment).

Exterior wall form tie assemblies shall be high tensile steel threaded rods, and of a type that will leave no metal closer than two inches from exterior surfaces and one inch from interior surfaces. Exterior wall form ties shall not be pull-out type, defined as any tie that can be completely removed from the concrete leaving a hole through the concrete. Twisted wire, taper ties and band iron ties shall not be allowed for exterior wall form ties.

Interior wall form ties shall conform to the same requirements specified for exterior wall form ties, except that taper ties may be used provided the Design-Builder develops a procedure to clean the thru-hole, roughen the hole surface to ¼-inch amplitude, and

completely fill the hole with a concrete repair material of equal or better compressive strength and permeability of the surrounding Pontoon concrete.

### 2.12.5.10.4 Pontoon Fabrication Tolerances

The Design-Builder shall adjust the plan length of each Pontoon as necessary to compensate for elastic shortening and creep due to prestress plus shrinkage.

Normal creep rates as specified in the AASHTO *LRFD Bridge Design Specifications* shall be used when the Pontoon is in the dry (before launching). A creep rate of one-third the normal rate shall be used after launching.

Differential shrinkage shall be included, as applicable, between the different components of the Pontoon. The ultimate differential shrinkage strain shall be 0.0002.

The effect of shrinkage shall be included in the dry condition only. This shrinkage rate can be assumed to be zero upon launching of the Pontoon.

Pontoon fabrication tolerances shall be as required, but shall not exceed the following:

- Slab and wall thicknesses shall be plus 1/8 inch, minus zero inches.
- The overall cross-sectional dimensions (that is the distance between centerlines of walls, bulkheads, top and bottom slabs, locations of columns, and the overall length of Pontoons after post-tensioning) shall be plus/minus one inch.
- The skew of the Pontoon across the end section shall be a maximum of ½ inch.
- Post-tensioning duct placement shall be plus/minus ¼ inch.
- Concrete cover over steel reinforcing bars shall be plus 3/8 inch, minus zero inches.
- Locations of sleeves, openings and inserts shall be plus/minus ½ inch.
- Deviation from a straight line in Pontoon alignment shall be plus/minus one inch in 500 feet.
- Locations of bolted joint bolt sleeves shall be plus/minus ¼ inch, and the deviation of the bolt axis from a straight line shall not exceed 1/32 inch for each foot of overall length of bolt.

### 2.12.5.10.5 Concrete Placement

At least two weeks before the first placement of each major element such as slab, wall, column, beam or deck of concrete construction, a pre-placement meeting shall be held to review proposed procedures including concrete and admixture handling, placing, finishing and curing; and to facilitate coordination between all the parties involved. Individuals attending this meeting should include representatives of the Design-Builder; the concrete supplier; WSDOT; and a technical representative from the microsilica manufacturer. A technical representative of the microsilica manufacturer shall be present to advise the Design-Builder regarding finishing the initial placements.

If concrete will be delivered by pumping, the Design-Builder shall submit working drawings to WSDOT for review and approval. The drawings shall show proposed equipment, including stand-by equipment; support of pumping lines; remixing facilities if any; method of prevention of segregation and plugging; and control of slump, taking into account the absorption of water by the aggregates.

Prior to placing concrete for the Pontoon bottom slab, the Design-Builder shall place a bondbreaker flooring system between the floor slab and the Pontoon bottom slab. The layout of the bondbreaker flooring system shall allow for uniform flooding, providing uniform water pressure beneath the Pontoon bottom slab. Fasteners connecting the bondbreaker flooring system to the floor slab shall not extend above the top surface of the bondbreaker flooring system. An example of a bondbreaker flooring system is a floor of 4-foot by 8-foot plyform panels with ½-inch gaps between the edges of all panels, with the plyform panels bonded to the concrete floor slab with construction adhesive, and with the ½-inch gaps covered with continuous sheet metal.

### 2.12.5.10.6 Precast Concrete Panel Erection

Precast concrete wall panels shall be braced so that the braces do not interfere with the concrete placement of the base slab. Cast-in inserts shall be placed in the base slab to accommodate the reinstalled braces for the subsequent wall and closure concrete placements. The cast-in inserts for the braces shall be shown in the integrated Pontoon drawings.

### 2.12.5.10.7 Construction Joints

Construction joints will be permitted at the intersection of members and at the ends of precast elements.

Construction joints shall be perpendicular to the mild steel reinforcing bars crossing the joint.

Construction joints that are parallel to post-tensioning ducts shall clear the ducts by four inches minimum.

Immediately following the placement of concrete for the keel slab or vertical walls, the construction joint between the keel slab and vertical walls or between the vertical walls and the top slab shall be green cut (prior to initial set) to remove all scum, laitance and loose material. After green cutting, the construction joint surface shall be tined parallel to the direction of the wall, leaving a groove with a ¼-inch minimum depth by ¼-inch width at 1½-inches spacing.

All formed construction joints in slabs and walls shall have continuous shear keys, 3½ inches wide by 1½ inches deep, centered between the reinforcing mats along the length of the slab or wall. Where post-tensioning ducts are in the path of the shear keys, the shear keys shall be continuous between post-tensioning ducts.

Before placing fresh concrete against the cured concrete of the construction joint, the construction joint shall be thoroughly cleaned of all scum, laitance, debris and loose material and saturated in accordance with Section 6-02.3(12) of the WSDOT Standard Specifications (Appendix D18).

Walls shall be cast full height. Horizontal construction joints are allowed at the intersection of keel slab and base of wall, and at the intersection of the deck slab and top of wall. No intermediate horizontal construction joints will be allowed in the walls. Vertical construction joints in the walls shall be placed in the walls to prevent shrinkage and thermal cracking as determined by analysis and the thermal control plan. Vertical construction joints shall be spaced at a 30-foot minimum.

The keel and deck slabs shall be cast the full width of the Pontoon with no longitudinal construction joints. Transverse construction joints will be allowable at 30-foot minimum spacing.

Construction joints shall be formed using a roughened surface, conforming to the groove depth and spacing specified in Section 6-02.3(12) of the WSDOT Standard Specifications (Appendix D18). The method used to strike off the construction joint surface shall not disturb the bond of the coarse aggregate. Abrasive blasting or hydraulic impulse water jet cutting shall be used on hardened concrete surfaces requiring roughening.

Construction joints at the intersection of fillets and walls shall have formed keyways such that the edge of any formed fillet is no less than ¾-inch thick.

If the Design-Builder elects to use cast concrete closures between the bottom of the precast concrete panels for the interior vertical walls and the keel slab, then the Design-Builder shall perform watertightness testing of all construction joints between the keel slab and the precast vertical walls. The watertightness test shall consist of subjecting the construction joint to a 10-foot pressure head by flooding every other bank of interior cells with potable water for a period of 24 hours. All leak locations shall be repaired in accordance with this section.

### 2.12.5.10.8 Concrete Curing

The Design-Builder shall be responsible for all costs associated with crack repair regardless of the concrete curing means and methods used. Concrete curing and thermal control methods in accordance with the recommendations of the *SR – 520 ACME Project Final Report* may be used in lieu of the following procedures. The Design-Builder may propose modifications to the curing procedures below based on the successful development and implementation of the concrete curing and thermal control plan during the mock-up test sections, as outlined in Section 2.12.5.10.1.

Thermal control modeling shall conform to the concrete thermal monitoring and control plan submittal specified in Section 2.12.6.3 and shall, at a minimum, include the effects of the Design-Builder's selected construction sequence, concrete mix design, aggregate coefficient of thermal expansion, range of ambient air temperatures, cure water temperatures, shrinkage strain effects, heating cooling methods, insulation to control gradients, and tested concrete heat of hydration curves.

Concrete shall be cured in accordance with Section 6-02.3(11) of the WSDOT Standard Specifications (Appendix D18), the PCI Manual for Quality Control for Plants and Productions of Precast Prestressed Concrete Products, and the requirements specified below.

The concrete for each placement sequence shall be kept constantly moist and protected against any drying action, and cured for no less than 10 days after the placing of the concrete as follows:

- Bottom Slab – Immediate and continuous fog spray followed with moist cure for 10 days.
- Bottom Slab Bolt Beam – Immediate and continuous fog spray followed with curing compound after 24 hours.
- Top of Wall – Immediate and continuous fog spray followed with moist cure for 10 days.
- Top Slab – Immediate and continuous fog spray followed with continuously wet cotton mats or burlap and white plastic sheeting for 10 days.
- Edges of Top Slab – Same as for Top Slab except that forms may be removed and curing compound applied after 48 hours.

- Interior Walls and Interior Wall Intersections – Curing compound placed within four hours of stripping. The curing compound shall be placed either with a roller or with a power sprayer.

Except for interior walls as noted above, curing of the concrete shall begin by the application of a water fog spray no later than 10 minutes after placement. Fog spray shall continue until such time as the moist cotton mats or burlap are placed. The amount of fog spray shall be strictly controlled so that accumulations of standing or flowing water on the surface of the concrete shall not occur. There shall be a sufficient amount of spray to keep up with the placing operations.

If atmospheric conditions render the use of fog spray impractical, the Design-Builder shall use plastic covers of suitable thickness and securely fastened down but not directly in contact with the deck concrete. The covers shall be used only until the initial set has taken place, whereupon moist cotton mats or burlap shall be placed immediately thereafter and kept wet for the duration of the curing period.

When the concrete has attained initial set, moist curing shall be substituted for the fog spray.

Cotton mats or burlap shall be saturated and ready to place on the newly finished concrete surface as soon as placement, consolidation and finishing of the concrete are complete. The time between initial exposure of the finished concrete to the environment and the application of soaked mats shall not exceed 10 minutes. The mats shall then be covered with plastic sheeting to prevent evaporation of the curing water. Additional curing water shall be applied through soaker hoses running under the protective plastic sheeting so that the mats are kept continuously wet throughout the period of cure.

The Design-Builder shall maintain the bottom and top cast-in-place Pontoon slabs continuously wet with water for not less than 10 days after the concrete is placed.

The Design-Builder shall maintain the formwork covering the interior and exterior wall surfaces continuously wet to prevent loss of moisture from the concrete. Under normal curing conditions, the forms may be removed from the faces of the Pontoon walls after three days.

Exterior and interior cast-in-place concrete surfaces of the Pontoon walls shall be kept wet with water for not less than 10 days.

All exterior surfaces of the Pontoons shall be cured for at least 10 days before contact with seawater is allowed.

Care shall be taken to ensure that exposed reinforcing steel and concrete surfaces to which concrete closures will be bonded are kept free of curing compounds.

Precast components of the Pontoon interior shall be cured by keeping them continuously wet for not less than 10 days after the concrete is placed. Forms for the precast components may be removed after the concrete has attained a minimum compressive strength of 5,000 psi. provided that the wet cure is maintained as specified.

#### 2.12.5.10.8.1 Conventionally Cured Concrete

In order to control the thermal strains in conventionally-cured concrete due to the heat of hydration and subsequent cooling, the following shall be required:

- The external surfaces of forms shall be insulated as necessary to prevent a thermal gradient through the walls of slabs, from center to edge, exceeding

27°F or a rate of 36°F per 24 hours. During this period, exposed surfaces such as slabs shall be similarly protected.

- After forms are stripped, and during subsequent cure, protective tarpaulins or enclosures shall be provided to protect the concrete from rapid thermal changes or gradients for a period of seven days from time of placement whenever the limitations specified above are exceeded.
- Certain construction sequences may require the use of heating and cooling pipes to control differential thermal strains similar to methods used in WSDOT Contract 7812 (Appendix B6). The Design-Builder shall develop thermal modeling and plans to analyze and control thermal strains for these construction sequences.

#### 2.12.5.10.8.2 Steam Cured Concrete

In order to control the thermal strains in steam-cured concrete due to the heat of hydration and subsequent cooling, the following shall be required:

- The rate of cooling of the atmosphere inside the steam hoods or chamber shall be limited to 20°F per hour until the temperature reaches 20°F above ambient. At this stage, steam hoods may be removed and subsequent curing procedures shall be carried out as specified for normal cured concrete.
- Heat shall not be applied until three hours after placement of concrete.
- Protective tarpaulins or enclosures shall be provided to protect concrete from rapid thermal changes or gradients for a period of seven days from the time of placement whenever the limitations specified above are exceeded.
- The protective tarpaulins or enclosures referred to above shall be reasonably complete coverings of heavy canvas, rubber-impregnated nylon, multi-layered burlap or similar material so as to retain heat and restrict wind. They are not required to be airtight and may be spaced away from the member to facilitate curing or other work by the Design-Builder.

#### 2.12.5.10.8.3 Thermally Cured Concrete

In order to control the thermal strains in thermally-cured concrete due to the heat of hydration and subsequent cooling, the following shall be required:

- The Design-Builder shall request WSDOT's approval to use thermal (dry heat) curing by submitting a thermal cure plan to WSDOT for review and approval. The Design-Builder's request shall include test results correlating core samples taken from a test precast element with test cylinders cured in the same manner.
- Heat shall not be applied until three hours after placing of concrete.
- The exposed concrete surfaces shall be kept continuously moist throughout the 10-day curing period by use of an insulated cover, sealed at the edges and enveloped with low-pressure steam or fog spray. A moist atmosphere shall be maintained throughout the thermal curing period.

### 2.12.5.10.9 Concrete Surface Finish

During finishing, the evaporation rate shall not exceed 0.10 psf. per hour of exposed concrete. Possible preventive procedures may include cooling ingredients before mixing and use of temporary windbreaks, sun shades and fog nozzles.

After removal of the forms, defects shall be repaired in accordance with this section. Fins and edgings shall be removed with a sharp tool or stone.

Form ties and bolts shall be removed to a depth of two inches minimum from exterior surfaces and 1½ inches from interior surfaces, with all residual release agent removed, holes roughened with a chipping gun or equivalent method, and the holes filled with grout. The grout shall be equal in compressive strength and permeability to the Pontoon concrete and shall form a watertight plug.

The outside walls of Pontoons in the complete structure shall be given Class 2 surface finish in accordance with Section 6-02.3(14)B of the WSDOT Standard Specifications (Appendix D18), and as follows:

- After forms have been stripped from the outside wall surfaces, the Design-Builder shall pressure wash the concrete surfaces (3,000 psi. minimum) to remove loose material and surface contaminants.

Following pressure washing of the walls:

- All cavities 1/8 inch or greater in diameter, or 1/8 inch or greater in depth, shall be filled with 1:2 mortar floated to an even, uniform finish.
- All holes receiving mortar repair shall be cured in accordance with items 7 and 8 of Section 6-02.3(14)A of the WSDOT Standard Specifications (Appendix D18).
- All other surfaces except top of top slab shall be given a Class 2 surface finish in accordance with Section 6-02.3(14)B of the WSDOT Standard Specifications (Appendix D18). The top of the top slab shall have wood float finish. Non-formed surfaces of precast sections shall have a steel trowel finish.

### 2.12.5.10.10 Concrete Repair

All rock pockets, honeycomb and laminar in-plane cracks shall be repaired by chipping out to sound concrete 1½ inches minimum behind near face reinforcement, cutting edges normal to the surface of the concrete ½-inch deep, coating with an epoxy bonding agent, then placing concrete while the epoxy is tacky and maintaining a sufficient head of fresh concrete to prevent shrinkage. Repairs shall be completed, and shall have attained the 28-day compressive strength specified for the surrounding concrete.

Laminar in-plane cracks and planar patches greater than 50 square inches in size shall be reinforced across the cracks or patch by drilled-in dowels, providing a 0.3-percent steel area. The concrete surfaces shall be inspected for cracks in accordance with ASTM C 597.

At the end of the thermal control period, but no less than 10 days after initial set of the last concrete placed, an in-depth crack inspection shall be performed. If any concrete area between adjacent horizontal, vertical and lateral bulkheads contains more than 30 feet of repairable cracks, as defined as both non-structural cracks and structural cracks below, the cracked area shall be removed and re-cast.

Non-structural cracks, defined as less than 0.006 inches in width, shall be coated with concrete waterproofing as specified in this section. Waterproofing shall be applied full length of the crack on each face of the concrete affected, and shall be applied to a width of no less than 18 inches centered on the crack.

Structural cracks (defined as greater than or equal to 0.006 inches in width) shall, at the discretion of WSDOT, be repaired by epoxy injection or they may be cause for rejection of the affected unit. Epoxy injection of structural cracks shall be done prior to any post tensioning of the Pontoons. After epoxy injection, structural cracks shall be coated with concrete waterproofing in like manner as non-structural cracks.

Products used for crack repair shall be submitted to WSDOT for review and approval. No surface-sealing repair materials will be approved as a permanent repair.

After launch, all Pontoon cells shall be inspected for leaks and signs of dampness. For the purpose of this Work, a leak shall be defined as any surface that shows visible migration of water or increasing dampness after the opposite concrete face has been under water pressure for seven consecutive days or more. Cells containing ballast water shall be pumped out and dried prior to inspection. The bottom of the keel slab shall be inspected by divers for defects as described above. Underwater inspections shall be documented by video. Underwater inspection videos for each Pontoon shall be submitted to WSDOT. All underwater repairs shall be done in the dry with a coffercell or similar device.

Pontoons cast on blocks, or falsework allowing inspection and repair of the keel slab from the underside, may be inspected for leaks by flooding of the interior of the Pontoons to a depth of 15 feet.

Conduit penetrations into the Pontoons shall be located at the pre-established locations shown in State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22). All conduit penetrations through the Pontoon walls and bulkheads shall be sealed watertight to withstand a 10-foot pressure head inside and outside of the conduit.

### 2.12.5.10.11 Post-Tensioning

The Design-Builder shall furnish and place post-tensioning prestressing steel, plastic ducts, anchorages and distribution plates; tension the prestressing steel; and pressure grout the ducts in the structure in accordance with Pontoon Minimum Technical Requirements (Appendix M22), the WSDOT Standard Specifications (Appendix D18), and this section. Post-tensioning ducts shall conform to Section 6-02.3(26)E of the WSDOT Standard Specifications. Duct placement shall conform to AASHTO *LRFD Bridge Construction Specifications*.

Distribution plates for anchorage assemblies shall conform to the following requirements:

- Anchorages shall conform to Sections 6-02.3(26)B and 6-02.3(26)C of the WSDOT Standard Specifications (Appendix D18).
- Materials and workmanship shall conform to the applicable requirements of Section 6-02 of the WSDOT Standard Specifications (Appendix D18). Tendon bearing plates shall receive one coat of paint conforming to Section 9-08.1(2)D of the WSDOT Standard Specifications.

- Anchorage assemblies shall include a distribution bearing plate perpendicular to the centerline of the tendon, capable of transmitting the total prestressing force to the concrete.
- The Design-Builder shall submit a certified report to WSDOT of each size and type of anchorage device proposed for use stating that the anchorage will develop 95 percent of the ultimate strength of the post-tensioning reinforcement.
- The Design-Builder shall provide all necessary local-zone confining reinforcing embedded in concrete to ensure that stresses under the distribution bearing plate do not produce transverse tensile cracking.

The Design-Builder shall jack and anchor the post-tensioning strands in the sequence shown in the Design-Builder's shop drawing submittal. The tensioning of the post-tensioning strands shall not commence until tests on concrete cylinders manufactured of the same concrete and cured under the same conditions as the Pontoon concrete indicate that all concrete has attained a minimum compressive strength of 5,000 psi.

After being anchored, the post-tensioning strands shall be cut at least ½ inch from the face of the anchoring device. Strands shall not be flame cut.

Post-tensioning anchorages shall be recessed. The anchorage assembly with projecting strands and the sides of the anchorage recess shall be coated with an epoxy-bonding agent. Immediately after applying the coating, and while the epoxy bonding agent is still tacky, a concrete encasement shall be placed to fill the recess. The concrete fill shall be tied to the structure by reinforcement, and the joints afterwards coated with epoxy bonding agent. The minimum concrete cover shall be two inches. The Design-Builder shall submit proposed concrete encasement mix to WSDOT for review and approval.

Grout and grouting procedures shall conform to Section 6-02.3(26)H of the WSDOT Standard Specifications (Appendix D18). For vertical ducts, grouting shall comply with the FIP Guides to Good Practice, "Grouting of Vertical Ducts," FIP/2/4. A field test grouting of a typical vertical tendon shall be conducted to verify complete filling of the duct. The Design-Builder's procedure in grouting shall be such as to positively displace all air and water in the ducts and force grout through the tendons in the anchorage during grouting.

### 2.12.5.10.12 Concrete Waterproofing

Before launching the Pontoons, the top side of all construction joints in the keel slab and both sides of all construction joints in the walls shall be coated with concrete waterproofing prior to floating the Pontoons in the Pontoon casting basin.

Concrete waterproofing shall be a surface applied, integral crystalline waterproofing coating conforming to one of the following, or an approved equal:

- Xypex Concentrate manufactured by Xypex Chemical Corporation, www.xypex.com
- Vandex Super manufactured by Vandex International Ltd., www.vandex.com
- Penetron manufactured by ICS Penetron International, Ltd., www.penetron.com
- Krystol T1 & T2 manufactured by Kryton International, Inc., www.kryton.com
- Adi-Con CW Plus manufactured by Gemite Products, Inc., www.gemite.com

- Hey'di K-11 manufactured by Euclid Chemical Company, www.euclidchemical.com

The concrete waterproofing shall be applied and cured in accordance with the manufacturer's recommendations. Waterproofing shall be applied full length of the construction joint to be treated, and shall be applied to a width of no less than 18 inches centered on the construction joint.

### 2.12.5.10.13 Watertight Hatches, Ballast Port Covers, and Doors

All watertight hatches, ballast port covers and doors shall successfully complete the following testing requirements prior to, and after, final installation into Pontoons.

Prior to installation in Pontoon:

- Each watertight hatch, ballast port cover and door assembly shall successfully complete gasket impression testing and hydrostatic testing.
- Gasket impression testing shall consist of applying chalk or dye to the edge of each assembly, and then closing the assembly by tightening by hand the drop bolts for the hatches, the bolts for the ballast port covers, and the dogs for the doors; or by using the tools to be used for tightening the bolts and dogs once the Pontoons are in service. Each assembly shall be opened, and the gasket shall be visually inspected for uniform impression of the chalk or dye. If the impression is not uniform, the assembly shall be adjusted or repaired, and shall continue through the cycle of testing and adjustment until the assembly achieves a uniform impression.
- Hydrostatic testing shall include a test apparatus capable of providing a pressure head of 10 feet minimum to 40 feet maximum.
- Hydrostatic testing for hatch and ballast port assemblies shall consist of each assembly being temporarily installed in a test apparatus and 10 feet of pressure head being applied to the top of the assembly such that compression is induced on the gasket, and all leaks shall be noted. The pressure head shall be removed and the assembly shall be adjusted or repaired as required to address all leaks noted. Each assembly shall continue through the cycle of hydrostatic testing and adjustments until the assembly completes one hour of testing under the specified head with no detected leaks.
- Hydrostatic testing for door assemblies shall consist of each watertight door assembly being temporarily installed in the test apparatus and pressure head being applied to the side of the door assembly such that tension is induced on the gasket, and all leaks shall be noted. The amount of pressure head depends on the vertical distance directly above the centerline of the door frame threshold to the top of Pontoon deck slab. Refer to the Pontoon Minimum Technical Requirements (Appendix M22) for locations of door thresholds. All doors with wall blockout thresholds less than or equal to 15-feet vertical distance below top of Pontoon deck slab shall be tested to 20-feet pressure head. All doors with frame thresholds more than 15-feet vertical distance below top of Pontoon deck slab shall be tested to 40-feet pressure head.

After Installation in Pontoon:

The Design-Builder shall verify watertight hatch and door assembly gasket impression testing after final installation into a Pontoon using the method outlined above.

#### 2.12.5.10.14 Pontoon and Elevated Structure Surveying

The Design-Builder shall maintain detailed survey records, including a description of the work performed on each shift, the methods utilized to conduct the survey, and the control points used. The record shall be of sufficient detail to allow the survey to be reproduced. A copy of each day's survey record shall be submitted to WSDOT within three working days after the end of the shift. The Design-Builder shall compile the survey information in an electronic file format acceptable to the WSDOT (Excel spreadsheet format).

Surveying of the Pontoon System and Elevated Structure shall conform to the following requirements:

- Surveying shall be performed using Leica TDM5000 and Leica TDM5005 total station instruments. These instruments have separate horizontal and vertical drives that allow the reference plane to be floating, moving, and rotating as long as the surface itself is not bending or flexing within the area defined by toe control orientation. WSDOT owns these instruments and they will be made available for the Design-Builder's use.
- An initial master control shall be established early in the Project when the Pontoons are in the best neutral ballast position. This shall be done on a day when only the survey team is on the structure. A master position and meridian shall be selected and the plane made to best-fit the freeboard measurements taken in the neutral ballast position.
- If poor orientation values occur, the Design-Builder shall review the variables involved, resurvey the control, add extra control, or find the weakness in a particular control point methodology within the orientation.
- Field procedures should be instituted to constrain the limits of the area in which each survey effort is performed in order to avoid problems of Pontoon deflection and flexing.
- No survey work shall be performed outside the orientation box, to negate or minimize the effect of Pontoon deflection. If necessary the survey control area should be minimized to obtain acceptable RMS values in orientation.
- The survey control shall be translated up to the bridge deck level using periscopes and placing benchmarks to shoot the grade to the tops of the columns, crossbeams, trusses, etc.
- Verification of the height of the roadway shall be performed by taking rapid measurements between the Pontoon deck and roadway in order to minimize the effect of wind and wave action on the readings.

#### 2.12.5.10.14.1 Pontoon System Surveying

The Pontoon System shall be surveyed at all times required in this section, including the Pontoon Ballasting section.

Surveying of the Pontoon System shall conform to the following additional requirements:

- Reference planes shall be established for each Pontoon.
- Pontoon surveys shall include data points at each survey marker shown in State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22) at a minimum.
- Pontoon freeboard shall be measured adjacent to all survey markers shown in State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22).

#### 2.12.5.10.14.2 Elevated Structure Surveying

Prior to placement of cast-in-place bridge deck falsework and/or placement of modified concrete overlay, the Design-Builder shall survey all bridge deck elements. Survey data points shall be on the top surface at the centerline of girders and/or at all lane lines for precast bridge deck elements. The survey data points shall be spaced parallel to the profile grade line at no greater than 15 feet centers. Data points shall also be taken at all precast joints and expansion joints.

Following placement of cast-in-place bridge deck falsework and/or placement of modified concrete overlay, the Design-Builder shall survey the roadway surface for final acceptance. Survey data points shall be collected at 15 foot station intervals, and also at the centerline of each bridge expansion joint. Survey information collected shall include station, offset, and elevation for each lane line and curb line. The survey shall extend 100 feet beyond the bridge back of pavement seats of the Transition Spans.

Surveying of the Elevated Structure shall conform to the following additional requirements:

- The Design-Builder shall ensure a surveying accuracy to within plus/minus 0.01 feet for vertical control and plus/minus 0.2 feet for horizontal control.

### 2.12.5.10.15 Survey Markers for Pontoons

Brass disc survey markers conforming to WSDOT Standard Plan A-10.20-00 (Appendix D17) will be furnished by WSDOT to the Design-Builder. The Design-Builder shall install the survey markers at the locations shown in the Pontoon Minimum Technical Requirements (Appendix M22), or as otherwise specified by WSDOT to avoid conflicts with other Pontoon attachments. The survey markers shall be placed symmetrically at about the centerline of the Pontoon, and shall be cast into the Pontoon top slab in accordance with WSDOT Standard Plan A-10.20-00 details for concrete installation. All survey markers for each Pontoon shall be set within the same horizontal plane plus/minus 0.01 feet. The Design-Builder shall survey the locations of the survey markers, vertically and horizontally. The horizontal position shall be relative to one Pontoon corner. The Design-Builder shall furnish a copy of this vertical and horizontal survey to WSDOT. Survey markers shall be either cast-in-place, or shall be after-set with epoxy grout in formed grout pockets at the Design-Builder's option.

### 2.12.5.10.16 Pontoon Monitoring System

The Design-Builder shall furnish and install a Pontoon monitoring system in each launched Pontoon in accordance with this section. This system is in addition to the manual Pontoon monitoring requirements specified elsewhere in this section. The

system shall detect leaks and changes in trim along any axis in the launched Pontoons. The system shall be capable of operating without the assistance of land-side power, shall have built-in redundancy, and shall include an alarm system to detect malfunctions or problems with the monitoring system.

### 2.12.5.11 CONSTRUCTION LOAD RESTRICTIONS ON PONTOONS

The Design-Builder shall not store construction materials on the catwalks and platforms on and within the Pontoons at any time.

The Design-Builder may store construction materials and operate construction equipment on the top deck of the Pontoons, subject to the following conditions:

- Loadings shall be less than the Pontoon capacity at all times. The Structural Lead Engineer shall verify the structural loadings and capacities and submit sealed calculations to WSDOT for review and approval.
- The Design-Builder shall not store construction materials or operate construction equipment within eight feet of an anchor cable wall. The Design-Builder shall install a temporary highly visible marking that says "ANCHOR CABLE WALL – NO CONSTRUCTION LOADS" at the location of each anchor cable wall.
- The loads on the top of the Pontoon deck slab within the area bounded by the supporting transverse and longitudinal Pontoon walls shall be limited to the loading specified in State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22). This loading shall not be applied until after the Pontoon has been post-tensioned.
- The Design-Builder shall not store unsecured construction material and shall not leave unsecured construction equipment on the Pontoons in Lake Washington during the Winter Storm Period.

#### 2.12.5.11.1 Pontoon Handling

The Design-Builder shall verify the capacity of the Pontoons as described in this section for all Pontoon Handling operations. Handling operations shall include, but not be limited to, the following:

- Launching;
- Towing;
- Temporary moorage;
- Assembly;
- Elevated Structure construction; and
- Ballasting operations.

For Pontoon Handling, the tensile stress in the mild reinforcing steel shall not be overstressed. Overstress shall be defined as any loading condition including impact that creates a tension stress in the mild reinforcement of the Pontoon hull exceeding 14,000 psi. Overstress in the Pontoon joints after assembly shall be defined as any loading which causes net tension stress or a compression stress greater than the allowable in the joint.

The Pontoon launching draft shall be based upon the weight of the basic intact Pontoon structure plus the weight of temporary ballast required to ensure the Pontoon floats level.

Pontoons shall not be launched until completion of all concreting, post-tensioning and grouting; the grouting of all form tie holes; and final sealing of the prestressed anchor recesses. All concrete, grout, waterproofing and post-tensioning fills and closures shall have a 10-day minimum wet cure before being exposed to salt water during launch. At launching, all Pontoon concrete shall have a minimum compressive strength of 7,000 psi.

At launching, all grout shall have a minimum compressive strength of 5,000 psi. and shall be in conformance with Section 6-02.3(7) of the WSDOT Standard Specifications (Appendix D18).

Hatches shall be in place and sealed and all exterior wall openings plugged or covered with watertight bulkheads before launching, and these plugs and bulkheads shall remain in place.

Draft boards shall be installed on each side of each corner of each Pontoon for a total of eight draft boards per Pontoon. Each one-foot increment shall be marked with bold numerals, and quarter-foot increments shall be clearly marked with a black and white checkerboard pattern. Numerals on the draft boards shall correlate with the actual Pontoon draft. The draft boards shall mark the draft from 10 feet to 20 feet of total draft. Draft boards shall be completely installed on the Pontoon before the Pontoon is launched.

The Design-Builder shall submit sufficient data and calculations to WSDOT for review and approval to demonstrate that the proposed method of launching will not overstress the Pontoons. The bottom of the Pontoon hull shall float one foot minimum above the casting basin or launch platform floor, taking into account the list and trim of the Pontoon. The maximum difference in freeboard between opposing sides (both longitudinal and transverse) of the Pontoons during launching shall be less than six inches. Each Pontoon shall be inspected by the Marine Lead Engineer to certify that the Pontoons are seaworthy and in conformance with the drawings and specifications immediately prior to Pontoon launch.

The Design-Builder shall provide all additional reinforcement and post-tensioning in the Pontoons, and all inserts for all required auxiliary buoyancy attachments, required for the Design-Builder's method of launching.

Refer to Pontoon Minimum Technical Requirements (Appendix M22) for definitions of the Pontoon types. The estimated float-out drafts of each Pontoon type for fresh and salt water are listed in Table 7 below:

**Table 7. Estimated Float-Out Drafts**

| Pontoon Type | Estimated Float-Out Freshwater (Ft) | Draft Saltwater (Ft) | Estimated Ballast to Meet List and Trim Requirements (Ton) |
|---|---|---|---|
| Type 2 | 18.5 | 18.1 | 109 |
| Type 5 | 17.0 | 16.6 | 143 |
| Type 6 | 15.3 | 14.9 | 146 |

The estimated float-out draft listed above includes the following elements, as shown in the Pontoon Minimum Technical Requirements (Appendix M22):

- Structural elements (concrete, steel reinforcing bars, etc.);
- Attachments such as hatches, catwalks and other hardware; and
- Ballast to meet trim and list requirements.

The Design-Builder shall submit detailed structural calculations using a 3D finite element program to WSDOT for review and approval to demonstrate that all Pontoon Handling; including each stage of ballasting, Pontoon assembly, anchor cable installation and stressing, and Elevated Structure erection; will not overstress the Pontoons or their connections. The calculations shall be consistent with the ballast calculations described in Section 2.12.5.14.

## 2.12.5.12 PONTOON JOINTS

The Design-Builder shall furnish and install all required Pontoon joints. The Design-Builder shall not join Pontoons during the Winter Storm Period, except that joining of Pontoons may be done during the Winter Storm Period at an offsite assembly area provided it has adequate protection to ensure no relative joint movement during assembly due to wind and waves. Waves may be due to wind exposure or passing vessels.

### 2.12.5.12.1.1 Assembly Bolts

The Design-Builder shall furnish and install Pontoon joint Assembly Bolts in accordance with the Outfitting and Assembly Minimum Technical Requirements (Appendix M23).

The Design-Builder shall submit an Assembly Bolt Tensioning Plan to WSDOT for approval. It shall include, but not be limited to the following:

1. Method and equipment used to control and contain water leakage, and to remove water from the Pontoon cells. The method and equipment specified must be a 24 hour/7 days a week plan to assure the safe and complete Pontoon joint assembly, water leakage detection, and emergency response to any leakage, until the associated Pontoon joint is grouted, grout achieves required strength, and all joint bolts are installed and tightened.
2. The sequence of placing the bolts.
3. Method and equipment used to calibrate the hydraulic jacks used for tensioning the bolts.
4. Methods used to prevent and correct binding of bolt and nut threads due to tensioning the bolts.
5. The bolt tensioning procedure, including initial tensioning, final tensioning, and method to verify bolt tension.
6. Method and equipment used to grout the bolts, including provisions for grouting bolt holes with water flow under a head pressure associated with the lowest bolt location.
7. Method and equipment used to repair damage to painted and galvanized surfaces.
8. Method and equipment used to clean and paint the completed installation of assembly bolts, bearing plates, fasteners, etc.

The Design-Builder shall not begin Pontoon joint Assembly Bolt installation until receiving WSDOT approval of the Assembly Bolt Tensioning Plan. The Design-Builder

shall not install Assembly Bolts in a cell without the presence of an operating pump in the cell.

Assembly Bolt threads shall be protected against damage during handling, storage and installation. The Design-Builder shall protect the bolts, bearing plates, nuts, and washers from corrosion. The Design-Builder shall replace all bolts that exhibit corrosion prior to installation. All damage to the primer coat shall be repaired and repair area shall be completely dry prior to installation.

Bolt and nut thread tolerances shall be compatible with the specified tensioning method. The Design-Builder is advised that tensioning the bolts with hydraulic jacks may cause binding between the bolt and nut threads when the bolt elongates. This binding can be aggravated when the taps and dies used are worn, the bolt threads are cut near the upper tolerance limit, and the nut threads are cut near the lower tolerance limit. Bolt/nut tolerance compatibility shall be required to assure smooth bolt installation.

#### *2.12.5.12.1.1.1 Tensioning the Bolts*

The Design-Builder shall tension the bolts with center hole ram hydraulic jacks. The jacks and gauges shall be certified in accordance with Section 6-02.3(26)G of the WSDOT Standard Specifications (Appendix D18).

The stressing procedure shall account for seating losses resulting from the take up of the nut, washer, and bearing plate. The temporary bolt force required to overcome seating losses of the nut, washer, and bearing plate shall be determined during the calibration of the hydraulic jack.

The maximum bolt force during the tensioning procedure shall not exceed 1.05 times the final bolt load specified in the plans. The final bolt force after seating losses shall be within plus/minus two percent of the final load shown in the Final Design Documents. The method used to tighten the nut shall not deviate from the method used during the calibration procedure. If the bolt tightening method needs to be revised, the hydraulic jack shall be recalibrated using the revised bolt tightening method. Hydraulic jacks shall be recalibrated and tested after every repair or adjustment of the hydraulic jack or the nut tightening equipment, and after completing each bolted joint.

The hydraulic jacks to be used shall be calibrated by tensioning bolts of the same size and material as to be used in the bolted joint in a test frame. The test frame shall measure the actual force in the test bolt and elongation of the test bolt. The Design-Builder shall follow the bolt tensioning procedure, specified in the Assembly Bolt Tensioning Plan as approved by WSDOT when calibrating the hydraulic jacks. The force in the bolt shall be measured using a certified load cell located at the opposite end of the bolt from the hydraulic jack being calibrated. A minimum of five tests shall be performed for each hydraulic jack being calibrated.

All nuts, washers, bearing plates and bolts used for calibration shall be new, clean, and lubricated. Nuts and washers may be used for two of the tests required for each calibration before being replaced. Nuts, bolts, bearing plates and washers used for calibration shall become the property of the Design-Builder and shall not be reused in the bolted joints.

Samples of the bolts shall be submitted to WSDOT for testing. The number of bolts submitted per lot shall be as specified in Section 9-06.5(3) of the WSDOT Standard Specifications (Appendix D18). The lot size shall not be less than six. These bolts shall not be installed in the final structure.

#### *2.12.5.12.1.1.2 Grouting and Painting*

Assembly Bolts shall be grouted after installation and tensioning. Grout and grouting procedures shall be as indicated in accordance with the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). After grouting, the exposed surfaces of the bolts, bearing plates, nuts, washers, and embedded steel plate shall be cleaned, the shop coat or primer applied or repaired as required, and the surfaces painted in accordance with Section 6-07.3(9) of the WSDOT Standard Specifications (Appendix D18). Galvanized surfaces need not be cleaned to bare metal, but shall be free of all other foreign material.

### 2.12.5.12.1.2 Pontoon Assembly Tendons

The Design-Builder shall furnish prestressed steel tendons as indicated in accordance with the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). In addition, the tendons shall be tensioned as indicated in accordance with the Outfitting and Assembly Minimum Technical Requirements.

### 2.12.5.12.1.3 Pontoon Joint Seal

The Design-Builder shall provide closed cell rubber sealing strips for Pontoons as indicated in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). Rubber sealing strip shall be manufactured of new general-purpose synthetic or natural rubber. The Design-Builder shall test the seal before installation.

### 2.12.5.12.1.4 Neoprene Sheets

The Design-Builder shall provide neoprene sheets at the Pontoon joints as indicated in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23).

Neoprene sheets shall be protected from sunlight and other elements prior to grouting the Pontoon joint. Neoprene sheets and adhesive used to form the voids shall be compatible with the Pontoon concrete and joint grout. The Design-Builder shall submit the proposed method of forming the filled voids for review and approval by WSDOT.

### 2.12.5.12.1.5 Joint Grout

Joint grout shall conform to the following requirements:

- Cement Type II or Type III – 800 pounds per cubic yard conforming to Section 9-01.2(3) of the WSDOT Standard Specifications (Appendix D18).
- Coarse Aggregate – 3/8-inch maximum.
- Sand – To be at least 45 percent of total aggregate.
- W/C Ratio - 0.42 maximum.
- Water-reducing admixture – either conventional or superplasticizer.
- No air-entrainment.
- Pozzolan conforming to Section 9-23.9 of the WSDOT Standard Specifications, up to 100-pounds per cubic yard (optional).
- The minimum ultimate 28-day compressive strength of the grout shall be 7,500-pounds per square inch.

### 2.12.5.12.2 Pontoon Joint Mockup

The Design-Builder shall construct a test section of the typical Pontoon joint consisting of two walls of concrete 28.5 feet high by 18 inches wide, three inches apart, and having one simulated anchorage pocket, with a continuous rubber seal around the sides and bottom. The Design-Builder shall demonstrate the ability to place grout without undue segregation, and to completely fill the void between the test slabs, by performing concrete coring at locations selected by WSDOT. Up to 10 cores may be required.

## 2.12.5.13 PONTOON ASSEMBLY

The Design-Builder shall connect all Pontoons in accordance with the construction process working drawing submittals for the Pontoon assembly process in this section, and as follows:

- It shall be the Design-Builder's responsibility to bring the Pontoons together and to provide a means for holding the Pontoons in approximate alignment until they are securely assembled. There shall be no relative movement between the ends of the Pontoons being joined during joining operations. A joint clamping force shall be applied to the joint, and adjustable flat jacks shall maintain a fixed-width joint (three inches nominal). The term "no relative movement" shall mean that the Pontoon ends shall be held sufficiently tight so that no tensile or shearing strain cracks in the joint thickness will occur from the time of joint clamping, through grouting and grout curing, and through final tensioning of the structural connections. The Design-Builder shall provide the joint clamping force and the alignment devices to accomplish this requirement.
- Within 5 Calendar Days prior to connecting adjoining Pontoons together, the Pontoon end wall or side wall concrete surfaces forming the Pontoon joint shall, in a dewatered setting, be cleaned of marine growth and film, and the surfaces prepared and roughened in accordance with Section 6-02.3(12)B of the WSDOT Standard Specifications (Appendix D18).
- All rubber seals and neoprene sheets shall be fastened and adhered to the Pontoon joint after the joint has been cleaned of marine growth and while in the dewatered setting. The Perimeter Rubber Seal for the joint shall be installed in position in the groove provided and fastened to the concrete with Type 316L stainless bolts and an adhesive as recommended by the manufacturer of the rubber seal. The continuous rubber seal shall form the seal against the entrance of water and escape of grout as the connections are being dewatered, flushed, and grouted for joining.
- All joint components shall be protected from damage due to winds and waves, flotsam debris, ultraviolet radiation, and towing and handling operations.
- After cleaning and installation of the seals and neoprene sheets, the Pontoons shall be aligned and relative joint movements shall be restrained. The joints shall then be dewatered and all leaks shall be sealed from allowing water into the joint cavity. Before grouting operations commence, the assembled joint shall be checked and cleaned of all laitance, debris or scum.
- During placement of grout, the grout shall be vibrated with internal pencil vibrators.

- Concrete placement pressure shall be determined in accordance with Section 6-02.3(17)J of the WSDOT Standard Specifications (Appendix D18) and shall not exceed a placement rate of six feet per hour.
- The top surface of the Pontoon joint grout shall be prepared by one of the following two methods:
  - After placing the grout flush with the adjacent Pontoon top deck surface, but before final set, the top surface of the grout that has been altered by bleed shall be removed, replaced with fresh grout, and vibrated to intermix the fresh grout to the remaining grout at the interface.
  - After forming and grouting the Pontoon joint a sufficient height above the plane of the adjacent Pontoon top deck surface to ensure that the grout bleed zone is entirely above the Pontoon top deck surface, the grouted Pontoon joint shall be struck off at the plane of the Pontoon top deck surface after all bleeding has ceased.
- The Design-Builder shall not assemble Pontoons during the Winter Storm Period except; joining of Pontoons may be done during the Winter Storm Period at an offsite assembly area provided it has adequate protection to ensure no relative joint movement during assembly due to wind and waves. Waves may be due to wind exposure or passing vessels.

### 2.12.5.14 PONTOON BALLASTING

The Design-Builder shall ballast all Pontoons as required. Pontoon ballasting shall be performed with the goal of preventing unnecessary locked-in stresses in the Pontoons and Elevated Structure in the final configuration while maintaining proper structure geometry. These operations consist of using temporary ballast during float-out, towing, Pontoon joining, Elevated Structure construction, and an interim balanced floating condition. The temporary ballast shall be replaced with permanent ballast for the final balanced floating condition.

All ballast calculations shall be the responsibility of the Design-Builder and shall be prepared by the Marine Lead Engineer. The Design-Builder shall perform ballasting calculations using a finite element program to analyze the Pontoon(s) as a beam on an elastic foundation in 3D. The analysis shall take into account load sharing among interconnected Pontoons in the assembled condition. The analyses needed for planning and the associated ballasting operations will have different requirements at various stages of work. In some cases, stability analyses will be needed, and others require more detailed structural evaluation, such as identifying loading conditions associated with the Pontoon System. All ballasting operations shall be performed by the Design-Builder.

The Design-Builder should note that Pontoon ballasting may be a highly iterative process, and the Design-Builder shall schedule the Work accordingly. Ballasting operations and adjustments may be required at nearly all stages of the Project due to the different loading conditions the Pontoons may experience.

See the Outfitting and Assembly Minimum Technical Requirements (Appendix M23) for allowable ballasting cell locations. Ballasting will not be permitted in any cells unless expressly indicated in the Outfitting and Assembly Minimum Technical Requirements.

### 2.12.5.14.1 Temporary Ballast

Temporary ballast shall be potable water conforming to Section 9-25.1, or shall be washed dry-surface gravel conforming to Section 9-03.12(4) of the WSDOT Standard Specifications (Appendix D18). Water and gravel ballast shall not be used simultaneously in the same Pontoon cell. Saltwater shall not be used for temporary ballast. The maximum height of temporary ballast in any Pontoon cell shall be as indicated in Appendices M11 and M22. In addition, the maximum height of temporary ballast in Pontoon cells with electrical or mechanical equipment shall be two feet minimum beneath the equipment. The method of distributing temporary ballast shall be in accordance with the Pontoon Ballasting Plan as reviewed and approved by WSDOT.

### 2.12.5.14.2 Permanent Ballast

Permanent ballast is defined as ballast remaining after construction is complete. The Design-Builder shall use washed dry-surface gravel conforming to Section 9-03.12(4) of the WSDOT Standard Specifications (Appendix D18) for the permanent ballast. Freshwater or saltwater shall not be used as permanent ballast. The maximum height of permanent ballast in any Pontoon cell shall be as indicated in Appendix M23. In addition, the maximum height of permanent ballast in Pontoon cells with electrical or mechanical equipment shall be a minimum of two feet beneath the equipment. The Design-Builder shall install the permanent ballast uniformly over the bottom of the Pontoon cells, level to within a tolerance of six inches over the maximum wall-to-wall dimension in any cell. The method of distributing permanent ballast shall be in accordance with the Pontoon Ballasting Plan as reviewed and approved by WSDOT.

Permanent ballast shall include reserve ballast. Reserve ballast shall be provided that equilibrates three inches of Pontoon displacement. The distribution of reserve ballast in the cells shall be recorded so that the reserve ballast can be removed (by others) in the future as necessary to increase freeboard, without changing trim or list.

### 2.12.5.14.3 Pontoon Ballast Logbook

Starting from the time of float out of PPDB and from time of acceptance of PFS until completion of construction of the Floating Bridge, the Design-Builder shall create and maintain a logbook of all ballast quantities, type, locations, purpose and date of adjustment for the duration of the Project. The Design-Builder shall also record all required measurements (freeboard dimensions, roadway surface and Pontoon top deck differences), along with the corresponding date and time, for all construction, interim and final ballast adjustments.

For each construction, interim and final ballast adjustment, the Design-Builder shall record the major completed items of work that affect the weight, balance and geometry of the Pontoons. The logbook shall be available for WSDOT to review at all times. PFS may contain existing ballast at the time of delivery. The Design-Builder shall measure and record the amount and cell locations of all existing ballast. Measurements of the existing ballast, and the existing floating condition of the Pontoons, shall be made prior to beginning any other work on the Pontoons, and shall be entered into the Pontoon ballasting logbook as the current condition.

### 2.12.5.14.4 Schedule of Ballasting Work

The Design-Builder shall not begin Pontoon ballasting work until receiving WSDOT's approval of the Pontoon Ballasting Plan. The Design-Builder shall measure the

clearances, roadway and Pontoon surface vertical differences, and freeboard dimensions only when reasonably calm weather conditions are occurring (wind speeds less than 10 miles per hour). All freeboard measurements shall be performed utilizing special precaution and equipment to account for variations due to water surface disturbances. The Design-Builder shall obtain WSDOT's approval that satisfactory weather conditions exist before proceeding with such measurements. There shall be no construction live load on the Pontoons during all measuring operations.

### 2.12.5.14.5 Pontoon Reference Geometry

Prior to joining the Pontoons or constructing the Elevated Structure, the Design-Builder shall ballast Pontoons with temporary ballast in order to establish reference geometries for all Pontoons. These operations shall be performed for all Pontoons, including PFS. The ballasted Pontoons shall meet the geometric tolerances shown in State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22). The difference in freeboard between opposing sides (both longitudinal and transverse) of each individual Pontoon shall be less than one-half inch. The Design-Builder shall determine Pontoon geometry by taking measurements at all survey markers shown in State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and Pontoon Minimum Technical Requirements (Appendix M22). Freeboard shall also be measured at all survey markers. The Pontoon Ballasting Plan shall include anticipated cell locations and quantities of temporary ballast required to meet the geometric requirements.

When any modifications to ballast are made, the Design-Builder shall tabulate the measurements in the logbook, submit the data to WSDOT, and repeat the process of making adjustments and determining the floating condition of the Pontoons until acceptable Pontoon reference geometries have been established. The Marine Lead Engineer shall provide guidance in making ballast adjustments to the Pontoons to reach the appropriate floating condition. Ballast models developed by the Marine Lead Engineer shall model the Pontoons as a beam on an elastic foundation in three dimensions with the appropriate structural and hydraulic properties.

Joining of Pontoons and/or construction of the Elevated Structure shall not begin until WSDOT has approved the Pontoon reference geometry.

### 2.12.5.14.6 Ballasting During Construction

Pontoons shall maintain the reference geometry during Pontoon joining. The difference in freeboard between opposing sides (both longitudinal and transverse) of each individual Pontoon shall be less than one-half inch. In addition, the difference in freeboard between adjoining Pontoons shall be less than one-half inch during joining operations. No excessive point loads shall be applied to the Pontoons during joining operations. Within two weeks prior to joining, the Design-Builder shall survey the Pontoons to verify that the reference geometry and freeboard difference limitations have been maintained. These measurements shall be taken in the same manner used to establish the reference geometry. The Design-Builder shall tabulate the measurements and submit them to WSDOT for review and approval. Joining of Pontoons shall not occur until WSDOT has approved the pre-joining Pontoon geometries.

Following joining of the Pontoons, the Design-Builder shall again survey the Pontoons in the same manner as performed prior to assembly. The Design-Builder shall tabulate the measurements and submit the data to WSDOT for review and approval.

Prior to Elevated Structure construction, the Design-Builder shall calculate revised column heights based on the Pontoon reference geometry. The trusses, columns, and crossbeams shall then be constructed to the calculated heights and shall conform to the appropriate construction tolerances. The Pontoons shall then be re-ballasted to accommodate additional Elevated Structure construction. Any construction operation or sequencing that warps or alters the geometry of the Pontoons shall be addressed in the Pontoon Ballasting Plan in order to prevent locked-in stresses due to Elevated Structure distortions in the interim and final balanced floating conditions.

The Pontoon ballasting shall be sequenced to accommodate the concrete placement sequence. In addition, the Design-Builder shall verify the stability of the Pontoon System for all construction loading conditions.

The Design-Builder shall perform ballasting operations if, at any time during the Elevated Structure construction, the difference in freeboard on opposing sides of the Pontoons is greater than two inches, or the hog and sag of the Pontoons is greater than two inches over 360 feet. The Design-Builder shall pre-ballast the Pontoon before commencing any out-of-balance operation that will result in a change in freeboard on opposing sides of the Pontoon of greater than two inches. The pre-ballast shall be placed eccentrically to cause a countering moment of at least 50 percent of the out-of-balance operation.

When any modifications to ballast are made, the Design-Builder shall tabulate the measurements in the logbook, submit the data to WSDOT, and repeat the process of making adjustments and determining the floating condition of the Pontoons until an interim balanced floating condition is reached as defined in this section. The Marine Lead Engineer shall provide assistance in making ballast adjustments to the Pontoons to reach the appropriate balanced floating condition.

### 2.12.5.14.7 INTENTIONALLY OMITTED

### 2.12.5.14.8 Ballasting for the Final Balanced Floating Condition

The final balanced floating condition is defined to include all of the following conditions when measured at an ambient temperature of 50°F:

- Use of permanent ballast only.
- Maintain Pontoon reference geometry: All Pontoon geometric measurements shall be within one-quarter inch of those measured in the reference geometry and the difference in freeboard between opposing sides (both longitudinal and transverse) of each individual Pontoon shall be less than one-half inch.
- All bridge elements meet the requirements of this section.
- Final Pontoon Freeboard shall be within one inch of the design freeboard.

The Design-Builder shall determine the necessary locations and quantities of permanent ballast, and shall submit the information to WSDOT. Removal of temporary ballast or placement of permanent ballast shall not begin until WSDOT has approved the proposed permanent ballast locations and quantities.

The Design-Builder shall remove all visible temporary ballast (defined as all water that can be removed with a commercial wet/dry vacuum) from a Pontoon cell before installing permanent ballast in that cell.

The Design-Builder shall perform the work in such a manner as to maintain the vertical differences between roadway surfaces and Pontoon top deck surfaces. The Design-Builder shall check the freeboard dimensions, roadway surface vertical differences and Pontoon top deck surface vertical differences during the ballast replacement process. The Design-Builder shall submit copies of each set of the recorded measurements specified to WSDOT, and shall record all measurements in the Pontoon ballasting logbook.

After removing all temporary ballast, and adding and adjusting all permanent ballast, the Design-Builder shall measure the freeboard dimensions and roadway surface and Pontoon top deck vertical differences as specified, compare the results to the specified tolerances for the final balanced floating condition, tabulate the results in the logbook, and submit copies to WSDOT.

The Design-Builder shall repeat the process of making permanent ballast adjustments and determining the floating condition of the Pontoons, until a final balanced floating condition is reached as approved by WSDOT.

The Design-Builder shall comply with state water quality standards, the requirements of Section 2.8, and shall obtain necessary discharge permits for disposing of temporary ballast into Lake Washington.

### 2.12.5.15 TEMPORARY ANCHORAGE SYSTEM

The Design-Builder shall design, construct and install temporary anchorage systems as necessary to construct the Floating Bridge. The temporary anchorage systems shall meet the following requirements:

- Resist the 20-YRP storm loads with construction live loads.

### 2.12.5.16 ANCHORAGE SYSTEM

#### 2.12.5.16.1 Anchor Cable Material Requirements

Anchor cables shall be pre-stretched structural strand, with Class C coated outer wires and Class A coated inner wires, conforming to ASTM A586. The strand shall be composed of the minimum number of individual wires of maximum diameter as recommended by the manufacturer. The strand shall be pre-stretched to attain a minimum modulus of elasticity of 22,000,000 psi in accordance with the requirements of ASTM A586. The cable diameter shall be 3-1/8 inches. Splices or joints will not be permitted in any length of strand, except as specified in ASTM A586.

The strand shall be thoroughly coated during the stranding operation with the specified fluid film corrosion control system, in accordance with the fluid film manufacturer's recommendations. The fluid film corrosion control system shall be Fluid Film Liquid A as manufactured by Eureka Chemical Company, P.O. Box 2205, South San Francisco, CA 94080, www.fluid-film.com.

#### 2.12.5.16.2 Anchor Cable Strand Socket Material Requirements

Steel castings for anchor cable strand sockets shall conform to ASTM A148, including supplemental requirements S1 and S2, and shall be galvanized in accordance with AASHTO M 232. The pin holes in the socket shall be sized to accommodate the pins after galvanizing.

The standards of acceptability for radiographic inspection shall be in accordance with ASTM Reference Radiographs E446 and E186 Level 3 for Category A, B and C

discontinuities. Category D, E, F and G discontinuities will not be acceptable. Radiographs shall be made by x-ray or gamma ray.

The standards for acceptability for magnetic particle inspection shall be in accordance with ASTM Reference Photographs E125 degree 3 for Type III and IV discontinuities. Type I or II discontinuities will not be acceptable. Castings with unacceptable discontinuities will be rejected, and shall be recast or repaired.

Personnel performing radiographic testing shall be qualified in accordance with the American Society for Nondestructive Testing's Recommended Practice No. SNT-TC-1A and its Supplement A Radiographic Testing Method.

Socket filler material shall be either zinc (high grade or better) conforming to ASTM B6, or a thermoset resin approved by the Structural Lead Engineer.

### 2.12.5.16.3 Anchor Cable Testing, Shipping, and Handling

The Design-Builder shall test each strand for minimum breaking strength in accordance with the requirements of ASTM A586. After testing each strand for minimum breaking strength, the Design-Builder shall test one sample of each strand for modulus of elasticity in accordance with the requirements of ASTM A586. The Design-Builder shall socket the ends of the test samples with the same type of strand socket, and following the same socketing procedure, as specified for the permanent installation. Strand sockets used for testing shall not be reused in the permanent installation.

After the anchor cable has been pre-stretched, the longitudinal axis of each anchor cable shall be durably marked continuously for the full length of the anchor cable, and the cable length shall be durably marked with a single circumferential stripe, beginning at the anchor end strand socket and at 50-foot intervals towards the Pontoon end of the anchor cable. The color of the stripes, when dry, shall match Federal Standard 595, Color No. 22510.

The Design-Builder shall ensure that the methods of coiling, shipping and handling the strand shall not permanently deform the strand wires. The Design-Builder shall ship the strand on reels with a minimum reel diameter of 25 times the strand diameter. Each reel of strand shall be wrapped with waterproofing paper and covered with timber lagging. Each individual anchor cable shall be coiled full-length on separate reels, with each reel clearly marked with the appropriate anchor cable designation and strand length.

The Design-Builder may socket one end of the strand prior to shipping. If socketing one end of the strand prior to shipping, the Design-Builder shall remove all cable dressing in the vicinity of the socket by either a degreasing solvent approved by the Structural Lead Engineer or by ultrasonic cleaning methods performed under shop conditions.

The method of socketing the anchor cable shall be in accordance with the *Wire Rope User's Manual*– 2005, published by the Wire Rope Technical Board, 801 N Fairfax Street, Suite 211, Alexandria, VA 22314-1757, Phone: (703) 299-8550, FAX: (703) 299-9253, www.domesticwirerope.org/wrtb/.

### 2.12.5.16.4 Anchor Cable Socket Testing

The Design-Builder shall test the socketing procedure specified in the Pontoon Anchor Installation and Testing Plan in this section. WSDOT will select two strand socket castings for testing by the Design-Builder from the lot of strand socket castings cast for this Project.

The Design-Builder shall remove a sufficient length of structural strand from a roll of anchor cable strand from this Project to socket both ends with the selected test strand socket castings. The Design-Builder shall socket both ends of the anchor cable in accordance with the socketing procedure specified in the Pontoon Anchor Installation and Testing Plan. The Design-Builder shall select an independent testing laboratory to apply a test load to the socketed test anchor cable. The Design-Builder shall apply a test load equal to the minimum guaranteed ultimate strength of the anchor cable to the socketed test anchor cable. The Design-Builder shall submit the independent testing laboratory's report on the test results to WSDOT for review and comment.

### 2.12.5.16.5 Anchor Gallery Hardware

Anchor Gallery Hardware shall include the following and shall be constructed as specified in this section and Outfitting and Assembly Minimum Technical Requirements (Appendix M23):

- cable guide bushing
- port cover
- saddle assembly
- cable socket
- cable pin
- cable crosshead
- tensioning rod
- jacking crosshead
- shims
- hydraulic ram
- pump

The cable bushing shall allow for changes in the angle of the anchor cable as it leaves the Pontoon. The cable groove may be cast or machined. The Design-Builder shall submit a procedure for accurately fabricating the bushing to the required diameter (to an accuracy of 0.001 inch) to WSDOT for review and comment. This procedure shall account for expansion of the bushing material.

The saddle assembly shall consist of a shoe and a base. Both shall be cast steel with a PTFE sheet between the two. The PTFE sheet shall bear on a stainless steel sheet welded to the saddle base. The saddle assembly shall be as described herein:

- The PTFE shall be composed of 100 percent virgin (unfilled) polytetrafluoroethylene polymer chemically bonded to a rigid confining sole plate. The sole plate shall limit the flow (elongation) of the confined PTFE to not more than 0.009 inch under a load of 2,000 psi. for 15 minutes at 78°F for a two-inch by three-inch test sample. The PTFE shall meet the requirements of ASTM D 4894. The specific gravity of the PTFE shall be between 2.13 and 2.19 and the melting point 623°F plus or minus two °F. The PTFE shall be bonded to the sole plate with an epoxy resin and shall be bonded under factory controlled conditions.
- The stainless steel thickness for the plate welded to the saddle base shall meet ASTM A 240 Type 304 specifications and have a number 8 mirror finish on the side in contact with the PTFE. The reverse side shall be welded to the bearing

plate. The stainless steel sheet shall be structurally bonded to the bearing plate by an approved adhesive system before welding.

- Welding of the sole plate which has the bonded PTFE sheet shall be performed in such a manner as to restrict the maximum temperature reached by the bond area to less than 300 °F as determined by temperature indicating wax pencils or other suitable means.
- The sliding surface of the PTFE shall have a thin coat of silicon grease applied before installation.

The Design-Builder may modify the dimensions of the socket shown in Appendix M23 to suit a socketing method to be used or to suit a standard socket. If the Design-Builder elects to deviate from the dimensions shown, the Design-Builder shall submit complete details of the proposed socket, and other changes to the Anchor Gallery Hardware necessary to accommodate the proposed socket, to WSDOT for review and approval. If the Design-Builder elects to use non-standard sockets, the patterns shall become the property of WSDOT.

The cable crosshead shall be attached to the cable socket and bear on the cable cheek plates provided with the PFS. The cable crosshead shall be cast steel.

The jacking crosshead shall consist of welded plates and shall transfer load from the hydraulic ram and shall bear on the jacking cheek plates provided with the PFS.

There are two types of shims. The Type A shims shall not bolt into place and shall be of varying thickness. The Type B shims shall bolt into place and shall be three-inches thick.

The steel tensioning rod shall conform to the requirements of ASTM A354, Grade BD.

The hydraulic ram shall be a 150-ton ram, OTC model RH1508 by SPX Hydraulic Technologies.

One hydraulic ram shall be furnished for each anchor cable.

The hydraulic rams shall be powered by a 115 volt electric pump, OTC Model PE174 by SPX Hydraulic Technologies. One pump shall be furnished for each pair of rams in the Type 1 and 1A Pontoons, and one pump shall be furnished for each ram in the Type 3, 3A, 4, and 4A Pontoons.

Each pump shall come equipped with 12 feet of spring guarded high pressure hoses with quick couplers at the cylinder ends, gage adapters, and direct reading liquid filled gages and shall be filled with hydraulic fluid of the proper grade. The gage dial shall not be smaller than 3½ inch diameter and shall be read directly in tons of force at the pull rod. All pumps shall be equipped with a four-way control valve (extend-hold-retract).

### 2.12.5.16.6 Placing Anchors

The Design-Builder shall place the anchors such that the end of the anchor cable is as specified in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23).

If the Design-Builder elects to place each Pontoon and its associated anchors concurrently, the anchor cable free ends shall be installed in the Pontoon anchor cable gallery. For installation in the Pontoon anchor cable gallery, the anchor cable shall be tensioned and connected to the strand crosshead before installation of the next Pontoon.

If the Design-Builder elects to place the anchors prior to placing the Pontoons, the anchor cable shall be removed from its storage reel and placed in the full-extended

position toward the bridge. The anchor cable ends shall be protected from damage and end-marked with a buoy. The buoys shall be of steel construction, painted with a finish coat of paint matching Federal Standard 595, Color No. 22510, and with reflective material approved by the U.S. Coast Guard. The buoys shall be connected to the anchor cable by shackling to a wire rope messenger line. The buoys and messenger lines shall be maintained by the Design-Builder until the anchor cables are installed in the anchor cable gallery of the Pontoon. Anchor cables shall not be placed more than nine months in advance of the Pontoon installation.

The Design-Builder shall create a clear zone in the vicinity of each anchor, consisting of the anchor plan area plus an area 10 feet wide by 500 feet long, beginning at the edge of the anchor and extending toward the bridge along the axis of the anchor line. Creating the specified clear zone shall be defined as removing all sunken snags, boats, anchors, derelict cables and frames, and other small debris that might snag the anchor cable to a minimum depth of six inches below the mudline. The specified clear zone shall also be clear of any metallic debris such as pieces of steel that could damage the cable. Errant anchor ballast or naturally occurring lake bottom features shall be leveled so that they project no more than one foot above the surrounding lake bottom.

The Design-Builder shall remove any existing anchors that interfere with the anchors and anchor cables in this Project. Removal of existing anchors shall consist of either displacing the anchor and associated riprap outside of the specified clear zone, or another method submitted to WSDOT for review and approval. Removal of obstructions within the specified clear zone, excluding existing anchors and associated riprap, shall consist of retrieval and disposal off site, displacement outside of the specified clear zone, or another method submitted to WSDOT for review and approval.

### 2.12.5.16.7 Anchor Placement Tolerance

Anchors shall be placed so that the end of the anchor cable is within 10 feet, horizontally and vertically, of the location specified in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). Additionally, anchors shall be oriented so that the anchor's extended axis of symmetry intersects the centerline of the Longitudinal Pontoons within plus/minus five degrees of arc.

The location, orientation and degree of tilt of the anchor shall be monitored and confirmed by an electronic position monitoring system as specified in the Anchor Placement Plan in this section.

### 2.12.5.16.8 Affixing Anchor Cable in Sockets

The Design-Builder shall place a sufficient tension on each anchor cable so that the length of anchor cable required between the anchor and a prescribed point within the Pontoon may be accurately determined. The anchor cable shall then be cut and socketed.

The socket shall be filled with the material selected by, and in accordance with the process outlined by, the Design-Builder as specified in the Pontoon Anchor Installation and Testing Plan.

Wire rope dressing damaged during socketing shall be repaired and reapplied.

### 2.12.5.16.9 Installing Anchor Cable

While playing out the anchor cable strand, the Design-Builder shall maintain the strand in proper alignment and shall not twist the strand.

The Design-Builder shall coat the exterior surface of the strand from the anchor to the inboard end of the Pontoon cable port with Fluid Film Gel WRO-EP as manufactured by Eureka Chemical Company, P.O. Box 2205, South San Francisco, CA 94080, www.fluid-film.com corrosion control system. The Design-Builder shall apply the coating as the strand is played out and submerged to the final position, in accordance with the dressing manufacturer's recommendations. The thickness of the dressing shall be 1/8-inch minimum to ¼-inch maximum.

The Design-Builder shall label the strand socket at the anchor end of each anchor cable with the appropriate anchor cable identification number, using paint conforming to Section 9-08.1(2)H of the WSDOT Standard Specifications (Appendix D18). The color of the finish coat, when dry, shall match Federal Standard 595, Color No. 22510.

The Design-Builder shall take precautions to protect the anchor cable being placed against concrete and other surfaces that could cause damage to the cables and their protective coatings. The Design-Builder shall ensure that the cables are not pulled against or around objects which could strain, scrape, kink or flatten the cable.

The Design-Builder shall tension the anchor cable to an initial tension of 20 tons minimum. The anchor cable shall then be marked for cutoff to place the Pontoon anchorage pins at the pin location along the cable adjustment channels specified in the design, unless another cutoff location is specified by the Structural Lead Engineer.

The Design-Builder shall seize the strand at least one location on the discard side of the cutoff mark and at no fewer than five places on the other side of the cutoff mark. The Design-Builder shall place one seizing just at the end of the socket, and shall leave it in place permanently. The length and spacing of the remaining seizings shall be as recommended by the anchor cable fabricator and as approved by the Structural Lead Engineer. The Design-Builder shall cut the anchor cable to the required length and shall fit the strand socket casting to the cable end. The Design-Builder shall leave four of the seizings in place after setting the socket and allowing the socket filler to set in accordance with the socket filler material manufacturer's recommendations.

The Design-Builder shall remove the wire rope dressing from the anchor cable, as required for socketing, with a degreasing solvent approved by the manufacturer. The Design-Builder shall repair all wire rope dressing damaged by the socketing operation.

After cutting the anchor cable to the required length and setting the strand socket casting to the end of the anchor cable, the Design-Builder shall tension anchor cables to achieve an axial pretension force that provides a horizontal component force as listed in Appendix M23. The force required to overcome the internal jack friction, friction loss in the cable saddle and environmental loads, if any, during tensioning shall be determined by the Design-Builder in the field at the time of installation and added to the required axial force to obtain the axial force. The Design-Builder shall submit the jack calibration curves, saddle friction loss data and method of installation to WSDOT for review and comment.

Transverse cables shall be installed by simultaneously jacking the north and the south cables of each Pontoon while maintaining the structure at the true bridge centerline. The longitudinal cables shall be installed by simultaneously jacking symmetrical groups of four cables while maintaining the correct structure position.

Adjustment in the cable stresses shall be made by pulling the anchor cable crosshead forward with the hydraulic jack and tensioning rod working against the jacking crosshead. After pulling forward the length of the ram extension, the cable crosshead shall be held in position by means of the bearing cheek plates which shall be bolted to the

cable track. While adjustments are being made the bearing plates shall be secured by at least six bolts on each side, top and bottom (24 total). When the anchor cables are finally secured the full complement of bolts shall be installed and the bolts tensioned. The load shall be applied at a maximum rate of two tons per minute. The total thickness of the shims after tensioning shall be a minimum of three inches and a maximum of nine inches.

After completing anchor cable tensioning, the Design-Builder shall use an approved degreasing solvent to remove the wire rope dressing from the anchor cable between the strand socket and within six inches of the interior end of the cable saddle. The Design-Builder shall not remove the wire rope dressing by immersing the anchor cable in the solvent. The Design-Builder shall apply one coat of paint conforming to Section 9-08.1(2)D of the WSDOT Standard Specifications (Appendix D18) to the cleaned anchor cable surface, and to the exposed surface of the strand socket and strand socket pin.

The Design-Builder shall not install anchor cables during the Winter Storm Period.

### 2.12.5.16.10 Anchor and Anchor Cable Inspection

The Design-Builder shall inspect each anchor and its associated anchor cable in their final positions. The inspection shall include the entire exterior surface of the full length of the cable, from the exit end of the Pontoon cable hawse pipe to, and including all: connection hardware, the anchor forged link or eyebar, the anchor above the lake bed and any anchor riprap.

The inspection shall identify damage such as broken wires, kinks, crushing or other damage; snagging of strand wires; snagging of anchor cables with themselves or with other cables; and the condition of the ballast and all exposed surfaces of the anchors. The inspection shall be performed using diver-operated or ROV (Remote Operating Vehicle) operated audio-video recording equipment capable of producing permanent records on DVD, or another recording medium acceptable to WSDOT in accordance with the Anchor Placement Plan.

The diver performing the inspection, or the individual directing the diver by video monitor and audio link, or the individual directing the ROV, shall be a Professional Engineer, licensed under Title 18 RCW, with five years minimum experience in the inspection of underwater structural elements.

The Design-Builder shall visually identify the anchor cable at the beginning of the DVD, at the exit end of the Pontoon cable hawse pipe, and at the anchor end. Each anchor cable inspection recording shall be continuous from the identification of the anchor cable at the exit end of the Pontoon cable hawse pipe to the anchor and anchor connection. A separate DVD shall be produced for each anchor cable. The Design-Builder shall furnish a video monitor and an audio link for WSDOT use during the inspection.

The inspection shall provide professional quality video coverage for the full length of the cable. The coverage shall be thorough and of sufficient resolution to completely define any abnormality of cable construction and installation. The records shall include the diver and engineer's voice communication that occurred during the inspection indicating the recording location and the conditions noted by the diver.

The Design-Builder shall furnish digital photographs of the anchor and anchor forged link or eyebar with the anchor cable. The Design-Builder shall furnish photographs with at least three views of the connection: one top view and one elevation view from each side. The Design-Builder shall complete an Anchor Inspection Form as furnished by

WSDOT for the appropriate anchor type, and shall submit the completed form with the photographs to WSDOT.

The Design-Builder shall submit certified inspection records, reports and DVDs (or other WSDOT acceptable recording media)—prepared by the individual who performed the dive or the individual who monitored the remote-controlled inspection—to WSDOT within 10 working days of completing the inspection of each anchor cable. WSDOT will review and comment on the records, reports and DVDs to determine the condition of the anchor cables, and will recommend the need for repairs.

The Design-Builder shall repair all damage to the anchor cables in accordance with Section 1-07.13 of the General Provisions and as specified in this section. After completing repairs, the Design-Builder shall completely re-inspect the anchor cable as specified within five working days of the repair at no additional expense to WSDOT.

### 2.12.5.16.11 Anchor Load Testing

The Design-Builder shall perform anchor load testing in accordance with the requirements of Section 2.6.

### 2.12.5.16.12 Anchor Orientation and Anchor Cable Length Plaque

The Design-Builder shall furnish a brass plaque for installation in the anchor cable anchorage gallery cell of each Pontoon anchor cable. Each brass plaque shall be 1/16 inch thick brass plate, stamped with the anchor cable designation, the year of installation, the anchor location and orientation about all three axes based on Global Positioning System (GPS) coordinates, and the final anchor cable length centerline to centerline of socket pins. The brass plaque for each anchor cable shall be installed on a wall near the saddle block for that anchor cable.

### 2.12.5.16.13 PATON Buoys for Anchor Cables

The Design-Builder shall design, provide and install PATON buoys above anchor cables ASW, ANW, WSE, and WNE in accordance with the requirements shown in the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). These buoys shall conform to the requirements of 33 CFR Part 66, Private Aids to Navigation. The buoys shall be anchored with an anchor line attaching to its own anchor. The buoy line anchors shall have a 20-ton minimum uplift capacity. The anchor buoy line connection to the anchors shall be a minimum of one foot above the Mudline. Barrier floats on a cork line shall be strung from the buoy to a padeye on the corner of the Cross Pontoon. The padeye shall be attached to the Pontoon with cast-in-place anchors. Drilled-in anchors in the Pontoons will not be permitted.

All buoys and barrier floats shall be urethane foam filled with molded HDPE cover shell no less than one-half inch in thickness, fully ultraviolet inhibited, and galvanized thru bolts. The buoys shall have a buoyant capacity of a minimum of 400 pounds, and shall be a high-visibility orange color. The barrier floats shall have a buoyant capacity of a minimum of 20 pounds, and shall be a white color.

The wire rope product for cork lines and anchor lines shall be 5/8-inch diameter Phillystran® Shipboard Ropes for Marine Applications Kevlar Aramid Rope by Phillystran, Inc.

All miscellaneous marine hardware shall be ASTM A240 Type 316L stainless steel, heavy duty.

## 2.12.5.17 ELEVATED STRUCTURE AND TRANSITION SPANS

The Design-Builder shall construct the Elevated Structure and Transition Spans in accordance with the requirements of Section 2.13 and the additional requirements of this section.

### 2.12.5.17.1 Concrete-Filled Steel Tubes

If the Design-Builder elects to use steel tubes for the superstructure, they shall be in accordance with Section 2.12.5.4, shall be filled with concrete, and shall not be galvanized.. The interior of the steel tubes shall receive a shop primer coat of paint in accordance with Section 6-07.3(9)G of the WSDOT Standard Specifications (Appendix D18). The exterior of the steel tubes shall be painted in accordance with the requirements of Section 2.13.

The inside of all steel tubes shall be completely filled with concrete. All connections shall be designed and constructed to prevent the formation of air pockets. Temporary vent/weep/bleed holes shall be provided as necessary for the removal of air from the interior of the tubes. The Design-Builder shall provide a concrete placement method that fills all voids. The Design-Builder shall demonstrate the concrete placement method on a full-scale test section of a steel truss section to ensure that the concrete placement method performs as required.

After erection is complete, all erection bolts and tabs shall be removed, seal welded, ground smooth, and touch-up primed in accordance with Section 6-07.3(9)I of the WSDOT Standard Specifications (Appendix D18).

Additionally, steel tubular members shall conform to the requirements specified in the Structures Minimum Standards (Appendix B2).

### 2.12.5.17.2 Modular Expansion Joints

The modular expansion joints shall conform to the requirements specified in Structures Minimum Standards (Appendix B2).

### 2.12.5.17.3 Construction Tolerances

The following construction tolerances supplement the requirements of the Structures Minimum Standards (Appendix B2).

- Vertical deviation from roadway grade shall be limited to plus/minus one inch.
- Vertical deviation of transverse slope between pivot point and edge of bridge deck shall be limited to plus/minus ¼ inch.
- Modified concrete overlay thickness shall be within plus/minus ¼ inch.
- Bridge slab thickness shall be within plus/minus ¼ inch.
- Elevations of top of columns and/or crossbeams shall be within plus ½ inch, minus ¼ inch.
- Lengths, widths, and depths of concrete columns and/or crossbeams shall be within plus ½ inch, minus ¼ inch.

### 2.12.5.17.4 Modified Concrete Overlay

If precast concrete is used for bridge deck construction, a modified concrete overlay shall be applied to the roadway surface after completion of the bridge deck construction. The modified concrete overlay shall be constructed in accordance with the requirements of Section 6-09 of the WSDOT Standard Specifications (Appendix D18). The bridge deck surface shall be scarified in preparation for the overlay using one of the following:

- Grinding equipment using diamond tipped saw blades mounted on a power driven, self-propelled machine that is specifically designed to texture concrete surfaces. The grinding equipment shall provide grooves that are between 3/32-inch to 5/32-inch wide. The land area between the grooves shall be approximately 3/32-inch wide.
- Shot blasting shall be in accordance with Section 6-09.3(5)D of the WSDOT Standard Specifications (Appendix D18).

The Design-Builder shall submit the type of equipment to be used to WSDOT for review and comment. The Design-Builder shall demonstrate to the satisfaction of WSDOT that the method and equipment for surface preparation is adequate for the intended purpose and will provide satisfactory results. The Design-Builder shall not begin bridge deck surface preparation until receiving WSDOT's acceptance of the Design-Builder's method and equipment.

The Design-Builder shall perform the bridge deck surface preparation in a manner that does not damage the bridge deck, and does not damage the expansion joint assemblies. The Design-Builder shall grind the concrete surface in a longitudinal direction between the bridge ends. Areas that are inaccessible to the grinding machine shall be hand chipped to the same depth.

The Design-Builder shall dispose of all debris and residue generated by the scarifying process in accordance with all Federal, State, and local regulations.

### 2.12.5.17.5 West Transition Span and Pier 36N&S

The Design-Builder shall construct Pier 36 N&S in accordance with the requirements of this section, Section 2.13, and as shown on the Conceptual Plans (Appendix M1), and the West Connection Bridge Drawings (Appendix M3). The "WCB Contractor," under separate contract with WSDOT, will have intermittent access to the work areas as defined below, and the Design-Builder shall coordinate construction operations with the "WCB Contractor." The "WCB Contractor" will not be permitted access to the east of Work Area 1.

Brief descriptions of work areas are as follows:

- Work Area 1 – An area surrounding Pier 36 N&S.
- Work Area 2 – An area west of Work Area 1.

Exact plan limits of work areas are shown on the Conceptual Plans (Appendix M1) and the Contractor Control Area (Appendix M7). Work areas shall include, but not be limited to, the bridge structure and lake.

The Design-Builder will have exclusive access to Work Area 1 and shall Physically Complete the following Work at Pier 36 N&S, and obtain acceptance of said Work by WSDOT, by not later than Date A given below.

1. Construction of foundations, columns, and crossbeams.
2. Installation of anchor bolts or anchor bolt sleeves for WCB and RSUP bearings.
3. Installation of grout pad pockets at said anchor bolts.
4. Installation of embedded reinforcing steel for WCB and RSUP girder stops and diaphragms.
5. Installation of roughened construction joint surfaces at said reinforcing steel.
6. Removal of all pier formwork and falsework after all concrete has attained its specified compressive strength.
7. Vacation of Work Area 1.

Refer to General Provisions Section 1-08.9(7) for liquidated damages due the State for failure by the Design-Builder to complete the Work described above by the date indicated.

The "WCB Contractor" will have exclusive access to Work Area 1 between Date A and Date B to complete the work on Pier 36S and Span 35. After Date B, the "WCB Contractor" will vacate Work Area 1 and the Design-Builder will have exclusive access to Work Area 1. Loadings from construction access on the WCB shall be limited as governed by Section 6-01.6 of the WSDOT Standard Specifications (Appendix D18). Refer to General Provisions Section 1-04.4(9) for remedies available to the Design-Builder in the event the work areas are not available by the date indicated.

The Design-Builder shall be responsible for the installation and construction of the elements as shown on the Conceptual Plans (Appendix M1), the West Connection Bridge Drawings (Appendix M3), and as indicated below:

- Modular expansion joint between the WCB and RSUP superstructures and the West Transition Spans at Pier 36N&S.
- Traffic barriers, pedestrian barriers, and railings on the West Transition Spans.
- Joint covers for barriers and railings between the WCB and RSUP superstructures and the West Transition Spans at Pier 36N&S.

All connections of the above items to Pier 36 N&S and the WCB and RSUP superstructures shall be the responsibility of the Design-Builder.

The Design-Builder will not be required to furnish and install the modular expansion joint and the joint covers for barriers and railings between Pier 36N and the West Transition Span (westbound bridge). The West Transition Span (westbound bridge) shall be outfitted by the Design-Builder with blockouts and connection points to permit installation of these items in the future by others.

The "WCB Contractor" will have exclusive access to Work Area 2 until the completion of the WCB and RSUP construction which will not be later than Date C given below. After Date C, the Design-Builder will have exclusive access to both work areas and shall complete the Work.

| **Milestone Dates** | |
|---|---|
| **Date A** | **November 15,** |

| | 2013 |
|---|---|
| Date B | May 15, 2014 |
| Date C | July 1, 2014 |

### 2.12.5.18 FLOATING BRIDGE COMMISSIONING

The Floating Bridge shall be commissioned in accordance with the requirements of Section 2.34 (Commissioning). Items to be commissioned include, but shall not be limited to: Pontoon ballasting; operation of all hatches, port covers and doors; operation of bridge monitoring and control systems; operation of navigational aids; confirmation of electrical bonding; and confirmation of adequate access clearances.

## 2.12.6 SUBMITTALS

### 2.12.6.1 DESIGN SUBMITTALS

WSDOT will review and comment on all scheduled submittals, and return comments to the Design-Builder in accordance with the requirements of this section and Section 2.28 (Quality Management Plan).

#### 2.12.6.1.1 Preliminary Design Properties

To validate the Pontoon design, the Design-Builder shall calculate and submit the following properties of their design to WSDOT for review and comment during the preliminary design phase:

- Elevated Structure mass and center of gravity;
- Elevated Structure mass moments of inertia;
- Elevated Structure sail area;
- Loads imposed on the Pontoons at all connection locations; and
- Preliminary ballasting plan.

Mass, center of gravity, mass moments of inertia and sail area shall conform to the Node Map shown in Wind/Wave Analysis (Appendix S15).

#### 2.12.6.1.2 Preliminary Design Plans

The Design-Builder shall submit Preliminary Design Plans on WSDOT standard sheets for all structures constructed under this Project, including the Elevated Structure, Transition Spans, anchors and all Pontoon Ancillary Items. All preliminary design documents shall bear the seal of the Structural Lead Engineer.

As part of the Preliminary Design Plans, the Design-Builder shall furnish a written narrative together with plans and calculations, including staging plans, to demonstrate that the Elevated Structure, Transition Spans and anchors are designed for the Future Six-Lane Plus Two HCT Configuration described in this section.

### 2.12.6.1.3 Intentionally Omitted

### 2.12.6.1.4 Final Design Properties

The Design-Builder shall calculate and submit the following properties of their design to WSDOT for review and comment before the Final Design Plan submittal:

- Elevated Structure mass and center of gravity;
- Elevated Structure mass moments of inertia;
- Elevated Structure sail area;
- Loads imposed on the Pontoons at all connection locations; and
- Final ballasting plan.

Mass, center of gravity, mass moments of inertia and sail area shall conform to the Node Map shown in Wind/Wave Analysis (Appendix S15).

### 2.12.6.1.5 Final Design Plans

The Design-Builder shall submit Final Design Plans on WSDOT standard sheets for all structures constructed under this Project, including Elevated Structure, Transition Spans, anchors, and all Pontoon Ancillary Items. All final design documents shall bear the seal and signature of the Structural Lead Engineer.

The Final Design Plans shall be complete prior to the start of construction and shall be submitted in conjunction with the shop drawing submittals specified in this section for precast concrete structural elements, and steel reinforcing bars and post-tensioning reinforcement.

For the Pontoons, the plans shall include the following:

- Placement of all post-tensioning ducts and associated hardware such as: anchorages, grout tubes, vent tubes, splices, stressing ram support points and block-out forms.
- Post-tensioning sequence, jacking force, lift-off force, elongation and anchor set.
- Final reinforcement placement and bends from steel reinforcing bar shop drawings, including reinforcement specified in the Pontoon Minimum Technical Requirements (Appendix M22) and supplemental reinforcement required for the following:
    - Pontoon launch and handling operations.
    - Towing and mooring system.
    - Fender system.
    - Precast handling and placing operations.
    - Blockouts required by the minimum technical requirements, post-tensioning system, formwork system, temporary drainage for storm and cure water, and temporary construction access.
    - Inserts for the formwork system, hatches, mooring/towing system, launch system, Pontoon access system, precast handling system, and those systems specified in the Pontoon Minimum Technical Requirements (Appendix M22).

- All construction joints required by the construction sequence with specified treatment.
- Maintenance Access facilities and details.
- Embedded items such as temperature sensors, thermal control pipes, bunk bars, assembly bars, anchor bolts, jigs and plates.
- All electrical, mechanical, piping, and drainage runs shall include placements, bends, offsets, cabinets, junction boxes, fasteners, embeds, and couplers.

Refer to Section 2.27 for additional requirements.

#### 2.12.6.1.6 Released For Construction (RFC) Document Submittal

The Design-Builder shall submit RFC documents to WSDOT for all structural work related to the Elevated Structure, Transition Spans, anchors and Pontoon Ancillary Items including plans, specifications, design calculations and supporting reports. All RFC documents shall bear the seal and signature of the Structural Lead Engineer.

All details and processes successfully completing the Pontoon test section requirements of this section shall be fully incorporated into the RFC documents prior to their release.

For the Pontoons, the plans of the RFC documents shall be complete integrated Pontoon drawings developed from the Pontoon fabrication plans and all associated shop drawings for all structural components incorporated into each Pontoon. The integrated Pontoon drawings of the RFC documents shall be reproduced on sheets conforming to standard WSDOT format for title block template. The integrated Pontoon drawings of the RFC documents shall include, but not be limited to, the following:

- Mild reinforcement.
- Post-tensioning system and components.
- Post-tensioning sequence.
- Embedments.
- Inserts.
- Anchor bolts.
- Blockouts.
- Construction joints.
- Construction aids.
- Grouting and venting ports.
- Temporary drainage.
- Temporary access.
- Repairs.

#### 2.12.6.1.7 Design Calculations

The Design-Builder shall furnish 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. All final design calculations shall bear the seal and signature of the Structural Lead Engineer and the Marine Lead Engineer.

The calculation sets shall include the following:

- Cover Sheet - The name of the Project, Structure Name, designer/checker initials, date (month, day and year) and supervisor's initials shall be listed. The stamp and signature of the Structural Lead Engineer shall also be included.
- Index Sheets - These shall include numbered calculation sheets and an index by subject with the corresponding sheet numbers. The name of the Project, Structure Name, designer/checker initials, date (month, day and year) and supervisor's initials shall be listed.
- Design Calculations (including calculations for the Future Six-Lane Plus Two HCT Configurations) – These shall include design criteria; loadings; structural analysis; results; member capacities; geotechnical calculations; horizontal and vertical settlement calculations; deflection diagrams; long term creep diagrams for horizontal flexural members; and all computer input and output data (reduced to an 8.5-inch by 11-inch sheet size). Electronic files of spreadsheets and computer input/output files shall be submitted.

### 2.12.6.2 SHOP DRAWINGS

The Design-Builder shall submit shop drawings for all steel, concrete and precast concrete elements, including reinforcing and post-tensioning reinforcement, FRP, joints, anchor lines, anchors, ladders, railings, hatches, ports, fabrications, inserts, and all other items specified above prior to implementing work based on the shop drawings. The following information shall be included in the shop drawings, as applicable:

- Size of member and fasteners.
- Length dimensions.
- Finish such as galvanizing, anodizing and painting.
- Weld size and type, and welding procedures, if required.
- Strand or steel reinforcing bar placement in accordance with Sections 6-02.3(24) and 6-02.3(26)A of the WSDOT Standard Specifications (Appendix D18).
- Post-tensioning reinforcement tensioning procedure, stress calculations, and elongations in accordance with Section 6-02.3(26)A of the WSDOT Standard Specifications (Appendix D18).
- Post-tensioning anchorage details in accordance with Sections 6-02.3(26)B, 6-02.3(26)C and 6-02.3(26)D of the WSDOT Standard Specifications (Appendix D18).
- Fabrication-reaming, drilling and assembly procedures.
- Wall penetrations.
- Erection procedures for steel elements in accordance with Section 6-03.3(7)A of the WSDOT Standard Specifications (Appendix D18).

- Handling and erection procedures for precast concrete elements in accordance with Sections 6-02.3(28)A and 6-02.3(28)I of the WSDOT Standard Specifications (Appendix D18), including complete details of all temporary supports, bracing and inserts placed for lifting, assembly and erection.
- Expansion joint systems

### 2.12.6.3 WORKING DRAWINGS

The Design-Builder shall prepare Working Drawings with supporting design calculations for all falsework, forms, temporary structures and construction processes.

Working Drawing submittals shall include, but not be limited to, the following:

- Elevated Structure erection.
- Expansion joint installation and leak testing.
- Transition Span erection.
- Anchor and anchor cable installation.
- Pontoon geometry control plan, including description of the personnel, equipment and process responsible for monitoring Pontoon geometry throughout the Pontoon fabrication process, particularly adherence to the Pontoon fabrication tolerance requirements.
- Details of Pontoon test sections.
- The bondbreaker system (floor and lubricant) to be placed and fastened to the top surface of the floor slab prior to placing concrete for Pontoon slab fabrication, including description of the floor material, the method of fastening the floor material in place, and the application procedure of the bondbreaker lubricant.
- Construction joint locations for all cast-in-place construction.
- Concrete pumping procedure, including proposed equipment, stand-by equipment, pumping line supports, remixing facilities, methods of preventing segregation and plugging, and slump control.
- Concrete curing methods.
- Concrete thermal monitoring and control plan, including placement, operation and decommissioning of heating and cooling pipes; placement, operation and decommissioning of thermal monitoring devices and associated temperature recording equipment; and the sequence and scheduling of concrete placement.
- Products used to perform crack repair, including manufacturer's recommended procedures for product use.
- Crystalline waterproofing material.
- Certified report for each size and type of post-tensioning anchorage device confirming that the anchorage develops 95 percent of the ultimate strength of the post-tensioning reinforcement.
- Mix to be used for concrete encasement of all post-tensioning anchorage recesses.

- Details of plugs and watertight bulkheads used for plugging all exterior wall openings prior to Pontoon launching.
- Methods to be used to provide for drainage of Pontoon cells during Pontoon construction.
- Pontoon launching procedure—including stability, ballast, towing and mooring calculations prepared by the Marine Lead Engineer—to ensure that the Pontoons are launched level and stable, and remain so through towing and their moored condition. Structural calculations shall be prepared by the Structural Lead Engineer.
- As part of the Pontoon launching method submittal, the Design-Builder shall include descriptions of proposed means of providing additional buoyancy, if required, to launch and float the Pontoons out of the Pontoon casting facility. The descriptions shall include, but not be limited to, the materials used to provide the buoyancy, the number required, the locations, and the methods of affixing them to the Pontoons.
- The Design-Builder shall submit detailed structural calculations using a 3D finite element program to WSDOT for review and approval to demonstrate that all Pontoon Handling; including each stage of ballasting, Pontoon assembly, anchor cable installation and stressing, and Elevated Structure erection; will not overstress the Pontoons or their connections. The calculations shall be consistent with the ballast calculations described in Section 2.12.5.14.
- The Pontoon Assembly Plan and Ballasting Plan, together with calculations, prepared by the Marine Lead Engineer to show that the Pontoons will not be overstressed or unstable due to the ballasting at all phases of the bridge construction.
- Provide calculations that demonstrate that reserve ballast will be available for removal (by others) in the future to increase freeboard by three inches, without changing trim or list. Indicate the distribution of reserve ballast in the cells.
- Pontoon moorage details, including marine anchorage and Pontoon connection details and Pontoon stability calculations developed by the Marine Lead Engineer, shall conform to Section 2.27.
- Diameter, number and arrangement of wires in the anchor cable strand, along with the results of all tests specified in this section and ASTM A586.
- Method of socketing the anchor cable strand, with certified test results verifying that the method will develop the strength required by the design. The method of socketing the strand shall conform to ANSI M 11.1.
- Method and equipment used to dewater the Pontoon end wall face to allow for surface cleaning and preparation for grouting and Pontoon assembly.
- Method and equipment used to clean and prepare the Pontoon end wall surface for assembly and grouting.
- Method and equipment used to affix the Pontoon joint seal in place and to dewater the Pontoon joint section to be grouted after bringing the Pontoons together in proper position and alignment.

- Method and equipment used to secure the Pontoons in a rigid connection in proper position and alignment for Pontoon assembly, from the moment of bringing the Pontoons together through the completion of structurally connecting the Pontoons at the joint, including all jacking devices, temporary stressing tendons, bolts and bars, restraining devices and assemblies, and all Pontoon inserts associated with such devices, and the location and amount of all temporary ballast placed in the Pontoon cells.
- Method and equipment used, and sequence followed, to grout the Pontoon joint section and to cure the grout once in place.
- Method and equipment used, and sequence followed, to permanently and structurally connect the Pontoons at the joint.

The Working Drawings shall be submitted to WSDOT for review and approval.

### 2.12.6.4 CONCRETE MIX DESIGN

The Design-Builder shall submit concrete mix designs conforming to the requirements specified in this section to WSDOT for review and approval in accordance with Section 6-02.3(2)A of the WSDOT Standard Specifications (Appendix D18).

### 2.12.6.5 LOCATING EMBEDDED ITEMS PLAN

The Design-Builder shall submit a Locating Embedded Items Plan outlining the methods for locating the embedded items in the Pontoons to WSDOT for review and approval. The plan shall include, but not be limited to, the following:

- The procedure to be followed.
- The equipment used with the proposed method.
- A sample of the permanent image, print or visual representation produced by the method.
- Documentation of the effective range and the accuracy limits of the method.
- Qualifications and experience of the personnel charged with operating all equipment involved with the method, including specific qualifications and experience with each equipment item for each operator.

The Design-Builder shall not begin locating embedded items in the Pontoons until receiving the WSDOT's acceptance of the Locating Embedded Items Plan and the successful demonstration of the method.

### 2.12.6.6 HOLE LOCATION AND DRILLING PLAN

The Design-Builder shall submit the Hole Location Plan showing the locations of the holes to be drilled in the Pontoons (only at locations and at Pontoons expressly permitted in this section) to WSDOT for review and approval. The plan shall include, but not be limited to, the following:

- Plan sheets showing the location of each hole for drilled-in anchors.
- A permanent image, print or visual representation at each location using the procedure and equipment outlined in the Locating Embedded Items Plan.

- Each permanent image, print or visual representation shall be cross-referenced with the plan sheets showing the locations.
- The equipment used to drill the holes. All drilling shall be done with a rotary-hammer type drill.

The Design-Builder shall not begin drilling holes at a site until receiving WSDOT's approval of the Hole Location and Drilling Plan for that site.

### 2.12.6.7 MONITORING AND DAMAGE CONTROL PLAN

Due to the potentially critical nature of any damage to the Pontoons, the Design-Builder shall submit a Monitoring and Damage Control Plan to WSDOT for review and approval. The plan shall describe the monitoring of the Pontoons for damage and flooding, and describe the emergency response procedure for rapid corrective action to prevent Pontoon flooding, stem flooding that may occur from any source, prevent progressive flooding, and restore the watertight integrity of the Pontoons.

The Monitoring and Damage Control Plan shall be prepared by the Marine Lead Engineer. Calculations and plans prepared shall bear the signature and seal of the Marine Lead Engineer.

The Monitoring and Damage Control Plan shall address the following at a minimum:

- The methods and procedure for monitoring the condition of all cells within a Pontoon at all times whenever the normal watertight integrity of the Pontoons has been breached, including, but not limited, to the following conditions:
  - Cutting holes in a Pontoon.
  - Opening hatches, doors or temporary openings into or within a Pontoon when such openings are left unattended.
  - Leaks or other causes of water entering the Pontoons.
- Presence of a Pontoon Monitor as specified in Section 2.27.
- The Design-Builder's plan for watertight closure of temporary openings when not in use.
- The pre-placement of pumps and other damage control equipment and materials at or near the Pontoons, including the type and quantity of equipment, pumping capacities and power sources.
- Emergency response staffing by the Design-Builder and any subcontracted emergency services, including names and phone numbers of all contact personnel.
- The emergency response to be taken by the Design-Builder's emergency response staff that will result in timely and effective damage control, including the calling and response times of additional Design-Builder personnel, WSDOT personnel, and subcontracted emergency services.

The Pontoons shall not be launched until WSDOT has reviewed and approved the Monitoring and Damage Control Plan. The Design-Builder shall maintain all provisions of the approved Monitoring and Damage Control Plan at all times after a Pontoon has been launched.

### 2.12.6.8 PONTOON MONITORING SYSTEM PLAN

The Design-Builder shall submit a Pontoon Monitoring System Plan, prepared by the Marine Lead Engineer, to WSDOT for review and approval. The Plan shall include a description of the overall system and the hardware and individual components associated with the system, with supporting working drawings outlining the installation, connectivity, and operation of the system and its hardware and individual components.

The Design-Builder shall prepare and submit an operations and maintenance manual for the Pontoon monitoring system in accordance with Section 2.27.

### 2.12.6.9 PONTOON BALLASTING PLAN

The Design-Builder shall submit a Pontoon Ballasting Plan prepared by the Marine Lead Engineer to WSDOT for review and approval. The Pontoon Ballasting Plan shall include, but not be limited to, the following:

- A clear description of all construction stages and ballasting operations required for each stage starting from the time of float out of the PPDB and from the time of acceptance of PFS until completion of the Floating Bridge..
- Equipment used in the operations, including the type and model of the equipment with catalogue cuts that specify capacities and geometry.
- Procedure for determining the floating condition of the Pontoons before beginning the Pontoon ballasting work and after each cycle of ballast adjustment. The procedure shall describe the process of measuring and recording the Pontoon freeboard dimensions and the roadway surface vertical differences as specified.
- Procedure for adding, shifting and removing Pontoon water and gravel ballast.
- Method of managing the leak detection system in cells where water ballast is used.
- Method used to remove and dispose of water ballast.
- Method used to install gravel ballast, and the method used to assure uniform distribution of the gravel within the cell.
- Method of protecting the existing Pontoon deck, hatches and other Pontoon attachments during construction activities.

The Design-Builder shall demonstrate that the methods and equipment are adequate for the intended purpose and will provide satisfactory results.

Ballast shall not be placed until WSDOT has reviewed and approved the Pontoon Ballasting Plan.

### 2.12.6.10 PONTOON ANCHOR INSTALLATION AND TESTING PLAN

The Design-Builder shall submit a Pontoon Anchor Installation and Testing Plan, prepared by the Marine Lead Engineer and the Structural Lead Engineer, to WSDOT for review and comment. The Pontoon Anchor Installation and Testing Plan shall include, but not be limited to, the following:

- The method and equipment used to anchor work barges and vessels in Lake Washington. The submittal shall specify the location and alignment of all ties and anchors used to anchor the work barge or vessel, and the proximity to the

existing bridge anchors, bridge anchor cables and submarine utility cables. The ties between the work barge or vessel and their anchors shall not cross the alignment of bridge anchor cables. The Design-Builder shall not anchor a work barge or vessel to existing or new bridge anchors, except that existing bridge anchors may be used after being disconnected from the existing bridge.

- Details of the anchor cable pulling apparatus. The Design-Builder shall not use any device for pulling anchor cables other than those specified in the Pontoon Anchor Installation and Testing Plan. The Design-Builder shall not use chains as an anchor cable pulling device.
- The method used to protect all components of the anchor cable saddle during anchor cable installation.
- The method and equipment used to socket the ends of the anchor cable, including certified test results verifying that the method develops 100 percent of the anchor cable's minimum breaking strength. The submittal shall include the name of the independent testing laboratory testing the socketing procedure on the socketed test anchor cable, the method and degreasing solvent used to remove the wire rope dressing from the anchor cable prior to socketing, and the number and spacing of seizings placed on the anchor cable ends prior to socketing. If thermoset resin is used as socket filler material, the submittal shall include the material and method used to fill all grooves and rings inside the socket cavity flush with the inside casting surface. The socketing procedure shall include the method of socketing the anchor cable at the Pontoon end on site. The Design-Builder shall not extend the anchor cable through a deck hatch to perform socketing.
- The product specifications and manufacturer's recommended application procedure for the wire rope dressing, and the method and equipment used to apply the dressing to the anchor cable during installation operations.
- The method and equipment used to load anchors at the fabrication and storage site, transport the anchors to the bridge site, locate the specified position of anchor placement, and place the anchor at the specified location.
- The equipment and procedure used to create the specified clear zone for the anchors and associated anchor cable, including the equipment and methods used to remove or displace obstructions within the specified clear zone.
- The electronic position monitoring system used to establish and monitor the anchor's position at the lake bottom, including the type and location of electronic devices placed in the anchor, the type of monitoring equipment used, and the ability of the system to provide information on the horizontal location, vertical elevation, orientation and degree of tilt of each anchor.
- The method and equipment used to install the anchor cable. If the anchor cable is to be installed with the anchor, the submittal shall describe all measures taken to protect the anchor cable from damage during anchor installation, and the measures taken to mark the location of, and identity of, the anchor cable for later retrieval during Pontoon installation.
- The methods used to protect the anchor cable from being dragged through or on top of the lake bottom sediment, and from contacting debris, other

abandoned anchor cables and anchors, and all sharp edges and corners, including the exit end of the Pontoon cable hawse pipe.

- The method and equipment used to provide video inspection and recording of each anchor cable and anchor after installation.
- The method used to improve the load-carrying capacity of each anchor if the anchor fails the proof load test requirement.

Anchors and anchor cables shall not be installed until WSDOT has reviewed and commented on the Pontoon Anchor Installation and Testing Plan.

### 2.12.6.11 MAINTENANCE ACCESS PLAN

The Design-Builder shall prepare a Maintenance Access Plan and shall submit the plan to WSDOT for review and approval. The plan shall take due account of Access Obstructions as defined in this section including the Future Six-Lane Plus Two HCT Configuration. The Maintenance Access Plan shall show all clearances and travel paths that the Design-Builder shall provide on the Pontoon deck. Special consideration shall be given to clearances above and around hatches.

The Maintenance Access Plan shall be submitted as part of the final design plans.

### 2.12.6.12 CABLE REPLACEMENT PLAN

The Design-Builder shall prepare a Cable Replacement Plan, and shall submit the plan to WSDOT for review and approval. The plan shall take due account of Access Obstructions as defined in this section, including the Future Six-Lane Plus Two HCT Configuration.

The Cable Replacement Plan shall show all steps required to replace anchor cables in the future (by others) during routine and emergency conditions, including the Future Six-Lane Plus Two HCT Configuration. The plan shall describe the tools and equipment required, the work force required, and the clearances the Design-Builder shall provide in this Work. Emergency conditions shall be defined as the wind and seas from a one-YRP storm. All work shall be able to be accomplished with standard tools and equipment available to any marine contractor within 24 hours. Any tools and equipment that are not readily available shall be furnished to WSDOT incidental to this Project along with additional storage capacity at the Maintenance Facility to store the tools and equipment so that they are protected from the weather.

The anchor cables shall not be installed until WSDOT has reviewed and approved the Cable Replacement Plan.

### 2.12.6.13 LOAD RATING REPORT

The Design-Builder shall provide a load rating report in accordance with the requirements of Section 2.13.

### 2.12.6.14 PHYSICAL COMPLETION REQUIREMENTS

Prior to the WSDOT Engineer granting Physical Completion, the following criteria shall be met:

- PPDB monitoring equipment/system shall be operational and in good working condition as required.

- Operation and maintenance manual for the monitoring equipment/system shall be provided as required in this section. The operation and maintenance manuals will only be required for the first PPDB at Physical Completion provided the Design-Builder does not change the PPDB monitoring system.
- As-Built Plans shall be provided as required.
- Final inspection checklist shall be provided documenting that all punch list items have been addressed, including repairs for any damage the PPDB sustained during launching and mooring.
- The bottom side of the keel slab shall have been inspected as described in this section.
- Monitoring and damage control documentation for the moorage period shall have been provided as required in Section 2.27.
- Final inspection shall be completed and water tight integrity of PPDB shall be documented.

The following shall occur within 15 Calendar Days prior to Physical Completion:

- The Design-Builder shall remove all equipment, materials, and debris from the PPDB deck and all PPDB cells.
- The Design-Builder shall perform a joint (coordinated) inspection with the WSDOT Engineer to verify the PPDB has not been damaged and is free of defects.
- The Design-Builder shall perform an underwater hull inspection, recorded on DVD or other recording media acceptable to WSDOT.

The Design-Builder shall provide to WSDOT ballasting logs documenting the current condition and depth of ballast water in each PPDB cell.

### 2.12.6.15 3D BIM MODEL REPORT

The Design-Builder shall create the 3D model by employing an iterative process whereby the 3D model shall be presented, assessed, modified and updated accordingly with the Preliminary Design Plan submittal and the Final Design Plan submittal.

The 3D BIM Model Report shall including the following:

- Original 3D Models of each Discipline's features
- Integrated 3D Model
- Interference Report

The 3D BIM Model Report shall include the following elements in the formats noted below:

- Original 3D Model Files: dwg, dgn
- Integrated Model file: .nwf file
- Integrated Model pdf-like file: .nwd file
- Interference Report – HTML and PDF.

End of Section

# 2.13 BRIDGES AND STRUCTURES

## 2.13.1 GENERAL

The Design-Builder shall conduct all Work necessary to complete design and construction of the bridges and structures. Elements of Work include, but are not limited to, the following:

- Permanent bridges including:
  - East Approach - North Bridge
  - East Approach - South Bridge
  - Pier 36 North and South (N&S)
- Permanent walls including:
  - Wall No. 1
  - Wall No. 2
  - Wall No. 3
  - Wall No. 4
- Removal of existing East Approach and West Approach Bridge components of Bridge No. 520/8. For removal of existing floating bridge, see Section 2.26 (Removal of Existing Floating Bridge).
- Except for the removal of the transit facility as defined in Section 2.31 (Transit Facility Demolition and Pavement Restoration), the selective removal of existing structures as required to complete the Work of this project.
- Noise barrier walls, temporary retaining walls, barriers, moment slabs, approach slabs, box culverts, pipes, precast concrete arches, sign structures, lighting structures, traffic CCTV camera poles, underground vaults and structure retrofits as required.
- Miscellaneous site retaining walls as required to support the pedestrian path.
- Permanent and temporary modifications of existing bridges and walls as required for mounting signs, structures, lighting structures and structure renovations.
- Installation of bridge deck overlay on the Existing West Approach (EWA) bridge and the WCB, and shifting of traffic barriers for the west end traffic switch.

As-Built Plans showing the existing bridges are located in Appendix A-B. The As-Built Plans are not guaranteed to be dimensionally accurate or complete. The Design-Builder shall field measure existing dimensions as required.

The requirements for the Floating Bridge and Transition Spans are specified in Section 2.12 (Floating Bridge). The superstructure for these bridges shall conform to the requirements of this section and Section 2.12.

## 2.13.2 MANDATORY STANDARDS

The following is a list of Mandatory Standards that shall be followed 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 standards 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, notify WSDOT immediately, so that WSDOT may resolve them. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication (including the supplemental interim revisions) as of the RFP publication date shall be used.

- SR 520 Design Criteria for Essential Bridges (Appendix S2).
- WSDOT Criteria for Bridges Subjected to Light Rail Transit Loading (Appendix S11).
- WSDOT Bridge & Structures Office Design Memoranda ("BSODM") (Appendix B4), as modified for Design-Build.
- WSDOT *Bridge Design Manual* (M 23-50) (BDM) (Appendix D1)
- Structures Minimum Standards (Appendix B2).
- Bridge Shaft Mandatory Standard (Appendix B5).
- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M 41-10) (Appendix D18).
- WSDOT *Geotechnical Design Manual* (M 46-03) (GDM) (Appendix D5).
- AASHTO *Guide Specifications for LRFD Seismic Bridge Design*.
- AASHTO *LRFD Bridge Design Specifications*.
- *Sound Transit Link Light Rail North/South Link Design Criteria Manual,* Chapter 8 Draft (Appendix S10).
- WSDOT *Design Manual* (M22-01) (Appendix D3).
- WSDOT *Plans Preparation Manual* (M 22-31) (Appendix D12).
- WSDOT *Construction Manual* (M 41-01) (Appendix D2).
- WSDOT *Materials Manual* (M 46-01) (Appendix D10).
- WSDOT Standard Plans (M 21-01) (Appendix D17).
- WSDOT Qualified Products List (M46-02) (Appendix D13).
- AASHTO *LRFD Bridge Construction Specifications*.
- AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.
- AASHTO *Guide Specifications for Structural Design of Sound Barriers*.
- Bridge Welding Code: ANSI/AASHTO/AWS D1.5M/D1.5 : 2008..
- Structural Welding Code – Reinforcing Steel: AWS D1.4/D1.4M.

- AASHTO *Guide Specifications and Commentary for Vessel Collision Design of Highway Bridges*.
- AASHTO *Guide Specifications for Bridges Vulnerable to Coastal Storms*.
- PIANC *Guidelines for the Design of Fender Systems*.
- Unified Facilities Guide Specification, UFGS- 35 59 13.16 *Marine Fenders*.
- Department of Defense, UFC 4-152-01, *Design: Piers and Wharves*.
- State of Washington, Washington State Building Code.
- IBC 2009 International Building Code (except where municipal statute references an antecedent edition).
- Structural Welding Code: ANSI/AWS D1.1/D1.1M.
- AASHTO *Guide Design Specifications for Bridge Temporary Works*.
- AASHTO *LRFD Guide Specifications for Design of Pedestrian Bridges*.
- AASHTO *Standard Specifications for Highway Bridges*, 17th Edition, 2002.

#### 2.13.2.1 MODIFICATIONS TO WSDOT BRIDGE DESIGN MANUAL

The BSODM (Appendix B4) shall apply to the Project, except that the references to the Project advertisement dates shall not apply.

The BDM (Appendix D1), as modified by the BSODM (Appendix B4), shall be further modified for Design-Build as follows:

- Rights and Responsibilities -- The following clarifies which rights and responsibilities discussed in the BDM (Appendix D1) will be applicable to the Design-Builder:
  - The Design-Builder shall complete all analyses, evaluations, load ratings, plans and specifications discussed in the BDM (Appendix D1).
  - All such analyses, evaluations, load ratings, plans and specifications will be 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 written approval for all proposed deviations from the provisions of the BDM (Appendix D1), except as included in these Technical Requirements.
- For the Future Six-Lane Plus Two HCT Configuration, the analyses and evaluations shall be completed to a level sufficient to demonstrate to the satisfaction of WSDOT that this future configuration can be accommodated, but shall not require final design plans, specifications or load ratings discussed in the BDM (Appendix D1). The Design-Builder shall obtain WSDOT's written approval for the Future Six-Lane Plus Two HCT Configuration design.

The Design-Builder shall follow the guidelines established in 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 (Appendix D1).

-

## 2.13.3 PERFORMANCE REQUIREMENTS

### 2.13.3.1 FUNCTIONALITY

The Design-Builder shall design and construct all bridges and structures as necessary to provide a complete, functional highway system.

### 2.13.3.2 DESIGN LIFE

The Design-Builder shall design and construct the permanent bridges and structures to achieve the required Design Life of at least 75 years. See Section 1-01.3 of the General Provisions for Definitions.

### 2.13.3.3 ROADWAY REQUIREMENTS

The minimum required vertical clearance is 16.5 feet for all new bridges over roadways and driveways at all times during and after construction.

### 2.13.3.4 NAVIGATION CHANNEL REQUIREMENTS

Navigation channel requirements shall be in accordance with Section 2.12.

### 2.13.3.5 EAST APPROACH – NORTH AND SOUTH BRIDGES

The East Approach - North and South Bridges shall connect the proposed East Transition Span to the SR 520 Eastside Transit and HOV Project as part of this Project. In the future, the North and South Bridges will be modified to accommodate the Future Six-Lane Plus Two HCT Configuration. The Design-Builder shall design and construct the North and South Bridge substructures to accommodate this future widening and loading by others without requiring future in-water work; e.g. adding falsework, shoring, cofferdams, piers, shafts, pilings, columns, or other foundation strengthening /modifications. Therefore, the Design-Builder shall design and construct the North and South Bridge substructures for the more stringent of the geometric and structural requirements of the North and South Bridges as shown in the Conceptual Plans (Appendix M1) or the future North and South Bridges as shown in the Future Six-Lane Plus Two HCT Configuration (Appendix M2).

The Design-Builder shall design and construct the North Bridge superstructure to its Future Six-Lane Plus Two HCT Configuration width as part of this Project. The Design-Builder shall design and construct the South Bridge superstructure to accommodate the Future Six-Lane Plus Two HCT Configuration width by means of future superstructure widening by others. See Section 2.13.4.6 for future widening restrictions.

The Design-Builder shall design and construct the East Approach Bridges with structure type and detailing that is consistent for both bridges. Water piers shall not interfere with boat access to the maintenance facility dock.

Fendering systems shall be required on the East Approach Bridges piers adjacent to the navigation channel. The Design-Builder shall design substructures to withstand vessel impacts without the benefit of the fendering system.

#### 2.13.3.6 WEST CONNECTION BRIDGE (WCB) AND WEST APPROACH BRIDGE (WAB)

The Design-Builder shall construct Pier 36S to a four-lane configuration as described in the Basic Configuration and as shown in the Conceptual Plans (Appendix M1) and the West Connection Bridge Drawings (Appendix M3). The Design-Builder shall design and construct Pier 36N&S to additionally accommodate a future six-lane configuration shown in SR 520 West Approach Conceptual Plans (Appendix M6) and for a Future Six-Lane Plus Two HCT Configuration (Appendix M2).

The WAB six-lane configuration, as shown in the SR 520 West Approach Conceptual Plans (Appendix M6), will be constructed by others in the future at the same location as the WCB and the RSUP. The WAB will have a taller profile, a different width, and will require a future widened bridge deck to support HCT loading. Therefore, the Design-Builder shall design and construct foundations and columns for Pier 36N&S for the more stringent of the geometric, aesthetic and structural requirements of the WCB, the RSUP, the WAB or the future widened WAB (Future Six-Lane Plus Two HCT Configuration). The layout and geometry of the WCB, the RSUP, the WAB and the future widened WAB, including piers and foundation locations, shall be a mandatory requirement. See Section 2.13.4.2 for specific design criteria for each of the three configurations described below:

- WCB - four lane configuration shown in the Conceptual Plans (Appendix M1), and the West Connection Bridge Drawings (Appendix M3), and the RSUP shown in the West Connection Bridge Drawings (Appendix M3).
- WAB – future six-lane configuration shown in the SR 520 West Approach Conceptual Plans (Appendix M6).
- WAB – Future Six-Lane Plus Two HCT Configuration shown in the Future Six-Lane Plus Two HCT Configuration Conceptual Plans (Appendix M2).

See this section for additional design requirements for the WAB Future Six-Lane Plus Two HCT Configuration.

Fendering systems shall be required on the Pier 36N&S adjacent to the navigation channels. The Design-Builder shall design substructures to withstand vessel impacts without the benefit of the fendering system.

#### 2.13.3.7 ENVIRONMENTAL REQUIREMENTS

The Design-Builder shall design and construct the bridges and structures in conformance with the environmental commitments as listed in Section 2.8 (Environmental).

### 2.13.4 DESIGN CRITERIA

#### 2.13.4.1 PERSONNEL REQUIREMENTS

The Design-Builder shall provide a Structural Lead Engineer in accordance with the requirements of Section 2.12. The Structural Lead Engineer shall be in responsible charge of all bridge and structures design elements, and shall be the Engineer of Record for all structural engineering Design Documents for this Project.

### 2.13.4.2 DESIGN CRITERIA

The Design-Builder shall analyze and design all new permanent bridges and structures, and all existing structural elements whose load-carrying capacities are altered by the Work, in accordance with the BDM (Appendix D1) and these Technical Requirements.

The seismic analyses and design for all new permanent retaining walls shall be in accordance with the AASHTO *Guide Specifications for LRFD Seismic Bridge Design*, as modified by the BDM (Appendix D1), and the site-specific response spectra and site coefficients applicable to this Project as defined in Section 2.6 (Geotechnical Design) and Seismic Ground Motion Design Criteria (Appendix G5).

The East Approach – North and South Bridge, as described in the Conceptual Plans (Appendix M1), shall be designed in accordance with all Mandatory Standards except the following: WSDOT Criteria for Bridges Subjected to Light Rail Transit Loading (Appendix S11), and Chapter 8 of the *Sound Transit Link Light Rail North/South Link Design Criteria Manual* (Appendix S10). The East Approach – North and South Bridges are classified as Essential Bridges and shall be designed in accordance with the SR 520 Design Criteria for Essential Bridges (Appendix S2) and the Seismic Ground Motion Design Criteria (Appendix G5).

The Future Six-Lane Plus Two HCT Configuration of the East Approach – North and South Bridge, as described in Future Six-Lane Plus Two HCT Configuration (Appendix M2), shall be designed in accordance with all Mandatory Standards. This future configuration of the East Approach – North and South Bridge is classified as an Essential Bridge and shall be designed in accordance with the SR 520 Design Criteria for Essential Bridges (Appendix S2) and the Seismic Ground Motion Design Criteria (Appendix G5).

The WCB and the RSUP, as described in the Conceptual Plans (Appendix M1) and the West Connection Bridge Drawings (Appendix M3), shall be designed in accordance with all applicable Mandatory Standards except the following: SR 520 Design Criteria for Essential Bridges for Essential Bridges (Appendix S2), WSDOT Criteria for Bridges Subjected to Light Rail Transit Loading (Appendix S11), and Chapter 8 of the *Sound Transit Link Light Rail North/South Link Design Criteria Manual* (Appendix S10). The WAB - Six lane configuration shown in the SR 520 West Approach Conceptual Plans (Appendix M6) shall be designed to all the applicable Mandatory Standards except the following: WSDOT Criteria for Bridges Subjected to Light Rail Transit Loading (Appendix (S11), and Chapter 8 of the *Sound Transit Link Light Rail North/South Link Design Criteria Manual* (Appendix S10). The WAB - Six lane configuration is classified as an Essential Bridge and shall be designed in accordance with the SR 520 Design Criteria for Essential BridgesDesign Criteria for Essential Bridges (Appendix S2) and the Seismic Ground Motion Design Criteria (Appendix G5).

The Future Six-Lane Plus Two HCT Configuration of the WAB, as described in the Future Six-Lane Plus Two HCT Configuration (Appendix M2), shall be designed in accordance with all Mandatory Standards. This future configuration of the WAB is classified as an Essential Bridge and shall be designed in accordance with the SR 520 Design Criteria for Essential Bridges (Appendix S2) and the Seismic Ground Motion Design Criteria (Appendix G5).

### 2.13.4.3 STRUCTURAL STEEL

High strength bolts for structural steel connections shall be galvanized.

Use of unpainted weathering steel will not be permitted.

Painting of structural steel shall be in accordance with the requirements of Section 6-07.3(9) of the WSDOT Standard Specifications (Appendix D18).

### 2.13.4.4 GENERAL BRIDGE DESIGN CRITERIA

The Design-Builder shall not use, deck bulb tee girders, thin flange bulb tee girders, solid or voided slabs, precast prestressed ribbed girders, or precast prestressed double tee girders for permanent structures. The Design-Builder shall not use masonry, timber, aluminum, or lightweight concrete as materials for permanent bridges and structures. The Design-Builder shall not use rolled steel beams for the superstructure except in the locations shown on the Conceptual Plans (Appendix M1).

The Design-Builder shall not use steel substructure elements (columns, crossbeams, pilings, etc) for permanent structures, except as shown on the floating bridge Conceptual Plans (Appendix M1). The use of non-structural or sacrificial shaft casings in accordance with the BDM (Appendix D1) will be acceptable.

The Design-Builder shall not design intermediate hinges into vehicular bridges, except for the hinge shown in the Conceptual Plans (Appendix M1) between the East Transition Span and the East Approach Bridges. A minimum of three longitudinal girders in the deck cross-section shall be used in girder superstructures to provide redundant load path structures. The superstructure shall not be fracture critical.

Girders, except for cast-in-place box girders, shall be designed to carry their weight and the weight of the fluid concrete bridge deck including formwork without shoring.

The criteria for deflection listed in Section 2.5.2.6.2 of the AASHTO *LRFD Bridge Design Specifications* is not optional and shall be requried for all bridges and structures, unless otherwise noted in this section.

A future wearing surface shall be included in the design in accordance with the BDM (Appendix D1).

### 2.13.4.5 AESTHETIC CRITERIA

The Design-Builder shall design and construct all Work in compliance with the requirements of Section 2.15 (Landscape and Aesthetics Design).

### 2.13.4.6 FUTURE SIX-LANE PLUS TWO HCT CONFIGURATION

In addition to the Basic Configuration shown in the Conceptual Plans (Appendix M1), the Design-Builder shall design and construct the bridges and structures to accommodate the Future Six-Lane Plus Two HCT Configuration (Appendix M2).

For the Future Six-Lane Plus Two HCT Configuration, the design of the bridges and structures shall conform to the requirements of Chapter 8 of the *Sound Transit Link Light Rail North/South Link Design Criteria Manual* (Appendix S10) and the WSDOT Criteria for Bridges Subjected to Light Rail Transit Loading (Appendix S11).

Loading demands from Future Six-Lane Plus Two HCT Configuration shall include the weight of vehicles and passengers; railings; overhead catenary systems (OCS) for electrification; trackage and plinths; and other features as required to support HCT. Design consideration shall also be given to wind pressures, longitudinal and lateral accelerations, and seismic forces. See Section 2.12 for HCT loading requirements.

The Design-Builder shall design for the Future Six-Lane Plus Two HCT Configuration so that the pier crossbeams constructed in this Work need not be added to, modified, strengthened, shored, or retrofitted in the future, except as noted below. It is anticipated that future widening by others will be done by selectively removing a portion of the concrete from the end of crossbeams and then extending the length of crossbeam as required. However, in the future it will not be permitted to remove, replace, or strengthen the crossbeam near the center of the bridge to accommodate the future HCT loading. Crossbeams shall be provided that will resist the loadings from both current and future requirements.

The Design-Builder shall design for the Future Six-Lane Plus Two HCT Configuration so that the superstructure constructed in this Work need not be modified, strengthened, or retrofitted in the future, except as noted below. It is anticipated that future widening by others will be done by selectively removing the edge of bridge deck slab, and adding exterior girders or webs, and widening the bridge deck slab as required. However, in the future it will not be permitted to remove, replace, or strengthen girders or bridge deck slabs near the center of the bridge to accommodate the future HCT loading. Girders and slabs shall be provided that will resist the loadings from both current and future requirements. It is anticipated that the bridge deck slab will need to be drilled for dowels to accept rails and plinths in the future.

The Design-Builder shall provide special reinforcing and prestressing steel placement in the bridge decks and approach slabs at the location of the future HCT lanes. All layers of reinforcing and prestressing steel shall be placed so that a six-inch by six-inch clear vertical opening between bars/strands/tendons will be available for others in the future to safely drill holes in the deck slab for track connections. See Future HCT Track Connection (Appendix M8) for future HCT track connection requirements.

### 2.13.4.7 TEMPORARY BRIDGES

"Temporary bridges" refers to any bridge or portion of bridge carrying public vehicular or pedestrian traffic that will not remain upon Physical Completion, and will be in use for less than five years. If a bridge will not remain functional upon Physical Completion but is scheduled to have a service life greater than five years, then the bridge shall conform to the requirements of permanent bridges in this section.

The Design-Builder may use salvaged structural members for temporary bridges meeting the following conditions:

- Documentation showing that the structural members meet all appropriate material properties for their intended function, such as: dimensions, yield strength, tensile strength, ductility, toughness, chemical composition, weldability and corrosion resistance shall be provided. If member documentation is unavailable, material testing of the structural members shall be required to provide assurance that the appropriate requirements of material properties have been met.
- Salvaged steel beams shall have no areas of detrimental section loss due to corrosion.
- All holes in structural members shall be less than one inch in diameter and shall be round and smooth.
- Salvaged prestressed concrete beams shall have no exposed strands, no defects, no spalls deeper than one inch, and no cracks wider than 0.010 inches. Beam

design sheets shall be provided indicating concrete strength, strand type and pattern, shear reinforcement and other pertinent information.

Maintenance of temporary bridges shall be the Design-Builder's responsibility.

The Design-Builder shall design temporary bridges in accordance with applicable sections of the BDM (Appendix D1), AASHTO *LRFD Bridge Design Specifications*, and the AASHTO *Guide Specifications for LRFD Seismic Bridge Design*. The Design-Builder shall follow the required geometric, lateral clearance and vertical clearance requirements except as modified herein.

The erected temporary bridge shall be reviewed in the field by the Design-Builder's Engineer responsible for design compliance with the Released For Construction documents. The Structural Lead Engineer shall review and approve actual details of the erected bridge and shall report all field changes to WSDOT.

### 2.13.4.8 CONSTRUCTION WORK BRIDGES

"Construction Work Bridges" refers to any bridge or portion of bridge whose sole purpose is carrying construction equipment, traffic and personnel; is not for public vehicular or pedestrian use; and that will not remain upon Physical Completion.

The Design-Builder shall design and construct Construction Work Bridges in accordance with applicable sections of the AASHTO *Guide Design Specifications for Bridge Temporary Works*.

The Design-Builder shall design all Construction Work Bridges for full equipment live loads and impacts.

The Design-Builder shall provide documentation showing that salvaged structural members meet all appropriate material properties for their intended function, such as: dimensions, yield strength, tensile strength, ductility, toughness, chemical composition, weldability and corrosion resistance. Material testing of the salvaged structural members may be required in order to provide assurance that the appropriate requirements of material properties have been met.

Maintenance and safety of Construction Work Bridges shall be the Design-Builder's responsibility.

The Design-Builder's Engineer responsible for design compliance with the Released For Construction documents shall review the erected Construction Work Bridge in the field. The Structural Lead Engineer shall review and approve actual details of the erected bridge.

The requirements of Section 2.5.2.6.2 of the AASHTO *LRFD Bridge Design Specifications* will not be required for Construction Work Bridges.

### 2.13.4.9 PERMANENT RETAINING WALLS

The Design-Builder shall design and construct permanent retaining walls that are appropriate for the Project. Retaining walls shall be of the following types, except as noted below:

- Proprietary Structural Earth Walls (SEW) in accordance with Section 6-13 of the WSDOT Standard Specifications (Appendix D18).

- Geosynthetic Walls in accordance with Drawing D-3 of the WSDOT Standard Plans (Appendix D17), and Section 6-14 of the WSDOT Standard Specifications (Appendix D18).
- Standard Reinforced Concrete Cantilevered Retaining Walls in accordance with Sections D-10.10-01 through D-10.45-01 of the WSDOT Standard Plans (Appendix D17), and Section 6-11 of the WSDOT Standard Specifications (Appendix D18).
- Soil Nail Walls in accordance with Section 6-15 of the WSDOT Standard Specifications (Appendix D18).
- Soldier Pile Walls and/or Soldier Pile Tieback Walls in accordance with Sections 6-16 and 6-17 of the WSDOT Standard Specifications (Appendix D18).

Retaining walls at the end of bridges, e.g. abutments, wingwalls, or closure walls, shall be cast-in-place concrete construction in accordance with Section 2.13.4.17.

For additional information and descriptions of these wall types refer to the BDM (Appendix D1) and GDM (Appendix D5). For geotechnical requirements, refer to Section 2.6.

The Design-Builder shall calculate lateral earth pressures in accordance with Section 3.11 of the AASHTO *LRFD Bridge Design Specifications* and site-specific geotechnical requirements. The Design-Builder shall modify WSDOT Standard Plans (Appendix D17) retaining walls as necessary to meet seismic design criteria for the Project in accordance with the requirements of Section 2.6.

The Design-Builder shall modify WSDOT Standard Plans (Appendix D17) retaining walls as necessary to meet aesthetic requirements for the Project in accordance with Section 2.15. Aesthetic modifications shall not adversely affect the strength and safety requirements of the retaining walls.

The Design-Builder shall provide fall protection, such as a safety cable railing 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. See Section 730.04(7)b of the WSDOT *Design Manual* (Appendix D3).

The Design-Builder shall coordinate the design of miscellaneous site retaining walls and final grading adjacent to the Evergreen Point Road lid structure in the Eastside Transit and HOV Project, WSDOT Contract 7963. The lid structure may be designed by others to rely on passive soil resistance for lateral stability. The miscellaneous site retaining walls and final grading shall not be permitted to reduce the passive soil resistance of the lid structure.

The Design-Builder shall construct a concrete surface for all permanent retaining walls. The concrete surface shall be one of the following types:

- Reinforced concrete in accordance with Section 6-11 of the WSDOT Standard Specifications (Appendix D18).
- Precast Concrete Facing Panel in accordance with Section 6-13.3(4) of the WSDOT Standard Specifications (Appendix D18).
- Concrete Fascia Panels in accordance with Section 6-15.3(9) of the WSDOT Standard Specifications (Appendix D18).

- Shotcrete facing in accordance with Section 6-18 of the WSDOT Standard Specifications (Appendix D18). Shotcrete facing will only be permitted at specific walls in accordance with the requirements of Section 2.15.

### 2.13.4.10 NOISE BARRIER WALLS

The Design-Builder shall construct noise barrier walls of precast concrete or cast-in-place concrete. Masonry, timber, metal, and gravity block (ecology block) noise barrier walls will not be permitted. The Design-Builder shall modify the noise barrier wall plans shown in the WSDOT Standard Plans (Appendix D17), as necessary, to meet the requirements of Section 2.15.

The Design-Builder shall design noise walls for all structural service limit state, strength limit state, extreme limit state and safety requirements, and in accordance with Section 3.12 of the BDM (Appendix D1), except that the limitations for wall heights shall not apply.. The Design-Builder shall also incorporate the requirements of Section 2.15, but they shall not diminish the structural requirements for the noise walls.

The Design-Builder shall provide fire hydrant access openings adjacent to fire hydrant locations, as required by each responsible local fire marshal having jurisdiction. Openings shall be provided, and locations shall be easily accessible to both emergency vehicles and water supply service lines. Each access door shall have entry door locking cores. Fire hydrant signs shall be attached to access doors as required by the local fire marshal having jurisdiction.

Final alignment tolerances shall be ½ inch within any 10-foot length of wall.

The Design-Builder shall design and construct grading and drainage to prevent the collection of water runoff on either side of noise barrier walls. Drainpipe and other structures shall not pass through noise barrier walls or noise barrier wall footings.

Where noise barrier walls are placed less than eight feet from the Right-of-Way line, Right-of-Way fencing is not required and the fence shall be attached to the ends of the noise barrier wall.

### 2.13.4.11 TEMPORARY RETAINING WALLS

“Temporary retaining wall” refers to any wall or portion of wall that retains earth adjacent to public vehicular traffic and will not remain functional upon Physical Completion. If a wall will not remain functional upon Physical Completion but is scheduled to have a service life longer than five years, then the wall shall conform to the requirements of permanent retaining walls in this section.

The Design-Builder may reuse structural components of temporary retaining walls as part of permanent retaining wall systems, provided all of the structural support elements and materials of the temporary retaining walls meet the requirements of permanent structure standards. Timber piles will not be allowed as foundations for temporary retaining walls. Maintenance of temporary retaining walls shall be the Design-Builder’s responsibility.

The Design-Builder may leave the buried portion of temporary retaining walls in place but shall remove them at least two feet below finished grade and completely cover them with soil material. Timber components of temporary retaining walls shall not remain buried but shall be removed in their entirety.

### 2.13.4.12 BRIDGE INSPECTION AND MAINTENANCE ACCESS

The Design-Builder shall design and detail all bridge superstructures, joints and bearings to be accessible for WSDOT inspection and maintenance, and to allow for replacement of joints and bearings. All bearing locations shall be designed with jacking points and adequate clearances to facilitate future bearing replacement. Jacking points shall be designed to support 200 percent of the calculated lifting load.

All exterior surfaces of superstructures, including bearings and between girders, shall be accessible by an Aspen Aerial A-62 Under Bridge Inspection Truck (UBIT), a 40-foot bucket truck, or a 15-foot ladder. "Accessible" is defined as within arm's reach of an inspector. Technical details including the flight path for an Aspen Aerial A-62 can be located at the following website:

http://www.aspenaerials.com/pages/a62.htm

All box girders and cells shall be accessible for interior inspection and maintenance during and after construction. Access doors or access between cells/girders shall be provided at both ends of the bridge. Access doors shall be lockable, shall swing into the box girders, and shall be placed at locations that do not impact traffic. Lock box latches shall be installed on all access doors accessible from ground level.

The Design-Builder shall paint the interior of steel box girders the color white (Federal Standard 595, Color No. 17925) and shall provide fluorescent inspection lighting and electrical power. Lighting fixtures, light switches and duplex receptacles shall be located inside the steel box girders in a manner consistent with the WSDOT Design Manual (Appendix D3).

The Design-Builder shall cover box girder penetrations greater than one inch in diameter through the exterior with wire mesh screen to prevent vermin and birds from accessing the interior of the box girders.

The Design-Builder shall strip and remove all falsework and formwork from bridges, including the interior of box girder cells.

### 2.13.4.13 BRIDGE LOAD RATINGS

The Design-Builder shall load rate all new, widened or rehabilitated vehicular bridges with an overall length of 20 feet or greater, measured from back to back of pavement seats along the centerline of the bridge deck.

### 2.13.4.14 PRECAST PRESTRESSED AND POST-TENSIONED CONCRETE GIRDERS

Precast prestressed and post-tensioned concrete girders shall be based on standard W girders, wide flange girders or trapezoidal tub concrete girder sections as shown in the BDM (Appendix D1). Use of other standard prestressed concrete girder sections shown in the BDM (Appendix D1) will not be permitted.

The Design-Builder shall provide continuity reinforcement at intermediate piers in the bridge deck to resist negative moments due to live load and superimposed dead loads. Prestressed concrete girders shall be designed to have the same depth in all spans of a bridge.

The Design-Builder shall bond match cast joints for segmental construction with an epoxy bonding agent. Dry cast joints will not be permitted.

### 2.13.4.15 STEEL PLATE GIRDERS AND STEEL BOX GIRDERS

Steel superstructures shall not be fracture critical. The main longitudinal load-carrying girders shall be cambered during fabrication. Heat cambered rolled girders shall not be used except as secondary members or temporary girders. Steel superstructures shall have a cast-in-place reinforced concrete bridge deck designed to be composite for live loads.

Pipe railing along the girder webs for future maintenance and inspection access will not be required.

Drip plates shall be provided on the bottom flanges on the exterior side of the exterior steel plate girders to direct water runoff away from bearings and bridge seats.

### 2.13.4.16 BRIDGE APPROACH SLABS

The Design-Builder shall provide a 25-foot minimum length cast-in-place reinforced concrete bridge approach slab with approach slab anchors at the ends of each new vehicular bridge. The bridge approach slab joints with the pavement section shall be perpendicular to the travel lanes. Bridge approach slabs shall extend the full width of the bridge deck and traffic barriers. The Design-Builder shall provide an underdrain system beneath all new bridge approach slabs to reduce water in embankment fills at bridge abutments.

### 2.13.4.17 BRIDGE FOUNDATIONS

The Design-Builder shall use either spread footings, shafts or cast-in-place concrete piles for permanent structures.

The Design-Builder shall design and construct shafts in accordance with the Bridge Shaft Mandatory Standard (Appendix B5).

The Design-Builder shall construct bridge abutments, wingwalls and curtain walls of cast-in-place reinforced concrete. Where structural earth walls adjoin bridge abutments or curtain walls, the joint shall be a single vertical joint full height to the bottom of the traffic barrier. Curtain walls at bridge abutment wall corners shall be cast-in-place walls integral with the abutment walls and extending to the back of the footings. All girder seats at abutments and pier caps shall be sloped to drain moisture accumulation.

The Design-Builder shall use wingwalls, curtain walls and retaining walls as required by slope geometry and under-bridge clearances. These walls shall prevent soil slopes from spilling onto girders and bearings. End slopes under bridge abutments shall be no steeper than 2:1 (horizontal to vertical); unless a geotechnical investigation allows a steeper slope, in which case the end slopes may be no steeper than 1.5:1.

### 2.13.4.18 BRIDGE DECKS AND EXPANSION JOINTS

The Design-Builder shall design and construct all vehicular bridge decks using cast-in-place reinforced concrete. On new vehicular bridges, decks shall include a System 1 bridge deck protective system in accordance with the BDM (Appendix D1). With the exception of the widened portion of the EWA and the overlay on the WCB, bituminous or bituminous-with-membrane overlays for permanent bridge deck construction on new vehicular bridges will not be permitted. Bridge decks and approach slabs shall be placed with an additional ½-inch of concrete cover over the top reinforcing to provide an allowance for NGCS texturing/grooving.

Stay-in-place forms and stay-in-place concrete deck panels for the bridge deck will not be permitted.

Bridge decks shall be continuous between expansion joints. Expansion joints shall be spaced apart as far as is practical, and not less than 300 feet spacing.

The Design-Builder shall not use steel finger expansion joints on new bridges. All expansion joints shall be watertight. Longitudinal expansion joints (parallel to traffic) shall not be used on new bridges. The maximum skew for expansion joints on new bridges shall be 30 degrees as measured perpendicular to the centerline of the bridge deck.

The Design-Builder shall construct/correct all bridge decks and approach slabs to achieve roadway smoothness in accordance with the requirements of Section 2.7 (Pavement).

The Design-Builder shall construct all bridge decks and approach slabs with NGCS grooving/texturing in accordance with the requirements of Section 2.7. The Design-Builder shall install expansion joints as required to account for NGCS grinding, and shall exercise caution when NGCS grinding at the expansion joints. At the Transition Span expansion joints, the Design-Builder is hereby cautioned that the roadway grade may require adjustment (by incorporating crest and sag angle points) to account for an actual lake level that differs from Project Lake Level.

The Design-Builder shall install a non-skid surface to plates, covers, and expansion joints in areas with pedestrian traffic. The non-skid surface shall be fabricated with a molten metal or metal grit deposition process on the substrate plate, and shall be one of the following products/processes, or an approved equal:

1) Algrip™ by Ross Technology Corporation (1,000 deposits per square foot minimum).

2) SlipNOT® Grade 2 by W.S. Molnar Co.

3) Mebac® Grade 3 by Harsco Industrial IKG.

After fabrication, the surface shall be hot-dip galvanized. The completed non-skid surface shall increase the surface coefficient of friction to 0.80 minimum in both dry and wet conditions in accordance with ASTM 1679. Non-skid tapes, treatments, or coatings (e.g. polyurethanes, paints, epoxies, acrylics, and the like) with embedded aggregate or grit will not be permitted.

### 2.13.4.19 BRIDGE DECK DRAINAGE

Bridge drain inlets shall be placed as required to capture runoff from the bridge upslope of expansion joints. At the West Transition Span, drainage pipes crossing modular expansion joints shall be avoided, and sheet flow conveyance over the joints will be permitted. The Design-Builder shall minimize bridge drain inlets and downspouts along bridges as much as practical. Runoff shall be captured at each end of the bridge. Downspout pipe supported by bridge superstructures shall be at least six-inch diameter Schedule 80 hot-dip galvanized steel pipe with a smooth two-mil epoxy coating on the pipe interior and shall have watertight joints. Exterior surfaces of all downspout pipes and supports shall be painted per the requirements of this section. Bridge drain inlets and downspout pipe shall be sized in accordance with Section 2.14 (Stormwater Management). The Design-Builder shall install drain inlets as required to account for NGCS grinding, and shall exercise caution when NGCS grinding around drain inlets to maintain slopes to drain as required in Section 2.14.

### 2.13.4.20 CONDUITS AND PIPE SUPPORTS

Refer to Section 2.12 for requirements for conduits and pipe supports.

### 2.13.4.21 INTENTIONALLY OMITTED

### 2.13.4.22 BRIDGE AND RETAINING WALL BARRIERS AND RAILINGS

The Design-Builder shall incorporate the aesthetic requirements of Section 2.15, but shall not adversely affect the strength limit state, service limit state and safety requirements for the traffic barriers and railings.

The Design-Builder shall not use precast concrete barriers for permanent applications on bridges or bridge approach slabs. Permanent barriers shall be cast-in-place reinforced concrete. Concrete barriers shall not be slip-formed.

The Design-Builder shall cast a minimum of two, two-inch diameter galvanized rigid steel conduit pipes with junction box pairs (one for each conduit pipe) spaced at 180-feet maximum into all new concrete bridge barriers for the full length of the barrier, including barriers on bridge approach slabs. Each conduit pipe shall terminate at separate Type 1 junction boxes within 15 feet of the exit from a barrier. The Design-Builder shall provide and install conduit expansion devices.

### 2.13.4.23 SIGN STRUCTURES, TRAFFIC CCTV CAMERA STRUCTURES AND LIGHTING STRUCTURES

The Design-Builder shall design overhead structures for the more severe forces resulting from the signs and lighting constructed for the Project, or the loads as defined in the BDM (Appendix D1) and AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

The permanent sign structures shall be standard WSDOT monotube sign bridge structures conforming to Bridge Standard Drawings 10.1-A1 thru A5.Where overhead sign structures, traffic CCTV camera structures, Variable Message Signs (VMS) or luminaires are mounted on bridges, the bridge structural elements shall be designed for the more severe forces resulting from the sign structures, traffic CCTV camera structures and luminaires for the Project, or for the loads as defined in the BDM (Appendix D1).

The design of retaining walls and foundations shall account for the placement of any major sign supports (such as cantilevered signs or sign bridges), lighting supports, and Intelligent Transportation System (ITS) signs and equipment supports on or adjacent to the retaining walls. All sign, traffic CCTV camera and luminaire loads shall be isolated from all wall systems except for cast-in-place reinforced concrete retaining walls.

For luminaires, traffic CCTV camera structures, or sign structures mounted on at-grade traffic barriers where the WSDOT Standard Plans (Appendix D17) are not applicable, the structural design of their supports shall meet the requirements of the BDM (Appendix D1) and AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

Hand holes in closed members shall have reinforcement around the holes. After fabrication, steel surfaces shall be galvanized in accordance with AASHTO M 111. Bolts, rods and related hardware shall be galvanized after fabrication in accordance with AASHTO M 232 unless otherwise noted in these Technical Requirements. All exterior

steel surfaces shall be painted or powder coated in accordance with Section 2.15. Traffic CCTV and luminaire poles shall not be painted or powder coated.

Basic design wind speed shall be 90 mph with 30-percent gust factor in accordance with AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

See Section 2.16 (Illumination and Roadway Electrical Systems), Section 2.17, Section 2.18 (Intelligent Transportation Systems), and Section 2.19 (Signing) for additional requirements.

#### 2.13.4.23.1 Intelligent Transportation System (ITS) Signs

The Design-Builder shall design and construct associated ITS sign housings, ITS sign mounting members (beams and brackets that attach the signs to the sign structures, existing bridges or other support structures), maintenance walkways, support structures and foundations (including all necessary hardware) to install the ITS Signs. VMS shall not be installed on cantilever sign structures.

The Design-Builder shall design and construct maintenance walkways for the VMS.

#### 2.13.4.23.2 Traffic CCTV

The analysis and design of traffic CCTV camera support structures shall conform to the following criteria:

- Pole deflection shall not exceed 0.7 inches in 30-mph wind or 1.4 inches in 70-mph wind.
- The Design Life and Recurrence Interval shall be as follows:
    - Fifty years for traffic CCTV camera support structures that are 50 feet or more in height.
    - Twenty-five years for traffic CCTV camera support structures that are less than 50 feet in height.
- Fatigue Design shall conform to Section 11 of the AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals* using Fatigue Category III.

### 2.13.4.24 UNDERGROUND VAULTS

The Design-Builder shall design and construct underground vaults of reinforced concrete in accordance with AASHTO *LRFD Bridge Design Specifications* and the following requirements of the ACI 350 *Code Requirements for Environmental Engineering Concrete Structures*:

- All concrete structures shall comply with the flexural and axial cracking requirements of the AASHTO *LRFD Bridge Design Specifications* and ACI 350.
- The loading as specified in *Seismic Design of Liquid-Containing Concrete Structures* (ACI 350.3) or equivalent analysis as approved by WSDOT shall be applied to all structure types, not just concrete. The assumption is that when the vault is almost full of water, the seismic event has moved

soil on one side away from the exterior walls and is sloshing the water, as the event ends.

Live load distribution through the soil shall be based on Sections 3.6.1.2.6 and 3.6.2.2 of the AASHTO *LRFD Bridge Design Specifications* for distribution of wheel loads and impact, respectively.

Seismic design of buried underground vaults shall be based on geotechnical recommendations as described in Section 12.6.1 of the AASHTO *LRFD Bridge Design Specifications*, even if the underground vaults do not rest on an active fault. The seismic design of portions of underground vaults that are not buried shall be designed in accordance with ACI 350.3.

The Design-Builder shall consider construction loads, in service load cases, for design of structure.

The Design-Builder shall check all underground vaults for buoyancy under high water table conditions, where all water has to be removed in order to repair the structure (i.e., vault is empty). Provide a safety factor of 1.25 against uplift from buoyancy, and include the appropriate self weight of the structure and/or tie-downs appropriate for soil conditions, including construction scenarios.

Underground vault connections shall meet the following criteria:

- Joints using welded shear connectors with grouted keyways shall use details for precast, prestressed voided slab details as shown in the BDM (Appendix D1) or approved equivalent, at four feet on center, or provide calculations showing the changes.
- Calculations shall be provided for grouted shear connections.

The Design-Builder shall design hatches and risers for a 16,000-pound wheel load, with increased impact as a deck joint in accordance with Table 3.6.2.1-1 of the AASHTO *LRFD Bridge Design Specifications*, at the critical location, in addition to the appropriate soil and live load lateral pressures. These loads shall be transferred to the vault structure with HL-93 loading distributed through the appropriate soil depth.

### 2.13.4.25 TOLLING STRUCTURES

The Design-Builder shall design, furnish and install all tolling structures. The Design-Builder shall design and construct all associated structural members and foundations to accommodate the toll collection system requirements and the loads as defined in the BDM (Appendix D1) and AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

The permanent tolling structures shall be standard WSDOT monotube sign bridge structures conforming to Bridge Standard Drawings 10.1-A1 thru A5. The permanent tolling structure design shall include a lightning protection system.

The temporary tolling structures may be truss-type structures, at the Design-Builder's option. The temporary tolling structure design shall be for a Design Life of 10 years. The reuse of existing structures for temporary tolling structures will only be permitted upon inspection, load rating, and certification by the Structural Lead Engineer.

The Design-Builder shall design and construct the permanent tolling structures to meet the following requirements:

- A Stockbridge (Type 31 lbs.) vibration damper or equal, approved by the Structural Lead Engineer and reviewed and commented on by WSDOT, shall be provided and mounted on the back of the beam opposite traffic.
- The structural design and analysis of the tolling structures shall use 50-year design life. The fatigue design of the structure shall conform to Fatigue Category 1 of AASHTO.
- All butt joint welds shall be full penetration groove welds with back-up plates of ¼-inch minimum thickness.
- The back-up plates for all full-penetration welds shall be welded continuously to the joined pieces.
- Beams shall be fabricated to provide a smooth parabolic camber curve. A camber curve shall be provided on the tolling structure design drawings. Shims will not be permitted at bolted splices.
- The posts shall be fabricated straight.
- Posts, base plates, beams and splice plates are main load-carrying tensile members or tension components of flexural members and shall meet the longitudinal Charpy V-notch requirements as described in Section 6-03.2 of the WSDOT Standard Specifications (Appendix D18) for AASHTO M270 material temperature zone 2. Non-destructive test acceptance criteria shall conform to tensile members with cyclic load.
- The maximum sign area that the tolling structure was designed for shall be noted on the design and working drawings.

See Section 2.23 (All Electronic Tolling Infrastructure) for additional requirements.

## 2.13.4.25 VESSEL COLLISION AND FENDERING

### 2.13.4.25.1 Vessel Collision

The Design-Builder shall design all components to comply with the requirements of Article 3.14 of the AASHTO *LRFD Bridge Design Specifications*. The following criteria shall be used for the vessel collision analysis and design:

- The operational classification of the bridges shall be “typical”.
- The nature of vessel traffic and the vessel traffic density shall be as provided Vessel Collision Data (Appendix S8).
- The typical vessel transit velocity in the navigation channels under normal environmental conditions is seven knots.
- The yearly mean current velocity for the bridge location shall be taken as one knot unless the Design-Builder can establish a different value through data and/or analysis approved by WSDOT.
- The Design-Builder shall design the substructures to withstand vessel impacts without the benefit of the fendering system.
- For the floating bridge, the vessel collision provisions only apply to the Pontoon fenders.

- The degree of damage permissible is detailed in Table 1 in this section:

**Table 1. Permissible Damage in Bridge Components due to Vessel Collision**

| Component | Permissible Damage |
|---|---|
| Superstructure | • Local crushing, spalling, or yielding is permissible over the zone of impact.<br>• Member buckling and collapse shall be prevented.<br>• Global behavior shall be essentially elastic. |
| Columns | • Local crushing, spalling, or yielding is permissible over the zone of impact.<br>• Member buckling and collapse shall be prevented.<br>• Plastic behavior shall be permitted in column regions designed as plastic hinges for SDC's C and D in accordance with AASHTO *Guide Specifications for LRFD Seismic Bridge Design*.<br>• Material strain limits, member ductility, and member capacity requirements in the plastic hinge regions shall be in accordance with the limits specified in the AASHTO *Guide Specifications for LRFD Seismic Bridge Design* for SDC D. |
| Foundation Elements | • Local crushing, spalling, or yielding is permissible over the zone of impact.<br>• Member buckling and collapse shall be prevented.<br>• Global behavior shall be essentially elastic. |
| Protective Systems | • Fender systems shall be sacrificial. |

### 2.13.4.25.2 Fendering

Fendering systems shall be required on piers adjacent to a designated navigation channel. Fendering systems shall be designed to minimize damage to the structure caused by collision of recreational and small commercial vessels.

As a minimum, fenders shall be vertical eight-inch by eight-inch marine fenders and shall be one of the following products, or an approved equal:

1) DD Fender by Trelleborg Marine Systems
2) "D" Series "D" Shaped Bore Fender by Longwood Elastomers, Inc.
3) D Shape with D Bore Marine Fender by Pacific Marine & Industrial

Fenders shall be installed at a four foot spacing along each face of the columns and shafts and shall extend at least three feet below and 10 feet above the Project Lake Level. Fenders shall be positioned to provide protection against damage to the corners of columns and architectural concrete.

The Design-Builder shall design and install marine fendering systems as required by the United States Coast Guard and according to the design requirements of UFGS- 35 59 13.16, *Marine Fenders* and UFC 4-152-01, *Design: Piers and Wharves*.

### 2.13.4.26 DESIGN-BUILDER PERFORMANCE CONCRETE

A separate class of performance concrete may be developed and proposed for use in bridges and structures. The performance concrete shall be tested in the lab and in the field to the same level as completed in WSDOT Contract 7812 (Appendix B6). The performance concrete shall conform to Table 2 and the following design requirements:

**Table 2. Design-Builder Performance Concrete**

| Material | Material Specification |
|---|---|
| Type I-II low alkali cement | Std. Spec. Sect. 9-01.2(1) and 9-01.2(3) |
| Microsilica | Std. Spec. Sect. 9-23.11 |
| Fly Ash | Std. Spec. Sect. 9-23.9 |
| Granulated Slag | Std. Spec. Sect. 9-23.10 |
| Coarse Aggregate | Std. Spec. Sect. 9-03.1(4) Grading No. 8 |
| Fine Aggregate | Std. Spec. Sect. 9-03.1(2), with a fineness modulus in the range of 2.7 to 3.1 |
| Water | Std. Spec. Sect. 9-25.1 |
| Retarding/Hydration-Stabilizing Admixture | Std. Spec. Sect. 9-23.6(5)[1] |
| High-Range Water-Reducing Admixture | Std. Spec. Sect. 9-23.6(7)[2] or Std. Spec. Sect. 9-23.6(8)[2] |
| Viscosity Modifying Admixture | Std. Spec. Sect. 9-23.6(9)[3] |

**Notes**:

[1] Retarding/hydration stabilizing admixture dosage shall be based on the slump life and/or setting time requirements.

[2] High-range water-reducing admixture dosage shall be based on the slump requirement.

[3] Viscosity-modifying admixture shall be based on the slump/slump flow requirements.

All concrete mix designs shall be submitted, tested, and approved in accordance with the requirements of this section and Section 2.25 (Control of Materials). The Design-Builder shall perform the following tests as part of the concrete mix design submittal:

- Compressive strength at one, two, seven, 14, 28 and 56 days in accordance with AASHTO T22.
- Rapid chloride permeability at 28 and 56 days in accordance with AASHTO T277.
- Creep and shrinkage in accordance with ASTM C512.
- Modulus of elasticity at three and 28 days in accordance with ASTM C469.
- Freeze-thaw in accordance with ASTM C666 (300 cycles, durability factor minimum).
- Heat of hydration in a semi-adiabatic chamber (used for thermal modeling by Design-Builder only).
- Shrinkage in accordance with AASHTO T 160.

- Ring shrinkage in accordance with ASTM C1581.
- Splitting tensile strength at 28 days in accordance with ASTM C496.
- Large batch in accordance with AASHTO R39.
- Static segregation of Self Consolidating Concrete (SCC) by column method in accordance with ASTM C1610.
- Passing ability of SCC by J-ring in accordance with ASTM C1621.
- Permeability test in accordance with AASHTO T 277

At least 50 percent of the surface area of the coarse aggregate shall be naturally rounded (not crushed or angular). Aggregates shall originate from sources as listed in the WSDOT Aggregate Source Approval (ASA) Database.

Aggregates shall have an expansion less than or equal to 0.20 percent when tested in accordance with Section 9-03.1(1) of the WSDOT Standard Specifications (Appendix D18). Use of aggregates with expansion rates exceeding these specified amounts, with or without mitigation measures, will not be allowed. The WSDOT State Materials Laboratory will perform the validation testing of aggregates.

The concrete shall exhibit no indications of aggregate or paste segregation.

Slump retention and setting time shall be controlled using a retarding or hydration-stabilizing admixture.

The concrete shall be air-entrained.

The concrete shall have a 28-day minimum compressive strength of 4,000 pounds per square inch (psi.) and a minimum modulus of elasticity of 3,600,000 psi.

Shrinkage shall be less than 350 microstrain.

The maximum permeability shall be 1,000 coulombs at 56 days. The permeability test results shall be submitted to WSDOT at least 30 Calendar Days prior to the first scheduled placement of concrete. This permeability test is required for the mix design only, and will not be a requirement for acceptance of production concrete.

The Design-Builder shall submit a mix design for the concrete to WSDOT for review and approval in accordance with the requirements of Section 2.25.

The provisions for mass concrete in the BDM (Appendix D1) shall be modified as follows:

- Concrete placement with the least dimension greater than six feet shall be considered mass concrete.
- The Design-Builder shall mitigate heat generation effects by the methods listed in the BDM (Appendix D1).
- The Design-Builder shall develop and submit a thermal control plan which shall include the items listed in the BDM (Appendix D1).

## 2.13.5 CONSTRUCTION CRITERIA

### 2.13.5.1 GENERAL

Construction shall meet the requirements of this section, the Structures Minimum Standards (Appendix B2), and the Bridge Shaft Mandatory Standard (Appendix B5).

The Design-Builder shall not operate cranes, drill rigs and other construction equipment exceeding the legal load on structures without WSDOT's written approval.

The prohibition against the construction of raised crossbeams expressed in Chapter 2.7.1 of the BDM (Appendix D1) will be suspended for this Project. The protection of the falsework shall conform to Division 6 of the WSDOT Standard Specifications (Appendix D18).

Construction of sign structure shaft foundations that are four feet in diameter or greater, or where the shaft depth is 15 feet or greater, shall conform to the requirements of Shafts for Sign Structure Foundations in the Structures Minimum Standards (Appendix B2).

Form liner finishes for concrete structures shall meet the requirements of Section 2.15.

#### 2.13.5.2 PERMANENT GROUND ANCHORS

The Design-Builder shall perform verification testing of permanent ground anchors for each soil type. At least one verification test shall be performed in each soil type within each anchor zone.

#### 2.13.5.3 ELECTRICAL CONTINUITY AND GROUNDING

The Design-Builder shall electrically ground and connect together all steel reinforcing bars, prestressing tendons and structural steel systems in the permanent bridges and structures.

Refer to Section 2.17 for electrical continuity, bonding, grounding, and testing requirements; and Section 2.12 for additional requirements.

#### 2.13.5.4 REMOVAL OF EXISTING HOLLOW PILES

The removal of existing hollow piles at the existing approach structures shall conform to the requirements of the Structures Minimum Standards (Appendix B2). Hollow piles shall be removed to a point at least two-feet below mudline. The open portion of hollow piles remaining and the excavations shall be backfilled with backfill material. Backfill placed underwater need not be compacted.

#### 2.13.5.5 REMOVAL OF EXISTING PIERS 40 AND 41

The removal of existing Piers 40 and 41 at the existing approach structures shall conform to the requirements of the Structures Minimum Standards (Appendix B2). Existing Pier 40 and Pier 41 shall be removed to an elevation shown on the Conceptual Drawings (Appendix M1) or two feet below mudline, whichever is lowest. The excavations shall be backfilled with approved backfill material. Backfill placed underwater need not be compacted.

### 2.13.6 SUBMITTALS

#### 2.13.6.1 BRIDGE AND STRUCTURE DESIGN SUBMITTALS

WSDOT will review and comment on all scheduled submittals and will return comments to the Design-Builder. All Design Documents shall bear the stamp and signature of the Structural Lead Engineer, unless otherwise noted herein.

#### 2.13.6.1.1 Preliminary Design Submittal

The Design-Builder shall submit preliminary design drawings on WSDOT standard sheets for all bridges and structures including drawings for the future six-lane WAB and the Future Six-Lane Plus Two HCT Configurations for all bridges. The signature of the Structural Lead Engineer will not be required.

#### 2.13.6.1.2 Final Design Submittal

The Design-Builder shall submit final design drawings on WSDOT standard sheets. The Design-Builder shall submit final specifications, design calculations and supporting reports for all bridges and structures.

#### 2.13.6.1.3 Released For Construction (RFC) Document Submittal

The Design-Builder shall submit RFC documents to WSDOT for all structural Work related to bridge construction, including drawings, specifications, design calculations and supporting reports.

#### 2.13.6.1.4 Design Calculations

The Design-Builder shall provide complete sets of calculations to support all structural engineering designs described in this section. The calculation sets shall include the following:

- Cover Sheet - The name of the Project, Structure Name, designer/checker initials, date (month, day and year) and supervisor's initials shall be listed. The stamp and signature of the Structural Lead Engineer shall also be included.
- Index Sheets - These shall include numbered calculation sheets and an index by subject with the corresponding sheet numbers.
- Design Calculations (including calculations for the future six-lane WAB and the Future Six-Lane Plus Two HCT Configurations for all bridges) – These shall include design criteria; loadings; structural analysis; results; member capacities; geotechnical calculations; horizontal and vertical settlement calculations; deflection diagrams; long term creep diagrams for horizontal flexural members; and all computer input and output data (reduced to an 8.5-inch by 11-inch sheet size). Electronic files of spreadsheets and computer input/output files shall be submitted.

#### 2.13.6.1.5 Shop Drawing Submittals

The Design-Builder shall submit shop drawings for all steel elements, precast concrete elements, post-tensioning reinforcement, bearings, expansion joints, railings, barriers, luminares, drainage and piles/drilled shafts prior to implementing Work based on the shop drawings. The shop drawings shall include, but not be limited to, the following information:

- Size of member and fasteners.
- Length dimensions.
- Finish such as galvanizing, anodizing and painting.
- Weld size and type, and welding procedures.

- Strand or steel reinforcing bar placement.
- Post-tensioning reinforcement tensioning procedure, stress calculations and elongations.
- Post-tensioning anchorage details.
- Fabrication-reaming, drilling and assembly procedures.
- Wall penetrations.
- Erection procedures for steel elements.
- Handling and erection procedures for precast concrete elements, including complete details of all temporary supports, bracing and inserts placed for lifting, assembly and erection.

#### 2.13.6.1.6 Submittals for Falsework, Forms, and other Temporary Structures

The Design-Builder shall submit Working Drawings with supporting design calculations for falsework, forms, construction work bridges, temporary retaining walls, temporary bridges and other temporary structures.

The Design-Builder shall submit procedures and Working Drawings with supporting design calculations for critical construction processes. Critical construction processes include, but are not limited to, bridge demolition and shaft installation.

All final design plans and calculations for the falsework, forms, construction work bridges, temporary retaining walls, temporary bridges, other temporary structures, demolition and installation shall bear the stamp and signature of a Professional Civil or Structural Engineer licensed under Title 18 RCW.

#### 2.13.6.1.7 Concrete Mix Design

The Design-Builder shall submit concrete mix designs conforming to the requirements specified in this section to WSDOT for review and comment in accordance with Section 6-02.3(2)A of the WSDOT Standard Specifications (Appendix D18).

### 2.13.6.2 PLAN REVISIONS DURING CONSTRUCTION

The Design-Builder shall incorporate calculations for revisions made during construction into the design/check calculation file when construction is completed. Whenever new plan sheets are required as part of a contract revision, the information in the title blocks of these sheets must be identical to the title blocks of the contract they are for. Every revision will be assigned a number. The assigned number shall be located both at the location of the change on the sheet and in the revision block of the plan sheet along with an explanation of the change.

### 2.13.6.3 END OF PROJECT SUBMITTALS

All Design Documents submitted at the end of Project shall bear the stamp and signature of the Structural Lead Engineer.

### 2.13.6.3.1 Plans

The Design-Builder shall prepare As-Built Plans for bridges and structures on WSDOT standard sheets. Plans shall be submitted on 11-inch by 17-inch white bond paper and as electronic files.. The Design-Builder shall submit the final approved shop drawings.

### 2.13.6.3.2 Calculations

The Design-Builder shall revise all calculations as necessary for the design covered by the Scope of Work to accommodate field changes. The calculations shall include all the items listed under "Design Calculations" previously specified in this section.

### 2.13.6.3.3 Load Rating Report

The Design-Builder shall complete and submit a load rating report as described in Section 13.4 of the BDM (Appendix D1) to WSDOT before a bridge that is new, widened or rehabilitated is opened to vehicular traffic.

The Design-Builder shall provide the load rating in BRIDG software format, using system input. If BRIDG is not suitable for a specific bridge type rating, then GT-STRUDL, SAP 2000 or structural software as approved by WSDOT may be used to analyze the forces in vehicular structures or elements of a vehicular structure. The forces and capacities shall be tabulated in an EXCEL spreadsheet for future updates to the ratings or to check permit loads.

The Design-Builder shall submit all electronic files generated for the load rating analysis on CD-ROM.

End of Section

# 2.14 STORMWATER MANAGEMENT

## 2.14.1 GENERAL

The Design-Builder shall conduct all Work necessary to design, document, and construct stormwater conveyance and management facilities. Elements of this Work shall include, but are not limited to, the following:

- Prepare a Hydraulic Report for the constructed project in accordance with the WSDOT *Highway Runoff Manual* (Appendix D6) and the WSDOT *Hydraulics Manual* (Appendix D7);
- Pavement drainage systems for both the permanent Project facilities and the temporary conditions during the construction of the project;
- Temporary erosion and sedimentation control measures that meet threshold requirements defined in the WSDOT Highway Runoff Manual (Appendix D6), and meet the Temporary Erosion Sedimentation Control (TESC) Plan Template and the Environmental Commitment List criteria, as defined in Appendix C1 and Section 2.8 (Environmental);
- Runoff treatment and flow control facilities, as required to meet the Mandatory Standards in this section and the Environmental Commitments List (Appendix C1);
- Continuation of existing offsite flows that pass through the Project area;
- Local drainage systems shall be designed, maintained, or restored to current local jurisdictional requirements;
- Maintain the functionality of existing stormwater collection, conveyance, flow control, runoff treatment and other stormwater facilities that are not affected by the Design-Builder's construction;
- Protect and maintain functionality of existing subsurface drainage systems (refer to the existing project as-built plans [Appendix A-B]);
- Design documentation;
- The Design-Builder is required to coordinate with the WSDOT Project Engineer for consideration of stormwater conveyance needs, runoff treatment and flow control facilities for adjacent WSDOT projects and other agency projects. Reference Section 2.1 (General Information) for the adjacent project list.
- Protect sensitive areas in compliance with Section 2.8 (Environmental). Work shall comply with Sections 2.13 (Bridges and Structures) and 2.28 (Quality Management Plan) for associated structural design aspects and submittal requirements that impact and/or affect shoreline and in-lake work.

## 2.14.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Highway Runoff Manual* (HRM) (M31-16) (Appendix D6).
- WSDOT *Hydraulics Manual* (HM) (M23-03) (Appendix D7).
- WSDOT *Bridge Design Manual (*BDM*)* (M23-50) (Appendix D1)
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D9).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D13).
- WSDOT *Environmental Procedures Manual* (M31-11) (Appendix D4).
- City of Medina Ordinance 843 (Appendix H3).

#### 2.14.2.1 COMPUTER SOFTWARE

The following computer software is the primary software accepted by WSDOT for use on the Project. Refer to Figure 1-4, Design Frequency for Hydraulic Structure, within the Hydraulics Manual (Appendix D7) for the design frequency requirements. The Design-Builder will be required to submit additional details about the software, and obtain approval from WSDOT HQ Hydraulics prior to use of any programs not listed. The Design-Builder is responsible for the expense of purchasing all software to be utilized for the design of the project.

- Mandatory Software:
  - MGSFlood for continuous simulation hydrologic model (Version 4.08).
- Approved Software:
  - WSDOT inlet analysis spreadsheets for pavement runoff spread calculations (www.wsdot.wa.gov/Design/Hydraulics/ProgramDownloads.htm);
  - HEC-1, Flood Hydrograph Package;
  - HEC-HMS Flood Hydrograph Package;
  - HEC-RAS Surface Water Computation;
  - StormShed3G by Engenious Systems;
  - HY-8, Culvert Hydraulic Analysis Program by FHWA; and
  - WSPRO Backwater/Surface Water Computation;

#### 2.14.2.2 APPROVED NON-WSDOT DESIGN MANUALS

The following design manuals are accepted by WSDOT for use in hydraulic design for the Project. The Design-Builder shall obtain WSDOT HQ Hydraulic Office's approval prior to using other design manuals. Documentation will be required to be included in Appendix 9 of the Final Hydraulic Report if any other design manuals are approved for use.

- HEC-11, Design of Riprap Revetment;
- HEC-12, Drainage of Highway Pavements;
- HEC-13, Hydraulic Design of Improved Inlets for Culverts;
- HEC-14, Hydraulic Design of Energy Dissipaters for Culverts and Channels;
- HEC-15, Design of Roadside Channels with Flexible Linings;
- HEC-18, Evaluating Scour at Bridges;
- HEC-20 Stream Stability at Highway Structures; and
- HEC-21 Design of Bridge Deck Drainage.

### 2.14.3 PERFORMANCE REQUIREMENTS

#### 2.14.3.1 GENERAL

The stormwater drainage systems (consisting of, but not limited to, runoff collection systems, conveyance systems, flow control facilities, runoff treatment facilities, and outfalls for the Project's new or reconstructed impervious and pollution-generating surface areas) shall meet the requirements of this section, the Mandatory Standards and the Project permits as defined in the Environmental Commitments List (Appendix C1). The Design-Builder shall maintain and provide facilities for handling runoff from non-pollution-generating surfaces throughout the project, flows originating from off-site, and cross-drainage as required in the Mandatory Standards and the Environmental Commitments List (Appendix C1). The Design-Builder shall design and construct the storm drain, flow control, runoff treatment, conveyance and cross-drain facilities using the methods described in the Mandatory Standards.

#### 2.14.3.2 PERSONNEL REQUIREMENTS - STORMWATER DESIGN LEAD ENGINEER

The stormwater management design shall be prepared by, or under the direct supervision of, the Stormwater Design Lead Engineer.

The Stormwater Design Lead Engineer shall have a minimum of 10 years of experience in the design and construction of highway-related stormwater elements, and a minimum of four years of specific WSDOT highway stormwater design experience in Western Washington within the last six years which includes bridge drainage experience. Experience shall also include demonstrated leadership in projects with low-impact development-type (LID) stormwater treatment techniques or emphasis, and five or more continuing education units (CEU's) in LID related topics in the past three years to supplement traditional stormwater treatment Best Management Practices (BMPs), as well as a working knowledge of the MGSFlood modeling program. The Stormwater Design Lead Engineer shall be a Professional Engineer licensed under Title 18 RCW, shall have completed WSDOT's training course in the WSDOT Highway Runoff Manual

(Appendix D6), and shall be in responsible charge of the stormwater design including downstream analyses and hydraulic impact mitigation evaluations. The Stormwater Design Lead Engineer shall also be responsible for any stormwater and drainage design revisions made throughout the duration of the Project.

#### 2.14.3.3 STORMWATER TASK FORCE AND MEETINGS

The Design-Builder shall establish and chair a Stormwater Task Force in accordance with Section 2.1 (General Information). The task force shall include representatives from the Design-Builder and WSDOT, including HQ Hydraulics, HQ Environmental Services Office (ESO) and WSDOT Bridge and Roadway Maintenance representatives. The task force shall 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.

The Design-Builder shall schedule and chair Stormwater Task Force meetings weekly from Contract execution through Physical Completion. The meeting schedule and frequency of meetings may be adjusted upon agreement by the Stormwater Task Force members.

The purpose of the Stormwater Task Force and Meetings is to achieve the following:

- Stormwater design coordination for compliance with the objectives of the project;
- Ensure stormwater design compliance with the Mandatory Standards and the Environmental Commitments List (Appendix C1);
- Discuss and develop construction hold points prior to start of work;
- Disseminate Project information to task force attendees; and
- Identify permit impacts from proposed design changes to the Conceptual Plans (Appendix M1) that might trigger the need to seek modification to the permits. Refer to Section 2.8 (Environmental) for permit modification requirements.

#### 2.14.3.4 HYDRAULIC REPORTS

##### 2.14.3.4.1 General

Two Hydraulic Reports were prepared for the Project, the Program Level Hydraulic Report, SR 520 Bridge Replacement and HOV Project: I-5 to Medina, Corridor Stormwater Management Strategy Report (Program Hydraulic Report [Appendix H1]) and the Supplemental Hydraulic Report, SR 520/I-5 to Medina – Stage 1 Evergreen Point Floating Bridge and Landings (Supplemental Hydraulic Report [Appendix H2]). The Program Level Hydraulic Report, SR 520 Bridge Replacement and HOV Project: I-5 to Medina, Corridor Stormwater Management Strategy Report is an overall corridor management strategy which defines full corridor requirements from the I-5 / SR 520 interchange to the eastern Project construction limits, east of 80th Avenue NE within the City of Medina. The Supplemental Hydraulic Report (Appendix H2) is a conceptual design level report that defines the specific requirements for the Project from the West Transition Span to the Project construction limits, east of 80th Avenue NE, within the City of Medina. The Project construction limits are based on the Conceptual Plans (Appendix M1).

#### 2.14.3.4.2 Program Hydraulic Report

The Program Hydraulic Report (Appendix H1) defines the program level stormwater management requirements for the SR 520 Bridge Replacement and HOV Project: I-5 to Medina. This report will not need to be altered or advanced by the Design-Builder; however, the Design-Builder is responsible for complying with the overall program level strategy outlined in this report.

#### 2.14.3.4.3 Supplemental Hydraulic Report

The Supplemental Hydraulic Report (Appendix H2) provides a stormwater management solution for the SR 520 Evergreen Point Floating Bridge and Landings Project's NEPA documentation. The report covers the Project construction limits. In accordance with the Mandatory Standards, the Design-Builder shall expand the content of the Conceptual Hydraulic Report to include all elements of the final design including plan sheets for facilities and conveyance systems, and shall produce a Final Hydraulic Report for submittal with the As-Built Plans. The Design-Builder shall refine and detail the documentation as necessary to demonstrate that the design meets all Mandatory Standards and fulfills the Project's commitments.

The Design-Builder is not responsible to advance work for conveyance and runoff treatment presented in the Conceptual Hydraulic Report for references to the West Connection Bridge (WCB). All drainage work required west of approximate Station MRWX: 37+11.82 (MR: 137+12.36, ML: 137+12.11) shall be constructed by others, except for the barriers required for the traffic switch located on the existing West Approach Bridge. These barriers may require scuppers for drainage and are the responsibility of the Design-Builder for design and construction.

### 2.14.3.5 INTENTIONALLY OMITTED

### 2.14.3.6 SPILL COLLECTION SYSTEM BENEATH EVERGREEN POINT ROAD LID

The Design-Builder shall design and construct flammable liquid spill collection systems on the SR 520 mainline roadways beneath the Evergreen Point Road Lid structure in accordance with the guidelines described in the Supplemental Hydraulic Report (Appendix H2). The Eastside Design-Builder will construct spill collection inlets and a conveyance system beneath the Evergreen Point Road Lid. The mainline conveyance pipe will be compatible with the Floating Bridge and Landings vertical alignment as shown in the Conceptual Plans (Appendix M1). The spill collection and mainline conveyance pipe will be existing when the Design-Builder commences work in the Evergreen Point Road vicinity. The Design-Builder shall utilize the existing mainline pipe conveyance systems installed by the Eastside Design-Builder. Any additional inlets or conveyance pipes that may be required shall be connected to the existing mainline pipe conveyance system. The Design-Builder shall remove or abandon any elements of the existing spill collection or conveyance system that are not required for the Floating Bridge and Landings horizontal and vertical alignment. Spill collection inlets shall have a means to prevent flames from traveling through the collection system or entering the mainline pipe system. The Design-Builder shall coordinate the design with the Eastside Transit and HOV Project. Refer to Sections 2.11 (Roadway Design), Section 2.13 (Bridges

and Structures), and Appendix A-7 of the Supplemental Hydraulic Report (Appendix H2) for details.

The Design-Builder shall account for rain driven runoff under the proposed Evergreen Point Road Lid by calculating the roadway surface area encompassed by a 30 degree projection from vertical from the top of the lid into and under the lid structure. This shall be from the highest opening point from the final roadway grade to the underside of the lid structure. This area shall be used to determine the limits of pollution generating impervious surface below the Lid that will be modeled to the stormwater treatment BMP. All other impervious surface below the Lid shall not be defined as pollution generating impervious surface and is not required to be treated.

#### 2.14.3.7 GROUNDWATER/DEWATERING

Discharge of groundwater shall comply with State water quality standards, NPDES permits and other WSDOT permits issued for the Project. Geotechnical field exploration and field and laboratory tests were conducted at numerous locations across the Project alignment. Details of the field exploration and field and laboratory test results are presented in the GDR (Appendix G2), The GDR provides additional data relevant to the dewatering plan for the Project. Refer to the GDR and Section 2.8 (Environmental) for additional information regarding groundwater/dewatering criteria.

### 2.14.4 DESIGN REQUIREMENTS

#### 2.14.4.1 STORMWATER DESIGN CRITERIA

The Design-Builder shall comply with the Mandatory Standards, Environmental Commitments List (Appendix C1), and the design criteria described in this section and in Sections 2.8 (Environmental), 2.12 (Floating Bridge), 2.13 (Bridges and Structures) and 2.15 (Landscape and Aesthetics Design) to develop the stormwater design for the Project.

If any of the design criteria are not achievable, the Design-Builder shall submit clear documentation to WSDOT, including an explanation and a proposed alternative for review and comment by WSDOT and the local agencies. WSDOT will review and comment on all scheduled submittals, and return comments to the Design-Builder in accordance with the requirements of this section and Section 2.28 (Quality Management Plan). Refer to Section 2.2 (Project Documentation) and Section 2.28 for these requirements.

The Design-Builder is encouraged to seek cost-effective designs that provide equal or greater environmental benefits and reduced long-term maintenance. Cost-effective solutions may include the innovative use of runoff treatment and flow control techniques; direct discharge to Lake Washington; low impact development type BMPs; reduction or conversion of existing impervious surfaces; and design features that utilize infiltration of stormwater where practical and feasible.

The Conceptual Plans (Appendix M1) will be submitted with the project permit applications, and the Design-Builder is responsible to prepare an as-constructed (As-Built) plan set for inclusion in the Program Hydraulic Report (Appendix H1) and the Supplemental Hydraulic Report (Appendix H2). The stormwater features shall be constructed according to the Design-Builder's final design plan set. The conceptual plan set was developed following criteria defined in the Mandatory Standards, Section 2.14 along with close consultation with the permitting agencies.

Any change to the Conceptual Plans (Appendix M1), during final design may create the need for permit modifications as required by permit conditions. The Design-Builder shall coordinate all changes to the Conceptual Plans with the Stormwater Task Force team to ensure changes comply with Section 2.8 (Environmental) and the Environmental Commitments List (Appendix C1).

The following reference documents are provided for assistance in design:

- Washington's Water Quality Management Plan to Control Nonpoint Sources of Pollution, June 2005, Publication #05-10-027 (Appendix H4).
- 2008 Washington State Water Quality Assessment: 305(b) Report, and303(d) list, Jan 2009(www.ecy.wa.gov/programs/wq/303d/2008/index.html)
- National Resources Conservation Service, Soil Survey of King County Area, Washington, June 2009 (Soil Map) and September 2009 (Soil Data (http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm).
- Implementing Agreement Between the Washington State Department of Ecology and Washington State Department of Transportation Regarding Compliance with the State of Washington Surface Water Quality Standards, 2004 (Appendix H7).
- Interagency Implementation Agreement - State of Washington Alternative Mitigation Policy Guidance for Aquatic Permitting Requirements from the Departments of Ecology and Fish and Wildlife, February 2000 (Appendix H8).
- Memorandum of Agreement between Washington State Department of Fish and Wildlife and Washington State Department of Transportation Concerning Construction of Projects in State Waters, June 2002 (Appendix H9 ).
- *AKART and Water Quality Studies for SR 520 Replacement Floating Bridge* (AKART Study), Appendix A-7 within the Supplemental Hydraulic Report (Appendix H2) .

### 2.14.4.2 COLLECTION AND CONVEYANCE STRUCTURES

The Design-Builder shall minimize disturbance to the existing pavement that is to remain. The Design-Builder shall analyze the capacity of new inlets, storm drains, ditches, outfalls and other conveyance structures within the Project limits and include this evaluation in the Design-Builder's Final Hydraulic Report. Capacity calculations shall provide for full developmental build out of the basin and provide capacity that meets the Mandatory Standards.

Conveyance system structures (catch basins, manholes, etc.) shall be located outside of the traveled way and auxiliary lanes of freeways and ramps. Existing drainage structures shall be removed and a new facility provided outside the traveled way if their location is within the new traveled way or auxiliary lanes.

The grate elevations for all the catch basins or bridge drains on the bridge structure shall be depressed a minimum of ¾-inch below the finished flow line gradient. A taper gradient of 12.5% shall extend 6 inches in length away from the depressed grate elevation along the three perimeter sides of the grate not adjacent to the traffic barrier. The perimeter side of the grate adjacent to the traffic barrier shall remain depressed ¾-inch with no taper length allowed.

If the Design-Builder opts to utilize the stormwater strategy outlined in the AKART and Water Quality Studies for SR 520 Replacement Floating Bridge (refer to Section 2.14.4.9 – Bridge Runoff Treatment within this section) then permanent bridge drainage will consist of "modified" catch basins and conveyance elements that route discharge to the lagoons within the Supplemental Stability Pontoons. Refer to Appendix A-7 in the Supplemental Hydraulic Report (Appendix H2) for the AKART and Water Quality Studies for SR 520 Replacement Floating Bridge dated June 30, 2010. Discharge of surface water runoff from the Floating Bridge shall be prohibited to the lagoons within the Supplemental Stability Pontoons which are utilized for Bridge Fire Protection appurtenances.

Temporary bridge drainage elements for the traffic switch area conceptually consist of scuppers located within the median and southern perimeter barrier of the WCB, the floating bridge and a portion of the existing West Approach Bridge. This design has been developed to present a solution for the transition area from six to four lanes from the floating bridge, west to the existing West Approach Bridge. The Design-Builder shall not advance the design of the WCB bridge drainage. This work will be constructed by others. The Design-Builder is responsible to ensure a conveyance design is completed for the traffic switch areas of the the floating bridge and transition areas on the Existing West Approach Bridge, west of the WCB. The Design-Builder shall coordinate efforts with the Contactor responsible for the design and construction of the WCB for compatible conveyance and drainage concepts. A conceptual design approach for the floating bridge, West Transition Span, and WCB is shown in the Conceptual Plans (Appendix M1). The Design-Builder shall optimize scupper designs to minimize potential staining effects on the permanent structure portions of the Project.

Conveyance elements shall be integrated with the structural design features of the floating bridge. Pipe sizes and slopes shall be designed to achieve a recommended self cleaning velocity of three feet per second. Clean-outs shall be provided at bend locations due to horizontal or vertical deflection. The use of ninety degree (90°) bends either by the utilization of pre-fabricated fittings or cold bends is prohibited. The maximum bend angle to be used at a single joint is sixty degrees (60°). If multiple bends are required at an angle point, due to the required deflection angle, the maximum bend angle shall be forty-five degrees (45°) in a single component of the combined bend and each bend shall have a cleanout. The stormwater discharge from the modified catch basins on the floating bridge and approach structures shall be piped to discharge locations below the water surface within the Supplemental Stability Pontoon lagoons. The vertical outlet elevation for the discharge pipes shall be submerged a minimum of two feet below the surface water elevation of the lake within the Supplemental Stability Pontoon lagoons. Discharge piping directed to the lagoons within the Supplemental Stability Pontoons shall be designed not to impact maintenance operations for the floating bridge. The Design-Builder shall coordinate conveyance elements with the WSDOT Bridge and Structures, WSDOT Bridge Maintenance and WSDOT Roadway Maintenance. Refer to an e-mail confirmation from WSDOT HQ Hydraulics, located in Appendix A-3 of the Supplemental Hydraulic Report(Appendix H2) for direction regarding pipe size and Manning's Roughness Coefficient for integration considerations within the structural elements of the floating bridge.

Runoff generated from the RSUP located along the northern perimeter of the Evergreen Point Floating Bridge will be allowed to drain flow from the structure and directly discharge into the Lake without treatment. The runoof will not be allowed to sheet flow or directly discharge onto the supplemental stability Pontoons. The Design-Builder shall incorporate elements that preclude staining of the structural elements on the Evergreen

Point Floating Bridge. Portions of the regional shared use path located on land shall be collected and routed to acceptable discharge locations or designed in accordance with the HRM (Appendix D6) provisions.

Runoff generated from the pedestrian path and associated outlook conceptually located within the southern perimeter of the SR 520 right-of-way between Evergreen Point Road and the east shoreline of Lake Washington shall preclude erosion to all disturbed and downstream areas. Portions of the pedestrian path and associated outlook may require collection. The collection systems shall be routed to an acceptable discharge location and designed in accordance with the HRM (Appendix D6) and the HM (Appendix D7).

The use of any galvanized products that contact the runoff water on storm drainage systems and other hydraulic structures will not be allowed as a standalone treatment or conveyance type due to the potential for water quality issues associated with stormwater runoff through a material that could add toxic metals through degradation off the bridge into waters of the State. Galvanized pipe will be allowed with the use of an acceptable epoxy type coating on the interior of the pipe. The exterior surface of the pipe shall also be coated to prevent dissolved zinc from entering the waters of the State associated with climatic events. The use of cold bend deflections is prohibited in the field if the epoxy coated galvanized pipe is utilized for the Project. The pipe shall be cold bent at the factory and then epoxy coated prior to installation in the field. Options for exterior coatings could include epoxy or powder coating following architectural guidelines for color in accordance with Section 2.15. The Design-Builder shall submit clear documentation to WSDOT, including an explanation and a proposed coating material for review, comment and acceptance by WSDOT and the local agencies.

The Design-Builder shall work with the Utility Owners to design and construct all storm drainage conveyance crossings to meet the requirements of the Utility and to comply with Section 2.10 (Utilities and Relocation Agreements).

Conveyance systems shall not be constructed by the open-cut construction method that transverse cuts the existing SR 520 traffic lanes unless the Design-Builder receives WSDOT approval for open-cut construction.

The Design-Builder shall prepare backwater calculations for the new mainline drainage systems. Calculations must address the spill collection system and connections to the mainline conveyance system to confirm the design does not backwater into the spill collection system during design storm events. The Design-Builder shall verify that the locations and depths of all mainline conveyance pipes and laterals, from approximately the eastern limits of the project improvement (approximate Stations MR: 243+25.02, ML: 243+93.85) to the west end of the Evergreen Point Lid (approximate Stations MR: 226+83.42, ML: 226+85.90), have been constructed to accommodate the grades and final pavement design geometry of the Project. The Design-Builder shall provide this evaluation to the State before commencing design of the storm drainage system. The conveyance and main lateral pipes shall be integrated into the design and inlet tops shall be adjusted to grades in order to meet final design requirements. All inlets, conveyance elements and surface drainage features shall be designed to meet the final constructed pavement for the Project with minimal reconstruction.

#### 2.14.4.3 GUTTER FLOW EVALUATION ON FLOATING BRIDGE

The Design-Builder shall perform a gutter flow spread evaluation on the final design for the floating bridge roadway. The evaluation shall be performed in accordance with the WSDOT *Hydraulics Manual* (Chapter 5-4, Gutter Flow), and based on the conceptual

channelization plans taking into account any proposed revisions for final design (Appendix M1).

The floating bridge design shall include inlet spacing at a maximum of 90 feet on center for the zero gradient (flat) portion of the gutter line for both the north and south gutter profiles. In addition, emergency scupper openings shall be designed and provided in the traffic barriers located along the north and south perimeter of the shoulders. These scupper openings shall preclude the allowable top width of the flow prism to exceed two feet into the traveled lanes within the zero gradient (flat) portion of the roadway alignment. The scupper openings shall not impact the structural integrity of the traffic barrier. Refer to the Conceptual Plans (Appendix M1) and the Supplemental Hydraulic Report (Appendix H2) for the conceptual design guidance.

#### 2.14.4.4 WALL DRAINS

The Design-Builder shall not place surface drainage structures and pipelines in the reinforcement zone of reinforced earth and soil nail/tie back type walls. Wall surface drainage systems shall be designed for ease of maintenance, providing low-clogging minimal maintenance type structures and/or removable clean-out covers and ports as necessary. Retaining wall drainage shall be designed to prevent surface water from running over the face of the wall.

Wall drainage systems (perforated pipe under the drain system) shall be connected directly to the highway collection and conveyance system or day-lighted with appropriate erosion protection, in accordance with the Mandatory Standards into ditches, stream channels or water bodies. . The under drain pipes shall not connect to downstream stormwater conveyance systems that route flows to stormwater BMPs. The under drain pipe system can connect to the conveyance system downstream of the stormwater BMP for discharge/outfall.

Underdrain outlets through “weep holes” will not be allowed. Under drain outlet ends shall be fitted with flap-type anti-rodent entry fittings. Maintenance clean-out ports shall be provided where under drain pipes are combined with surface drainage pipes downstream of stormwater BMPs and outside of a drainage structure

Discharge of groundwater shall not be routed to or combined with the surface drainage systems that connect to stormwater runoff treatment or flow control facilities. Consideration shall be given to discharge of this flow independently back to the streams, wetlands or other water bodies. All discharge outlets shall be provided with erosion protection in accordance with the Mandatory Standards.

Wall foundations and associated underdrain systems that may intercept surface and subsurface water that feeds or recharge downstream wetlands shall be designed to maintain the wetland hydrology and inflows.

Where Media Filter Drain BMPs are placed at the top of walls, the wall drainage system may be integrated to provide the function of the Media Filter Drain BMP underdrain. No Media Filter Drain BMPs are proposed for this project in the conceptual design. Additional investigation may be required prior to using this BMP.

#### 2.14.4.5 CROSS-DRAINS AND CULVERTS

The Design-Builder shall be responsible for video, cleaning, documenting condition and maintaining functionality of all existing and constructed culverts and cross-drain pipes throughout the life of the Project. The Design-Builder shall maintain, modify and protect

ends of headwalls, or abandon the existing cross-drains and culverts as required to match revised roadway sections, except where specifically noted in the Conceptual Plans (Appendix M1) or in the Supplemental Hydraulic Report (Appendix H2). Note that the duration of this Work is until Physical Completion of of the Project, and shall be limited by the Site of Work and the Environmental Commitments List (Appendix C1). The Design-Builder is responsible for replacement of any failing culverts or methods of fixing/options acceptable by WSDOT to ensure culvert use during and until Physical Completion. If the culverts cannot be videotaped due to sediment, blockage or failure, the Design-Builder is responsible for cleaning or fixing the culvert or blockage to ensure inspection.

Cross-drains operated and maintained by others (e.g., local jurisdiction and county storm drain systems) that are located outside of the Right-Of-Way shall be protected, kept separate from the Project drainage system, and maintained at their existing capacity and function unless noted otherwise in the Supplemental Hydraulic Report (Appendix H2).

All existing SR 520 cross-drain pipes shall be abandoned or replaced in accordance with the Mandatory Standards. All replaced cross-drain pipes shall be replaced with new pipes at or near the same location as appropriate for final design, or as shown in the Supplemental Hydraulic Report (Appendix H2), in accordance with criteria of the Commitments Lists (Appendix C). All cross-drains and culverts in the Project area shall be sized for capacity based on the standards in the HM (Appendix D7) and the results shall be included in the Design-Builder's design calculations and Final Hydraulic Report. All culvert designs and capacity checks shall be completed based on the step-by-step design guidelines in accordance with the HM (Appendix D7). Capacity calculations shall include a comparison of full-flow capacity to calculated capacity. The capacity calculations shall use future land use conditions when modeling runoff flows from off-site basin areas. The background information on full build out conditions can be obtained from the local jurisdictions and their zoning maps.

While investigating the existing drainage features, the Design-Builder is required to investigate for off-site runoff and illicit connections and document them for WSDOT review.

Culvert ends shall be beveled and subject to further reinforcement protection as required in the Mandatory Standards.

### 2.14.4.6 INFILTRATION

Infiltration BMPs shall be used to the maximum extent possible in the final design. The design of infiltration facilities shall be in accordance with the HRM (Appendix D6). Preliminary subsurface explorations, including field and laboratory tests, were performed to verify the assumptions used in the Supplemental Hydraulic Report (Appendix H2). Details of these subsurface explorations and field and laboratory tests including locations, borehole and test pit logs, piezometer data, and test results are included in the in the GDR (Appendix G2).

The Design-Builder shall evaluate the adequacy of the existing geotechnical explorations and monitoring well and piezometer locations, and perform supplemental explorations and tests for the final design of any infiltration systems in order to meet the requirements of the Mandatory Standards. The Design-Builder's design of infiltration systems, including the locations, BMP types and design infiltration rates, shall be based on the recommendations of the Design-Builder's Geotechnical Engineer. After NTP 1, the

Design-Builder shall continue recording the existing wells' and piezometers' water elevations as needed for design purposes. If the Design-Builder is required to remove any existing monitoring wells or piezometers during construction, the Design-Builder shall coordinate with the well or piezometer owner and shall replace the removed well in kind, if required by the owner, and continue to monitor the new well until Physical Completion. Well decommissioning shall be performed in accordance with Section 2.6.3.7. The Design-Builder shall coordinate the new well location with WSDOT, provide all permits and install new monitoring equipment. Refer to Section 2.6 (Geotechnical Design) for responsibility of monitoring and data transfer procedures.

### 2.14.4.7 RUNOFF TREATMENT AND FLOW CONTROL

Permanent highway runoff flow control and runoff treatment facilities shall be located outside of stream, steep slope and wetland buffer areas, and designed in accordance with the HRM (Appendix D6), and the Environmental Commitments List (Appendix C1).

The use of emerging technologies and proprietary (vendor-supplied) flow control and runoff treatment facilities shall meet the requirements of Section 5-3.5 of the HRM (Appendix D6). Any proprietary stormwater treatment products proposed for use by the Design-Builder shall be specifically submitted for review and acceptance by WSDOT prior to incorporation into the Project.

Facility EQ, described in the Supplemental Hydraulic Report, has been conceptually designed to meet the runoff treatment requirements for the WCB. The Design-Builder shall not advance this design as it will be constructed by others.

Stormwater treatment Facility K has been conceptually designed to meet the runoff treatment requirements for portions of the on-land sections of the SR 520 alignment west of the Evergreen Point Lid portal as well as the Bridge Maintenance Facility access roadway and parking lot. The Design-Builder shall verify the stormwater runoff treatment rate required based on the final design and alignment of the SR 520 Evergreen Point Floating Bridge and Landings Project and the final Bridge Maintenance Facility Site Plan. Facility K has been designed and sited on a slope just below the proposed east approach in the Conceptual Plans. Additional information regarding Facility K can be reviewed in the GBR (Appendix G1). The Design-Builder shall conduct an independent investigation into the geotechnical requirements and engineering requirements necessary for such placement should this be the preferred location based on the Design-Builder's solution. Details of the field explorations, field tests and laboratory test results for the conceptual design are presented in the GDR (Appendix G2).

The Eastside Transit and HOV Project includes a separate Facility K and location (Appendix M13). The Design Builder shall coordinate through WSDOT with the Eastside HOV and Transit Project Team regarding timing opportunities to identify efficiencies related to these stormwater treatment facilities, and to coordinate access to the area where the East Approach pier foundation may conflict with the Eastside control and access area (Appendix M7).

The Eastside Transit and HOV Project's Facility K, piping, access and all other appurtenances associated with the facility shall be removed by the Floating Bridge and Landings Design-Builder once a permanent Facility K for the Floating Bridge and Landings Project is in place and operational. The area of disturbance for the facility removal shall be restored to similar and adjacent ground surfaces and re-vegetated as appropriate.

The Eastside Transit and HOV Design-Build contractor will design and construct / install stormwater treatment Facility J. The Eastside Transit and HOV Contract requires the Design-Builder's Stormwater Engineer to forward design Facility J to accommodate runoff treatment needs for this Project and the Eastside Transit and HOV Design Build Project. The SR 520Evergreen Point Floating Bridge and Landings Project Design-Builder shall verify and coordinate Project needs for stormwater treatment Facility J with the Eastside Transit and HOV Project Design-Builder.

Stormwater run-on carried under the lid shall be captured and directed into the mainline pipe system, draining to a stormwater treatment facility.

The Design-Builder shall review the BMP selection process in the HRM (Appendix D6) and document the procedures and final selections in the Final Hydraulic Report. Should the Design-Builder provide alternative BMPs not shown in the conceptual design, documentation for the selection of the alternative BMP shall follow guidelines in the HRM (Appendix D6) and final selections shall be included in the Final Hydraulic Report for the SR 520 Evergreen Point Floating Bridge and Landings Project.

The use of enclosed vaults, tanks or galleries for flow control or runoff treatment shall be minimized. Vaults, tanks or galleries will only be accepted where it is demonstrated that other treatment BMPs are not feasible due to hydraulic limitations and Right-of-Way constraints. No vaults, tanks or galleries shall be allowed under any travelled way of the SR 520 mainline or ramps. Any proposed vault under the shoulders or elsewhere within the Right-of-Way will require review and comment by WSDOT prior to installation. Where vaults, tanks or galleries are proposed, the Design-Builder shall minimize the sizes by incorporating alternate BMPs whenever feasible and practicable.

Stormwater management facilities shall be equipped with necessary hydraulic controls for ease of dewatering permanent wetpools for maintenance. WSDOT shall be consulted with on the design prior to incorporating proposed hydraulic controls.

If the Design-Builder proposes vaults, tanks or galleries, they shall be arranged, partitioned or compartmentalized with internal baffles or partial-height water-tight walls to ensure maintenance workers will be able to handle, remove or relocate up to a maximum volume of 6,000 gallons of combined fluid and debris/sediment within each compartment. Access covers shall be located directly above the inlet and outfall pipes, and over the low floor end (sump) of each compartment. The floor of the wet vault shall slope (in both longitudinal (0.5% – 2.0%) and transverse (5%) directions) to the clean-out location and outlet. Smaller vaults, tanks and galleries, up to 10 feet wide, shall be designed and constructed in order to be suitable for cleaning with high-pressure rodding and vactor trucks. Larger vaults greater than 10 feet in width shall have ramp access suitable for motorized sediment removal equipment (e.g., small front-end loaders such as Bobcats or skid steers), or removable lids suitable for crane lift access of larger cleaning equipment and buckets, as acceptable to WSDOT.

WSDOT requires 50-foot spacing for access points for the first third of any vaults or tanks as needed for sediment removal. The Design-Builder shall also provide secondary access that is suitable for easy entry by personnel during inspections. All hatches shall include access ladders. The facility shall meet OSHA confined space requirements for entry (examples include: a maximum of 50 feet to the nearest exit point when inside, ladder fall restraints, ventilation, and provisions for lighting in large vaults). The vault shall be vented; and shall have locking covers or otherwise be fenced to protect against unauthorized entry. Confined spaces with access shall be a minimum of four feet wide and seven feet tall. Depth from the access cover to the invert shall not exceed 20 feet.

Inspection access covers shall be at least 30 inches in size. Access covers and ladders shall be supplied for the inlet and outfall controls such that visual inspection of the inlet and outfall elements can be achieved conveniently. The access ladders and operating controls shall be designed such that a maintenance person can reach any grab handles, grates or screens outside of the standing water.

Where access lids or covers are required to be placed within the pavement, curb gutters, parking areas and vehicle travel areas such as shoulders, the access lids or covers shall be designed for structural loading in accordance with the Mandatory Standards. Access lids shall not be located within the traveled way or auxiliary lanes. The cover and frame types for live loadings shall be bolt-down ductile iron type. Refer to Section 2.13 (Bridges and Structures) for additional structural requirements.

The Design-Builder shall submit maintenance access, pipe slope, internal baffle walls, drain systems and other provisions for maintenance to WSDOT for review and comment.

### 2.14.4.8 OUTFALLS TO LAKE WASHINGTON

The existing outfalls to Lake Washington shall be revised and constructed in compliance with the Project Environmental Commitments List (Appendix C1). Pipe outfalls proposed to Lake Washington shall be located vertically up gradient above the Project Lake Level as defined in Section 2.1 (General Information), with an additional increase in elevation of 0.8' for Lake Washington. The outfalls shall discharge to a channel/ditch which will convey flows from the discharge location to the lake. Compliance for energy dissipation and armoring within the channel / ditch segments shall conform to the HRM (Appendix D6) and the HM (Appendix D7). The Conceptual Plans (Appendix M1) show a design that is compliant with the Project Environmental Commitments List.

### 2.14.4.9 BRIDGE RUNOFF TREATMENT

An AKART and Water Quality Studies Report for the SR 520 Bridge Replacement and HOV Program – I-5 to Medina Project has been completed by WSDOT and conditionally approved by the Washington State Department of Ecology (Ecology) for a stormwater treatment solution on the floating bridge. This approval grants equivalency for runoff treatment in lieu of the traditional BMPs for runoff treatment contained within the HRM (Appendix D6). If the Design-Builder opts to propose an alternative runoff treatment strategy for the SR 520 Evergreen Point Floating Bridge and Landings Project, the Design-Builder shall be responsible for coordination with Ecology and other regulatory agencies for approval. All delays, risks and costs associated with the revised runoff treatment strategy shall reside solely with the Design-Builder.

The Design-Builder is not responsible to complete the "Site Specific Sweeping Program" for an Ecology-approved monitoring plan required by the conditional approval letter from the Department of Ecology for the AKART and Water Quality Studies for SR 520 Replacement Floating Bridge dated June 30, 2010. Refer to Appendix A-7 in the Supplemental Hydraulic Report (Appendix H2).

### 2.14.4.10 DOWNSTREAM ANALYSIS

Preliminary downstream analyses have been performed for the conceptual plan layout in the Supplemental Hydraulic Report (Appendix H2). The Design-Builder shall perform a final downstream analysis for all individual stormwater facilities to be constructed, as a required part of the Final Hydraulic Report. This analysis shall include a review of all downstream conveyance systems receiving runoff and the Design-Builder is responsible

to identify any capacity issues and scour/erosion potential as part of the downstream analysis. Project improvements shall not increase the potential for flooding downstream of the Project. All calculations, maps and final plans shall be included in the Final Hydraulic Report.

Final design downstream analyses shall include verification and any required revisions to the downstream maps contained in the Supplemental Hydraulic Report (Appendix H2) for at least one quarter (1/4) mile. The Final Hydraulic Report shall also identify the final outfall system. Refer to Chapter 4-7 of the HM (Appendix D7).

### 2.14.4.11 MAINTENANCE ACCESS

All new stormwater structures shall be located and provided with separate access such that routine maintenance and inspections can be easily achieved. Catch basins, inlets and manholes on storm sewer pipe systems shall be located at the outer edges of shoulders, or in medians or merge areas, where Vactor high-pressure rodding and suction trucks can access them without requiring traffic lane closures. Where roadway geometric design constrains the ability to locate the infrastructure to accomplish this goal, the Design-Builder shall locate infrastructure in such a manner to minimize impact from maintenance related traffic closures. Manholes, hydraulic control and sedimentation structures located outside of the paved or non-paved shoulder areas shall be provided with a maintenance access road. Culverts and cross-drains isolated from convenient maintenance and inspection access shall be provided with achievable maintenance and inspection access at one end of the cross-drain or culvert.

Stormwater treatment facilities such as ponds, constructed wetlands and biofiltration swales shall have maintenance access in accordance with the HRM (Appendix D6) and Sections 2.11 (Roadway Design), 2.12 (Floating Bridge) and 2.13 (Bridges and Structures). Hydraulic control structures such as weirs, orifices, valves and gates that are used for the operation, monitoring, and maintenance of vaults, ponds, and other treatment or flow control facilities shall be provided with a maintenance access road. Maintenance access adjacent to the sedimentation pools of ponds and vaults shall include a working area suitable for the loading and maneuvering of sediment disposal equipment and trucks.

Where Media Filter Drains are located outside of the shoulder or median area, or where isolated by barriers, walls or berms, maintenance access shall be provided for such routine work as monitoring, inspections, mowing and changing of filter media.

Maintenance access roads shall be designed to be compatible with maintenance equipment, in accordance with the following table:

| Location | Design Vehicle | Access Requirement |
|---|---|---|
| Open ponds | SU, SU with trailer, WB-40 | Vactor (SU) to clean outfall structure. Self-propelled crane (WB-40) with clam bucket to clean pond (this is a four-axle with two steering axles on the front and two driving axles on the rear). Dump truck with trailer for hauling spoils. |
| Detention vaults and tanks less than 10 feet wide. | SU | Vactor to clean tank and outfall/inlet structures. |

| | | |
|---|---|---|
| Detention vaults and tanks 10 feet wide and greater. | SU, SU with trailer, WB-40 | Vactor to clean outfall structure. Self-propelled crane to remove vault lids, lift cleaning equipment, load trucks. Dump truck with trailer for hauling spoils. |
| Media Filter Drain | SU, SU with trailer | Vactor to clean structures. Dump truck, trailer and backhoe to change filter media. Truck and trailer with mower. |

Maintenance access roads on land shall be a minimum of 12 feet wide on straight portions and 15 feet wide on curved portions with longitudinal slopes not to exceed 15 percent. Maintenance roads shall be paved with pervious paving materials that meet the frequency of use and equipment requirements respective to each location. A minimal light-use access road shall consist of a prepared subgrade in accordance with Section 2.11 (Roadway Design), shall be sloped and shaped and/or provided with underdrains for proper drainage, and shall include a layer of construction geotextile and six-inch minimum thickness of crushed surfacing. Maintenance access roads in landscaped areas shall be designed and constructed to fit with the landscaping theme, using alternative surfacing reinforcement such as soil grids and grow-through paver blocks (grasscrete). Turnaround areas shall be provided where warranted in accordance with WSDOT requirements.

Refer to Sections 2.12 (Floating Bridge) and 2.13 (Bridges and Structures) for operation and maintenance procedures on the floating bridge.

Maintenance access designs shall be submitted to WSDOT for review and comment prior to incorporation into the Project.

### 2.14.4.12 Maintenance Access to City of Bellevue Sewer system

The City of Bellevue operates a pumped sewer system along the shore of Lake Washington. Refer to the Utility As-Built Plans (Appendix U1) for the location of the sewer system. The stormwater facility constructed by the Design-Builder shall allow for future maintenance of the system and maintenance access by City personnel. Refer to Sections 2.10 (Utility Relocation) and 2.15 for additional information on limitations.

### 2.14.4.13 Protection and Restoration of Sensitive Resource Areas

All Design-Builder's staff shall have environmental training in accordance with Section 2.8 (Environmental), and shall be aware that no access or impacts are permitted beyond the high-visibility construction fencing. Outfalls to Lake Washington shall be designed in accordance with the Environmental Commitments List (Appendix C1). Direct pipe discharge shall be armored against erosion in accordance to the HRM (Appendix D6), HM (Appendix D7) and requirements in the Environmental Commitments List (Appendix C1). All temporary work areas for conveyance or facility construction shall be graded, and vegetation restored to stabilize the area.

Where there are no impacts to riparian areas beyond the end of the existing cross-drain culverts on streams identified in the Conceptual Plans (Appendix M1) or in the Supplemental Hydraulic Report (Appendix H2), the design work shall maintain a no-disturbance area around the existing stream riparian zones. All temporary working areas shall be restored following the construction and finished in accordance with the requirements of Sections 2.8 (Environmental) and 2.15.

Conveyance design for off-site drainage entering the Right-of-Way shall be located entirely within proposed Right-of-Way limits and proposed drainage easements. Any modification to proposed Right-of-Way or easement limits shall be performed as defined in Section 2.24 (Right-of-Way).

#### 2.14.4.14 MAINTENANCE OF DRAINAGE CONVEYANCE FACILITIES

Refer to Section 2.29 (Maintenance During Construction) for specifications on maintaining drainage conveyance facilities during the course of the Work.

#### 2.14.4.15 TEMPORARY EROSION AND SEDIMENT CONTROL PLAN/SPILL PREVENTION CONTROL AND COUNTERMEASURES PLAN

The Design-Builder shall prepare and maintain a Temporary Erosion and Sediment Control (TESC) Plan and a Spill Prevention Control and Countermeasures (SPCC) Plan with narratives, in compliance with Section 2.8 (Environmental), Chapter 6 of the HRM (Appendix D6), Section 1-07 of the General Provisions, Division 8 of the Standard Specifications, the Environmental Commitments List (Appendix C1) requirements and the Construction NPDES permit. Runoff from the floating bridge structures and land side construction areas shall be collected and treated and/or discharged consistent with the HRM (Appendix D6) and Project permits. Refer to Section 2.8 (Environmental) for details on TESC and SPCC.

Temporary runoff treatment for Pontoon sections, bridge superstructure construction and new traffic deck shall be addressed in the TESC Plan and the SPCC Plan. Measures shall be in place prior to Pontoons entering Lake Washington, and shall be maintained throughout the duration of the Project to protect Lake Washington.

The Design-Builder shall employ temporary measures for construction activities (e.g. staging, access, storage of materials, parking, etc.) for the existing floating bridge following traffic closure and during the demolition phase while the Design-Builder has control of the structure. TESC and SPCC measures shall be designed and in place prior to any demolition activities.

Any working vessel, barge or other contractor equipment used on Lake Washington shall be current and compliant with all State water quality regulations for runoff from those vessels into the Lake.

#### 2.14.4.16 ABANDONMENT AND REMOVAL OF EXISTING DRAINAGE STRUCTURES

Abandonment and/or removal of existing drainage structures and pipes shall meet the applicable requirements of Divisions 2 and 7 of the WSDOT Standard Specifications (Appendix D18). Any existing pipe or other structure that will be abandoned and will remain under any traffic pavement shall be filled using methods and materials that assure the pipe or structure is completely filled in a supported, non-void final condition. The Design-Builder shall include the abandonment details, including any abandon-in-place filling methods and materials, with the drainage structure and pipe shop drawings for WSDOT review and comment. Refer to Section 2.26 (Removal of Existing Floating Bridge) for specifications regarding the abandonment and removal of the existing floating bridge.

### 2.14.4.17 DEWATERING

The Design-Builder shall investigate dewatering requirements for construction of stormwater facilities and structures, including requirements in the Environmental Commitments List (Appendix C1). Should dewatering be necessary, dewatering plans shall be prepared that meet all Project requirements and commitments as needed, in accordance with Sections 2.6 (Geotechnical Design) and 2.8 (Environmental).

If dewatering is necessary, the Design-Builder shall prepare a Temporary Dewatering System Plan for concurrence by the State prior to any excavation or grading associated with storm sewer pipe installation or stormwater facility work. The Design-Builder shall allow a minimum of two weeks for State review and comment.

The Temporary Dewatering System Plan shall be included with the Design-Builder's TESC Plan. The Temporary Dewatering System Plan shall describe how the Design-Builder will remove, clean and dispose of sediment-laden dewatering flows. Refer to Section 2.6 (Geotechnical Design) for additional dewatering information.

### 2.14.4.18 PONTOON CASTING FACILITY DEVELOPMENT

#### 2.14.4.18.1 Stormwater Design

The Design-Builder shall coordinate any required stormwater improvements for the Pontoon Casting Facility Site Development with local agencies. The Conceptual Plans (Appendix M1) and the Supplemental Hydraulic Report (Appendix H2) do not address the Pontoon Casting Facility Site Development.

#### 2.14.4.18.2 Process Water

Operation of the Pontoon Casting Facility shall require treatment of process water as stipulated in the Sand and Gravel General Permit required by Ecology in accordance with Section 2.8 (Environmental). The Permit defines the substances that constitute process water.

### 2.14.4.19 BRIDGE MAINTENANCE FACILITY

#### 2.14.4.19.1 Stormwater Design

A conceptual drainage design has been developed for the proposed Bridge Maintenance Facility Building, access road and parking lot and is included in the Conceptual Plans (Appendix M1) and the Supplemental Hydraulic Report (Appendix H2). The Design-Builder shall ensure that the stormwater interception and collection systems for the access roadway be designed to preclude surface water runoff from flowing into the parking level. The Design-Builder shall slope the parking level in such a way that any runoff from the parking surface flows away from the Bridge Maintenance Facility Building. Stormwater Treatment Facility K has been conceptually designed to provide runoff treatment for the surface water runoff from the pollution generating impervious surfaces for the site development associated with the Bridge Maintenance Facility. The Design-Builder shall verify the stormwater runoff treatment rate required based on the final design and alignment for the SR 520 Evergreen Point Floating Bridge and Landings Project and the final Bridge Maintenance Facility Site Plan.

#### 2.14.4.19.2 Groundwater / Dewatering

Conceptual groundwater investigations have been completed for the area of impact for the Bridge Maintenance Facility and dock construction. Details of the field explorations, field tests and laboratory test results are presented in the GDR (Appendix G2). Permanent groundwater dewatering may be required post-construction for the Bridge Maintenance Facility foundation, footings and wall drains. Groundwater discharge from the foundation, footing and wall drains shall bypass the runoff treatment facility for the Bridge Maintenance Facility. The Design-Builder shall evaluate the viability of connecting foundation, footing and wall drainage systems to the outfall piping system conceptually designed for Facility K and shall have the opportunity to do so if feasible. The connection(s) shall be made downstream of the Facility K and shall connect up-gradient of the energy dissipation device designed by the Design-Builder.

## 2.14.5 SUBMITTALS

### 2.14.5.1 GENERAL

Drawing submittals shall be complete with associated engineering documentation sufficient to verify that the design meets the Mandatory Standards, WSDOT Standard Specifications (Appendix D18), the Environmental Commitments List (Appendix C1). WSDOT will Review and Comment on all scheduled submittals, and return comments to the Design-Builder in accordance with the requirements of this section and Sections 2.2 (Project Documentation) and 2.28 (Quality Management Plan).

### 2.14.5.2 DRAINAGE EXISTING CONDITION REPORT

The Design-Builder shall complete the existing condition inventory, cleaning and survey to include all existing drainage pipe systems and associated structures within the Project limits. This report shall include identifying all storm sewer pipes, cross-drains and culverts within Project limits. The survey shall identify each system by Milepost (MP) and Project stationing and offset, and it shall show the pipe end and structure coordinates, size and material type. The Design-Builder shall prepare both a Draft Existing Condition Report and Final Condition Report that describes the location of the existing pipe systems discovered and proposed activities to be taken relative to each identified feature. The Design-Builder shall submit the Final Condition Report together with or prior to the Final Hydraulic Report.

### 2.14.5.3 DESIGN PLANS

The Design-Builder shall prepare stormwater management plan sheets in accordance with Sections 2.2 (Project Documentation) and 2.28 (Quality Management Plan), and the Mandatory Standards.

In addition to the items listed in the WSDOT *Plans Preparation Manual* (Appendix D12), all sensitive areas (including wetlands, streams, riparian zones, and their buffer boundaries), stream and wetland ordinary high water elevation contours, and FEMA flood level contours shall be shown on the Design-Builder's grading and drainage plan sheets. In addition, the Grading Plans shall show the placement, locations and fence type for the high-visibility sensitive area protective fencing.

### 2.14.5.4 DESIGN CALCULATIONS

The Design-Builder is responsible for completing all calculations necessary for the design of the Project. The Design-Builder shall prepare calculations in accordance with the WSDOT *Plans Preparation Manual* (Appendix D12), the HM (Appendix D7) and the HRM (Appendix D6) to support the design shown on the plans and details. All design supporting calculations shall be included in the Final Hydraulic Report as a hard copy and shall also be submitted in an approved electronic format on a CD-ROM.

### 2.14.5.5 FINAL HYDRAULIC REPORT

The Conceptual Hydraulic Report is preliminary and is proof of concept only that fulfills the environmental requirement and meets WSDOT's design guideline and standards. A Preliminary Hydraulic Report is not required from the Design-Builder.

A Final Hydraulic Report shall be prepared by, or under the direct supervision of, the Stormwater Design Lead Engineer. The Final Hydraulic Report shall follow the guidance, outline and format and be assembled in accordance with Section 1-3, Appendix 1-3 and Appendix 1-4 of the HM (Appendix D7) and the HRM (Appendix D6). The Final Hydraulic Report shall be submitted to WSDOT for review and comment as specified in accordance with Sections 2.2 (Project Documentation) and 2.28 (Quality Management Plan).

The Stormwater Design Lead Engineer shall also follow the format of the WSDOT Northwest Region Hydraulic Report Template located on-line at www.wsdot.wa.gov/Northwest/Environment, and for guidance shall reference the WSDOT Hydraulic Report Checklist located online at:

www.wsdot.wa.gov/Design/Hydraulics/default.htm

By following the hierarchy outlined in the Mandatory Standards, the Design-Builder may choose to prepare the Hydraulic Report by expanding the content of the Supplemental Hydraulic Report (Appendix H2) to include all elements of the final design. The Design-Builder shall submit the Final Hydraulic Report, including the final drainage plans, to WSDOT for review, comment and Final Acceptance, following the specifications outlined in the Review Process of the *HM* (Appendix D7). The Final Hydraulic Report shall meet the applicable Mandatory Standards and fulfill the Environmental Commitments List (Appendix C1).

The Final Hydraulic Report shall incorporate the final as-constructed (As-Built) documentation in accordance with this section, including the updated Report text, records of decision, associated design criteria, drainage maps, drainage plans and profiles, facility sheet plans and sections, details, and include both hard and electronic copies of calculations on a CD-ROM.

The Design-Builder shall submit six copies of the Final Hydraulic Report in hard copy format in a three ring binder, on 8.5-inch by 11-inch paper, except that exhibits may be on 11-inch by 17-inch paper and in a PDF format on a CD-ROM in accordance with the HM (Appendix D7). The final submittal shall also be complete with all associated drawing files (Microstation format), digital copies of calculations, documents (Microsoft Word format) and digital copies of hydrologic/hydraulic models as specified in the HM (Appendix D7) and HRM (Appendix D6) and shall be provided to WSDOT for review and comment.

The Final Hydraulic Report and all supplemental attachments shall include the Design-Builder's Stormwater Design Lead Engineer's PE Stamp and Signature.

### 2.14.5.6 SHOP DRAWING SUBMITTALS

The Design-Builder shall submit shop drawings in accordance with Section 2.28 (Quality Management Plan) for all drainage structures and structural attached pipe elements. Shop drawings shall be provided to WSDOT for review and comment.

### 2.14.5.7 DESIGN REVISIONS DURING CONSTRUCTION

Calculations for revisions made during construction shall be incorporated into the Final Hydraulic Report. When new plan sheets are required as part of a construction revision, the revisions shall be made in accordance with Section 2.28 (Quality Management Plan).

### 2.14.5.8 DRAINAGE MAINTENANCE MANUAL

The Design-Builder shall prepare a Drainage Maintenance Manual that describes the maintenance procedures for all Project drainage facilities, including the maintenance requirements for flow control, runoff treatment and the floating bridge. The Drainage Maintenance Manual shall include a description of the BMPs used on the Project and how they function; and a tabulation of quantities for new stormwater facilities (e.g., manholes, catch basins, linear feet of storm drain pipe, vaults, sand filters, linear feet of Media Filter Drain, acres of pond site, and linear feet fencing). The Drainage Maintenance Manual shall be bound on 8.5-inch by 11-inch paper, except that exhibits may be on 11-inch by 17-inch paper. The Design-Builder shall submit the Drainage Maintenance Manual to WSDOT for review and comment. After incorporating WSDOT's review comments, the Design-Builder shall provide six bound copies of the Final Drainage Maintenance Manual with or included in the Final Hydraulic Report. The final submittal shall also include an electronic version in PDF format on a CD-ROM.

### 2.14.5.9 LIST OF SUBMITTALS

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

- TESC Plan;
- SPCC Plan;
- Temporary Dewatering System Plan(s);
- Draft Drainage Existing Condition Report;
- Final Drainage Existing Condition Report;
- Certifications of Construction Site Erosion Control personnel;
- Gutter Flow evaluation for existing mainline;
- Shop drawings;
- As Constructed (As-Built) Plans;
- Design-Builder Technical Specifications;
- Final Hydraulic Report Type A in both hard copy and PDF format including a copy on a CD-ROM including all calculations, documents, and drawing files in a digital format; and
- Drainage Maintenance Manual in both hard copy and PDF format, including all calculations, documents, and drawing files on a CD-ROM.

All submittals shall be provided as both hard copies and electronic copies on CD-ROM in accordance with Section 2.14.5 and Section 2.28 (Quality Management Plan).

End of Section

# 2.15 LANDSCAPE AND AESTHETICS DESIGN

## 2.15.1 GENERAL

### 2.15.1.1 GENERAL SCOPE

The Design-Builder shall conduct all Work necessary to design and construct the roadside restoration, landscape, bridge architecture elements and aesthetic treatments for the Project. The landscape and aesthetic design Technical Requirements for these elements are listed in this section. Design principles that are required to be addressed by the final designs for the landscape and architectural elements are documented in the SR 520 Eastside Urban Design Criteria (Appendix L1), the WSDOT SR 520 Bridge Architectural Elements Diagram (Appendix L11), and in this section. For the purposes of these Technical Requirements, the term Landscape includes plantings, irrigation, site furnishings and hardscapes. The term Architecture includes free-standing and fixed structures such as railings, barriers, screens, belvederes and other elements, and surface treatments of walls and concrete surfaces.

Roadside Restoration for this Project shall include restoring plantings along the roadway, blending those roadway plantings with their context and fitting the Bridge Maintenance Facility within the context of the adjacent community. Roadside Restoration shall be conducted in accordance with the "urban" category per the WSDOT *Roadside Classification Plan* (Appendix D15).

## 2.15.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- WSDOT SR 520 Bridge Architectural Elements Diagram (Appendix L11).
- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT Design Memorandums (Appendix B4).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Bridge Design Manual* (M 23-50) (Appendix D1).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT *Roadside Manual* (M25-30) (Appendix D16).
- WSDOT *Roadside Classification Plan* (Appendix D15).
- WSDOT *Highway Runoff Manual* (HRM) (M31-16) (Appendix D6).

- WSDOT *Traffic Manual* (M51-02) (Appendix D19).
- WSDOT *Local Agency Guidelines* (M36-63) (LAG) (Appendix D8).
- City of Medina Municipal Code.
- Pedestrian Facilities Guidebook (Appendix D30).

## 2.15.3 PERFORMANCE REQUIREMENTS

### 2.15.3.1 GENERAL

Landscape and Aesthetics performance requirements established by WSDOT for this project include:

1) Minimum qualifications for key design personnel.

2) Design principles to guide the final designs of all elements.

3) A specific urban design review process.

These design Technical Requirements and the Design Principles herein together represent community input WSDOT has received during the Citizens' Design Advisory Group process, as documented in the Corridor Aesthetics Handbook (Appendix L6), and are intended to enhance corridor visual unity and Project-related character. They are also consistent with preferences expressed by City of Medina officials regarding the "look and feel" of the Bridge Maintenance Facility. WSDOT recognizes that innovation during the design stages of the Project may alter aspects of the conceptual landscape and architecture plans and details presented in the Conceptual Plans (Appendix M1). However, the Design-Builder shall ensure that these commitments are reflected in the Design Submittals and the Released For Construction (RFC) Documents described in Section 2.28 (Quality Management Plan).

### 2.15.3.2 PERSONNEL REQUIREMENTS

The Design-Builder shall employ Washington State-licensed Landscape Architects, each with 10 years minimum experience.

The Design-Builder shall employ an Architect with 10 years minimum experience with documented design and construction oversight experience of regionally or nationally significant bridges, including bridge architecture and aesthetics design of bridge features.

The Landscape Architect and Architect shall be experienced in context-sensitive design, public outreach, shall have familiarity with WSDOT plans preparation and be able to communicate and work in a multidisciplinary team. A Landscape Architect licensed in the State of Washington shall affix his/her original signature, original seal, license number and date of signature to all landscape Design Documents and Released for Construction Documents for this Project. An Architect licensed in the State of Washington shall affix his/her original signature, original seal, license number and date of signature to all bridge architecture Design Documents and Released For Construction Documents for this Project.

### 2.15.3.3 DESIGN PRINCIPLES

Design principles are intended to guide the design of architectural and landscape features throughout the Project and reinforce corridor continuity and character. They are derived through community and jurisdictional processes including but not limited to the Citizens' Design Advisory Group process as documented in the Corridor Aesthetics Handbook (Appendix L6).

The design of the SR 520 Floating Bridge and Landings Project shall encompass the following design principles and sub-principles for all Project elements:

**Physical;** Designs shall be an expression of SR 520 Program corridor unity between all contiguous projects and land and water based features through the use of consistent forms, materials, color, character and textures.

Sub-principles of physical design characteristics include:

1. Utilize high quality, durable and easily maintained materials and construction
2. Establish a hierarchy of sentinel, major, and minor elements to create rhythm and enhance experiential qualities for bridge users, including pedestrian, cyclist, transit and vehicular users
3. Reflect the regional significance of the floating bridge and its approaches through unified architectural composition
4. Express the uniqueness of the world's longest floating bridge
5. Express transitions between the floating bridge and approach bridges with sentinel elements
6. Utilize the natural environment to signalize arrival to or departure from land-based features on the East Approach
7. Establish architectural expressions that respond to the structural form and function of bridge elements
8. Reinforce the rhythmic experience with lighting that adds beauty for all users
9. Express the design of navigational channels for boat passage
10. Utilize the "green over gray" principle for walls of East Approach landing

**Social:** Designs shall reflect a contextually sensitive design approach which balances the needs of cyclists, pedestrians, transit and vehicular users and those of the adjacent communities.

Sub-principles of social design characteristics include:

1. Design to illustrate the differences between the inside-corridor and outside-corridor experience
2. Employ universally accessible design best practices and reduce potential for conflict between pedestrians, cyclists, and motorists
3. Utilize safety and security design principles
4. Enhance user civility
5. Respect views of and around the bridge from surrounding communities
6. Provide opportunities for the enjoyment of surrounding views from the bridge
7. Provide opportunities for rest and refuge

8. Create infrastructure for way-finding and regional interpretive education opportunities

**Environmental:** Designs shall minimize the effects of the project on the land, water and air and shall implement long-term, sustainable solutions.

Sub-principles of environmental design characteristics include:

1. Utilize noise reduction best practices
2. Minimize light pollution on the water's surface and glare towards drivers on the floating bridge (see Section 2.16 [Illumination and Roadway Electrical Systems])
3. Embody low lifecycle cost
4. Tread lightly over the surrounding natural environment and regional character

#### 2.15.3.4 URBAN DESIGN REVIEW PROCESS

Through an Urban Design Review Plan, the Design Builder shall propose a methodology that integrates opportunities for review and comment of all design elements with interested parties. The proposed plan shall, at a minimum, allow interested parties including WSDOT, the City of Medina and the City of Seattle opportunities to review the design for all elements addressed by this section for conformance with the design principles and Technical Requirements.

At a minimum, this Urban Design Review Plan shall establish an Urban Design Task Force (UDTF) with WSDOT and local jurisdiction reviewers. The Urban Design Review Plan shall include bi-weekly meetings between the Design-Builder and WSDOT during the development of the Preliminary Design Submittal and the Final Design Submittals. The UDTF shall include representatives from the aforementioned local jurisdictions, WSDOT and technical disciplines. The local jurisdiction representatives shall be determined by WSDOT and communicated to the Design-Builder. The methodology shall address the design for all elements addressed by this section.

This task force shall reflect WSDOT's understanding of the need to effectively develop the depth and quality of aesthetic treatments of all exposed structural and architectural elements and to provide a positive experience for pedestrians, bicyclists, transit users, vehicular users of the facility and surrounding areas.

### 2.15.4 DESIGN CRITERIA

### 2.15.5 GENERAL

These Landscape and Aesthetics Design Technical Requirements define the type, number, durability, scale and rhythm of the landscape and architecture design elements of the new floating bridge, transition spans, approach bridges, roadside restoration and maintenance facility. The Design-Builder shall document and demonstrate how final designs reflect the principles herein through the Design Submittals and the RFC Documents described in Section 2.28.

# 2.15.5.1 STRUCTURES AESTHETICS

## 2.15.5.1.1 Bridge Aesthetics

The Bridge Aesthetics include all visible elements associated with the floating bridge, transition spans and approaches. These include, but are not limited to, vertical and horizontal structures and other elements that are utilized to express the required rhythm, belvederes, pedestrian furnishings, safety barriers, railings, sign structures and lighting standards/fixtures. Designs for these elements shall comply with both these Technical Requirements and the WSDOT SR 520 Bridge Architectural Elements Diagram Appendix L11.

### 2.15.5.1.1.1 Bridge Superstructure

The Design-Builder shall design the floating bridge superstructure to have a consistent character and rhythm across the distinct sections of the floating bridge. Specifically, the construction types for the floating bridge section with 0% grade and the two sections with grades greater than 0% may be different, but they shall express a similar character.

Concrete post, beam and girder systems where used shall be a reflection of the form and character of the East Approach Bridge and Eastside Transit and HOV project.

All exposed concrete surfaces, exclusive of pontoon surfaces, shall be sealed with the same base concrete pigment sealer color as described in this section or as noted otherwise in these Technical Requirements. All steel structural members shall be galvanized and painted with the superstructure primary steel paint color as described in this section.

The floating bridge approach and transition spans shall be supported in their entirety from below the roadway deck.

### 2.15.5.1.1.2 Sentinel, major and minor elements

The Design-Builder's final design shall provide elements of the following function, number, location, durability, and scale and design standards described below and in Appendix L11.

**Function:** Three types of vertical marking elements shall be provided (sentinel, major, and minor) that establish a rhythm of sequential scale and experience from viewpoints both on the roadway/path and from water/land of the new bridge and approach structures. This rhythm shall be accomplished by vertical height, scale, horizontal spacing and lighting. The sentinel vertical elements shall be coordinated with required service stairs accessing the pontoons below.

**Number:** Four sentinel elements, a minimum of 6 major elements and a minimum of 46 minor elements shall be provided.

**Location:** All elements shall be located in respect to the hierarchy of elements concept presented in Appendix L11. The sentinel markers shall be significant architectural statements that note the location where the land-based structure transitions to the water-based structure. The major elements shall be located at the two sets of piers on the East Approach Bridge and at pier 36N&S located at the interface with the West Approach Bridge. The minor elements shall be located at a 360 feet spacing along the floating bridge and opposite of the major elements alongside the inside shoulder of the approach bridges.

**Durability:** The elements shall be constructed of concrete or other construction not requiring regular maintenance (excluding vandalism/graffiti).

**Scale:** All elements shall be scaled in respect to the hierarchy of elements presented in Appendix L11. The sentinel elements shall be scaled to provide significant architectural expression above the adjacent roadway deck noticeable from a regional perspective. The major elements shall extend above the adjacent roadway or path deck to a height which is noticeable to all facility users. The minor elements shall extend above the adjacent roadway or path deck to a height which is noticeable to all facility users.

**Design Standards**: All elements shall comply with applicable Mandatory Standards, including but not limited to minimum element offsets from the vertical face of a traffic barrier facing traffic.

#### 2.15.5.1.1.3 Belvederes

Belvederes shall be provided that are accessible from the north side of the Regional Shared Use Path (RSUP) and meet the following function, number, location, and scale:

**Function:** Belvederes shall create a safe and secure place, outside of the footprint of the bicycle and pedestrian path to rest and appreciate views of the water and surroundings for bicycle and pedestrian path users. Each belvedere shall be a minimum of 210 square feet and located clear of the RSUP. All belvederes shall include appropriate seating for six individuals. The bench designs shall discourage use for sleeping and be constructed with vandal resistant and sustainable materials.

**Number:** Five belvederes shall be provided.

**Location**: Belvederes shall be provided at each sentinel element, and at three locations on the flat portion of the floating bridge, spaced to provide regular intervals for rest. The three central belvederes shall be at least 300-feet from the sloped portions of the floating bridge and from any static sign bridge or ATM sign gantry/monotube structure. All belvederes shall be accessible from the RSUP.

**Dimension:** The minimum width of the belvedere deck shall be 11-foot clear measured perpendicular to the north edge of the RSUP.

#### 2.15.5.1.1.4 Traffic Barriers

All permanent barriers shall be single slope concrete barriers with a class 2 concrete finish.

#### 2.15.5.1.1.5 Regional Shared Use Path and Pedestrian Railings

The Design-Builder's final design of the RSUP and pedestrian railings shall meet the requirements listed below and reflect design principles expressed in the SR 520 Bridge Architectural Design Principles (Appendix L2). Refer to Section 2.12, Section 2.13 (Bridge and Structures), the WSDOT *Design Manual* (Appendix D3), and the WSDOT *Bridge Design Manual* (Appendix D1) for additional railing design criteria.

- RSUP railing member spacing shall meet AASHTO *Roadside Design Guide* requirements for maximum opening widths.
- Railing heights along the RSUP shall be 54 inches from finished grade.
- The maximum obstruction created by a railing element extending into the bicycle or pedestrian travel way shall comply with applicable Mandatory Standards.

- Railing shall be provided on top of the North single slope, vertical back concrete traffic barrier. The combined traffic barrier and railing shall be 54 inches from finished grade.
- Railing shall deter climb-ability and minimize catch hazards for bicycle users.
- A pedestrian path railing shall be provided at pedestrian paths where required to comply with the Mandatory Standards.
- Pedestrian path railing shall be provided at pedestrian path overlooks along the edge of paved areas adjacent to downhill slopes in compliance with the Mandatory Standards.
- The final design and aesthetic character of the pedestrian path railing shall be coordinated with the City of Medina.

#### 2.15.5.1.1.6 Stormwater

The Design-Builder's final design and location of stormwater piping shall meet the following design criteria:

- Stormwater catch basins shall align with minor element spacing.
- Stormwater conveyance piping and stormwater catch basins shall be painted the same color as the structure to which it is affixed or by which it is supported.

#### 2.15.5.1.1.7 Conduits and Utilities

The Design-Builder shall not mount any utilities, longitudinal fire standpipes or conduits to the barriers or to the north or south sides of the roadway deck of the bridge structures, unless otherwise approved by WSDOT. Conduits shall not be mounted to any visible portion of the RSUP railing.

### 2.15.5.1.2 Retaining Wall Aesthetics

The Design-Builder shall comply with the aesthetic treatments and finishes for retaining wall and abutment wall surfaces in accordance with the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1) and these Technical Requirements. For all permanent retaining walls, an outward facing pre-cast or cast-in-place fascia shall be formed or installed as described within these Technical Requirements. The Design-Builder shall submit all proposed wall aesthetic treatments for each proposed wall type for WSDOT review and comment.

Where used, all Structural Earth Walls (SEW) shall be faced with pre-cast or cast-in-place concrete fascia as illustrated in Appendix L1 and as described in Section 2.15.5.1.5.

The Design-Builder's wall designs shall minimize the scale of retaining walls by:

- Using wall profiles and alignments that blend with the natural terrain;
- Grading to reduce the need for walls and to minimize the impact on sensitive areas.

The following wall types will not be allowed:

- Gabion;
- Crib walls;

- Shotcrete;
- Engineered Slopes; and
- Ecology block embankment.

Refer to Section 2.13 for additional wall Technical Requirements.

#### 2.15.5.1.3 Noise Wall Aesthetics

The Design-Builder shall utilize random flare finish for both sides of noise walls within the Project area as documented in WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1) and these Technical Requirements.

Refer to Section 2.9 (Public Information) for WSDOT noise wall polling and outreach process.

Refer to Section 2.13 (Bridges and Structures) for specific wall design criteria and other requirements.

#### 2.15.5.1.4 Form Liners for Concrete Walls

The Project uses one primary pattern for the surface treatment of cast-in-place and precast retaining walls, noise walls, screen walls and abutments. The 'random flare' finish is a custom finish developed for the Project for land-based retaining and noise wall surfaces facing public spaces or facilities such as: the RSUP, public pedestrian paths, the SR 520 mainline and ramps, parks and open spaces, Lake Washington, and city streets. The random flare finish evokes the scale and pattern of a Pacific Northwest forest without being a literal rendering.

The "striated" finish is a standard wall finish for the recessed areas of the random flare finish. Striated finishes shall be accomplished by the use of either a form liner from the approved products listed in the latest edition of the WSDOT *Qualified Products List* (QPL) (Appendix D13) or a form liner approved by WSDOT. For approval of form liners not listed in the current QPL, the Design-Builder shall submit the request, along with catalogue cuts and other descriptive supporting information, to WSDOT for approval.

Walls not inclusive of the above mentioned 'random flare' finish locations may utilize a shotcrete facing. Such facing shall meet the requirements for 'Alternative B' aesthetic treatment of Section 6-18.3(8) of the WSDOT Standard Specifications (Appendix D18).

#### 2.15.5.1.5 Random Flare Design

- The Design-Builder shall coordinate with the SR 520 Eastside Transit and HOV Project for final design of the random flare finish form liners. The form liners produced by this aforementioned project shall take precedence over the following criteria: Width of flares at the top and bottom edge of panels shall vary randomly from three inches to 22 inches.
- Angle of flare lines shall vary randomly between +/- 2 degrees.
- Flare lines shall terminate at least two inches away from the horizontal edge of the form liner panel and not along the vertical edge.
- All recessed flare edges shall be sloped 15 degrees to facilitate form removal.
- The recessed surfaces of the random flare finish areas shall be one inch deep.

- The raised surfaces of the random flare finish shall receive a Class 2 surface finish. Form ties shall be of a type that leaves a clean hole when removed. All spalls and form tie holes shall be filled as specified for a Class 2 surface finish in the standard specifications.
- The recessed surfaces of the random flare finish shall conform to the 3/16-inch depth striated finish form liners listed in the WSDOT QPL.

Refer to the architectural plans in the Conceptual Plans (Appendix M1) for illustrations of the above design criteria.

#### 2.15.5.1.6 Panel Design

The standard panel size for the random flare form liner shall be 12 feet square. Random flare form liners shall be manufactured of an elastomeric material. The panels shall meet the following criteria:

- A minimum of three random flare form liner panels shall be used in different combinations to ensure a random quality in the final wall finish. Form liner panels may be used in an upright position or rotated 180 degrees to create more patterns and help reduce the look of noticeable repetitive patterns.
- Horizontal breaks at form liner panels which create the bands of treatment shall be level, except those construction joints identified in the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1).
- Horizontal breaks at random flare form liner panels shall be incorporated into walls 10 feet tall or higher to form two bands of treatment. The horizontal bands of treatment shall draw the eye forward towards the horizon and help to maintain a human scale.
- When walls are 10 feet or taller, the lower band of treatment shall be between two and 10 feet tall.
- The upper band of treatment shall be at least four feet tall.
- A third band of treatment shall be incorporated if a wall is greater than 22 feet tall. The lower band shall be between two and 10 feet tall. The center and upper bands shall each be at least four feet tall.
- Vertical joints between form liners shall be smooth and not visible.
- Wall finish shall extend two feet below grade or to the top of wall footing, whichever is less.

#### 2.15.5.1.7 Panel Fabrication

Panel fabrication shall meet the following criteria:

- After removing the forms, the Design-Builder shall treat the joint areas by patching or light sandblasting as required by the WSDOT to ensure that the joints are not visible.
- Prying against the face of the concrete will not be allowed for form liner removal.
- Expansion and dummy joints in walls shall be ‘v’ notch in accordance with the architectural details in the Conceptual Plans (Appendix M1).

- All wall surfaces shall receive Washington Gray pigmented sealer for concrete surfaces unless otherwise noted in the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1) or these Technical Requirements.
- Only elastomeric form liners are allowed to have horizontal splices.
- Striated finish shall be placed with striations and joints vertically, as shown in the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1).
- For striated finish, horizontal joints in the elastomeric form liners are permitted on surfaces greater than eight feet in height provided that the minimum form liner panel dimension is eight feet.

Refer to the Structures Minimum Standards (Appendix B2) for additional requirements.

#### 2.15.5.1.8 Sign Structures Aesthetics

The Design-Builder shall powdercoat all monotube sign structures located West of Evergreen Point Road with WSDOT Blue-Gray. Monotube sign structures located East of Evergreen Point Road shall be powdercoated with WSDOT Cascade Green.

The Design-Builder shall not mount any signs other than street identification to lid portal faces.

Signs shall not be mounted directly to RSUP and pedestrian railings. Refer to Section 2.19 (Signing) for additional requirements.

#### 2.15.5.1.9 Right-of-Way Fencing, Security Fencing and Fall Protection Aesthetics

The Design-Builder shall comply with aesthetic treatments of Right-of-Way fencing, security fencing and fall protection as shown in the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1) and as listed below:

- All new chain link fencing shall be black vinyl-coated.
- Fall protection shall comply with design criteria in Section 2.13.
- Where identified in the Conceptual Plans (Appendix M1), the Design-Builder shall provide and install an automatic operating black powder-coated metal gate meeting Section 12.40 of the City of Medina Municipal Code and of similar character and form as found at residential entries along Evergreen Point Road.
- A six foot height, continuous, black vinyl-coated chain link fencing shall be provided as a security perimeter between pedestrian paths, overlooks, the RSUP, and the Bridge Maintenance Facility access drive as indicated in Appendix L10 or as otherwise approved by WSDOT in writing.
- Placement of perimeter security fencing, where required to meet these requirements, shall meet Section 17.76 of the City of Medina Municipal Code.

#### 2.15.5.1.10 Lighting Aesthetics

The Design-Builder shall select pedestrian lighting fixture styles that are consistent with community preferences as shown in the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1) for light fixtures East of the east approach bridge abutment and for use along the pedestrian path.. Exposed pedestrian lighting elements East of the East

Approach Bridge Abutment shall be powdercoated to match WSDOT Cascade Green. RSUP wayfinding lighting shall be provided West of the East Approach Bridge abutment as indicated in Section 2.16 and the SR 520 Bridge Architectural Design Principles (Appendix L2). Exposed RSUP wayfinding lighting elements shall be powdercoated to match WSDOT Blue-Gray.

Sentinel elements shall incorporate lighting that highlights the element with an even green glow visible from the lake level for a minimum distance of one-quarter mile.

Major elements shall incorporate lighting that ties into the rhythm of the elements. Lighting for the major elements shall match the light spectrum of portal transition columns of the SR 520 Eastside Transit and HOV Project, as described in Appendix L1. Lighting associated with major and sentinel elements shall not create glare to pedestrian, cyclists or motorists.

Refer to Section 2.16 for additional requirements.

#### 2.15.5.1.11 Wayfinding and Signage

The Design-Builder shall develop wayfinding and signage that are consistent with community preferences shown in the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1) and the East King County Bicycle Wayfinding Practice Guide (Appendix L7). Bicycle and pedestrian path signage shall be provided at key decision points along the regional bicycle and pedestrian path and shall meet the WSDOT *Design Manual* (Appendix D3) requirements for sign locations.

Interpretive signage shall be provided at each belvedere, clear of the regional bicycle and pedestrian path, identifying key regional features as seen from each belvedere location, historical information and images related to the Evergreen Point floating bridge.

Interpretative signage shall be provided at the pedestrian path overlook identifying key ecological features.

### 2.15.5.2 COLOR AESTHETICS

The Design-Builder shall comply with the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1), the WSDOT SR 520 Bridge Architectural Design Principles (Appendix L2) and pigmented sealer and paint application as documented in the WSDOT Standard Specifications (Appendix D18) for paint or pigmented color application. Color shall be applied to all exposed above-ground or above-water surfaces including, but not limited to: bridge structures; architectural elements; all sides of the outermost girder of any structure; all exposed sides of the superstructure; all exposed sides of cap beams, columns, and retaining, pier, abutment and noise walls; fencing; gates; barriers; railings; sign structures; lighting; maintenance sheds; and all metal work. Painting of pontoons shall not be required unless otherwise required in these Technical Requirements.

Paint and pigment sealer colors for this Project shall be:

- WSDOT Washington Gray – Concrete primary color.
- WSDOT Mt. Baker Gray – Concrete accent color.
- WSDOT Cascade Green – Medina pedestrian lighting.
- WSDOT Blue-Gray (Federal Standard 595 Color35237) – Metal applications above deck primary color.

- Narrows Green (Federal Standard 595 Color 34277) – Metal applications above deck accent color.
- Dark Blue (Federal Standard 595 Color 36118) – Metal applications below deck primary color.

Pigmented sealer and paint colors shall match the lab values as shown in the WSDOT Standard Specifications (Appendix D18) or Federal Standard 595 Color specifications.

Refer to Section 2.25 (Control of Materials) for additional requirements.

### 2.15.5.3 LANDSCAPE FUNCTION AND AESTHETICS

#### 2.15.5.3.1 Vegetation Protection

The Design-Builder shall preserve and protect existing trees as identified in the roadside planting and irrigation Conceptual Plans (Appendix M1). No construction activities or storage of construction materials or vehicles shall be allowed within the drip line of any tree identified as "to preserve and protect" in Appendix M1. Refer to the Vegetation Protection and Restoration section of the WSDOT Standard Specifications (Appendix D18) for additional requirements.

#### 2.15.5.3.2 Roadside Restoration Function and Aesthetics

The Design-Builder shall comply with the requirements of the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1) when developing landscape designs. Landscape designs shall also meet the requirements of Sections 2.8 (Environmental) and 2.14 (Stormwater Management). When developing planting designs, the Design-Builder shall consider the following:

- Give high priority to the long-term sustainability and maintenance requirements of plantings in the unique conditions of roadside areas, including the ability of maintenance crews to safely access the plantings.
- Travel speeds, sight distance, drainage needs, signage, maintainability and other elements that affect the safety and views of the motorists entering and leaving SR 520.
- Sight distances from at-grade intersections of other roads.
- Placement of trees within roadside restoration areas consistent with setback requirements in the roadside planting details in the Conceptual Plans (Appendix M1) and clear zone requirements of the Roadside Manual (Appendix D16).
- Roadside restoration design shall meet plant spacing and plant sizing similar to the plant schedules in the Conceptual Plans (Appendix M1).
- Landscaping of stormwater facilities shall take into consideration existing utility needs for access and future maintenance and repair/replacement. The Design-Builder shall be responsible for coordinating these requirements with the local utilities.

### 2.15.5.3.3 Bridge Maintenance Facility Landscape and Aesthetics

When developing landscape and shoreline restoration for the Bridge Maintenance Facility and surrounding landscape, the Design-Builder shall comply with the requirements of the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1), Section 2.8, Section 2.14 and the following requirements when developing designs:

- Environmental commitments as listed in Appendix C1;
- City of Medina Shoreline Master Program shoreline use regulations;
- Bridge Maintenance Facility Architectural Concept (Appendix L10);
- Provide a 5' clear width pedestrian path with connections to the Evergreen Point Road lid and one pedestrian path overlook at the locations indicated in the Conceptual Plans (Appendix M1). The pedestrian path and pedestrian path overlook surfacing shall be HMA or as otherwise approved by WSDOT.
- The pedestrian path overlook located at the lower terminus of the pedestrian path shall be a minimum of 110 square feet and not more than 120 square feet. The pedestrian path overlook shall be furnished with a 6-foot length bench that is consistent with requirements in Appendix L1. Coordination will be required with the Eastside Contractor so that there is consistency.
- Pedestrian paths and pedestrian path overlooks shall meet all applicable Mandatory Standards including the ADA Accessibility Guidelines (ADAAG);
- Approximate layout and ratio of evergreen tree species to deciduous tree species shall be as shown in Appendix L10.
- Native conifer and broadleaf evergreen plantings shall be provided along the southern Right-of-Way line, in the proximity of the pedestrian path. Such plantings shall provide a 100% opaque screen with a minimum height of six feet from the finished grade within three years after plantings are accepted.

### 2.15.5.3.4 Grading and Drainage Aesthetics

The Design-Builder shall comply with the following guidelines when developing grading plans:

- Median and shoulder planting areas shall be graded as detailed in the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1).
- Side slopes and embankments shall be graded to minimize the use of barriers, guardrails and fall restraint measures, except that barriers shall be used at medians and roadside to decrease clear zone requirements for planting.
- Slopes in planting areas shall not be steeper than 2:1, unless otherwise shown in the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1) or the Conceptual Plans (Appendix M1).
- Stormwater facilities shall look natural in appearance and follow setback requirements and WSDOT *Highway Runoff Manual* requirements (Appendix D6). Refer to Section 2.14 and the Commitments List (Appendix C1) for details.

Refer to Section 2.11 (Roadway Design) for roadside grading design and Section 2.14 for stormwater facility grading design Technical Requirements.

### 2.15.5.4 TOPSOILS

#### 2.15.5.4.1 Topsoil and Soil Amendments for Roadside Restoration

The Design-Builder shall provide two feet of imported topsoil for roadside landscape restoration in the following locations as identified in the Conceptual Plans (Appendix M1):

- Transitional/driver guidance and roadway corridor planting areas.
- Corridor planting areas that are on imported fill, unless it can be shown that by amending the existing fill, a suitable growing medium for plants can result.

The Design-Builder shall prepare the soil for community corridor planting areas that are over existing undisturbed soils or cut slopes. Soil preparation shall include loosening of compacted soils by ripping to a depth of 18 inches, followed by uniform and even placement of soil amendment over planting areas to a 3-inch non-compacted depth and incorporation into existing soil to a 10-inch depth.

Refer to the WSDOT Standard Specifications (Appendix D18) for other requirements.

#### 2.15.5.4.2 Lightweight Topsoil

The Design-Builder may use lightweight topsoil as the planting medium when planting on top of the Bridge Maintenance Facility to establish planting areas and landforms as indicated in the Conceptual Plans (Appendix M1). These planting areas and landforms were designed to meet commitments made by WSDOT with the City of Medina as represented in the Bridge Maintenance Facility Architectural Concept (Appendix L10). Any lightweight topsoil used as part of this Project shall drain freely, maintain sufficient bearing and internal friction capacity to support selected plant species, and shall be of quality and placed at a depth sufficient to maintain long-term health and survival of plants.

## 2.15.6 CONSTRUCTION CRITERIA

### 2.15.6.1 PLANT ESTABLISHMENT

The Design-Builder shall develop a Plant Establishment Plan and Weed and Pest Control Plan in accordance with Section 8-02.3(2) of the WSDOT Standard Specifications (Appendix D18).

The Design-Builder shall be responsible for the plant establishment and landscaping warranty period in accordance with Section 1-05.16(9) of the General Provisions, and as listed in measures of success below, to begin immediately upon written notification from WSDOTof the completion of initial planting for the Project.

Written notification of completion of initial planting shall be requested for all Work, segmented as required to form distinct areas of the Project including:

- Roadside Restoration –
    - Roadside Landscape
    - Stormwater Facilities
    - Bridge Maintenance Facility Landscape and Shoreline

The measures of success for all landscaped Project areas are as follows:

- In all Project areas, at the end of the first, second and third years following completion of initial planting, 100% of the number of plants required by the Plans and Specifications shall be alive, healthy and vigorously growing; and all dead, dying or unhealthy plants shall be replaced. Project planting areas shall be free of all unwanted trees, shrubs or weeds as defined in the WSDOT *Roadside Manual* (Appendix D16).

### 2.15.6.2 IRRIGATION AND WATERING

The Design-Builder shall design and install irrigation systems, including meters, based on the hydrozones performance provisions described in the roadside planting and irrigation Conceptual Plans (Appendix M1) and this Section. Permanent irrigation systems shall consider the full growth habits of plant material so that plant growth does not create irrigation shadows.

The Design-Builder shall design and install irrigation components of the same manufacturer and type as specified by the SR 520 Eastside Transit and HOV Project Contractor.

The Design-Builder shall design and install irrigation systems based on head-to-head coverage in all permanent irrigation areas including, but not limited to, Bridge Maintenance Facility and roadside areas. The irrigation design developed by the Design-Builder shall avoid overspray on walls, fences and pavement areas. Temporary watering systems, when used, shall keep all plantings and grass sufficiently watered to ensure plant establishment.

#### 2.15.6.2.1 Bridge Maintenance Facility Irrigation

The Design-Builder shall design and install a permanent drip irrigation system for the Bridge Maintenance Facility in the areas identified in the Bridge Maintenance Facility planting enlargement plan in the Conceptual Plans (Appendix M1), independent from roadside and shoreline restoration planting areas. The Design-Builder shall not connect roadside restoration irrigation systems to lid irrigation systems installed as part of the SR 520 Eastside Transit and HOV Project.

The design of the irrigation system shall meet the following requirements:

- The irrigation system design shall provide one-quarter inch of precipitation per week for the life of the facility.
- The irrigation system shall be designed so as to not adversely affect soil or slope stability.
- The irrigation system shall contribute toward the U.S. Green Building Council LEED NC silver certification as documented in the Bridge Maintenance Facility Checklist (Appendix S14). LEED project limits for this Project shall be as identified in Appendix S14.
- The irrigation water source for the Bridge Maintenance Facility irrigation system may be established through an alternate source, such as groundwater or treated stormwater. The Design-Builder shall be responsible for obtaining all applicable local, state and federal permits associated with securing an alternate source of water for the Bridge Maintenance Facility irrigation system. The Design-Builder shall be responsible for all costs and any delays resulting from obtaining the applicable permits required for the alternate water source.

- If the irrigation system is supplied by a source other than municipal water, a supplemental connection shall be established to a municipal water source in the event of a failure of the alternate source or extreme drought.

The Design-Builder shall coordinate with the SR 520 Eastside Transit and HOV Project for opportunities to utilize a shared water, electric and telecommunications service connection independent from Evergreen Point Road lid or Bridge Maintenance Facility systems for the purposes of providing roadside restoration irrigation.

#### 2.15.6.2.2 Bridge Maintenance Facility Irrigation Walkthrough

Following the completion of the establishment for the Bridge Maintenance Facility landscape, the Design-Builder shall request and perform a walkthrough of all landscaped Bridge Maintenance Facility areas with WSDOT. The walkthrough shall include introductions to irrigation systems and identifying locations and operation of critical system components such as irrigation point of connections, irrigation controllers and any underground irrigation reservoirs/vaults if installed. The Design-Builder shall provide WSDOT with As-Built Plans for irrigation systems in accordance with Sections 8-03.3(10) and 8-20.3(17) of the WSDOT Standard Specifications (Appendix D18). The Design-Builder shall provide manuals for operations of irrigation, including cut sheets of all system components.

#### 2.15.6.2.3 Irrigation Control Devices

The Design-Builder shall provide one irrigation controller for each system enclosed in a vandal-resistant stainless steel pedestal enclosure. Irrigation controllers shall be equipped to meet these additional requirements:

- Communication with central computer via dial-tone telephone or cellular telephone technology;
- Rain and soil moisture sensing with programmable rain delay period setting with auto-restart function; and
- Flow sensing with a flow monitoring device.

#### 2.15.6.2.4 Irrigation Service and Service Agreements

The Design-Builder shall be responsible for developing the information necessary for WSDOT to modify or enter into new water, electrical and communication service agreements as required to operate fully-functioning individual irrigation systems.

WSDOT will obtain all service agreements from the electric power company, telecommunications company and water district for roadside and bridge maintenance irrigation systems. The Design-Builder shall pay all costs charged by the electric power company, telecommunications company and water district, and for the company's and district's costs associated with upgrading its facilities to meet the requirements of the service agreements. WSDOT will pay the monthly electric, water and telecommunications bills, starting on the day Work begins, for the existing services and for the services installed under the Project until completion of plant establishment periods.

The Design-Builder shall coordinate with WSDOT to submit a service agreement request for all new and modified services required for the Project. The service agreement request

shall include the information needed to complete all service agreement checklists and the following:

- Location of existing and new electric, water and telecommunications services submitted in plan sheet format;
- Load calculations for electrical services requested showing designed loads; and
- Water meter size and landscape and irrigation water budget as defined in the City of Bellevue City Code Section 24.02.205.

The Design-Builder shall submit the service agreement request a minimum of 120 Calendar Days in advance of when the power connection 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 120 Calendar Day advance notice will begin when the revision to the service agreement request is accepted and determined complete by WSDOT and/or local jurisdictions. Electric, telecommunication or water service connections may take longer to establish than the service agreement execution, depending on the workload of the power company, telecommunications company or water district. WSDOT is not responsible for added cost resulting from such delays by the above-mentioned parties.

If the Design-Builder proposes to remove existing services, the Design-Builder shall submit a service agreement request at least 14 Calendar Days prior to the proposed removal, so that the service account can be cancelled. The service agreement request shall contain the service agreement number, location and electrical load or water budget.

Refer to Section 2.1 (General Information) for additional service agreement procurement process requirements.

#### 2.15.6.3 DEFECTS, FLAWS, VANDALISM

- The Design-Builder shall be responsible for monitoring the appearance of the aesthetic treatments on the walls and bridges for defects, flaws or vandalism. The Design-Builder shall notify WSDOT promptly of any defects, flaws, or vandalism, and shall be responsible for remedying defects, flaws or vandalism until Physical Completion. Refer to Section 2.29 (Maintenance During Construction) for maintenance and appearance of aesthetic treatments.

### 2.15.7 SUBMITTALS

#### 2.15.7.1 PRELIMINARY LANDSCAPE AND AESTHETICS DESIGN SUBMITTALS

The Design-Builder shall prepare Preliminary Landscape and Aesthetics Design Submittals in accordance with Divisions 5 and 6 of the WSDOT *Plans Preparation Manual* (Appendix D12), and Sections 2.2 (Project Documentation) and 2.28 for WSDOT review and comment.

Preliminary Landscape and Aesthetics Design Submittals shall include, but are not limited to, the following:

- Preliminary Roadside Work Plan;

- Preliminary Urban Design Review Plan;
- Preliminary Contour Grading Plans;
- Preliminary Planting Plans and Details;
- Preliminary Landscape and Architectural Plans and Details; and
- Preliminary Irrigation Plans and Details.

### 2.15.7.2 FINAL LANDSCAPE AND AESTHETICS DESIGN SUBMITTALS

The Design-Builder shall prepare and submit Final Landscape and Aesthetics Design Submittals in accordance with Divisions 5 and 6 of the WSDOT *Plans Preparation Manual* (Appendix D12), and Sections 2.2 and 2.28 of these Technical Requirements for WSDOT review and comment. Final Landscape and Aesthetics Design Submittals include, but are not limited to, the following:

- Final Roadside Work Plan;
- Final Urban Design Review Plan;
- Final Contour Grading Plans;
- Final Planting Plans and Details;
- Final Landscape and Architectural Plans and Details;
- Final Irrigation Plans and Details; and
- Design-Builder Landscape, Irrigation and Architectural Technical Specifications.

### 2.15.7.3 RELEASED FOR CONSTRUCTION DOCUMENTS SUBMITTALS

The Design-Builder shall prepare and submit Released for Construction Documents in accordance with Divisions 5 and 6 of the WSDOT *Plans Preparation Manual* (Appendix D12), and Sections 2.2 and 2.28 of these Technical Requirements for WSDOT review and comment. Released for Construction Documents shall include plans, details and specifications for all landscape, irrigation and architecture features.

### 2.15.7.4 PRECONSTRUCTION LANDSCAPE AND AESTHETICS DESIGN SUBMITTALS

The Design-Builder shall prepare Preconstruction Landscape and Aesthetics Design Submittals and shop drawings for WSDOT review and comment.

These shall include, but are not limited to, the following:

- One form liner sample for each retaining wall and noise wall finish.
- Three 5-foot by 5-foot concrete samples of noise wall finishes and, if used, three structural earth wall panels with random flare finish.
- One concrete wall test section with the random flare finish shall be submitted to the Urban Design Task Force (UDTF) for approval for any proposed changes to the design details as utilized for the SR 520 Eastside Transit & HOV project.

This test section shall be provided at a location convenient to the UDFT. The test section shall be constructed using the forms and materials intended to construct the permanent cast-in-place concrete structures. The test section shall be composed of two 12-foot by 12-foot form sections which shall be assembled to make a 12-foot by 24-foot concrete surface section, and shall include the wall top treatment, one expansion joint treatment and one horizontal joint treatment. The Design-Builder shall not proceed with casting of any concrete elements specified to receive random flare finish prior to receiving the UDTF's approval of the test section. Adjustments to the form liner to improve constructability that may be needed during the testing process shall be made by the Design-Builder at no additional expense to WSDOT.

- One precast type 11 concrete noise barrier wall panel test section, if precast concrete noise panels are used as part of this Project. The test panel shall be composed of the random flare finish on both sides of the panel (refer to the WSDOT SR 520 Eastside Urban Design Criteria, Appendix L1); and one concrete pilaster. The test panel shall be 12 feet high by six feet wide. The Design-Builder shall not proceed with casting additional concrete noise wall panels prior to receiving the UDTF's approval of the test section. Adjustments to the form liner to improve constructability that may be needed during the panel testing process shall be made by the Design-Builder at no additional expense to WSDOT.

- One 2-foot by 2-foot sample of noise absorptive panel, if used.
- Pigmented sealer color samples (including paint colors for metal applications).
- One 4-foot section of each railing type including two posts for each railing type.
- One 2-foot by 2-foot sample of all architectural finishes

End of Section

# 2.16 ILLUMINATION AND ROADWAY ELECTRICAL SYSTEMS

## 2.16.1 GENERAL

The Design-Builder shall perform all Work necessary to meet the requirements for temporary and permanent illumination and roadway electrical systems in accordance with these Technical Requirements.

The Design-Builder shall provide required roadway and pedestrian illumination specified in Section 1040.05 of the WSDOT *Design Manual* (Appendix D3) and additional illumination required in this section. The illumination design areas shall include, but are not limited to, the roadway and RSUP on the West and East Transition Spans, the floating bridge, the East Approach Bridges, and the east connections to the SR 520 Eastside Transit and HOV Project.

The Design-Builder shall perform the roadway electrical Work including, but not limited to, the following:

- Design and construct the permanent roadway electrical systems for roadway and pedestrian illumination systems, Intelligent Transportation Systems (ITS), and all electronic tolling infrastructure constructed or modified as part of the Project in accordance with the Mandatory Standards and the requirements included in this section.
- Design and construct the medium voltage (12.47 kilo-volt) power distribution system, bridge maintenance facilities, navigation, Pontoon and pier lights, and other floating bridge electrical systems on the floating bridge, the East and West Transition Spans, and the East Approach Bridges in accordance with Section 2.17 (Electrical Bridge and Services). The Design-Builder shall provide power to the roadway and pedestrian illumination and ITS systems on the floating bridge using the medium voltage power distribution system in accordance with this section.

The Design-Builder shall maintain electrical power to all existing illumination systems, tolling system and ITS during construction of the Project unless otherwise specified in these Technical Requirements, and design and construct temporary electrical systems in accordance with the Mandatory Standards and the requirements in Section 2.22 (Maintenance of Traffic).

### 2.16.1.1 COORDINATION WITH ADJOINING PROJECTS

The following projects will occur within the immediate vicinity of and at the same time as the Project, and have direct interfaces with the electrical systems on the Contract. The Design-Builder shall coordinate with the WSDOT Engineer to obtain additional plans and design documents for these projects. The Design-Builder shall develop the design and construction schedule to coordinate with these projects and shall ensure continuous functioning of all roadway illumination, navigation lighting, and electrical systems throughout the Project.

#### 2.16.1.1.1 SR 520 Eastside Transit and HOV Project

The SR 520 Eastside Transit and HOV Project will reconstruct and reconfigure SR 520 from the east shore of Lake Washington at MP 3.98 to 108th Avenue NE at MP 6.43. The new roadway will connect to the existing floating bridge. As part of the Eastside project,

the following work elements are directly related to the illumination and roadway electrical systems of this Project:

- Relocation and replacement of existing floating bridge 12.47 kilo-volt power line at the east end of the existing floating bridge;
- Removal of all existing power distribution and lighting systems between the east shore of Lake Washington and 108th Avenue NE;
- Installation of new roadway and pedestrian illumination and ITS between the east shore of Lake Washington and 108th Avenue NE;
- Installation of under-lid lighting at Evergreen Point Road, 84th Ave NE, 92nd Ave NE lids; and
- Installation of new electrical power distribution systems for the existing toll facility at the east end of the existing floating bridge, and new illumination systems and ITS between the east shore of Lake Washington and 108th Avenue NE.

The under-lid lighting at Evergreen Point Road installed by the Eastside project will be constructed based on the roadway geometry of this Project. The Design-Builder shall coordinate with WSDOT, and shall provide Project design documentation and support for WSDOT to construct the under-lid lighting system as part of the Eastside project.

Upon notification by WSDOT as the Eastside project completes these new facilities, the Design-Builder shall maintain these new facilities within the Project limits during construction of the Project until new illumination, ITS, and tolling systems are operational. The Conceptual Plans for the SR 520 Eastside Transit and HOV Project are included in Appendix M13.

The Design-Builder shall coordinate with the WSDOT Engineer to obtain additional plans and design documents for the Eastside project. The Design-Builder shall develop the design and construction schedule to coordinate with the Eastside project and shall ensure continuous functioning of the illumination and roadway electrical systems.

#### 2.16.1.1.2 SR 520 West Connection Bridge Project

The SR 520 WCB Project will construct the WCB to connect the new floating bridge to the Existing West Approach Bridge, and will construct the West Connection Shared Use Path to connect the RSUP between the floating bridge to Foster Island and its vicinity areas. As part of the WCB project, the following illumination and electrical related work elements will be designed and constructed:

- Roadway illumination on the WCB;
- Navigation lighting including all pier and navigation lights on the WCB and the West Connection Shared Use Path;
- Pedestrian lighting on the West Connection Shared Use Path;
- A new or modified electrical service in the Foster Island area;
- A new power distribution system along the WCB and the West Connection Shared Use Path to the above lighting systems; and
- Relocation and replacement of existing 13.8 kilo-volt power line on the Existing West Approach Bridge where it connects to the WCB.

The Design-Builder is advised that the temporary pier lights on the western piers of the West Transition Span shall be designed and provided by the Design-Builder as part of

this Contract. Refer to Section 2.17 for design and construction requirements for the pier and navigation lighting.

Upon notification by WSDOT as the WCB project completes these facilites, the Design-Builder shall maintain all above facilities (with the exception of the 13.8 kv power line) until Physical Completion of the Project.

The Design-Builder shall maintain all navigation channels and the navigation lighting system on the WCB, the existing floating bridge, and the new floating bridge as a whole in accordance with Sections 2.12 (Floating Bridge) and 2.17.

The conceptual plans for the SR 520 WCB project are included in Appendix M3.

## 2.16.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- WSDOT Northwest Region Current Practices in Electrical Design (Appendix I1).
- WSDOT Northwest Region Special Provisions for Illumination, Traffic Signal Systems, and Electrical (Appendix B9).
- WSDOT Northwest Region Special Provisions for Intelligent Transportation System (Appendix B10)
- WSDOT Northwest Region Illumination and Signal Details (Appendix I2).
- WSDOT Northwest Region ITS Details (Appendix I3).
- WSDOT Power Supply Design for Transportation Applications (Appendix I4).
- WSDOT Illumination Design for Transportation Applications (Appendix I5).
- WSDOT AGI32 Illumination Design (Appendix I6).
- WSDOT Advanced Inspection Class Illumination and Signal Systems Electrical Training (Appendix I7).
- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT *Traffic Manual* (M51-02) (Appendix D19).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).

- WSDOT *Maintenance Manual* (M51-01) (Appendix D9).
- WSDOT *Bridge Design Manual* (M23-50) (BDM) (Appendix D1).
- WSDOT *Roadside Manual* (M25-30) (Appendix D16).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- Washington Administrative Code (WAC) Chapter 296-46B, Electrical Safety Standards, Administration and Installation.
- IESNA *American National Standard Practice for Roadway Lighting*, 2000 (ANSI/IES RP-8-00).
- AASHTO *Roadway Lighting Design Guide*, 2005.
- IESNA *Lighting Handbook*, 2000.
- National Fire Protection Association (NFPA), *National Electric Code* (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*.
- ITE *Traffic Control Devices Handbook*, 2001.
- FHWA *Traffic Control Systems Handbook*, 2005.
- ITE *Traffic Engineering Handbook*, 6th Edition, 2009.

#### 2.16.2.1 DESIGN-BUILD MODIFICATIONS TO THE WSDOT NORTHWEST REGION SPECIAL PROVISIONS

The WSDOT Northwest Region Special Provisions (Appendices B9 and B10) included in these Technical Requirements are mandatory design documents to be used on all WSDOT Northwest Region projects. For purposes of this Project, the Design-Builder shall perform all Work in accordance with the following:

- When the Special Provisions refer to "Contracting Agency," it shall mean WSDOT.
- When the Special Provisions refer to "Contractor" or "Contractors," it shall mean the Design-Builder.
- When the Special Provisions refer to "Engineer," it shall mean the Design-Builder unless otherwise specified in these Technical Requirements.
- When the Special Provisions refer to an activity that "shall" be done or that "must" be done, the Design-Builder shall assume those activities are mandatory.

- "As shown on plans" refers to the design details shown in the Mandatory Standards and the Conceptual Plans (Appendix M1) included in these Technical Requirements, as applicable.
- The Design-Builder shall ignore the provisions in the Special Provisions with regard to "Measurement" and "Payment."
- Variable project data, or "fill-ins," shall be determined and documented by the Design-Builder.

No changes have been made to the WSDOT Northwest Region Special Provisions that do not apply to the Project; however, in some cases it may not be clear whether rights or responsibilities in these special provisions are applicable to the Design-Builder. If it is unclear whether specific provisions are applicable to the Design-Builder, the Design-Builder shall raise the issue with WSDOT and WSDOT will make that determination at its sole discretion. WSDOT has identified the following provisions of the WSDOT Northwest Region Special Provisions for Illumination, Traffic Signal Systems, and Electrical (Appendix B9) that are not applicable to this Project:

- Steel High Mast Light Standards.
- Lowering System for Steel High Mast Light Standards.

## 2.16.3 PERFORMANCE REQUIREMENTS

### 2.16.3.1 DESIGN-BUILDER PERSONNEL

The Design-Builder shall provide an Illumination and Electrical Design Lead Engineer with a minimum of 10 years of supervisory experience in the design and construction of roadway and pedestrian illumination, electrical power distribution systems and other highway-related electrical elements. The Illumination and Electrical Design Lead Engineer shall have at least two years of experience working in Washington State, and shall be familiar with the WSDOT Northwest Region design and construction standards. The Illumination and Electrical Design Lead Engineer shall be an Electrical Engineer, licensed under Title 18 RCW, and shall be responsible for the illumination and electrical design elements of the Project.

### 2.16.3.2 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.

WSDOT will designate a WSDOT Electrical Inspector. The Design-Builder shall contact WSDOT to arrange for electrical inspection. 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 illumination, electrical, all electronic tolling infrastructure, and ITS design teams.

- Review and comment on illumination, electrical, all electronic tolling infrastructure and ITS plans.
- Perform periodic inspections during construction.
- Witness required illumination, electrical, all electronic tolling infrastructure, and ITS field tests (as desired).
- Inspect and approve all illumination, electrical, all electronic tolling infrastructure, and ITS installations in accordance with these Technical Requirements.

### 2.16.3.3 SOFTWARE

The Design-Builder shall use AGI32 Lighting Design Software Version 2.04 (or latest version) 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 CD-ROM. All hard and electronic copies of the lighting analysis and AGI32 files shall be available for WSDOT to review and comment as required in this section as part of the Preliminary Design Submittal.

### 2.16.3.4 DESIGN AND CONSTRUCTION PROGRESS MEETINGS

The Design-Builder shall work with WSDOT to establish a Traffic Design Task Force to oversee and provide input on the design and construction issues including, but not limited to, illumination, electrical, signing, pavement marking, and Intelligent Transportation Systems (ITS). The Design-Builder shall schedule and chair weekly Traffic Design Task Force meetings from NTP 1 to Project completion. The Design-Builder shall prepare the agenda, meeting minutes, exhibits and design documents for each meeting (refer to Section 2.1, General Information).

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

The Design-Builder shall use the weekly Traffic Design Task Force meetings to conduct over-the-shoulder design reviews during the course of the development of the Preliminary and Final Design Submittals, and other contract submittals as required in Section 2.28 (Quality Management Plan). The Design-Builder shall coordinate with WSDOT to schedule these over-the-shoulder review meetings, and the list of attendees shall include representatives from the following groups within WSDOT:

- SR 520 Design-Build Project Staff;
- WSDOT Toll Division;
- WSDOT Northwest Region Traffic Operations;
- WSDOT Northwest Region Traffic Design;
- WSDOT Northwest Signals Maintenance;
- WSDOT Northwest Bridge Maintenance;
- WSDOT Electrical Inspector(s);
- Local Agencies; and

- Other representatives as requested by WSDOT.

### 2.16.3.5 TESTING OF ILLUMINATION AND ELECTRICAL SYSTEMS

The Design-Builder shall perform all required testing for temporary and permanent illumination and electrical systems in accordance with the Mandatory Standards and the requirements in these Technical Requirements. Refer to Section 2.25 (Control of Materials) and Section 2.28 for additional requirements.

The Design-Builder shall test all illumination and roadway electrical systems installed as part of the Project, including, but not limited to, the following:

- All luminaires and photocell controls installed in all required areas;
- Conduits, conductors and wiring including conductor insulation, grounding, and electrical continuity;
- Electrical equipment inside the ITS/lighting room of the maintenance, substation and control sheds, including panel boards, cabinets, transformers, lighting control, ventilation fans, heaters, and lights; and
- Service cabinets, circuit breakers, fuses, switches, receptacles, lighting contactors, transformers and associated electrical equipment.

The Design-Builder shall coordinate the testing with the WSDOT Engineer and the Northwest Region Signal Maintenance Office. Prior to any testing, the Design-Builder shall provide 14 Calendar Days notice to the WSDOT Engineer and the Northwest Region Signal Maintenance Office.

The WSDOT Northwest Region Signal Maintenance Office may be contacted at the following address:

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

For any testing to be performed on the floating bridge, the Design-Builder shall also coordinate with the WSDOT Northwest Region Bridge Maintenance Office 14 Calendar Days prior to any testing. The WSDOT Northwest Region Bridge Maintenance Office may be contacted at the following address:

10833 Northup Way NE
Bellevue, Washington 98004
Telephone: (425) 739-3700

The Design-Builder shall have current training and certification on all testing equipment used, which shall consist of documentary evidence that staff performing tests are familiar and able to perform the test procedures. 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 and have in its possession a certification of test device calibration in accordance with the American National Standards Institute (ANSI) guidelines for the duration of the Project. Measurements recorded during the tests shall be supplied to WSDOT in accordance with this section and Section 2.28.

The Design-Builder shall incorporate all testing in the Baseline Contract Schedule and Monthly Contract Schedule Updates, and shall provide these schedules for all testing to WSDOT for review and comment. Time and location for all tests shall be provided to WSDOT a minimum of 14 Calendar Days in advance of any test.

Upon installation of all equipment including illumination, lighting control, and electrical systems, the Design-Builder shall be responsible for conducting the field acceptance testing including, but not limited to, the following:

- Field inspection of all installed electrical equipment, cabinets, conduits, conductors, cables, and wiring for any damage, proper installation, grounding, and connection for circuit breakers, switches, splices, and terminations;
- Prior to energizing the electrical circuits, record field measurements of conductor insulation, grounding resistance, and electrical continuity;
- Upon energizing the electrical circuits, record field measurements of voltage and current loading on each circuit, and rebalance 3-phase load as necessary; and
- Testing of service panels, transformers, circuit breakers, switches, receptacles, and photocell controls

The Design-Builder shall develop all testing procedures and pass/fail requirements to ensure all tests are performed in accordance with the Mandatory Standards and this section. The Design-Builder shall be responsible for all labor, materials, test equipment and test documentation to complete the testing.

All components that fail a test shall be replaced and retested. The Design-Builder will not be granted an extension of time for delays caused by defective equipment.

The Design-Builder shall submit all testing procedures, pass/fail requirements, Manufacturer's Certificate of Compliance, and equipment documentation to WSDOT for review, and resolve all WSDOT comments on this documentation, a minimum of 14 days prior to any testing, and shall submit test reports upon completion of each test in accordance with this section and Section 2.28.

The test reports shall include:

- A list of all equipment used to perform the tests;
- Testing equipment calibration records;
- Evidence of testing staff training and certification;
- A record of each test step and associated pass/fail requirement, who performed the tests, who witnessed the tests, and the test results; and
- A record of test failures, corrective action taken, and results of the retest.

Upon successful completion of the field installations and field acceptance testing, the Design-Builder shall notify WSDOT for field inspection by the WSDOT Electrical Inspector. WSDOT may observe any tests and will audit test results.

Refer to Section 2.17 for additional requirements for testing the medium voltage power distribution system, navigation, Pontoon and pier lights, and other electrical systems on the new floating bridge, East and West Transition Spans, and East Approach Bridges.

### 2.16.3.6 MAINTENANCE OF ILLUMINATION AND ROADWAY ELECTRICAL SYSTEMS

Upon NTP2, the Design-Builder shall be responsible for maintaining all new and temporary electrical facilities constructed or modified by the Design-Builder until Physical Completion of the Project at no additional cost to WSDOT.

New electrical facilities will be constructed by other projects at the same time of this Project, or existing electrical facilities will remain upon completion of these projects. Appendix M7 includes the allowable access and control areas for the Design-Builder and the anticipated timeline for each area that will be available for the Design-Builder. Upon notification by WSDOT, the Design-Builder shall provide maintenance of the following new and existing facilities within the Project limits until Physical Completion of the Project at no additional cost to WSDOT:

- The new roadway and pedestrian illumination systems, and associated electrical facilities constructed or modified by the SR 520 Eastside Transit and HOV Project;
- The new electrical systems for ITS and tolling infrastructure constructed or modified by the SR 520 Eastside Transit and HOV Project;
- Any existing electrical facilities east of the abutment of the East Approach Bridges that will remain within the Project limts upon completion of the SR 520 Eastside Transit and HOV Project;
- The new roadway and pedestrian illumination systems, and associated electrical systems on the WCB and the West Connection Shared Use Path; and
- The new pier and navigation lighting system on the WCB and the West Connection Shared Use Path (refer to Section 2.17 for additional maintenance requirements for the navigation lighting).

WSDOT will be responsible for maintaining all existing electrical facilities on the existing floating bridge including the existing West and East Approach Bridges until decommissioning of these existing electrical facilities on the existing floating bridge.

The Design-Builder shall be responsible for repairing, to WSDOT's satisfaction and at no additional cost to WSDOT, any damage caused by the Design-Builder to the illumination and roadway electrical systems during the life of the Project.

Refer to Section 2.29 (Maintenance During Construction) for additional requirements.

#### 2.16.3.6.1 Existing Floating Bridge Electrical Facilities

The following existing electrical and communication facilities are located adjacent to or along the existing SR 520 floating bridge, and are crucial to the existing floating bridge operations:

1. The SR 520 Eastside Transit and HOV Project will modify this existing underground power line as described below:
    - Maintain the Puget Sound Energy (PSE) electrical service drop at its original location next to the park and ride lot at Evergreen Point Road;
    - Install a new switchgear on the south side of the existing SR 520 mainline roadway, west of the Evergreen Point Road lid;

- Install new underground conduits and new medium voltage conductors between the PSE service location and the new switchgear along the south side of the existing SR 520 mainline roadway;
- Install new underground conduit and new medium voltage conductors from the switchgear to the existing junction box adjacent to the existing floating bridge east abutment on the south side of the existing SR 520 mainline roadway; and
- Splice the new medium voltage rated conductors to the existing electrical conductors in the existing junction box adjacent to the existing floating bridge east abutment on the south side of the existing SR 520 mainline roadway.

The Design-Builder shall coordinate with WSDOT and the Eastside Design-Builder to determine the final location of the above infrastructures. The Design-Builder shall maintain and protect this power line at all times until all traffic is switched onto the new floating bridge in accordance with this section and Section 2.17.

2. A medium voltage power line (13.8 kilo-volt) from the existing electrical service at Foster Island to the mid-span of the existing floating bridge. A portion of this power line will be relocated and replaced by others when constructing the WCB;
3. Communication conduits and cables along the SR 520 freeway and the existing floating bridge;
4. Roadway illumination on the existing floating bridge, and the existing West and East Approach Bridges;
5. Navigation, pontoon and pier lights on the existing floating bridge, the West and East Transition Spans, and the West and East Approach Bridges; and
6. Equipment cabinets, cable vaults, pull boxes, conduits, junction boxes, Active Traffic Management (ATM) signs, closed circuit television (CCTV) traffic and bridge surveillance cameras, traffic detectors, and other communication and electrical equipment adjacent to or on the existing floating bridge.

Refer to the as-built Plans (Appendix A-B) for locations of these existing electrical facilities. The Design-Builder shall field verify and locate these existing electrical facilities prior to the commencement of any Work.

The Design-Builder shall maintain and protect all electrical and communication services to the above facilities until decommissioning of the existing electrical facilities. Refer to Section 2.17 for additional requirements for maintaining and protecting the existing medium voltage power lines and other bridge electrical systems until the demolition of the existing floating bridge.

Any disruptions to the existing floating bridge services and electrical facilities will not be permitted prior to the demolition of the existing floating bridge unless they are deemed necessary and approved by WSDOT. The Design-Builder shall coordinate with the WSDOT Northwest Region Bridge Maintenance Office to determine allowable working days and hours for disruptions to the existing floating bridge facilities. The Design-Builder shall not perform any work that will disrupt the existing bridge services and electrical facilities during the storm season (October 1 through April 30).

Any unplanned disruptions that the WSDOT engineer determines to be caused by the actions of the Design-Builder or the Design-Builder's representative(s) shall be corrected by the Design-Builder to WSDOT's satisfaction and at no cost to WSDOT.

In the event of an unplanned disruption and subsequent notification by the WSDOT Engineer, the Design-Builder shall immediately 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 will result in the assessment of liquidated damages in accordance with Section 1-08.9 of the General Provisions.

## 2.16.3.7 REMOVAL, SALVAGE AND DELIVERY

### 2.16.3.7.1 Removal, Salvage, and Delivery of Existing Illumination, ITS and Roadway Electrical Equipment

The Design-Builder shall remove and deliver existing illumination and roadway electrical equipment in accordance with the Mandatory Standards and the requirements included in this section.

The following existing equipment shall be removed by the Design-Builder and shall become the property of the Design-Builder:

- One square camera pole next to the existing floating bridge east abutment;
- One ATM structure next to the existing floating bridge east abutment;
- One medium voltage (12.47 kv) switchgear, and associated aerial and underground cables, conduits, poles, and junction boxes between the existing Puget Sound Energy (PSE) service location at Evergreen Point Road and the existing floating bridge installed by the SR 520 Eastside Transit and HOV Project; and
- Medium voltage switchgears and transformers on the existing floating bridge.

The Design-Builder shall remove, salvage and deliver the following existing equipment to the WSDOT Northwest Region Signal Maintenance Office:

- One CCTV camera and associated equipment next to the existing floating bridge east abutment;
- One Permanent Traffic Recorder cabinet and associated equipment next to the existing floating bridge east abutment;
- Two LCS and one SDMS on the existing ATM structure, one ATM cabinet, and associated equipment next to the existing floating bridge east abutment;
- All other ITS equipment, poles, ITS cabinets, service cabinets, ITS transformers, lighting control equipment and other electrical equipment on the Eastside corridor, if removed by the Design-Builder;
- Two CCTV cameras, cabinet and associated equipment at the drawspan of the existing floating bridge;
- One Wavetronix detector, cabinet and associated equipment at the drawspan of the existing floating bridge;
- Two CCTV cameras, cabinet and associated equipment on the west high rise of the existing floating bridge;

- All light poles and luminaires on the existing floating bridge; and
- All other ITS cabinets, NEMA junction boxes, ITS and illumination transformers on the existing floating bridge.

The WSDOT Northwest Region Signal Maintenance Office shall be contacted 30 Calendar Days in advance of delivery at the address below:

3700 9th Avenue South
Seattle WA 98134
Attention: Secretary Supervisor
Telephone: (206) 442-2110
FAX: (206) 442-2147

The Design-Builder shall refer to Section 2.23 (All Electronic Tolling Infrastructure) for the requirements for removal of the existing AET equipment.

#### 2.16.3.7.2 Delivery of New Illumination and Roadway Electrical Equipment

Initial delivery, storage and movement of illumination and roadway electrical 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 herein.

### 2.16.3.8 ILLUMINATION AND ELECTRICAL SYSTEM ACCEPTANCE

The Design-Builder shall notify WSDOT when all illumination and electrical requirements have been met in accordance with these Technical Requirements, including training, documentation, testing and field installations. WSDOT will perform the final electrical inspection and acceptance of illumination and roadway electrical systems in accordance with Washington Administrative Code (WAC) Chapter 296-46B after verifying the proper operation of all components upon Physical Completion of the Project.

The roadway electrical systems on the new floating bridge will be inspected and accepted by WSDOT together with other electrical systems on the new floating bridge. Refer to Section 2.17 and Section 2.34 (Commissioning) for additional requirements for system testing, commissioning and acceptance.

### 2.16.3.9 WARRANTY

The Design-Builder shall provide a Warranty commencing on the day of Physical Completion and ending a minimum of one year later for all illumination and roadway electrical systems furnished and installed as part of this Project, including both equipment and workmanship. Before the Warranty commences, a complete Materials Certification Package shall be submitted to WSDOT for acceptance in accordance with Section 2.25.

The Warranty for the illumination and electrical systems shall be in accordance with the Section 1-05.16 of the General Provisions.

## 2.16.4 DESIGN REQUIREMENTS

### 2.16.4.1 FIELD-REVIEW AND AS-BUILT VERIFICATION

As-built documentation for existing illumination, ITS and roadway electrical systems are provided in Appendix A-B. The Design-Builder shall coordinate with WSDOT personnel to obtain additional as-built documentation for existing illumination, tolling, ITS and electrical systems impacted by construction activities. The Design-Builder shall be responsible for field-verifying the as-built information and shall identify and document all existing WSDOT electrical equipment impacted by construction that is not otherwise documented by as-builts.

The inventory of existing illumination and roadway electrical systems is included in Appendices I13 and I14. The Design-Builder shall be solely responsible for verifying the accuracy of content and completeness of all information in the existing inventories used in the design and construction of the Project.

### 2.16.4.2 TEMPORARY LIGHTING DESIGN REQUIREMENTS

The Design-Builder shall provide temporary illumination when required in accordance with lighting design requirements in the WSDOT *Design Manual* (Appendix D3) and Section 2.22.

### 2.16.4.3 PERMANENT LIGHTING DESIGN REQUIREMENTS

#### 2.16.4.3.1 General

Unless otherwise noted in these Technical Requirements, permanent illumination shall be designed and constructed at all required locations in accordance with the WSDOT *Design Manual* (Appendix D3). The required illumination shall include, but is not limited to, the following:

- Illumination shall be provided at added lanes, lane reductions, transit vehicle on/off-ramps, and merging and diverging areas on the new floating bridge, the West and East Transition Spans, and the East Approach Bridges.
- Full, continuous lighting shall be provided on the new floating bridge where the outside shoulder width is less than 10 feet or the inside shoulder is less than four feet.
- Full, continuous illumination shall be provided in both directions within one safe stopping sight distance from the Evergreen point Road lid western portal including the SR 520 mainline roadways and transit on/off ramps.
- Pedestrian wayfinding lighting shall be provided for the new floating bridge RSUP between the East Approach Bridges abutment and the west end of the West Transition Span.
- Full, continuous pedestrian walkway illumination shall be provided on the RSUP between the East Approach Bridges abutment and Evergreen Point Road and shall provide a smooth connection to the pedestrian lighting system on the Evergreen Point Rd lid installed by the SR 520 Eastside Transit and HOV Project. Pedestrian light standards and luminaires shall be the same as those installed as part of the Eastside Transit and HOV Project east of Evergreen Point Road along the RSUP.

- Additional pedestrian lighting shall be provided at pedestrian conflict areas on the RSUP east of Evergreen Point Road where the areas are not covered by the continuous pedestrian illumination. The pedestrian conflict areas shall include, but is not limited to, stairs, gates, local trail junctures, and areas where shadows and horizontal and vertical geometry obstruct a pedestrian's view.
- Bollard light fixtures shall be furnished and installed along the pedestrian path and in the overlook area as described below:
    - Full cutoff bollard light fixtures shall be installed at all path landings along the pedestrian path and in the overlook area;
    - Spacing between any two adjacent bollard light fixtures shall not be more than 30 feet;
    - Additional bollard lights shall be provided if the spacing between any two adjacent path landings is more than 30 feet;
    - Each path landing area shall be fully covered by the bollard lighting with an average horizontal light level of 0.8 foot candles and a uniformity ratio of 3:1 or lower;
    - The Design-Builder shall shield the bollard lights, as necessary, to minimize light spillage onto adjacent properties in accordance with this section; and
    - A minimum of three bollard light fixtures shall be provided in the overlook area.

Where the roadway connects to the WCB and the eastside roadway constructed by others, the Design-Builder shall coordinate with WSDOT to obtain design documentation, and shall design and construct the roadway illumination systems that smoothly transition to adjacent roadways. The Design-Builder shall evaluate the lighting system affected by the Project, and shall replace the affected lighting, and design and construct additional illumination to meet the design requirements of the Project.

All existing equipment that is removed including, but not limited to, luminaire poles, luminaire pole bases, lamps, luminaires, photocells, cabinets, junction boxes, conduits, wiring, conductors and cables, shall be replaced with new equipment meeting the Project requirements specified in these Technical Requirements. No existing equipment shall be reused for the permanent illumination system. Removed light standards and luminaires shall be salvaged in accordance with the Project requirements specified in this section. Existing light standard foundations shall not be reused and shall be removed.

The Design-Builder shall design and construct the illumination system to minimize lane closures required for maintenance.

The Design-Builder shall provide no less than two light standards for illumination of each design area as defined in WSDOT *Design Manual* (Appendix D3). This requirement applies to both temporary and permanent illumination.

The Conceptual Plans (Appendix M1) only identify the type and approximate location of required roadway illumination for the floating bridge, West and East Transition Spans, West and East Approach Bridges, and connections to the WCB and the eastside roadway, and required pedestrian lighting for the RSUP, but do not attempt to address all required lighting for the Project.

### 2.16.4.3.2 Roadway Illumination on the New Floating Bridge

Continuous roadway illumination is not required on the new floating bridge. However, the Design-Builder shall provide additional lighting in addition to the required areas in the WSDOT *Design Manual* (Appendix D3):

- Lighting on the new floating bridge shall provide a smooth transition to the continuous roadway lighting on the WCB and the eastside roadway, and shall minimize the spillover light in accordance with this section.
- If the distance between two adjacent luminaires is less than six hundred feet in either direction when only the required lighting is provided at two adjacent design areas, the Design-Builder shall design and construct additional luminaires with uniform spacing between these two adjacent luminaires to provide a smooth transition between these two design areas.
- Additional lighting shall be provided for the transit vehicle on/off-ramps when they are not covered by continuous lighting.

### 2.16.4.3.3 Pedestrian Wayfinding Lighting on the Floating Bridge

Pedestrian wayfinding lighting shall be provided on the RSUP between the East Approach Bridges abutment and the west end of the west transition span of the new floating bridge. The pedestrian wayfinding lighting shall be designed and constructed in accordance with, but not limited to, the following requirements:

- The wayfinding lighting shall be continuous and uniformly spaced along the RSUP. Spacing between two adjacent luminaires shall be no more than 40 feet.
- Luminaires shall be recessed into the concrete barrier on the south side of the RSUP with a minimum mounting height of 31 inches from the top of the luminaire to RSUP pavement surface. All luminaires shall be installed at the same height above the bridge deck.
- Luminaire face plates/lens shall not protrude more than four inches into the RSUP. Luminaires shall not contain any moving parts.
- Metal halide, induction or Light Emitting Diode (LED) light source shall be used for the wayfinding lighting. The correlated color temperature shall be between 3,000 Kelvin and 5,000 Kelvin.
- The luminaires shall be a minimum of eight inches in width and eight inches in height, but shall not exceed 16 inches in width and 12 inches in height.
- Luminaires shall not cause glare to motorists, pedestrians and bicyclists.
- Luminaires shall be designed to direct light downward with a circular or oval distribution pattern longitudinally along the RSUP.
- Light level at the north edge of the RSUP shall be kept below the assumed light spillage intensity and area as described in the Environmental Project Description Narrative (Appendix E6).
- All luminaires shall be vandal resistant with an Ingress Protection rating of 65 or better. Wireguard is not allowed.
- Nighttime visibility distance of each luminaire shall be a minimum of one half mile on a clear night in any direction.

- Conduits shall be installed inside the concrete barrier in accordance with the Mandatory Standards.
- Junction boxes shall be flush-mounted with the concrete barrier surface without protruding into the RSUP, concealed behind the luminaire, or integrated with the luminaire as single unit.
- The Design-Builder shall coordinate with WSDOT the pedestrian wayfinding lighting design and selection of a suitable luminaire fixture. All pedestrian luminaire fixtures used on the floating bridge, West and East Transition Spans, and East Approach Bridges must be accepted by WSDOT prior to construction.
- The Design-Builder shall coordinate with WSDOT for the design of pedestrian wayfinding lighting at the area where the new floating bridge connects to the WCB at the west end of the new floating bridge.

#### 2.16.4.3.4 Photometric Analysis

The Design-Builder shall use the AGI32 software to complete a photometric analysis for all roadway and pedestrian facilities that requires illumination. At a minimum, the photometric analysis shall include the following:

- Minimum average maintained horizontal lighting intensities (foot candles); maximum uniformity ratio (average/minimum) and maximum veiling luminance ratio (maximum veiling luminance/average luminance); light pole locations and heights; luminaire types, distributions and wattage; and quantities of each.
- The total light loss factor 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 Lake Washington, streams and rivers. Topographic plan features shall be shown at least 250 feet beyond the illumination contours.
- Lighting analysis for the pedestrian wayfinding lighting on the floating bridge does not require light intensities and uniformity ratios, but shall include the lighting contours as required above.
- Lighting calculation grid spacing shall be five feet by five feet for roadway and adjacent sensitive areas.

The Design-Builder shall consider the three-dimensional aspects of the roadway with respect to the positioning of the illumination assemblies. For example, roadways, ramps, and overpasses are typically located at various vertical and horizontal distances from the luminaires being used to light the roadways. The analysis may be presented using two-dimensional computer modeling for areas where vertical considerations are minimal, and the analysis shall consider using three-dimensional computer modeling where elevated ramps, bridges and retaining walls impact lighting of the adjacent or

below roadways. A surface shall be created for each lighting design area that matches the three-dimensional roadway contours.

### 2.16.4.3.5 Roadway and Pedestrian Lighting Control

The Design-Builder shall design, furnish and install photoelectric light control and lighting contactor systems for the roadway and pedestrian illumination systems installed for the Project in accordance with the Mandatory Standards and the requirements below.

Where lighting contactors are installed in the service cabinets, photocells shall be mounted on the service cabinets in accordance with the WSDOT Standard Plans (Appendix D17). Where lighting contactors are installed in the ITS/Lighting room of the maintenance, substation and control sheds on the floating bridge, the photocells shall be installed above the roadway level on the roadway luminaire fixtures. Where roadway luminaire standards are not available, CCTV traffic surveillance camera poles, Active Traffic Management (ATM) sign structures, or other above-roadway structures may be used. All photocells shall be installed in an open area away from artificial light sources and shaded areas, and the photocell head shall be mounted horizontally with the eye facing north without sunlight obstruction. The Design-Builder shall include the photocell locations and mounting details in the Final Illumination and Electrical Design Submittal for WSDOT review and comment.

The lighting contactors shall be constructed in accordance with the Mandatory Standards and the following requirements:

- Electrically operated and compliant with UL 508 and NEMA ICS 2; and individually mounted and enclosed.
- Suitable for use on 480 volt, 60 Hz AC circuits serving ballasted high-pressure sodium lighting loads and other light fixtures furnished and installed as part of the Project.
- The ampere ratings of the main contacts shall meet NEMA standards. Contactor terminal lugs shall be rated for 75° C.
- The control circuit voltage of each contactor shall be single phase, 120 volt, 60 Hz AC.
- All contactor parts and assemblies shall be accessible for inspection and maintenance.
- All contactors shall bear the UL label.

### 2.16.4.3.6 Spillover Light

Spillover light on Lake Washington has the potential to affect the behavior of fish species. For purposes of environmental documents, WSDOT has assumed a maximum intensity and area of spillover light on Lake Washington. Refer to the Environmental Project Description Narrative (Appendix E6) for these requirements. If the Design-Builder proposes an increase in spillover light on Lake Washington it may trigger the need to modify environmental documents as described in Section 2.8 (Environmental) of these Technical Requirements. When adjacent to non-commercial areas (other than the environmentally sensitive 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 with non-reflective shields to limit spillover light over sensitive areas and outside of the Right-of-Way. When

shields are used, the Design-Builder shall perform the photometric analysis using the photometric data file tested with shielding per IES standards. The shape, type, material, appearance and color of the shields shall be reviewed and commented by WSDOT prior to the photometric analysis. The Design-Builder shall submit a sample of each type of lighting fixtures and shields for WSDOT review and comment.

The above spillover light requirements apply to all permanent and temporary lighting unless otherwise noted. When existing light fixtures remain within the Project limits, the Design-Builder shall modify the existing light fixtures with shields where spillover concerns exist as determined by WSDOT.

### 2.16.4.3.7 Light Standards

Light standards and foundations on freeway mainline and ramps shall conform to the Mandatory Standards and the following requirements:

- Light standards shall be tapered and round steel sections. The height of the pole shall be limited by the maximum mounting height of 40 ft for the luminaire and in no case shall the pole exceed 40 feet in height. WSDOT standard Type I mast arms shall be provided and attached to the light standards in accordance with the WSDOT Standard Plans (Appendix D17). Light standards with a maximum 40-foot luminaire mounting height shall be used on all freeway applications.
- The luminaire mast arm shall not exceed 16 feet in length for a single mast arm and shall not exceed 12 feet in length for a double mast arm. The mast arm length shall be in two-foot increments when the total arm length is between six feet and 16 feet.
- Base details shall conform to the WSDOT Standard Plans (Appendix D17). Bases shall be fixed or slip, as required.
- For light standards mounted on a median barrier, the base plates shall be modified to conform to the dimensions shown in either the WSDOT Standard Plans (Appendix D17) or the electrical details in the WSDOT Northwest Region Illumination and Signal Details (Appendix I2).
- For light standards mounted on outside bridge barrier or retaining wall, elbow mounting shall be used in accordance with WSDOT Standard Plans (Appendix D17).
- Light standards, mast arms, and pole base plates shall be galvanized finish and shall not be painted or powder-coated, in accordance with the WSDOT Northwest Region Special Provisions for Illumination, Traffic Signal Systems, and Electrical (Appendix B9).
- All openings shall be installed during fabrication. All openings in the pole shall have a watertight, gasketed cover attached with stainless steel box bolts.
- No field welding shall be permitted.
- Light standard and foundation placement shall conform to the WSDOT Standard Plans (Appendix D17) for the slope embankment requirements.
- The design of the light standards shall conform to the pre-approved drawings listed in the WSDOT Northwest Region Special Provisions for Illumination, Traffic Signal Systems, and Electrical (Appendix B9).

- Light standards on the floating bridge and eastside roadways shall be the same as the light standards installed by the SR 520 Eastside Transit and HOV Project in shape, materials, appearance and color.

Complete calculations for light standard foundation structural design shall be prepared and submitted to WSDOT for review and comment in accordance with Section 2.13 (Bridges and Structures).

When an existing bridge or wall requires placement of light standards, the Design-Builder shall mount the light standard on the bridge or wall if the structure is adequate for the additional loads and the alternative would otherwise result in a spot deviation. The height of the light standard shall be modified to maintain the required luminaire height above the roadway. The Design-Builder shall submit to WSDOT for review and comment on the calculations indicating that the bridge or wall (existing or new) is adequate for the additional loads, in accordance with Section 2.13. The method of mounting the light standard to the existing structure shall be submitted as part of the Final Design Submittal to WSDOT for review and comment in accordance with this section.

The Design-Builder shall provide light standards and foundations with slip-base features when in the clear zone, except for barrier mounted light standards. Light standard foundations shall not be located in ditches.

#### 2.16.4.3.7.1 Decorative Light Standards

Decorative light standards shall be provided on the RSUP east of the East Approach Bridges abutments in accordance with Section 2.15 and the following requirements:

- All decorative light standards shall be provided in accordance with Section 2.15 (Landscape and Aesthetics Design).
- Light standards shall be tapered and round steel sections not exceeding 20 feet in height with a mast arm not exceeding two feet.
- All new decorative light standards east of the floating bridge abutment shall be the same as the decorative light standards installed by the SR 520 Eastside Transit and HOV Project in shape, materials, appearance and color.

The Design-Builder shall maintain a uniform luminaire mounting height for all arterial street and pedestrian light standards. When light standards are mounted on top of structures such as walls or barriers, the light standards shall be modified so that the mounting height of the luminaire matches the mounting height of the light standards and luminaires mounted off the structures.

#### 2.16.4.3.7.2 Light Standard Foundations

The Design-Builder shall review the Geotechnical Baseline Report (GBR) (Appendix G1) and the GDR (Appendix G2), and perform additional geotechnical analysis for each light standard location. The geotechnical analysis shall include allowable lateral bearing pressure values at each light standard location and shall be submitted as part of the Preliminary Permanent Illumination Plans. The Design-Builder shall design and construct the light standard foundations in accordance with the Mandatory Standards.

Wherever applicable, the light standard foundations shall be placed behind a concrete barrier, or constructed integral with the concrete barrier or retaining/noise wall in a

manner that the foundations do not encroach into the adjacent roadway shoulder. Light standards shall not be placed behind retaining or noise walls.

An approved design deviation associated with shoulder width at light standard foundations is included in Appendix O8. The Design-Builder shall design the light standard foundations and barrier systems to minimize shoulder width reductions as required in the approved design deviation document.

See Sections 2.11 (Roadway Design) and 2.13 for additional requirements for concrete barriers and luminaire foundations.

#### 2.16.4.3.8 Luminaires

For roadway luminaires, the Design-Builder shall furnish and install cobra head-style luminaires with flat-lens, high-pressure sodium, Type III, medium cut-off distribution in accordance with the Mandatory Standards. Light standards shall have no more than two luminaires per pole. A maximum of 250 watts lamp shall be used for over-water or adjacent to environmental sensitive areas and a maximum of 400 watts shall be used for all-other areas. 310 watts lamp shall not be used. Roadway luminaires shall be the same as the roadway luminaires installed by the SR 520 Eastside Transit and HOV Project in shape, materials, appearance and color.

Refer to Section 2.17 for pier and navigation luminaire requirements.

##### 2.16.4.3.8.1 Decorative Pedestrian Luminaires

The Design-Builder shall provide and install decorative luminaires on the regional shared use path east of the East Approach Bridges abutment in accordance with Section 2.15 and the following requirements:

- Pedestrian luminaire fixtures shall be LED with flat lens.
- The entire LED luminaire assembly, including the LED light source, driver and associated equipment, shall feature a minimum of 50,000 hours operating life at 40 degrees Celsius.
- The Color Rendering Index (CRI) shall be a minimum of 65 and the Correlated Color Temperature (CCT) shall be between 3,000 Kelvin and 5,000 Kelvin.
- Pedestrian luminaire fixtures shall be installed on the decorative light standards, and shall be the same as the pedestrian luminaires installed by the SR 520 Eastside Transit and HOV Project in shape, materials, appearance and color.

Along the pedestrian path and in the overlook area, the Design-Builder shall provide and install bollard LED decorative luminaires. The bollard light fixtures shall be the same as those installed as part of the Eastside Transit and HOV Project in height, shape, materials, appearance and color. The LED decorative luminaires shall conform to the above requirements for LED operating life, CRI and CCT.

Refer to elsewhere in this section for requirements for the pedestrian wayfinding luminaire on the floating bridge, the West and East Transition Spans, and the East Approach Bridges.

## 2.16.4.4 ELECTRICAL DESIGN

The Design-Builder shall design and construct the electrical systems for the following facilities:

- Roadway and pedestrian illumination including all new and modified lighting systems throughout the Project.
- ITS equipment throughout the Project. Refer to Section 2.18 (Intelligent Transportation Systems) for ITS equipment locations and requirements.
- All Electronic Tolling Infrastructure within the Project limits. Refer to Section 2.23 (All Electronic Tolling Infrastructure) for the toll facility locations and requirements.

The Design-Builder shall design and construct the medium voltage (12.47 kilo-volt) power distribution system, bridge maintenance facilities, navigation, Pontoon and pier lights, and other floating bridge electrical systems on the floating bridge, the East and West Transition Spans, and the East Approach Bridges in accordance with Section 2.17.

The Design-Builder shall perform utility coordination with the power company, and design all electrical systems as required in these Technical Requirements.

The electrical design and calculations shall be submitted as part of the Final Illumination and Roadway Electrical Design Submittal in accordance with this section.

### 2.16.4.4.1 General Requirements

#### 2.16.4.4.1.1 Electrical Service and Branch Circuits

Electrical services shall be provided and installed for all electrical systems including roadway and pedestrian illumination, new floating bridge electrical systems, pier and navigation lights, all electronic tolling infrastructure, and ITS constructed as part of the Project. Separate services shall be provided for the following systems based on maintenance responsibilities included in WAC 468-18-050 (Policy on the Construction, Improvement and Maintenance of Intersections of State Highways and City Streets):

- WSDOT-maintained electrical systems including roadway and pedestrian illumination, new floating bridge electrical systems, pier and navigation lights, all electronic tolling infrastructure, and ITS;
- Local agency-maintained electrical systems, if any, including illumination and other electrical systems in the City of Medina, Town of Hunts Point, Town of Yarrow Point, City of Clyde Hill, and other jurisdictions; and
- Transit agency-maintained electrical systems including illumination and other transit systems at transit facilities.

The Design-Builder shall refer to Section 2.17 for electrical service requirements for the medium voltage power distribution system.

Underground service laterals (conduit and conductors) shall be provided by the Design-Builder between the Utility power source and the service drop location where an electric meter is required (i.e. a WSDOT service cabinet or switchgear). Power feed conductors, from the Utility transformer to the service cabinet, shall be isolated from other circuits by using a separate conduit. Downsizing of feeder conductors between the serving utility and WSDOT's main service cabinet is not allowed. 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 do not overlap or cross paths with circuits from other services.

Existing electrical services that are modified or have the electrical loads increased, shall be evaluated using the same design criteria for new service cabinets. Existing service cabinets that do not meet the design requirements as indicated in this section shall be replaced.

The maximum allowable line loss for new lighting systems, Intelligent Transportation Systems, all electronic tolling infrastructure, and other electrical systems is 3%. The maximum allowable line loss for existing lighting systems that are modified by the addition of an electrical load is 5%. Existing lighting systems that exceed 5% line loss prior to adding any additional electrical load shall be modified to reduce the line loss to 5% or lower.

Sizes of branch circuit breakers shall be in accordance with the WSDOT Power Supply Design for Transportation Applications (Appendix I4) and the WSDOT Standard Plans (Appendix D17). Illumination branch breakers shall be at least 140 percent of the total computed illumination circuit load. Non-illumination branch breakers shall be sized to carry 125 percent continuous load plus 100 percent of the non-continuous load. The breaker size shall not exceed the ampacity of the smallest conductor it protects. The Number 10 AWG cables in the luminaire pole and mast arm are protected by fusing and shall not be a consideration in this sizing requirement. 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, and shall include a minimum of an additional 33 percent capacity for future loads for each panel board. The service buss work for WSDOT standard size Type E or Type D services, as detailed in the WSDOT Standard Plans (Appendix D17), shall be rated at 250 amps. For all other special design, non-standard electrical services, the buss work capacity shall exceed the size of the main breaker. The minimum main breaker size shall be 200 amps for WSDOT services. The maximum size for illumination circuit branch breakers is 50 amps. The rating of each lighting contactor shall equal or exceed the rating of its associated branch breaker.

Lead in conductors for electrical services, panels and cabinets shall be sized to the capacity of the main breaker. Lead in conductors for transformers shall be sized to carry 133% of the rated size of the transformer. Step up transformers shall not be permitted between electrical services and loads.

The breaker size for ITS circuits and transformers shall be sized in accordance with the WSDOT Northwest Region ITS Details (Appendix I3) in addition to the requirements in this section.

The Design-Builder shall provide all branch breakers and contactors as shown in the WSDOT Standard Plans (Appendix D17). Unused branch breakers shall be labeled as spare in the service cabinets.

Electrical services shall offer 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. If the installation of an electrical service on a slope of 4:1 or greater is unavoidable and allowed by WSDOT, slope protection in the form of a permanent retaining wall shall be designed and constructed by the Design-Builder.

#### 2.16.4.4.1.2 Conduit System

All underground cables and conductors shall be installed in conduit. Direct-buried cables or conductors shall not be used under any circumstances.

For conduit installation, the Design-Builder shall not sawcut or open trench across the freeway mainline or ramps where existing pavement remains and is not affected by the Project.

The Design-Builder shall not sawcut or open trench across the following roadways outside of WSDOT 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 as required by local agencies.

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 and electrical systems with the following exception:

- Existing conduit under pavement may be reused if the existing pavement remains, provided the conduit is free of debris, in good repair, and proofed and cleaned in accordance with Section 8.20 of the WSDOT Standard Specifications (Appendix D18).

The Design-Builder shall coordinate the placement of light standards and the associated conduit system with guardrail, noise walls, retaining walls, utilities and overhead power lines. All conduits shall have a minimum clearance of three feet from guardrail posts.

The minimum-size conduit for illumination systems is two inches in diameter, except for the following:

- Three-quarter-inch conduit shall be used from the first junction box to an underdeck luminaire.
- One-inch conduit shall be used between the light standard and the first junction box.

The Design-Builder shall install a spare two-inch conduit along with every conduit crossing under pavement or through structures, including walls. The Design-Builder shall also install a spare two-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.

For conduits and junction boxes installed below the roadway superstructures on the new floating bridge, the West and East Transition Spans, and the East Approach Bridges, the Design-Builder shall design and install the conduits and junction boxes in accordance with the requirements in this section and Sections 2.12, 2.13 and 2.17. All other conduits and junction boxes shall be designed and installed in accordance with the Mandatory Standards.

#### *2.16.4.4.1.2.1 Conduit in Structures*

Conduit installed within new structures shall be in accordance with the WSDOT Standard Specifications (Appendix D18) and the WSDOT Northwest Region Special Provisions for Illumination, Traffic Signal Systems, and Electrical (Appendix B9). Where the conduit system is routed across bridge structures, the Design-Builder shall design, furnish and install a structural hanger system and accompanying conduit sweeps and joints to convey conduit under the bridge structure. Conduits mounted under bridge structures shall be located between girders, between bridge support structures, or within a box girder. Conduit shall not be attached to the existing bridge girders.

The Design-Builder shall install two two-inch conduit/junction box systems (embedded in concrete) in each of the following in accordance with the WSDOT Standard Plans (Appendix D17):

- The median cast-in-place barrier; and
- The roadside cast-in-place barrier.

Where conduits transition from ground to structure, or from structure to structure, the Design-Builder shall furnish and install conduit deflection fittings. All conduits installed in concrete structures shall be fitted with appropriate deflection and/or expansion fittings.

#### *2.16.4.4.1.2.2 Junction 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 coordinate with WSDOT when considering installation of heavy duty junction boxes. No junction boxes shall be placed in the traveled way or auxiliary lanes.

Junction boxes installed face-up in the sidewalk of bridge structures shall be cast iron with a skid-resistant cover and a drain tube. Junction boxes located outside of paved areas shall be Type 1, 2 or 8. Refer to the WSDOT Standard Plans (Appendix D17) and details in the WSDOT Northwest Region Illumination and Signal Details (Appendix I2).

Junction boxes shall be installed between five feet and 10 feet from each light standard, at all cabinets, and where a conduit system requires a change of direction of 45 degrees or more. A junction box shall be installed at each side of a roadway crossing, and within 10 feet of the traveled way or shoulder. The maximum spacing for junction boxes in traffic barriers, retaining walls or structures shall be 180 feet within each raceway system and 240 feet in all other areas.

Junction boxes shall be properly sized in accordance with the WSDOT Power Supply Design for Transportation Applications (Appendix I4) and the NEC. When conduits are installed to an existing junction box, the existing junction box shall meet the size requirements for the installed conduits including existing conduit(s); otherwise, the existing junction box shall be replaced with a properly-sized junction box. Junction boxes installed with spare conduit shall be sized to include an additional future conduit of equal size to the spare conduit.

Junction boxes installed on the bridge structures, cast-in-place concrete barriers, and walls shall be rated NEMA 4X and shall be installed in accordance with the Mandatory Standards.

#### 2.16.4.4.1.3 Conductors, Cables and Wiring

All conductors for roadway and pedestrian illumination, all electronic tolling infrastructure and ITS shall be copper, rated for 600 volt, and shall be in accordance with the Mandatory Standards.

The Design-Builder shall provide a design to properly size the conductors in accordance with the Mandatory Standards, as well as to provide the conduit and wiring systems for ease of installation and maintenance. Conductors not exceeding No. 2 AWG are preferred for ease of installation. The maximum size of conductors shall not exceed 500 kcmil. The Design-Builder shall not use more than one conductor per phase.

Conductors No. 10 AWG and smaller shall be solid; No. 8 AWG and larger shall be stranded. The minimum size conductors for roadway illumination circuits shall be No. 8 AWG, except for the No. 10 AWG cables in the luminaire poles. The minimum size conductors for other feeders and branch circuits shall be No. 10 AWG except those branch circuits connecting convenience receptacles and light switches where a No. 12 AWG minimum shall be acceptable, No. 14 AWG conductors shall be used for control, alarm, and signal cables.

Conductors, cables, and wiring for ITS shall be in accordance with additional requirements in Section 2.18.

Refer to Section 2.17 for additional conductors, cables and wiring requirements for electrical systems installed below the roadway superstructures on the new floating bridge, the West and East Transition Spans, and the East Approach Bridges.

#### 2.16.4.4.1.4 Bonding and Grounding

The Design-Builder shall furnish and install a bonding and grounding system and protection devices that are suitable for the specific installation and equipment installed for this Project, in accordance with the Mandatory Standards. The Design-Builder shall replace the existing bonding and grounding systems of the existing conduit and junction boxes modified or reused by this Project if the existing bonding and grounding systems do not meet the Mandatory Standards.

Bonding and grounding for electrical installations on the new floating bridge, the West and East Transition Spans, and the East Approach Bridges shall be designed and installed in accordance with Section 2.17.

### 2.16.4.4.2 Intentionally Omitted

### 2.16.4.4.3 New Floating Bridge, West and East Transition Spans, and East Approach Bridges

The Design-Builder shall design and construct the roadway electrical power distribution system for the roadway and pedestrian illumination, and ITS equipment on the new floating bridge, the West and East Transition Spans, and the East Approach Bridges as an extension of the new floating bridge medium voltage (12.47 kv) power distribution system as required in Section 2.17. The roadway electrical power distribution system shall accept the 480Y/277 v power feed from the medium voltage step-down transformers and distribute the 480Y/277 v power to the maintenance, substation and control sheds installed along the floating bridge Pontoon deck, in which an ITS/lighting room shall be used to house the electrical power panels and equipment for the roadway

and pedestrian illumination, ITS equipment and other roadway-related electrical systems.

All ITS/lighting rooms in the maintenance, substation and control sheds shall be the same size and shall meet the structural, architectural and mechanical requirements in Section 2.12, Section 2.15, and Section 2.32 (Mechanical Bridge Services), respectively. The requirements for the ITS equipment housed in the ITS/lighting room inside these sheds are described in Section 2.18. The requirements for the electrical equipment associated with the roadway/pedestrian lighting and ITS inside the ITS/lighting room are described below.

#### 2.16.4.4.3.1 Electrical Equipment inside ITS/Lighting Room

The Design-Builder shall design, furnish and install all electrical equipment inside each ITS/lighting room in the same manner for placement and installation of all electrical components including, but not limited to, panel boards, transformers, lighting contactor cabinets, lighting control cabinets, thermostats, heaters, ventilation fans, raceways, conduits, equipment racks, terminal/junction boxes, switches, receptacles, cables, conductors, and wiring. The same electrical component housed by all ITS/lighting rooms shall be of uniform size and shape; the same installation method, mounting brackets and location; and shall be made of the same materials and fabricated by the same manufacturers for ease of maintenance. Separation between the electrical components shall be in accordance with the Mandatory Standards and NEC. A minimum of three feet of clearance shall be provided for maintenance access on all sides of each of the electrical components where equipment operation, routine maintenance or inspection is required. All mounting brackets and hardware shall be Type 316 stainless steel.

The Design-Builder shall design and construct the power distribution system to provide the AC power to the roadway and pedestrian luminaires, and ITS equipment at their respective voltage levels from each ITS/lighting room.

At a minimum, each of the ITS/lighting room shall house the following electrical equipment:

- A lighting power panel board;
- An ITS power panel board;
- A dry-type step-down ITS transformer for converting the 480 VAC power to lower voltage levels as required by the ITS and internal equipment inside the ITS/lighting room;
- A lighting control cabinet; and
- A lighting contactor cabinet.

The 480 VAC power shall be distributed to the roadway lighting and the 277 VAC power shall be distributed to the pedestrian lighting where applicable. Only one ITS transformer shall be installed in each ITS/lighting room for distributing 240 VAC or 120 VAC power to the ITS equipment and all internal equipment inside the ITS/lighting room. No additional step-down transformers shall be installed in the ITS/lighting room for distributing power to the lighting system, ITS or any other systems.

A minimum of an additional 33 percent capacity for future loads shall be provided for each panel board installed in the ITS/lighting room.

A nameplate (white on red, using a minimum of two-inch high letters) shall be attached with stainless steel screws to the front of each panel board and cabinet.

All metal enclosures, equipment racks, raceways, conduits, cabinets, and junction boxes shall be bonded and connected to the ground bus in accordance with the requirements in Section 2.17.

Refer to Section 2.12 for requirement for drilling into the top of Pontoon deck where any equipment is installed on the Pontoon deck.

#### *2.16.4.4.3.1.1 Lighting and ITS Panel Boards*

The Design-Builder shall design, furnish and install the wall-mounted lighting and ITS panel boards in accordance with the service panel in the standard WSDOT Type E service cabinet and the following additional requirements:

- All lighting and ITS panel boards shall be rated NEMA 4X, Type 316 stainless steel enclosures with a hinged door and flush lock, and shall be of dead-front type.
- All lighting and ITS panel boards shall be provided with copper lugs in the mains, full-sized copper neutral and ground bars.
- A minimum of 24 circuit breakers shall be provided for all lighting and ITS panel boards.
- A minimum of 20 % spare circuit breaker spaces, or one spare circuit per each phase, whichever is greater, shall be provided on all panel boards.
- The lighting panel board shall accept the incoming 480Y/277 VAC, three-phase power feed from the medium voltage step-down transformers. The main disconnect switch shall be an integral part of the panel board and shall be rated a minimum of 200 amperes. The buss work shall be rated a minimum of 250 amperes.
- The lighting panel board shall provide one circuit breaker disconnect switch for the step-down ITS transformer installed in each ITS/lighting room.
- The ITS panel boards shall accept the incoming three phase, 240/120v or 208Y/120v AC power from the step-down ITS transformer. The ITS panel board shall only be used for distributing power to the ITS equipment. The main circuit breaker and branch breakers shall be designed in accordance with the WSDOT Northwest Region ITS Details (Appendix I3).
- All panel boards and circuit breakers (including spare circuit breakers) shall be labeled.

#### *2.16.4.4.3.1.2 Dry-Type ITS Transformers*

The Design-Builder shall provide and install dry-type ITS transformers in accordance with the following requirements:

- Type I – One transformer in each of the ITS/lighting room that house only 120 VAC ITS equipment. The transformer shall be 480 Delta – 208Y/120v, three-phase, with a minimum of four 2.5% primary taps, two above and two below rated primary voltage level.
- Type II – One transformer in each of the ITS/lighting room that house the 240/120 VAC ITS equipment. The transformer shall be 480-240V delta

secondary, three phase, with a 120V center tap (high leg delta) and a minimum of two 5% primary taps, below rated primary voltage level.

- All transformers shall be UL listed, energy efficient type, and shall conform to NFPA 70 - National Electrical Code, and NEMA ST20 – Dry-Type Transformers for General Applications.
- All transformers shall be constructed with copper winding.
- Sound levels shall not exceed 50 db when measured in accordance with NEMA ST20 unless otherwise noted in these Technical Requirements.
- All transformers shall be rated for 220 Degree C insulation with temperature rise no more than 150 Degree C above 40 Degree C ambient.
- Transformer enclosures shall be of NEMA 3R equipped with a weather shield at a minimum.
- Transformers shall be wall-mounted or floor mounted inside the ITS/lighting room. When floor mounted, the Design-Builder shall provide a concrete pad for mounting the transformer to elevate the bottom of the transformer at least 10 inches above the Pontoon deck.
- All transformers shall provide 120 VAC power to the internal electrical equipment inside each ITS/lighting room including internal lighting, ventilation and heater. Refer to Section 2.17 for lighting requirements inside the ITS/lighting room. Refer to Section 2.32 for ventilation and heater requirements inside the ITS/lighting room.

The Design-Builder shall provide transformer KVA loading as part of the electrical calculation submitted in the Final Illumination and Roadway Electrical Design Submittal in accordance with this section.

#### *2.16.4.4.3.1.3 Lighting Control Cabinets*

The Design-Builder shall provide and install a wall-mounted lighting control cabinet, rated NEMA 4X Type 316 stainless steel, in each ITS/lighting room. The lighting control cabinet shall be a minimum size of 30 inches in width and 30 inches in height, and shall house the following equipment:

- A panel board that shall accept the incoming 208Y/120v three phase power from a Type I ITS transformer, or 120v single phase power from a Type II ITS transformer;
- The panel board shall conform to the requirements for the lighting and ITS panel boards with exception of a minimum of eight circuit breakers in total and a minimum of two spare circuit breakers;
- A photocell test switch as required in the standard WSDOT Type E service cabinet;
- A GFCI receptacle as required in the standard WSDOT Type E service cabinet;
- The panel board shall distribute the 120 VAC power to the photocell, photocell test switch, GFCI receptacle, and internal equipment including lighting, ventilation, thermostat, and heater in the ITS/lighting room;

- The photocell test switch and the GFCI receptacle shall be installed on a dead-front mounting panel below the panel board, or integrated with the panel board.

#### *2.16.4.4.3.1.4 Lighting Contactor Cabinets*

The Design-Builder shall provide and install a wall-mounted lighting contactor cabinet, rated NEMA 4X Type 316 stainless steel, in each ITS/lighting room. The lighting contactor cabinet shall be a minimum size of 30 inches in width and 30 inches in height, and shall house the following equipment:

- A removable mounting panel for mounting all lighting contactors including roadway and pedestrian lighting;
- Lighting contactors, properly rated for each lighting circuit for roadway and pedestrian illumination;
- The lighting contactor cabinets shall be properly sized to accommodate control wiring terminal blocks.
- A nameplate (white on black) shall be provided for each lighting contactor. The nameplates shall include the contactor designation, voltage, circuit number, number of wires, and withstand rating using one inch high letters and numbers.

### 2.16.4.4.3.2 Conduits and Junction Boxes below Roadway Superstructure

Conduits and junction boxes installed below the roadway superstructure shall be in accordance with the following requirements:

- Conduits or cable raceway installed on the ITS/lighting room ceiling or roadway deck shall be mounted using a structural hanger system in accordance with the Mandatory Standards.
- All junction boxes shall be Type 316 stainless steel rated NEMA 4X.
- Conduits between panel boards, lighting control and contactor cabinets shall be installed on the interior wall of the ITS/lighting room.
- Conduit entry to the panel boards, cabinets, and junction boxes shall be from the side or bottom. Top entry is not allowed, with the exception of ITS racks in the ITS/lighting room.
- No conduits and junction boxes shall be attached to Pontoon deck surface under any circumstances unless otherwise noted in these Technical Requirements.
- The Design-Builder shall avoid routing conduits through Pontoons wherever possible for the roadway and pedestrian illumination and ITS. When the conduits must be routed through Pontoons, the pre-determined conduit penetrations shall be used (Refer to Appendix M11), and the Design-Builder shall submit the conduit routing plan and penetration locations for WSDOT review and comment.

Refer to Section 2.17 for additional requirements for conduits and junction boxes under the roadway superstructure.

#### 2.16.4.4.4 East Connection Roadway

The Design-Builder shall coordinate with WSDOT and the SR 520 Eastside Transit and HOV Project for design and construct the electrical services and cabinets at Evergreen Point Road and 84th Avenue NE to accommodate the following electrical components to be constructed as part of this Project:

- ITS equipment including permanent traffic recorders, data stations, CCTV traffic surveillance cameras, ATM signs, and roadside equipment cabinets;
- All electronic tolling infrastructure; and
- Freeway and pedestrian lighting and associated electrical equipment between the abutment of the East Approach Bridges and the east end of the Project.

All new electrical service cabinets installed, that supply power to freeway mainline, ramp or ramp terminal illumination, shall be the Type E, 480 volts service cabinet. All existing Type C service cabinets, if any, supplying power to an electrical system in this roadway segment of the Project shall be replaced with a Type E 480 volts service cabinet.

All service cabinets, conduits, junction boxes, cables, conductors and wiring shall be designed, furnished and installed in accordance with the Mandatory Standards and the requirements in these Technical Requirements.

### 2.16.4.5 EQUIPMENT PROVIDED BY WSDOT

The Design-Builder shall provide all equipment and materials for illumination and electrical systems required in this section.

### 2.16.4.6 AESTHETICS

The Design-Builder shall perform all Work in accordance with the following requirements:

- Roadway light standards, mast arms and luminaires shall be finished in accordance with the WSDOT Northwest Region Special Provisions for Illumination, Traffic Signal Systems, and Electrical (Appendix B9). Galvanized steel and mill finish aluminum shall not be painted or powder-coated.
- For decorative pedestrian light standards and luminaires, the finished surfaces shall be painted or power-coated in color in accordance with Section 2.15. All decorative pedestrian light standards and luminaires shall be the same as the ones constructed by the SR 520 Eastside Transit and HOV Project.
- Recessed RSUP luminaires installed on the floating bridge, the West and East Transition Spans, and the East Approach Bridges shall be installed and finished in accordance with Section 2.15.

### 2.16.4.7 DESIGN DOCUMENTATION

The Design-Builder shall provide all documents and information required for the Design Documentation Package in accordance with this section, Section 2.2 and Section 2.28.

## 2.16.5 CONSTRUCTION REQUIREMENTS

Existing illumination and roadway electrical systems shall remain operational at all times during construction unless new or temporary illumination and roadway electrical

systems are provided to cover the affected area. Any damage to the existing illumination systems shall be repaired, to WSDOT's satisfaction and at no cost to WSDOT, prior to the hours of darkness on the following day. The Design-Builder shall notify WSDOT 14 Calendar Days prior to removing existing illumination systems or disrupting power to any illumination system.

All lighting conductors shall be installed in conduits containing only lighting electrical conductors. The lighting conduit and junction box system shall be separated from ITS conduit, junction box, pull box and cable vault system. A shared trench, shared power service and shared cabinet foundations may be used. Conduits, raceways and junction boxes shall not share conductors from more than one separately derived power source.

The Design-Builder shall coordinate with the Utility companies to determine the separation between overhead Utilities and illumination structures. A minimum of 10 feet of circumferential clearance to all power lines, including the neutral line, shall be maintained.

### 2.16.5.1 MATERIALS AND FABRICATION

The Design-Builder shall furnish all materials in accordance with this section, Section 2.25, and the Mandatory Standards. The Design-Builder is notified that “Buy America” requirements apply to illumination and electrical materials and equipment. All illumination and roadway electrical components and materials furnished by the Design-Builder shall be the commercially off-the-shelf items typically stocked by the suppliers. No custom made items are allowed.

The Design-Builder shall use stainless steel mounting hardware such as bolts, nuts, washers and external hinges on cabinets, junction boxes and other outdoor electrical devices. The Design-Builder shall use only components designed for 10 or more years of industrial use.

All materials, 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.

If any equipment specified in these Technical Requirements 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.

The Design-Builder shall round and smooth sharp corners and edges on all electrical components installed by the Design-Builder.

### 2.16.5.2 TEMPORARY ILLUMINATION CONSTRUCTION REQUIREMENTS

Refer to Section 2.22 for additional temporary illumination requirements.

### 2.16.5.3 REPAIR PARTS

During construction, the Design-Builder shall identify local vendors for repair parts for all illumination and electrical components, so that required parts may be obtained within four hours. The Design-Builder shall provide a list of vendors to WSDOT within 60 Calendar Days of execution of the Contract.

### 2.16.5.4 ELECTRICAL SERVICE

The Design-Builder shall coordinate with WSDOT and submit the design information for removal or modification of existing electrical services, and installation of new electrical services.

The Design-Builder shall design and coordinate the request for the service agreement for electrical work above the lids, at the transit facilities, and along arterial streets with local jurisdictions and transit agencies. These electrical services shall be separate from WSDOT electrical services within the Project.

The Design-Builder shall coordinate with WSDOT to modify existing service agreements with the utility company if modification to the existing services is required. 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 all the current design standards and requirements in the Mandatory Standards.

#### 2.16.5.4.1 Electrical Service Agreements

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

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 I16) and the following:

- Location of existing and new services submitted in plan sheet format;
- Load calculations showing design and future loads in phase, voltage and Kilo-Volt-Amps (KVA);
- Request for modifications to existing services showing existing load, new load and ultimate load; and
- Name of the Utility and the service agreement number (for existing services).

The Design-Builder shall submit the Service Agreement Request a minimum of 120 Calendar Days in advance of when the power connection 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 Request are required by the Design-Builder, the Design-Builder shall pay all costs associated with the Service Agreement Request revisions. A new 120 Calendar Day advance notice period shall 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 power company. WSDOT is not responsible for any delays incurred by the Design-Builder as a result of the power company's actions.

If the Design-Builder proposes to remove existing services, the Design-Builder shall submit a Service Agreement Request for existing services that are scheduled to be removed at least 14 Calendar Days prior to the proposed removal, so that the service

account can be cancelled. The Service Agreement Request shall contain the Service Agreement number, location and electrical load in phase, voltage and KVA.

Refer to Section 2.1 for additional requirements for service agreements.

#### 2.16.5.4.2 Service Cabinets and Equipment

The Design-Builder shall furnish and install all electrical service cabinets, transformers and associated equipment. Existing service cabinets and equipment, if replaced, shall be uninstalled and salvaged in accordance with this section.

### 2.16.5.5 CONDUIT SYSTEM

Unless otherwise specified, the Design-Builder may use existing conduit provided all design criteria are satisfied. Existing aluminum conduit shall not be reused under any circumstances. Where existing conduit shall be replaced, abandoned or is otherwise not acceptable, the Design-Builder shall furnish and install new conduit. The Design-Builder shall not relocate or use salvaged conduit.

The Design-Builder shall ensure that the conduit and conduit splices sustain a pressure of 150 psi.

The Design-Builder shall immediately cap all open ends of installed conduit until cables are installed. “Abandon conduit” means the Design-Builder shall remove the unused cables and conduit elbows.

Standard bell ends shall be installed on all conduit ends by the Design-Builder to prevent damage to the installed cable.

With open trench installations of conduit, the Design-Builder shall place the conduit a minimum of two feet below the finish grade in unpaved areas or the bottom of the pavement under paved areas, wherever possible. The Design-Builder shall place granular material in the bottom of the trench, and shall compact the granular material to a depth of six inches over the top of the conduit. Refer to the WSDOT Standard Specifications (Appendix D18) for additional requirements.

The Design-Builder shall use Non-Metallic Conduit (NMC) PVC schedule 80 conduit installations under paved areas. NMC PVC schedule 40 may be used in all other conduit installations unless otherwise specified. Where the PVC conduit is trenched under paved areas, it shall be encased in red-tinted Controlled-Density Fill (CDF) for electrical conduits or orange-tinted CDF for communications conduits, and shall include a trace wire. Where two feet between the bottom of the pavement in paved areas and the conduit cannot be provided, the conduit shall be placed at least two feet below the pavement surface, and shall be encased in Class 3,000 before the CDF is applied.

Refer to Section 2.17 for additional requirements for conduit installations below the roadway superstructures on the new floating bridge, the West and East Transition Spans, and the East Approach Bridges.

### 2.16.5.6 JUNCTION BOXES

When a junction box is abandoned, the Design-Builder shall remove it and the existing void shall be filled in accordance with the WSDOT Standard Specifications (Appendix D18).

If the Design-Builder uses an existing junction box installed by others, it shall clean and adjust the junction box to grade given that the junction box meets all requirements included in this section and the Mandatory Standards.

All metallic junction box lids shall be grounded, including any existing junction boxes that are to remain.

Junction boxes shall be placed such that the lid of the junction boxes is one inch above grade in unpaved areas.

Refer to Section 2.17 for additional requirements for junction box installations below the roadway superstructures on the new floating bridge, West and East Transition Spans, and East Approach Bridges.

#### 2.16.5.7 UTILITY LOCATES

Prior to installing any element of the illumination 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 1-07.17 of the General Provisions and Section 2.10 (Utilities and Relocation Agreements) of these Technical Requirements.

In addition, the Design-Builder shall be responsible for responding to the One-Call number requests as the owner. When requested to do so, the Design-Builder shall mark all conduit installed as part of the Project. WSDOT will locate and mark existing undisturbed conduit that is owned by WSDOT. The Design-Builder shall verify exact locations of all underground conduits and Utilities before Work begins.

### 2.16.6 SUBMITTALS

The Design-Builder shall provide all documents and information required for the Design Documentation Package in accordance with Sections 2.2, 2.25 and 2.28.

The Design-Builder shall submit a Preliminary Illumination and Roadway Electrical Design Submittal for review and comment, and prepare a Final Illumination and Roadway Electrical Design Submittal prior to issuance of the Released For Construction Documents. All submittals shall follow the requirements of Section 2.28.

#### 2.16.6.1 PRELIMINARY ILLUMINATION AND ROADWAY ELECTRICAL DESIGN SUBMITTAL

##### 2.16.6.1.1 Photometric Analysis

Photometric analysis shall be performed for all illumination areas, including temporary illumination areas. The analysis shall identify the mounting 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 analysis data for all design areas as required by Section 1040.05 of the WSDOT *Design Manual* (Appendix D3) and this section.

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 that requires 3D lighting analysis.

The Design-Builder shall submit an electronic copy of the photometric analysis (in AGI32 format) to WSDOT along with the Preliminary Illumination and Electrical Design Submittal for review and comment.

#### 2.16.6.1.2 Preliminary Permanent Illumination Plans

The Permanent Illumination Plans shall be prepared in accordance with the WSDOT Northwest Region Current Practices in Electrical Design (Appendix I1), the Photometric Analysis, and the WSDOT *Plans Preparation Manual* (Appendix D12). The Plans shall include, but are not limited to, the following items:

- Existing Utilities;
- Proposed channelization;
- Location of light standards, service cabinets, conduits and junction boxes required for installation;
- Location of the bridge maintenance, substation and control sheds, and ITS/lighting room in each shed;
- Plan section view for each light standard location and a soil analysis for light standard location installed at grade;
- Pier and navigation lighting;
- Luminaire schedule specifying mounting height, luminaire type, distribution, lamp, voltage, wattage, station and offset, and service number;
- Identification of existing illumination to remain; and
- All identified non-standard design items, if any.

The Design-Builder shall submit the Permanent Illumination Plans to WSDOT for review and comment in accordance with Section 2.28.

The Design-Builder shall also submit backup data Items 1 through 3 as described in the WSDOT Northwest Region Current Practices in Electrical Design (Appendix I1).

### 2.16.6.2 Final Illumination and Roadway Electrical Design Submittal

The Final Illumination and Electrical Design Submittal shall include all of the items finalized from the Preliminary Illumination and Electrical Design Submittal as well as the following items included on the Final Permanent Illumination Plans:

- Existing Utilities;
- Proposed channelization;
- Light standards as specified, including foundation bases and anchorages;
- Pier and navigation lighting on the WCB;
- Conduit and conductor schedule showing new wire and existing wire to remain;
- Details and notes specifying how new illumination is tied into the existing illumination and electrical systems;

- Electrical equipment layout and mounting details inside the ITS/lighting room in each of the maintenance, substation and control sheds;
- Transformer schedules;
- Sub-panel schedules;
- Service cabinet types including photocells, breaker schedules, and wiring diagrams;
- Photocell locations and mounting details where the photocells are not mounted on the service cabinets;
- Wiring diagram for each illumination, pier and navigation lighting, electrical and control circuit;
- Bonding and grounding details;
- Complete construction notes;
- Wire notes (including identification of new and existing conductors and conduit);
- All wire, cable and terminators that are needed for the complete operation of the lighting and electrical systems;
- Illumination details for non-standard design elements;
- Electrical calculations to support sizing of transformers, overcurrent protection devices, conduits, junction boxes, service loads, breaker panels, and conductors;
- All references to the WSDOT Standard Plans (Appendix D17) and electrical details; and
- Structural calculations in accordance with Section 2.13.

Refer to Sections 2.2 and 2.28 for submittal and review requirements.

The Design-Builder shall also submit Items 4 through 12 as described in the WSDOT Northwest Region Current Practices in Electrical Design (Appendix I1).

### 2.16.6.3 SHOP DRAWINGS

Shop drawings and product data shall include, but are not limited to, the following:

- Light standards and mast arms for each type and size;
- Luminaires and lamps;
- Ballasts and photoelectric controls;
- Wiring diagrams;
- Service cabinets;
- Electrical panels;
- Circuit breakers;
- Lighting contactors, relays and other protective devices;

- Splice enclosures;
- Conduits;
- Transformers;
- Grounding and lightning protection equipment;
- Concrete for foundations;
- Junction boxes; and
- Conductors, cables and wiring.

Refer to Section 2.28 for submittal and review requirements for shop drawings.

### 2.16.6.4 RELEASED FOR CONSTRUCTION DOCUMENTS

The Design-Builder shall include the following items with the Released For Construction Documents:

- All elements required for the Final Design Submittal;
- All resolved comments from the Final Design Submittal; and
- Additional design elements addressed.

Refer to Sections 2.2 and 2.28 for submittal and review requirements.

### 2.16.6.5 OTHER SUBMITTALS

The Design-Builder shall submit the following items upon Physical Completion of the Project:

- All testing documentation including test equipment documentation, test procedures, and test reports;
- Product samples;
- List of repair part vendors; and
- Product manuals.

End of Section

# 2.17 ELECTRICAL BRIDGE AND SERVICES

## 2.17.1 GENERAL

The Design-Builder shall perform all Work necessary to meet the requirements for the replacement of the SR 520 Floating Bridge and Landings in accordance with these Technical Requirements.

The Design-Builder shall design and construct the permanent electrical systems for the following items in accordance to the Mandatory Standards and the requirements included in this section:

- Cathodic Protection and Stray Current Mitigation.
- Grounding and Bonding:
  - Electrical Incoming Service, Generator, and Automatic Transfer Switch Equipment Medium Voltage Distribution Equipment;
  - Medium Voltage Unit Substations; and
  - Medium Voltage Generator and ATS.
- Bridge Power Distribution Equipment:
  - Circuit Breaker Disconnect Switches;
  - Dry Type Transformers; and
  - Panelboards.
- Wire and Cable.
- Raceway.
- Junction and Pull Boxes.
- Hardware and Supports.
- Lights, switches and Receptacles.
- Bridge Control System:
  - All required control equipment;
  - Anemometer and embedded roadway temperature sensor;
  - Autodialer; and
  - A programmable logic controller (PLC) based system to monitor and control the bridge equipment including cathodic protection systems and if possible the stray current mitigation system selected by the Design-Builder.
- Navigation Lighting System.
- Security Closed Circuit Television.
- Electrical Demolition and Salvage.
- Emergency Response System for Stranded Boaters.

- Provide power and monitoring to the four 300hp Bridge Fire Protection pumps and motorized control valves.

In addition to the construction, the Design-Builder shall provide full Field Measuring, Start-up and Commissioning, As-Built Plans, Operations and Maintenance Manuals, and Operator Training.

The Design-Builder shall maintain electrical power to the new Floating Bridge and Landings, and Bridge Maintenance Facility and Dock from the time the new electrical service is placed in service until physical completion.

The Design-Builder shall maintain electrical power to the WCB from the time the WCB is turned over to the Design-Builder until physical completion.

The Design-Builder shall provide all coordination of temporary power to the construction site and shall be responsible the safety of the existing service to the existing bridge.

The Design-Builder shall not disrupt electrical service to the existing floating bridge.

On the east side of the existing bridge adjacent to the Floating Bridge and Landings project limits, the existing medium voltage service will be relocated by others. This relocation shall be coordinated between projects to locate the new temporary service in a location that will not impact the construction of the new floating bridge and landings. The Design-Builder shall coordinate this work and demolish the temporary service as part of the demolition of the existing floating bridge."

On the west side of the project, the construction of the connection bridge will cause the medium voltage service to the existing bridge to be demolished and a temporary medium voltage feeder will be provided. This work shall be performed by others. Refer to Section 2.16 (Illumination and Roadway Electrical Systems) for service requirements for 480VAC service on the west side of the new floating bridge and landings.

## 2.17.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If conflicts between standards occur, the more stringent requirement shall be used. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT *Traffic Manual* (M51-02) (Appendix D19).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).

- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D9).
- WSDOT *Bridge Design Manual* (M23-50) (BDM) (Appendix D1).
- WSDOT *Roadside Manual* (M25-30) (Appendix D16).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- Washington Administrative Code (WAC) Chapter 296-46B, Electrical Safety Standards, Administration and Installation.
- National Fire Protection Association (NFPA), *National Electric Code* (NEC).
- National Fire Protection Association (NFPA), *Life Safety Code (NFPA-101)*.
- Underwriters Laboratory (UL).
- American National Standards Institute (ANSI).
- National Electrical Manufacturer's Association (NEMA).
- Institute of Electrical and Electronic Engineers (IEEE).
- International Cable Engineers Association (ICEA).
- The Occupational Safety and Health Act (OSHA).
- International Electrical Testing Association (NETA).
- National Association of Corrosion Engineers (NACE), Standard Recommended Practice "Control of External Corrosion on Underground or Submerged Metallic Piping Systems."
- NACE, Standard Test Method, "Measurement Techniques Related to Criteria for Cathodic Protection on Underground or Submerged Metallic Piping Systems."
- American Association of State Highway and Transportation Officials (AASHTO), *Movable Highway Bridge Design Specifications, 2nd Edition with 2008 Interim Revisions*.
- U. S. Army Corps of Engineers, Department of Defense, Unified Facilities Criteria (UFC) UFC- 3-570-02N Electrical Engineering Cathodic Protection.
- Illuminating Engineering Society of North America (IESNA).

The Design-Builder shall be required to get approval from *WSDOT* for any deviations from the standards during the design phase, prior to starting any related construction.

### 2.17.3 SUMMARY OF WORK

The Design-Builder shall perform all Work necessary to meet the requirements for the bridge electrical, cathodic protection, and stray current mitigation systems in accordance with these Technical Requirements.

Locations for blockouts and conduit penetrations for the PFS and PPDB are shown in the Conceptual Plans (Appendix M1). The Design-Builder shall base its preliminary electrical systems design on these locations. Prior to RFC of the electrical plans, the Design-

Builder shall verify all blockouts and conduit penetration locations and make the necessary corrections to accommodate the Work.

The Design-Builder shall join the PFS and PPDB and electrical equipment as required by the Technical Requirements. All Work shall take place during this Project unless specifically called out elsewhere in the Technical Requirements. All equipment shall be sized for the Future Six-Lane Plus Two HCT Configuration. Pontoons such as A and W require the installation of all equipment necessary for this Project and the Future Six-Lane Plus Two HCT Configuration. The remainder of the Pontoons shall be equipped for the needs of this Project, with spare capacity and routing capability for the Future Six-Lane Plus Two HCT Configuration as outlined in the Conceptual Plans (Appendix M1).

### 2.17.3.1 FUTURE SIX-LANE PLUS TWO HCT CONFIGURATION

The following is a description of the Future Six-Lane Plus Two HCT Configuration work, of which the specific Work is not a part of this Project. Specific Pontoons in the Future Six-Lane Plus Two HCT Configuration may have additional Supplemental Stability Pontoons (SSP) attached. New conduit and wire shall then be provided and routed to the new SSP through the Pontoon. The new SSPs shall be equipped with items that include, but are not limited to: lights, receptacles, leak detection float switches, light switches, cathodic protection systems and stray current mitigation systems to match the other Pontoons.

While the specific equipment to be located in the new SSPs shall not be installed as part of this Project, all the Pontoon equipment supplied under this Contract shall have spare capacity for the future equipment. Specifically the PLC, lighting contactors, and power distribution panels shall be sized to meet the future capacities and dedicated spares shall be identified in the panels for this work. The cathodic protection rectifiers shall also have sufficient output capacity and circuits available to power future cathodic protection systems in the SSPs.

### 2.17.3.2 ELECTRICAL

- Demolish all existing electrical equipment from the existing SR 520 Bridge, except for the equipment listed. Provide new racks and conduit for the radio repeater in the Pontoon G Shed Type I (Maintenance Shed).
- Furnish 16 portable pumps.
- Coordinate the power and control for the HVAC equipment in the Sheds.
- Provide jib cranes on Pontoons GSW and QNW.
- Provide all raceway, conduit, fittings, and supports to complete the electrical installation.
- Provide all wire and conductors to completely interconnect the electrical system.
- Provide all junction, pull and terminal boxes to complete the electrical installation.
- Provide all receptacles and switches. Provide pumping station panels with 240VAC receptacles and 120VAC receptacles on the Pontoon underdeck.
- Provide all disconnect circuit breaker switches.

- Provide a complete grounding system, consisting of ground rods and a dedicated ground wire system. Provide a complete bonding system.
- Provide step down transformers for service equipment and pump receptacles.
- Provide service panel boards for service equipment.
- Provide lighting in the Pontoon interior cells, access areas, sheds, dock and underdeck area.
- Provide a complete navigation lighting system on the west approach, Pontoons, and transition spans. (Maintain navigation lights on the existing and new SR 520 Bridges during construction.)
- Provide a medium voltage electrical service, a fused service disconnect switch, a service transformer, an automatic transfer switch and a diesel generator. Provide a medium voltage distribution system along the floating bridge with a minimum of four service points where the voltage is stepped down to 480VAC and safely distributed to the equipment.
- Provide a complete security closed circuit television system for the underdeck and Bridge Maintenance Facility. The system shall consist of cameras, multiplexers, fiber optic transmitters, fiber optic receivers, digital video recorders, remote pan-tilt-zoom control, motion detection and color monitors.
- Provide a complete control system, consisting of a main PLC control panel, PLC remote control panel, float switches, light switches and other control equipment.
- Provide complete cathodic protection systems consisting of an AC power source, cathodic protection rectifiers, anodes, reference cells, monitoring system and conduits and cables.
- Provide a complete stray current monitoring system.
- Furnish complete factory and field testing and inspection for all electrical equipment.
- Coordinate power and control for all ITS equipment, roadway lights, data stations, CCTV Stations, and Active Traffic Management.
- Provide pedestrian lighting.
- Provide complete function testing, maintenance and operation manuals, and training for bridge personnel.
- Provide emergency call stations for stranded boaters on the Pontoon deck.

### 2.17.3.3 COORDINATION

The Design-Builder shall design the complete electrical system for the entire bridge and approaches. This shall include the systems for the floating bridge and landings, the Bridge Maintenance Facility and Dock, and the roadway illumination and ITS systems. The Design-Builder is responsible for all design and integration required between these systems.

The bridge control system and bridge CCTV system have equipment located in the Bridge Maintenance Facility, and the Design-Builder shall integrate the technical requirements in the design of the locations and power connections for these systems.

The incoming service, automatic transfer switch and generator are to be located in the parking lot and mechanical level of the Bridge Maintenance Facility. The technical requirements are in this section.

## 2.17.4 PERFORMANCE REQUIREMENTS

### 2.17.4.1 DESIGN-BUILDER ELECTRICAL DESIGN ENGINEER

The Design-Builder shall provide a Professional Engineer licensed in the Electrical Discipline to perform the services of Electrical Design Lead Engineer. The Electrical Design Lead Engineer shall have a minimum of 10 years of supervisory experience in the design and construction of roadway, tunnel, pedestrian movable bridge, electrical power distribution systems and other highway-related electrical installations. The Electrical Design Lead Engineer shall have at least two years of experience working in Washington State, and shall be familiar with the WSDOT design and construction standards. The Electrical Design Lead Engineer shall be an Electrical Engineer, licensed under Title 18 RCW, and shall be responsible for the illumination and electrical design elements of the Project. The Design-Builder shall provide the resume of the Electrical Design Lead Engineer for the project and provide at least 5 specific movable bridge, roadway, and/or tunnel project the Electrical Engineer designed in the last 10 years, and clearly identifying the Washington State work.

### 2.17.4.2 DESIGN-BUILDER CATHODIC PROTECTION AND STRAY CURRENT CONTROL

The Design-Builder shall provide a NACE certified Corrosion and Cathodic Protection Specialist. The Specialist shall have as a minimum 10 years of experience in design and supervision of cathodic protection systems.

### 2.17.4.3 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 Right-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.

WSDOT will designate a WSDOT Electrical Inspector. The Design-Builder shall contact WSDOT to arrange for electrical inspection. It is the role of the WSDOT Electrical Inspector to assure that all electrical installations meet the requirements of the RFP, National Electric Code, and all applicable State laws and provisions.

The WSDOT Electrical Inspector will perform the following:

- Act as a resource for the electrical and control design team.
- Review and comment on electrical and control plans.
- Perform periodic inspections during construction.
- Witness required field tests.

- Inspect and approve the installations in accordance with these Technical Requirements.

### 2.17.4.4 DESIGN-BUILDER CONTROL SYSTEM VENDOR

The Design-Builder shall provide a Control System Vendor to provide the selection and integration of the electrical systems. All apparatus and equipment of the bridge control system, including, but not limited to, limit switches, control panels, panelboards, control stations, PLC hardware, PLC ladder programs and other apparatus required to provide proper functioning of the control system, shall be manufactured and/or furnished, assembled, integrated, programmed and tested by a single qualified Control System Vendor. The Control System Vendor shall assemble the control panels at an Underwriters Laboratory listed facility in accordance with UL 508. The Control System Vendor shall be completely responsible for providing and coordinating all programmable controllers, panels, and field instrumentation specified in this section:

- Cathodic Protection and Stray Current Mitigation;
- Closed Circuit Television;
- Circuit Breaker Disconnect Switches;
- Dry Type Transformers;
- Panelboards;
- Navigation Lighting; and
- Bridge Control System.

The Control System Vendor shall designate one individual who shall assume these responsibilities. This person shall be the sole contact between the Design-Builder and the Electrical Design Lead Engineer for the purposes of coordination of the electrical control systems and resolving conflicts. This person shall be present during all control system related activities during the start-up of all critical elements and shall be present during all testing, calibration and acceptance testing.

### 2.17.4.5 CONTROL SYSTEM VENDOR RESPONSIBILITIES

The Control System Vendor shall assume complete system responsibility for the integrated functioning of all components to provide a satisfactory system operating in accordance with specified requirements. The Control System Vendor shall be responsible for developing the detailed schematics and fabrication of the control and power distribution system to ensure compatibility of equipment and suitability for the intended system functioning. The Control System Vendor shall provide supervisory assistance in the installation of equipment at the bridge site to ensure maximum reliability and ease of maintenance.

The Control System Vendor shall provide field service staff capable of providing field coordination of construction and final adjustments to the bridge control system. Field staff shall be capable of responding to an emergency within 24 hours until the end of the Post Acceptance Phase of Commissioning.

### 2.17.4.6 CONTROL SYSTEM VENDOR QUALIFICATIONS

Due to the critical and complex technical requirements of this section, only those suppliers who can demonstrate that they possess the requisite knowledge, capabilities and experience with the equipment being installed shall be acceptable.

The Control System Vendor shall have experience in providing electrical control systems for bridges incorporating Programmable Logic Controllers (PLC). Such experience shall be demonstrated by identifying a minimum of 10 bridges for which the system vendor has provided complete systems, for PLC based bridge and auxiliary controls hereinafter specified.

The following suppliers are known to meet these requirements:

EHM
Michael Hanley
1851 S.W. 31st Ave.
Pembroke Park, FL. 33009
954-981-0023

Link Control Systems, Inc.
William Bowden
16 Colt Court
Ronkonkoma, NY 11779
631-471-3950

Panatrol Corporation
Dean Chrones
7481 South Sayer Ave
Bedford Park, Il 60638
708-496-3080

If a Control System Vendor other than one of the Vendors listed above is selected, the Design-Builder must provide a submittal showing written certification that the proposed Vendor meets the experience requirements described above. No work shall begin on the bridge control system or motor control equipment prior to submission and approval of the certification letter for the Control System Vendor by the Electrical Design Lead Engineer. The certification letter will include the following information:

A. Documentation of 10 bridge projects for which the Control System Vendor has provided complete systems for PLC based controls. The documentation of the 10 bridge projects shall include the bridge owners name, contact person, phone number, address, bridge type, and PLC type. The documentation shall also include, written documentation from the owners of the 10 bridges addressing the following questions:

   i. Did the Control System Vendor supply a complete PLC based control system for the bridge?

   ii. At the completion of the project, did the control system operate as specified in the project specifications?

   Provide the names of the individual persons who are responsible, under this Project, for office engineering and project management, field-testing, calibration and start-up, and maintenance training. The bridge projects

called for in the previous item shall include recent projects of these individual persons.

B. Provide UL File Number for verification of UL 508 certification of the control panel assembly facility.

### 2.17.4.7 CONTROL SYSTEM VENDOR FACTORY INSPECTION AND TESTING

The enclosed control panels, PLC panels, and other apparatus supplied, assembled or fabricated by the vendor of the electrical control system shall be subjected to shop inspections to demonstrate compliance with all specified requirements. The inspection is intended as a means of facilitating the work and avoiding errors, and it is expressly understood that it will not relieve the Design-Builder of responsibility for imperfect material or workmanship.

The enclosed control panels shall be completely assembled at the factory, and shall be subjected to the manufacturer's standard inspections and testing. The manufacturer's standard testing for the enclosed control panels shall comprise of at least the following:

1. Inspection of materials, fit of parts, finishes, supports and adjustments
2. Wire continuity tests, either visual or verified with continuity tester
3. Operational check of devices to determine proper pick-up and drop-out voltages and contact operation
4. Operational check of circuits to determine proper interlocking of circuits and operator's devices
5. Polarity of connections to instruments and other polarity-sensitive devices
6. Dielectric test in accordance with applicable NEMA standards

The enclosed control panels, PLC panels, and other apparatus supplied shall be completely interconnected and shall be subjected to electrical and operational testing to ensure accuracy of connections and to demonstrate proper functioning of equipment. Limit switch contacts shall be simulated using the actual limit switches.

The factory testing shall also include a complete sequenced, simulated operation of the bridge auxiliaries, and shall include complete adjustment, verification and testing of the PLC, Alarm Panel, autodialer, cathodic protection panels, control relays and contactors to demonstrate operation in accordance with specified requirements.

The factory inspection and special testing required herein shall be witnessed by the Electrical Design Lead Engineer or his authorized representative, and no equipment shall be shipped from the factory until it has been released for shipment by the Electrical Design Lead Engineer. The Design-Builder shall provide 30 Calendar Days notification in advance of the date of tests so that arrangements can be made for the Engineer to be present at the tests. The Design-Builder shall submit to the Electrical Design Lead Engineer for review, 10 days prior to the testing date, a copy of all standards, and all special tests and procedures to be performed.

During the witnessed inspections, nameplate legends, conductor identifications, instrument scales, escutcheon plate engraving and all other details of construction shall be checked for conformity with specified requirements.

Additional factory tests for equipment shall be as specified in the Technical Requirements of the Contract Documents.

### 2.17.4.8 SPARE PARTS

The Design-Builder shall furnish and deliver to WSDOT provided location the following spare parts for the bridge electrical system after the electrical system has been accepted:

- Two packages of six fuses of each kind and size installed.
- One circuit breaker of each kind and size installed for every five of each kind and size installed, with a minimum of one.
- A set of contacts and contact fingers for each kind or size of contactor and starter installed. (Note: For units that do not incorporate replaceable contacts, furnish a complete unit with coil.)
- One coil for every five of each size relay and contactor installed, with a minimum of one.
- One complete relay, timer, contactor and starter for every five of each kind and size installed, with a minimum of one.
- Ten spare PLC card for each type furnished including processors, I/O, power and communication cards.
- Five spare PLC Power Supply 1756-PAR redundant power supply bundle.
- Five spare PCMCIA card of each type supplied.
- Five spare PanelView of each type.
- One spare computer cable and printer cable of each type furnished.
- One spare power conditioner.
- One spare UPS.
- Five spare fiber optic converters.
- One spare power supply for each type supplied.
- One spare CCTV Camera, housing, and fiber optic transmitter and receiver.
- One spare fuse of each type in each cathodic protection rectifier.
- Six anode assemblies of each type for cathodic protection.
- One spare navigation, Pontoon, and pier light.
- Five spare luminaires of each type provided. Include all parts in the luminaire, including, but not limited to: supports, ballast, cover and lamps.
- One spare transformer of each type provided.
- One spare medium voltage substation and transformer.
- Ten spare leak detection sensors.

## 2.17.5 SUBMITTALS

### 2.17.5.1 DESIGN SUBMITTALS

WSDOT will review and comments on all scheduled submittals and will return comments to the Design-Builder. All Design Documents shall bear the stamp and signature of the Electrical Design Lead Engineer, unless otherwise noted in this section.

#### 2.17.5.1.1 Plans

The Design-Builder shall submit Preliminary, Released For Construction Documents and Final Electrical Bridge and Services Plans on WSDOT standard sheets and in accordance with Section 2.2 (Project Documentation) and Section 2.28 (Quality Management Plan). The drawings shall conform to the As-Built Plans requirements in this section.

#### 2.17.5.1.2 Technical Specifications

The Design-Builder shall submit Preliminary, Released for Construction Documents and Final Electrical Bridge and Services technical specifications in accordance with Sections 2.2 and 2.28.

#### 2.17.5.1.3 Design Calculations

The Design-Builder shall submit Preliminary, Released For Construction Documents and Final Electrical Bridge and Services design calculations to support all engineering designs described in this section on 8.5-inch by 11-inch sheets. Complete sets of calculations shall be included with each design review submittal, in accordance with this section and Sections 2.2 and 2.28.

All final design calculations shall include the stamp of the Electrical Design Lead Engineer.

#### 2.17.5.1.4 Shop Drawing Submittals

The Design-Builder's Quality Management Plan (Section 2.28) shall include submittal of shop drawings for all Electrical Bridge and Services equipment, elements and components.

### 2.17.5.2 AS-BUILT DOCUMENTATION

The Design-Builder shall prepare As-Built Plans as specified in Section 2.2.3.4.1. The As-Built Plans shall incorporate the following information:

The Design-Builder shall make complete working drawings for the electrical equipment. The drawings shall become the property of WSDOT after they have been corrected to show the work as constructed. These drawings shall include:

1. Complete wiring interconnection diagrams, giving complete termination identification of wires and cables, and sizes and numbers of all wires and cables, and the make and capacity of all apparatus. Schematic diagrams shall include three-line power diagrams showing the scheme of connections including detailed apparatus and complete control schematic diagrams which shall include the control panels. The number of each wire and an individual device designation for each electrical device or piece of apparatus shall be shown on the control schematic diagram. This device

designation shall be used to identify each piece of apparatus on all assembly and installation drawings. Assembly drawings shall include locations to scale of all external and internal identified components including terminal blocks contained on or in the control panels, panels, transformers, terminal boxes and CCTV system.

2. Complete conduit drawings, which show the physical routing and the size of each conduit and the wire number and size of each wire therein. These drawings shall show the exact location and method of support of all conduits, ducts, boxes and expansion fittings, and each conduit shall be given an individual conduit designation.

3. A suitably coordinated conduit and cable schedule.

4. Installation drawings giving locations of all cables, conduits, transformers, panels, circuit breakers, cathodic protection equipment, annodes, cathodes, navigation lighting, roadway equipment and lighting, service equipment, control panels, float switches, CCTV equipment, switches, lights, pump receptacle stations, receptacles, and all other apparatus.

5. Final drawings of all installed mechanical and electrical components including layout and installation drawings.

6. Drawings showing the general construction and dimensions of the control panels and the arrangement of all apparatus thereon.

7. Certified dimension prints of all electrical apparatus.

8. Detailed construction drawings of all boxes, troughs, ducts, and raceways other than conduit.

9. Special apparatus shall be designated by the manufacturer's name and catalog reference.

10. Anode and ground connections for the cathodic protection systems.

11. Locations of reference electrodes for the cathodic protection systems.

After the drawings have been updated, the Electrical Design Lead Engineer shall submit to WSDOT a final set of electrical plans for review and comment prior to issuing the As-Built Plans as outlined in Section 2.2.3.4.1.

### 2.17.5.3 OPERATIONS AND MAINTENANCE MANUALS

The Design-Builder shall compile and develop an operation and maintenance manual for all newly installed equipment. The Work shall be performed in accordance with Section 2.25 (Control of Materials). The Design-Builder shall perform the mechanical Work in accordance with Section 2.32 (Mechanical Bridge and Services). The Design-Builder shall provide the following information in the title page:

Operation and Maintenance Manual
Evergreen Point Floating Bridge
SR 520 Bridge No. 520/8
Contract No. ____
Date of Preparation

All drawings shall be as follows:

- All As-Built drawings shall be originals. No photocopies shall be permitted.
- All As-Built catalog cuts shall be identified with part identifiers, contract number, complete manufacture's part number, pertinent information highlighted and non-pertinent information crossed out.
- All As-Built drawings showing equipment assemblies shall be documented with part identifiers.

Operation and maintenance manuals shall contain the following minimum information:

1. Schedule of newly installed mechanical (pumps, crane, elevators, and HVAC) apparatus and modified existing apparatus.
2. Descriptive leaflets, bulletins, maintenance instructions, and drawings covering all items of equipment furnished and installed as part of this Project.
3. Names, addresses, websites and telephone numbers of vendors and suppliers.
4. Maintenance instructions for all newly installed mechanical equipment and modified existing mechanical equipment, including warnings and precautions to be observed during maintenance actions, provided as part of this Project.

Electrical Equipment Maintenance:

A. Manufacturer's Information

1. Schedule of newly installed electrical apparatus.
2. Descriptive leaflets, bulletins, maintenance instructions, and drawings covering all items of equipment furnished and installed as part of this Project.
3. Names, addresses and telephone numbers of vendors and suppliers.
4. Maintenance instructions for all newly installed electrical equipment and modified existing electrical equipment, including warnings and precautions to be observed during maintenance actions, provided as part of this Project.

B. Spare Parts Directory

C. Electrical System Wiring Diagrams and Panel Drawings

1. Complete electrical shop/working drawings prepared by the control system vendor.
2. Control desk, control panels, equipment panels, motor control center, motor drives and PLC control panel layouts and wiring diagrams for the work covered in this Project.
3. Schedule of newly installed (pumps, cranes, elevators, etc.) apparatus and modified existing apparatus.
4. Descriptive leaflets, bulletins, maintenance instructions, and drawings covering all items of equipment furnished and installed for this Project.

D. Electrical Installation Shop/Working Drawings

1. Conduit layout drawings.
2. Mounting and construction detail drawings for electrical components.
3. All complete shop/working drawings related to the electrical installation.

E. Programmable Logic Controller (PLC) Program

1. Final version of the installed PLC Program in hard copy format (8.5" x 11").
2. Electronic copy of final version of the installed PLC program on CD.

F. Alarm Panel (PanelView) Program

1. Final version of the installed Alarm Panel Program in hard copy format (8.5" x 11").
2. Electronic copy of final version of the installed Alarm Panel Program on CD.

Cathodic Protection System:

A. Manufacturer's Information

1. Descriptive leaflets, bulletins, maintenance instructions, and drawings covering all items of equipment furnished and installed for this Project.
2. Names, addresses and telephone numbers of vendors and suppliers.
4. Maintenance instructions for all Rectifiers including warnings and precautions to be observed during maintenance actions, provided for this Project.

B. Spare Parts Directory

C. Electrical System Wiring Diagrams and Panel Drawings

1. Complete electrical shop/working drawings prepared by the Rectifier Manufacturer.
2. Complete electrical shop/working drawings prepared by the control system vendor.
3. Rectifier panels and PLC control panel layouts and wiring diagrams for the work covered in this Project.
4. Descriptive leaflets, bulletins, maintenance instructions, and drawings covering all items of equipment furnished and installed for this Project.
5. Complete mechanical drawings of the anode assembly and reference cell installation.

D. Electrical Installation Shop/Working Drawings

1. Conduit layout drawings.
2. Mounting and construction detail drawings for all rectifiers.
3. All complete shop/working drawings related to the electrical installation.

E. Programmable Logic Controller (PLC) Program

1. Final version of the installed PLC Program in hard copy format (8.5" x 11").

2. Electronic copy of final version of the installed PLC program on CD-ROM.

F. Alarm Panel (PanelView) Program

1. Final version of the installed Alarm Panel Program in hard copy format (8.5" x 11").

2. Electronic copy of final version of the installed Alarm Panel Program on CD-ROM.

G. Instructions for Monitoring Cathodic Protection Systems

Provide complete instructions for regular monitoring of the cathodic protection systems using both the rectifier panel instruments and the PLC Controller including obtaining the following information:

1. Reading output voltage and current for each zone.
2. Reading reference cell "on-pontential".
3. Reference cell "off-potential".
4. Performing polarization and depolarization testing.
5. Adjustment of output voltage/current using the PLC Program.

The material for the operation and maintenance manual shall be assembled to form a book with heavy plastic covers. Each book shall be approximately 9 inches by 12 inches, three-ring binder with 3-inch "D" rings, and vinyl cover to allow title sheet inserts. Each book shall be neatly entitled with a descriptive title, the name of the bridge, WSDOT, the contract number, date of installation, and Design-Builder contact information. Copies of drawings shall be in black on a white background and shall be easily legible. Sepia and/or blue line drawings shall not be used. Each section/subsection shall be separated with laminated tabbed divider sheets. Each tab shall be suitably titled. All literature, descriptive materials for inclusion in the manuals shall have all sheets numbered and listed by section in the Table of Contents. The arrangements of the booklets, the method of binding, material to be included, and the text shall all be as approved by the Design Lead Electrical Engineer.

The Design-Builder shall submit a 90% preliminary copy of the maintenance manual to WSDOT for review, prior to the 100% review copy. The manuals shall be submitted to WSDOT for review and comment. All comments have been addressed to the satisfaction of WSDOT prior to commencement of the training session specified. The manuals shall also be made available at the bridge site for use during the start up and commissioning period. Three copies of the final operation and maintenance manuals shall be submitted to WSDOT for review to verify all comments have been incorporated. Once all comments have been addressed to the satisfaction of WSDOT, three bound copies of the final operation and maintenance manuals shall be delivered to WSDOT 14 days before the schedule date for the first day of the instruction period begins.

Completion of each volume of the Operation and Maintenance Manual shall be obtained by the Design-Builder prior to final acceptance testing of the bridge.

## 2.17.6 TRAINING

The Design-Builder shall provide training services for WSDOT. The Design-Builder shall submit at least two weeks (14 Calendar Days) prior to the schedule date for the first day of the instruction training session, a complete training syllabus outlining topics to be

covered, timeframes and training location for said topics and materials to be furnished as part of the training sessions. The training sessions shall be organized and be administered to a multi-disciplined group. Training sessions shall be devoted to theory of operation, maintenance and trouble shooting of the Bridge Maintenance Facility and Bridge equipment, electrical control and power distribution systems.

Each session shall be capable of training a minimum of 25 people at the Bridge Maintenance Facility. The Design-Builder shall furnish all necessary instruction sheets, student training aids, paper and booklets to supplement training.

### 2.17.6.1 MAINTENANCE PERSONNEL TRAINING

The Design-Builder shall provide on-site training of WSDOT's electricians, maintenance workers, and other personnel as indicated by the agency on subjects such as maintenance, adjustment, troubleshooting, and repair of all equipment furnished and/or installed by the Design-Builder as part of this Project. Six sessions of eight hours shall be devoted to electrical equipment and maintenance-related topics. The Design-Builder shall submit to WSDOT for review and comment, a detailed outline of topics to be covered and training material for review, The outline of topics shall consist of a schedule of training based upon a detailed list of topics, including start and finish times for each topic each day.

It shall also be the Design-Builder's responsibility to schedule with WSDOT. The training location shall be an approved WSDOT facility as determined by the WSDOT. Supplying of visual aid equipment and other miscellaneous items required for training shall be the responsibility of the Design-Builder.

Design-Builder shall provide copies of step-by-step operating instructions for each trainee.

Training shall not commence until the bridge is operational and system has been conditionally accepted by WSDOT.

### 2.17.6.2 SPECIAL PERSONNEL TRAINING ON PLC EQUIPMENT

Additional PLC training is to occur before the shop testing and the dates are to be sheduled with WSDOT.

In-depth, hands-on training by the PLC manufacturer shall be provided for four of the Contracting Agencies personnel. The PLC training shall be specific to the PLC that is used on the bridge and shall include programming, fundamentals, and maintaining and troubleshooting. Training shall occur on identical types of equipment to be installed on the bridge for this Project.

All required airfare, lodging, transportation and training costs shall be provided for each of the four personnel.

## 2.17.7 SPECIAL PROJECT CONDITIONS

### 2.17.7.1 SPECIAL CONDITIONS - BRIDGE OPERATION

The Design-Builder shall comply with all United States Coast Guard requirements concerning the existing SR 520 bridge operations.The Design-Builder shall coordinate all Work with the required bridge openings of the existing SR 520 Bridge and the waterway channels.

It is brought to the Design-Builder's attention that the existing SR 520 floating bridge center span may be required to operate to allow waterway traffic through the bridge during construction. The Design-Builder shall coordinate the construction work and the channels so it does not impede waterway traffic.

### 2.17.7.2 SPECIAL CONDITIONS – DRILLING AND ATTACHING SUPPORTS TO STRUCTURES

The Design-Builder shall follow the requirements outlined in Section 2.12 (Floating Bridge) for all drilling and supports attached to the Pontoons.

The Design-Builder shall provide embedded supports in all supplemental stability Pontoons supplied for this Project and shall coordinate with WSDOT regarding revisions to the embedded support locations on the PFS.

In locations other than the Pontoons and on the Pontoon deck, the Section 2.13 (Bridges and Structures) lists the requirements for installing inserts, drilling, and mounting equipment to the different types of structures.

### 2.17.7.3 SPECIAL CONDITIONS – EXISTING PUMPING EQUIPMENT

Throughout construction the Design-Builder shall maintain and protect all existing pumping equipment for the existing SR 520 floating bridge. All equipment shall be kept operational during the demolition of the existing SR 520 floating bridge pontoons. The equipment shall then be delivered to WSDOT.

### 2.17.7.4 SPECIAL CONDITIONS – CONDUIT ENTRANCE INTO ENCLOSURES

The Design-Builder shall ensure all conduits entering panels or enclosures are bottom entry whenever possible, and side entry when approved by the Electrical Design Lead Engineer. No conduits shall enter the top of an enclosure, as water can accumulate on the top and leak into the enclosure.

### 2.17.7.5 SPECIAL CONDITIONS – LOCATING AND INSTALLING EQUIPMENT IN THE PONTOON CELLS

All equipment to be installed in the Pontoons must be able to enter the Pontoon through the hatches. All equipment shall be sized to fit through the hatches and then fit through the Pontoon cell openings to their final location. The Design-Builder shall be responsible for verifying and field measuring the entry path for equipment to ensure a proper fit. It is further brought to the Design-Builder's attention that the work shall be coordinated with the installation of the ladders into the openings. Once the ladders are installed the available space will be reduced. The Design-Builder shall coordinate the work such that the ladder installation shall not impact the electrical installation work.

All equipment to be installed in the Pontoons shall be mounted such that the equipment is located above the water line. The Design-Builder shall be fully responsible for designing and furnishing supports, pads, stand-offs, or other equipment required to install the Pontoon equipment at a safe mounting height. (The only equipment that shall be installed below the waterline consists of the float sensors to detect water leakage and the cathodic protection system anodes which shall be installed outside the Pontoon.)

For the cross Pontoons, all panels, enclosures, transformers, and major pieces of equipment shall be installed on the side of the interior anchor galleries located opposite

the navigation channels. In all other Pontoons, the equipment shall be installed on the east side of the interior anchor gallery Pontoon cells. Coordinate the equipment locations with the blockouts provided in the Pontoons. No panels, enclosures, transformers, and major pieces of equipment shall be located in the Pontoon cells adjacent to marine traffic unless approved by WSDOT.

Equipment such as lights, receptacles, float sensors, conduit, wire, CCTV patch panels, hatch access light switches, and other equipment may be located in other cells. The design shall locate all equipment adjacent to platforms or in anchor galleries to allow access and maintenance of the equipment.

### 2.17.7.6 SPECIAL CONDITIONS – EQUIPMENT NEMA-4X RATING

All junction boxes installed in the Sheds and Pontoons shall be rated as NEMA-4X except for the step down transformers. NEMA-3R with rain shield shall be used for all step down transformers.

### 2.17.7.7 SPECIAL CONDITIONS – CONDUIT ROUTING ON THE PONTOON DECK, DECK PENETRATION AND BLOCK-OUTS IN PONTOONS

The PFS shall be provided with cast in place wall penetrations in the interior Pontoon walls and floors, as well as block-outs in the exterior Pontoon walls and decks. The Design-Builder is limited in using these locations for all conduit penetrations and shall not drill any new or unnecessary holes in the Pontoons.

The Design-Builder shall not route conduit along the Pontoon deck. The only exception to this requirement shall be for the navigation lights, where the conduit penetrations could not be located directly adjacent to the Pontoon railing corner post. These are on Pontoons A and W, and the NW and SW SSPs. Cast in place all inserts and required supports for the conduit in the aforementioned locations..

All conduits to Pontoon deck or roadway equipment shall be routed through the Pontoon cells or up through the Pontoon deck directly up to the roadway underdeck and then to the equipment.

### 2.17.7.8 SPECIAL CONDITIONS – TEMPORARY LIGHTING AND WARNINGS

The Design-builder shall maintain continuous power to the existing SR 520 bridge and any Pontoon brought on the site for the following systems:

- Channel Marker lights (green lights on the transition spans);
- Pier marker lights (red lights on the piers);
- Pontoon marker lights (red lights on the pontoons); and
- WCB (red lights on the piers).

The Design-Builder shall comply with all United States Coast Guard requirements for lighting and warning.

Temporary lighting and warning systems to be maintained on the existing bridge include the pontoons, transition spans, and piers. The existing system locations shall require maintained power or temporary battery systems as long as the specific pontoons are on site and until the transition spans and piers have been demolished.

Throughout construction periods the Design-Builder shall maintain power to the new systems or provide temporary battery operated systems until the permanent units are installed and operational on the new SR 520 Bridge Pontoons, piers, and transition spans. During any relocation of the navigation lights the Design-Builder shall provide temporary battery operated lights in the locations of the new lights until the permanent units are installed and operational.

### 2.17.7.9 SPECIAL CONDITION - LOCKS/LOCK SETS

Any Item specified as lockable shall be supplied with a lock set compatible with a "Best Brand" figure eight six pin (A) keyway blue contractor core, or shall have a stainless steel padlock hasp sized to accept a padlock with a minimum 3/8-inch diameter shackle.

Specified Items shall include, but not be limited to, the following:

- Entry doors;
- Electrical cabinets;
- Control consoles;
- Junction boxes accessible to the public; and
- Sidewalk hatches.

Substitute lock sets for items that are too small for practical application of this specification shall be reviewed and commented by the WSDOT. All comments shall be addressed to the satisfaction of WSDOT prior to installation.

### 2.17.7.10 SPECIAL CONDITION - EXISTING FLOATING BRIDGE ELECTRICAL FACILITIES

The following existing electrical and communication facilities are located adjacent to or along the existing SR 520 floating bridge, and are crucial to the existing floating bridge operations:

1. A medium voltage power line (12.47 kilo-volt) from the existing electrical service adjacent to the park and ride lot at Evergreen Point Road to the mid-span of the existing SR 520 floating bridge. This power line will be relocated and replaced under the SR 520 Eastside Transit and HOV Project. The Design-Builder shall coordinate with WSDOT and Eastside project, and facilitate the relocation/replacement of this power line to relocate the medium voltage temporary power to a location that will not interfere with this project; and
2. A medium voltage power line (13.8 kilo-volt) from the existing electrical service at Foster Island is currently routed to the mid-span of the existing floating bridge. The work on the WCB to relocate minimum voltage service to the existing floating bridge will be performed by others. The work on the WCB shall also provide electrical service to illumination, naviagation lights and ITS equipment on the WCB, and the work to provide this service will be performed by others; and
3. Communication conduits and cables along the SR 520 freeway and the existing floating bridge; and

4. Roadway illumination on the existing floating bridge, West and East Transition Spans, and West and East Approach Bridges; and

5. Navigation, pontoon, and pier lights on the existing floating bridge, West and East Transition Spans, and West and East Approach Bridges; and

6. Equipment cabinets, cable vaults, pull boxes, conduits, junction boxes, Active Traffic Management (ATM) signs, closed circuit television (CCTV) cameras, traffic detectors, and other communication and electrical equipment adjacent to or on the existing floating bridge.

Refer to the As-Built Plans (Appendix A-B) for locations of these existing electrical facilities. The Design-Builder shall field verify and locate these existing electrical facilities prior to commencing any work.

The Design-Builder shall be responsible for the following:

- Maintain and protect the existing power and communication and ITS infrastructures on the existing bridge and within the vicinity area.

- For the medium voltage power line (12.47 kilo volt) from the existing electrical service adjacent to the park and ride lot at Evergreen Point Rd to the mid span of the existing SR 520 floating bridge, the Design-Builder shall coordinate with WSDOT and Eastside project, and facilitate the relocation/replacement of this power line to relocate the medium voltage temporary power to a location that will not interfere with this project. When the new floating bridge and landings are opened to traffic, the Design-Builder shall full demolish the temporary service;

- For the medium voltage power line (13.8 kilo-volt) from the existing electrical service at Foster Island to the mid-span of the existing floating bridge, the Design-Builder shall not disrupt the service until the new floating bridge and landings are opened to traffic. When the new floating bridge and landings are opened to traffic, the Design-Builder shall full demolish the temporary service up to the service point at Foster Island.

- For the service to the WCB, the Design-Builder shall maintain the service to the WCB when the WCB is turned over to the Design-Builder. Refer to Section 2.16 and 2.18 for the Work to be performed on the WCB.

During the construction, WSDOT will continue maintaining and operating the existing floating bridge electrical facilities prior to the bridge demolition.

Any disruptions to the existing floating bridge electrical, communication and ITS facilities will not be permitted unless they are deemed necessary and approved by WSDOT. The Design-Builder shall coordinate with the WSDOT Northwest Region Bridge Maintenance Office to determine allowable working days and hours for disruptions to the existing floating bridge facilities. The WSDOT Northwest Region Bridge Maintenance Office may be contacted at the following address:

10833 Northup Way NE
Bellevue, Washington 98004
Telephone: (425) 739-3700

Any unplanned disruptions that WSDOT determines to be caused by the actions of the Design-Builder or the Design-Builder's representative(s) shall be corrected by the Design-Builder to WSDOT's satisfaction and at no cost to WSDOT.

In the event of an unplanned disruption and subsequent notification by WSDOT , the Design-Builder shall immediately 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 will result in the assessment of liquidated damages in accordance with Section 1-08.9 of the General Provisions.

### 2.17.7.11 SPECIAL CONDITION – PONTOON SHEDS TYPE I, II, AND III

The Design-Builder shall coordinate the electrical equipment installation and layout with the Pontoon Shed design.

WSDOT has provided a conceptual layout of the electrical equipment rooms and has shown this configuration in the State Furnished Pontoon Minimum Technical Requirements (Appendix M11) and the Outfitting and Assembly Minimum Technical Requirements (Appendix M23). Inserts will be provided in the Pontoon Construction Project to match these conceptual layouts for the Design-Builder to use if it wishes. However the rooms with electrical equipment shall be laid out by the Design-Builder. The quantity, size, and location of the other Sheds Type II and III shall be determined by the Design-Builder. The Design-Builder shall coordinate the electrical equipment to be installed in all the Sheds with the Shed design. Specifically the Design-Builder shall design the Sheds to house the medium voltage equipment to allow for safe operation of the equipment with hot-sticks and safety gear, in accordance with all code minimum requirements. The clearance at these locations will require special attention to how to safely operate the equipment with standard safety equipment.

The Design-Builder shall design the service equipment and all lighting, switches, receptacles, heating and ventilation as required in this section and Sections 2.16, 2.18, and 2.32.

### 2.17.7.12 SPECIAL CONDITION – TRAFFIC MANAGEMENT CENTER COORDINATION

The Design-Builder shall install systems capable of communicating all alarms, bridge wind speed/direction information, bridge temperature sensor and barometer information, and CCTV video and controls to the Traffic Management Center (TMC) in Shoreline, WA. The primary method of communicating alarms shall be the autodialer which is detailed in this Section. The Design-Builder shall design the CCTV system to allow the system to be remotely monitored and controlled by the TMC, as well as at least one more user.

The Design-Builder shall design a fiber optic cable connection to be located in the Bridge Maintenance Facility. This connection shall be used to transmit the required information to the TMC. The requirements for fiber optic connections are located in Section 2.17 and 2.30.

The Design-Builder shall also provide a remote monitoring system for WSDOT to monitor the Programmable Logic Controller (PLC) status, alarms, and outputs for the floating bridge and landings, and Bridge Maintenance Facility and Dock at the offsite location at the Traffic Management Center in Shoreline, WA. The Design-Builder shall

meet with the TMC and coordinate the project autodialer, PLC, CCTV, and HVAC for the floating bridge and landings, and Bridge Maintenance Facility and Dock information for transmission to the TMC, as described in this Section and Section 2.16, 2.18, and 2.32. The network requirements shall be coordinated with WSDOT and the TMC. The Design-Builder shall provide all fiber connections, CCTV and computer equipment at the TMC to provide the required monitoring. The monitoring points shall be verified and only the information requested by the TMC shall be provided.

The system resident in the TMC is a Barber Colman Network 8000 system. Since it is not probable that this system will be expanded to the new TMC, the system considered would provide access through web based browsers with security login.

The Design-Builder shall provide a remote monitoring and operating system at the TMC to energize or de-energize the Bridge Fire Protection pumps and operate the motorized control valves. All work shall be coordinated with the work in Section 2.35. The Design-Builder shall meet with the TMC, Fire Department, and the WSDOT to coordinate the requirements. The system shall monitor if any fire pump motor is activated, operate the control valves to send water to the north or south side, and allow the TMC to energize or de-energize the motors remotely.

## 2.17.8 FIELD MEASURING

The Design-Builder shall field survey and measure the Pontoon and supplemental stability Pontoons (SSP) cell penetration locations and structural components as required ensuring that the electrical system will fit into the existing Pontoons. All such survey and measurement shall be done before performing work.

The Design-Builder shall be responsible to ensure the field measuring accuracy is sufficient to properly install the electrical equipment.

The existing dimensions/information to be field measured includes, but need not be limited to, the following:

- Any dimensions, sizes and/or features necessary to achieve the proper fit-up of new and/or existing components.
- Any existing dimensions or features which in the opinion of the Design-Builder and/or WSDOT deviate from the Contract Documents or As-Built drawings and which may impact the installation or alignment of machinery or electrical components.
- The existing As-Built wall naming and Pontoon identification schemes shall be updated to the current project nomenclature.

Once the surveying and measuring has been completed, any discrepancies shall be marked on the corresponding Contract Documents, working drawings, and submitted to WSDOT for approval. If any substantial discrepancies are determined to affect the design, the change will be addressed in accordance with Section 1-04.4 of the General Provisions. If any discrepancies are determined to not affect the design, the Design-Builder shall construct the item of work to the field measurement.

Errors in measurements could result in errors in the shop plans and working drawings, delays in the approval process, and impacts to the project schedule. The Design-Builder shall submit a Measure and Survey Plan that shall include but not be limited to the following:

- The overall sequence and schedule of the systems and components to be measured.
- A description of the methods and equipment used to perform the measurements. Identify control points, datums and plumb lines.

All measurements affecting elements to be included in the shop plans and working drawings shall be performed by or under the direct supervision of the Design-Builder Professional Engineer who is responsible for preparing the shop plans or working drawings.

The Design-Builder shall submit a copy of the marked-up As-Builts from the prior stages of construction for review. The Pontoon and wall naming nomenclature will be verified by WSDOT.

## 2.17.9 DESIGN CALCULATIONS

The Design-Build shall perform a complete design and perform all calculations and studies required for the project. The Design-Builder shall provide the following calculations and submit them for review prior to construction, including but not limited to:

- Short Circuit Analysis: The short circuit analysis shall be used to size the over current protection equipment interrupting capability.
- Fuse/Relay/Circuit Breaker Coordination Study: This study shall analyze all over current protection devices from the medium voltage equipment to the 208/120VAC equipment. The study shall coordinate each of the transformer short circuit contribution, damage curves and the transformer in-rush currents.
- Voltage Drop Study
- Cathodic protection design calculations
- Stray Current monitoring design calculations

The short circuit analysis shall be used to size the protection equipment interrupting capability.

## 2.17.10 START UP AND COMMISSIONING

The Design-Builder shall demonstrate that all the bridge and Bridge Maintenance Facility electrical and mechanical systems have been correctly installed and function properly. The Design-Builder shall integrate this work with the Start Up and Commissioning of the Bridge Maintenance Facility and Dock.

This work shall be done in accordance with Section 2.34 (Commissioning).

Conduct all tests in the presence of WSDOT, except when WSDOT allows the test to be performed otherwise. The Design-Builder's Commissioning Authority (CxA) shall provide 28 calendar days notice to WSDOT prior to testing and submit the dates for any testing for approval. Testing shall not commence until the date is accepted by WSDOT.

The Design-Builder shall generate the test plans, procedures, pass/fail criteria, and product manuals for WSDOT to review and comment on. All comments from WSDOT shall be addressed prior to starting any testing.

The medium voltage power distribution equipment testing shall include fully loading the floating bridge and Landings electrical system, all roadway equipment, and Bridge Maintenance Facility and Dock operate properly. All the above systems and portable pumps shall all be placed in service and energized. The medium voltage system, ATS, and generator shall be fully loaded and demonstrated to transfer load properly.

All control equipment and control points shall be tested. All alarms and control screens shall be tested. All dial-up and transmitted information to TMC shall be tested and operated. All HVAC and roadway systems shall be tested and shown to operate properly in accordance with the testing in Sections 2.16, 2.18, and 2.32.

Maintain a written record of all tests showing date, personnel making test, equipment or material tested, tests performed, manufacturer and serial number of testing equipment and results. All test reports and data shall be submitted to the Electrical Design Lead Engineer for approval.

All Start Up and Commissioning shall be completed prior to allowing traffic on the bridge.

### 2.17.10.1 FIELD ACCEPTANCE TESTING

The Design-Builder shall provide all test equipment, safety equipment, personnel and monitoring devices necessary to show each piece of equipment has been installed, operates properly, is in proper operating condition, and integrated into the control system. This work shall be coordinated with control system vendor and the installing Design-Builder. All field acceptance start-up and commissioning shall be completed prior to allowing traffic on the bridge.

The work shall include:

Stage 1 – Pre-Functional Checkout (PC)

The Design-Builder shall adjust, calibrate and test all equipment, place the integrated system in service, and test the integrated system.

The Design-Builder shall perform the test procedure approved by the Electrical Design Lead Engineer and verify everything is operational. The CxA and Electrical Design Lead Engineer shall review the testing and approve the results to complete this stage.

Once the PC is completes the system enters Stage 2.

Stage 2 - Functional Performance Testing (FPT) and Integrated Performance Testing (I-FPT)

Upon successful completion of Stage 1 Pre-Functional Checkout (PC) and its acceptance by the CxA and Electrical Design Lead Engineer, the Design-Builder shall demonstrate that the completed control systems comply with the Contract requirements.

The Functional Performance Testing (FPT) and Integrated Performance Testing (I-FPT), as required, shall not commence until receipt by the Design-Builder of written permission from WSDOT, based on the Design-Builder's Stage 1 written 2.17.10.1report. This shall include certification of successful completion of Stage 1 Pre-Functional Checkout (PC), as required above. WSDOT may terminate this portion of the testing at any time when the system fails to perform as specified.

Upon a failure resulting in termination of testing by WSDOT or by the Design-Builder, the Design-Builder shall commence an assessment period. The Design-Builder shall identify all failures, determine the cause of all failures, repair all failures, and deliver a written report to WSDOT. The report shall explain in detail the nature of each failure, corrective action taken, results of tests performed, and shall recommend the point at which the testing shall be resumed. After delivering the written report, the Design-Builder shall convene a test review meeting at the job site to present the results and recommendations to WSDOT. As part of this test review meeting, the Design-Builder shall demonstrate that all failures have been corrected by performing the appropriate portions of the conditional acceptance functional checkout test. Based on the Design-Builder's report and test review meeting, WSDOT will determine the retest date.

Upon successful completion of the conditional functional checkout testing, the Design-Builder shall deliver test reports and other documentation specified to WSDOT for approval prior to commencing the endurance test.

Stage 3 – Endurance Test

The Endurance Test shall not be started until WSDOT notifies the Design-Builder, in writing, that the Stage 2- Functional Performance Testing (FPT) and Integrated Performance Testing (I-FPT) has been completed and correction of all outstanding deficiencies have been satisfactorily completed.

The Design-Builder shall provide one qualified person to direct WSDOT's operator how to operate the system as required during Phase I and Phase II of the Endurance Testing. WSDOT may terminate testing at any time the system fails to perform as specified. Upon termination of testing by WSDOT or by the Design-Builder, the Design-Builder shall commence an assessment period as described for Phase II. Upon successful completion of the Endurance Test, the Design-Builder shall deliver test reports and other documentation required to WSDOT prior to acceptance of the system.

Phase I (Testing): The test shall be conducted 24 hours per day for 30 consecutive calendar days, including holidays, and the system shall operate as specified without fault or failure. The Design-Builder shall make no repairs during this phase of testing unless authorized by WSDOT in writing. If the system experiences no failures during Phase I testing, the Design-Builder may proceed directly to Phase III testing, after receipt of written permission from WSDOT.

Phase II (Failure Assessment): If Phase I is unsuccessful, the Design-Builder shall identify all failures, determine causes of all failures, repair all failures, and deliver a written report to WSDOT. The report shall explain in detail the nature of each failure, corrective action taken, results of tests performed, and shall recommend the point at which testing shall be resumed. After delivering the written report, the Design-Builder shall convene a test review meeting at the job site to present the results and recommendations to WSDOT. As a part of this test review meeting, the Design-Builder shall demonstrate that all failures have been corrected by performing appropriate portions of the conditional acceptance functional checkout test. Based on the Design-Builder's report and the test review meeting, WSDOT will determine the restart date, or may require that Phase I be repeated. If the retest is completed without any failures, the Design-Builder may proceed directly to Phase III testing after receipt by the Design-Builder of written permission from WSDOT.

Phase III (Completion): If Phase I is successful, the Design-Builder shall prepare and submit a written report to WSDOT. The report shall explain in detail the length of operation and any issues that occurred. Based on the Design-Builder's report, WSDOT will determine whether the bridge and Bridge Maintenance Facility control/machinery system is to be accepted by WSDOT.

All cathodic protection start up commission shall be performed by a NACE certified Cathodic Protection Specialist.

WSDOT will perform the final electrical inspection and acceptance of the electrical systems in accordance with Section Washington Administrative Code (WAC) Chapter 296-46B after verifying the proper operation of all components upon Physical Completion of the Project.

### 2.17.10.2 OTHER TESTING AND INSPECTION REQUIREMENTS

The following test shall be performed as part of the Pre-Functional Checkout (PC) and the results submitted to WSDOT for review and comment include, but are not limited to:

- Perform insulation resistance testing on all new electrical conductors installed for this Project.
- Perform inspection of pump and elevator motors and motor starters installed for this Project.
- Perform ground measurement testing on all new electrical panels installed for this Project.
- Perform inspection of anodes, rectifiers, reference cells, ground connections, PLC control system, and all cathodic protection wiring. Perform anode to ground circuit resistance measurement, system ground to cable and system ground to reinforcement continuity testing, and reference cell calibration. Also perform rectifier operation testing.

Conduct all tests in the presence of WSDOT, except when WSDOT allows the test to be performed otherwise. The Design-Builder shall submit the dates for any testing for approval. Testing shall not commence until the date is accepted by WSDOT.

Maintain a written record of all tests showing date, personnel making test, equipment or material tested, tests performed, manufacturer and serial number of testing equipment and results. All test reports and data shall be submitted to the Electrical Design Lead Engineer or their designated representative for approval.

In order to prevent accidents, all roadway equipment tests will be performed during periods when there is no traffic on the bridge.

A. Resistance to Ground Measurements

Measure the resistance to ground at the service entrance, each ground rod, and each motor control center on the bridge. Use a handheld ground resistance meter and leakage current meter. The Design-Builder shall record the resistance to ground and leakage current at each location. Failure of the ground resistance to be 25 ohms or less shall result in the Design-Builder providing additional ground rods until the correct resistance is achieved, at no additional cost to the Department.

B. Ground Fault Interrupting Receptacle Tests

Test all ground fault interrupting receptacles for proper connection and operation with methods and instruments prescribed by the manufacturer. The Design-Builder shall record each location of the receptacle and each receptacle identifier, and whether the equipment passed or failed the test. Failure of a receptacle to pass the test shall result in the replacement of the faulty receptacle at no additional cost to WSDOT.

C. Wire Conductor Insulation Resistance Test

An insulation resistance test shall be performed for all conductors after said conductors have been installed but prior to being connected to a device at either end of the conductor. The insulation resistance of each conductor shall be tested to ground and to every other conductor in the raceway bonded together. The tests shall follow the recommendations of IEEE Standard No. 4 and shall be completed in the presence of WSDOT. The conductor installation shall be rejected if the insulation resistance is lower than 10 megohms. Rejected conductors shall be removed and replaced. Then all conductors in the raceway with the replaced conductor shall then be tested as described above.

D. Wire Continuity Tests

The continuity of all wires shall be tested before energizing the circuit. Any conductor that is not continuous shall be investigated for poor connection to terminal blocks or other concern. If the discontinuity is not determined the conductor shall be replaced. The new conductor shall then be tested for proper continuity.

E. Fiber Optic Testing Requirements

Test each fiber in the cable for attenuation (or decibel loss) in dB/kM. Return loss of light reflected back through the fiber from the far end. This value shall be less than -20dB. Measure and record the propagation delay. Measure and record the time domain reflectometry (TDR). Record any faults along the cable. If the fiber optic cables are found to have faults or signal loss that will interfere with the operation of the equipment the cable shall be replaced.

F. Coaxial Cable Testing Requirements

Test each cable for attenuation (or decibel loss) in dB/kM. Return loss of signal reflected back through the cable from the far end. This value shall be less than 20dB. Measure and record the propagation delay. Measure and record the time domain reflectometry (TDR). Record any faults along the cable. If the cable is found to have faults or signal loss that will interfere with the operation of the equipment the cable shall be replaced.

G. Additional Wire and Cable Testing Requirements

If the insulation resistance test or the continuity tests fail, the Electrical Design Lead Engineer may request additional tests on the conductors in the same raceway in order to guarantee the quality of the installation. Proposed test equipment shall be subject to approval of the Electrical Design Lead Engineer. Test instruments shall have been calibrated within the last six months by a calibration facility approved by the manufacturer of the test instruments. Written certification of calibration shall be submitted to and approved by the Electrical Design Lead Engineer prior to executing the tests.

H. Medium Voltage Equipment Testing

Perform factory and start-up tests in accordance with manufacturer's instruction manual for the switchgear, ATS, and generator.

Touch-up paint all chips and scratches with manufacturer-supplied paint and leave remaining paint with owner.

Verify key interlock operation.

Perform low frequency withstand (Hi-Pot) tests according to ANSI/IEEE C37.20.2, paragraph 5.5. All medium voltage cables shall be 'Hi-Pot' tested, however the Design-Builder may submit alternative 'or equal' tests that are equivalent but not destructive.

Specific Unit Substation testing shall be conducted in accordance with the provisions of IEEE C57.12.91 and shall include, as a minimum, the following tests:

1. Ratio
2. Polarity
3. Phase Rotation
4. No-Load Loss
5. Excitation Current
6. Impedance Voltage
7. Load Loss
8. Applied Potential
9. Induced Potential
10. QC Impulse Test
11. Temperature Test (typical data from previous unit is acceptable)
12. Sound Test (typical data from previous unit is acceptable)

### 2.17.10.3 START UP, COMMISSIONING, FIELD ACCEPTANCE AND TESTING SUBMITTALS

The Design-Builder shall provide a written procedure all testing to WSDOT at least forty Calendar Days prior to commencing any testing. These procedures shall be reviewed and approved by the Electrical Design Lead Engineer before any testing may be performed. All written test procedures shall be the step by step, with pass or fail, check marks as required.

The tests shall be coordinated with the requirements in Sections 2.16, 2.18, 2.32, and 2.34 to demonstrate all systems operate properly.

At a minimum the tests shall include, but are not limited to:

- Each PLC I/O is wired properly.
- Each float switch is manually operated and provides the correct alarm.
- Each light switch operates properly and energizes the lights.
- Each PLC input is operated and provides the correct alarm.

- Each PLC Alarm Panel provides the complete alarm and status information.
- Each Pontoon Pumping Station on a single Pontoon can energize 8 submersible pumps simultaneously.
- Each cathodic protection panel is providing the correct voltage and current output.
- Each cathodic protection panel is communicating the information correctly.
- Each jib crane shall be tested.
- Each receptacle operates at the proper voltage and phasing.
- Each transformer is providing the correct voltage at the correct phasing.
- The utility service is functioning at the correct voltage, current, and phasing.
- The diesel generator is operating to power the entire bridge and Bridge Maintenance Facility for 24 hours without failure.
- All navigation lights operate properly.
- Each CCTV camera pan-tilt-zoom function operates properly. The motion detection system operates properly. The monitor viewing operation operates properly and the digital video recorder operates properly. Verification that each screen can show independent camera information.
- All equipment with technical requirements in this section, but located in the Bridge Maintenance Facility and Dock operate properly.
- All roadway lights, sign lights, ATM, data stations, and CCTV systems shall be tested and shown to operate properly.
- Anemometer shall be tested and shown to operate properly.
- All lights and floodlights in Pontoon cells, underdeck, pier box columns, girder bearings, and Sheds shall be tested and shown to operate properly.
- Submit calibration and certification documents for all testing equipment.
- Submit test equipment certifications.
- Submit all wire testing, motor starters and motors, and ground measurements test results. Test reports shall identify each conductor by its wire number and its test results shall be tabulated and submitted to the Electrical Design Lead Engineer for approval.
- Submit all final test reports. All reports shall be organized, bound and signed by the Design-Builder.

Furnish and use safety devices such as rubber gloves and blankets, protective screens, barriers and danger signs to adequately protect and warn all personnel in the vicinity of the tests.

Test equipment shall be calibrated and certified. Certification data shall be dated within six months of the testing.

All testing shall be performed after the equipment has been fully installed at its final location.

The Design-Builder shall be responsible for all damage to the equipment or material as a result of any test procedures, improper testing, or test apparatus handling. The Design-Builder shall replace or restore to the original condition any damaged equipment or material.

All repairs and replacements will be made to the satisfaction of the Engineer at no additional cost to WSDOT. All repairs and replacements shall be made and tested before proceeding to the next stage.

## 2.17.11 WARRANTY

### 2.17.11.1 WARRANTIES BY DESIGN-BUILDER

Design-Builder warrants that:

a) All design Work performed pursuant to the Contract Documents shall conform to all professional engineering principles generally accepted as standards of the industry in the State;

b) The Project shall be free of defects, including design defects, deficiencies, errors and omissions, except to the extent that such defects are inherent in prescriptive specifications included in the Technical Requirements;

c) Materials and equipment incorporated into the Work shall be of good quality and except as noted in the Technical Requirements, when installed, shall be new;

d) Equipment provided by the Design-Builder shall be of modern design and in good working condition;

e) The Work shall meet all of the requirements of the Contract Documents;

f) The specifications and/or drawings selected or prepared for use during construction are appropriate for their intended use; and

g) The Project shall be fit for use for the intended function.

### 2.17.11.2 PROJECT WARRANTY TERM

The Design-Builder shall provide a Warranty commencing on the day of Physical Completion and ending a minimum of one year later for all equipment supplied in accordance wtih this section, including both product and workmanship. If any of the work fails to meet the standards set forth in this section at any time within the applicable warranty period, then the Design-Builder shall correct such work in accordance with this section.

### 2.17.11.3 CORRECTIVE WORK

WSDOT, as the owner of the project, will have full authority to undertake enforcement of the Warranties. Within seven days of receipt of a notice from WSDOT specifying:

- A failure of any Work to satisfy the Design-Builder's Warranties;
- Of any Subcontractor warranty;
- Or of any Manufacturer warranty, guarantee or obligation which the Design-Builder is responsible to enforce;

The Design-Builder and WSDOT shall mutually agree when and how Design-Builder shall remedy such violation.

However, in case of an emergency requiring immediate curative action, Design-Builder shall implement such action as it deems necessary and shall notify WSDOT on an expedited decision.

The Design-Builder and WSDOT shall agree on such remedy (or an alternate remedy, if necessary) as soon as reasonably practicable. If the Design-Builder does not use its best efforts to proceed to effectuate such remedy within the agreed time, or if the Design-Builder and WSDOT fail to reach such an agreement within such seven-day period (or immediately, in the case of emergency conditions), then WSDOT, after notice to the Design-Builder, will have the right to perform or have performed by third parties the necessary remedy, and the costs thereof shall be borne by the Design-Builder. WSDOT may agree to Nonconforming Work.

## 2.17.11.4 COST OF CORRECTIVE WORK

Design-Builder shall be responsible for obtaining any required approvals from WSDOT in connection with any such corrective Work. Design-Builder shall bear all costs for correcting any rejected Work, including additional testing and inspection, and shall reimburse WSDOT and pay WSDOT's expenses made necessary thereby within 10 days after Design-Builder's receipt of invoices therefor. If WSDOT agrees to accept any Nonconforming Work without requiring it to be fully corrects, Design-Builder shall be responsible for obtaining any required Governmental Approvals or other consents from any other Person in connection with the Warranty Work.

## 2.17.11.5 WARRANTY OF CORRECTIVE WORK

The Warranties shall apply to all Work redone, repaired, corrected or replaced in accordance with the Contract. The Warranties as to each redone, repaired, corrected or replaced element of the Work shall extend beyond the original warranty period if necessary to provide at least a one-year warranty period for any redone Work.

## 2.17.11.6 SUBCONTRACTOR WARRANTIES - ASSIGNMENT

Design-Builder shall obtain from all Subcontractors and suppliers and cause to be extended to WSDOT, appropriate representations, warranties (for period of at least co-extensive in duration with the Design-Builder's Warranties for such Work), guarantees and obligations with respect to the design, materials, workmanship, equipment, tools and supplies furnished by each Subcontractor and suppliers under their Subcontracts or supply agreements. These representations and warranty shall supplement the representations and warranties of Design-Builder hereunder. All representations, warranties, guarantees and obligations of Subcontractors and suppliers (a) shall be written so as to survive all WSDOT and Design-Builder inspections, tests and approvals hereunder, and (b) shall run directly to and be jointly and severally enforceable by Design-Builder and/or WSDOT and their respective successors and assigns. Design-Builder hereby assigns to WSDOT all of Design-Builder's rights and interest in all extended warranties for any periods exceeding the applicable Warranty period which are received by Design-Builder from any Subcontractors or suppliers.

### 2.17.11.7 SUBCONTRACTOR WARRANTIES – ENFORCEMENT

Upon receipt from WSDOT of notice of a failure of any of the Work to satisfy any Subcontractor or supplier warranty, representation, guarantee or obligation, Design-Builder shall enforce or perform any such representation, warranty, guarantee or obligation, in addition to Design-Builder's other obligations hereunder. WSDOT rights under this section shall commence at the time such representation, warranty, guarantee, or obligation is furnished, and shall continue until the expiration of Design-Builders relevant Warranty (including extensions thereof under this section). Until such expiration, Design-Builder shall be responsible for the cost for any equipment, material, labor (including re-engineering) or shipping, and Design-Builder shall be responsible for the cost of any equipment material, labor (including re-engineering) or shipping, and Design-Builder shall be required to replace or repair defective equipment, material or workmanship furnished by any Subcontractor or supplier.

### 2.17.11.8 MANUFACTURER WARRANTIES

Design-Builder shall obtain from all Manufacturers and cause to be extended to WSDOT, appropriate representations, warranties (for period of at least co-extensive in duration with Design-Builders Warranties for such Work), guarantees and obligations with respect to the installation of pre-manufactured items that are furnished with a Manufacturer's Warranty. This includes manufactured equipment furnished by Subcontractors and suppliers under their Subcontracts or supply agreements. These representations and warranty shall supplement the representations and warranties of Design-Builder hereunder. The Design-Builder shall provide extended Manufacturer Warranties for equipment to be extended to include the full one-year warranty period. The warranty cards and other documents shall be submitted to WSDOT as a complete package, with WSDOT as the owner. Design-Builder hereby assigns to WSDOT all of Design-Builder's rights and interest in all extended warranties for any periods exceeding the applicable Warranty period which are received by Manufacturers.

## 2.17.12 CATHODIC PROTECTION AND STRAY CURRENT MITIGATION

The Design-Builder shall provide a complete cathodic protection system designed to protect the entire sections of anchor cables submerged in water and reinforcing steel in the sections of the Pontoons exterior walls and bottom slabs located below the waterline. The primary goal of the cathodic protection system is to mitigate fresh water corrosion of anchor cables. In addition, the cathodic protection system shall also protect the reinforcing steel in the exterior walls and bottom slabs which may experience stray current discharge. The reinforcing steel in the Pontoon walls is not expected to corrode in this environment. However, medium voltage electrical power sources located on the floating structure may generate stray current which can be expected to be discharged from the reinforcing steel into the water causing delamination and spalling of the cover concrete. This could generate a leak and compromise the water tight envelope of the Pontoon. In the Future Six-Lane Plus Two HCT Configuration there are plans to install a light rail on the floating structure which could also generate stray current. The cathodic protection system has to be designed to be scalable to accommodate the future requirement of stray current control when the light rail system is installed. The scalability of the cathodic protection system is required primarily to accommodate increase in stray current from light rail.

### 2.17.12.1 DESIGN PARAMETERS

- The cathodic protection system for the reinforcing steel in the Pontoon walls and the bottom slabs shall be designed to meet following requirements:
    - The anodes shall be designed to output at least 1.5 mA/Square feet of submerged concrete surface area.
    - The anode header cable, conduits, junction boxes and fittings shall be sized to accommodate 100% more anodes in the future.
    - The rectifier shall have sufficient capacity to output current to 3 mA/Square feet of submerged concrete surface area.
    - The rectifier shall have constant current and potential control circuitry to control the output current.
    - The rectifier shall have connectors and posts to connect and monitor two reference cells.
    - The PLC remote monitoring system shall be able to monitor two reference cells per zone.
- The anchor cables and the reinforcing steel shall be located in separate cathodic protection zones in each Pontoon. Each anchor cable shall be powered by its own separate circuit, i.e. each anchor cable shall be an independent zone.
- The PFS shall have all reinforcing steel bonded and electrically continuous. All metallic elements installed in the Pontoons will be made electrically continuous to the reinforcing steel, except those isolated in accordance with the technical requirements of the PFS. The manufacturer of the PFS is required to make all effort to isolate the reinforcing steel from the anchor cable assemblies. However, this isolation may not be sufficient and shall be considered in the design of the cathodic protection system.
- An anode assembly shall be installed adjacent to each anchor cable submerged in water.
- The anode assembly to protect the reinforcing steel can be located either on one side or both sides. If the anode for the reinforcing is located on one side of the Pontoon, the Design-Builder shall provide calculations to document the ability of the anode to uniformly protect all reinforcing steel below the water line. The design of the cathodic protection system for the reinforcement shall ensure that it protects all steel susceptible to stray current uniformly.
- The cathodic protection system for the cable shall be designed assuming a current requirement of 3 mA per square feet of cable surface area. The surface area of the anchor installed in the lake bottom shall not be included in the protection area. The surface are of the cables is to be determined by the Design-Builder once the exact cables to be used for anchoring the Pontoons are selected.
- The resistivity of the lake water for design of the cathodic protection system can be assumed to be 10,000 Ω-cm or its conductivity to be 91 μmhos/cm.
- The PFS shall have connector plates installed at specified locations on the wall surface and electrically connected to the reinforcement. One plate can be used for ground connection to the reinforcement for cathodic protection. The other plates

shall be used for connection of the reinforcement to the electrical grounding system for stray current control.

- The anchor cable cathodic protection system shall utilize rectifiers located inside the Pontoon to power titanium mixed metal oxide anodes or equivalent and reference electrodes specially designed for fresh water use shall be located on select cables to provide a means of monitoring the system.
- Two reference cells shall be installed in each of the four selected zones. The zones shall be selected by the Design-Builder's Corrosion and Cathodic Protection Specialist. The locations and depths shall be submitted to WSDOT for review and comment during the design phase. The reference cell locations shall be finalized only after all WSDOT comments have been resolved.
- A PLC based system shall be provided to monitor the cathodic protection systems.

### 2.17.12.2 CRITERIA FOR CATHODIC PROTECTION

1. The anchor cables shall either be polarized to -850 mV with respect to copper-copper sulfate reference electrode or meet the 100 mV polarization criteria. Under no circumstances shall the anchor cable instant-off potential exceed 1 volt with respect to copper-copper sulfate reference electrode.
2. The reinforcing steel shall be considered protected if it meets the 100 mV polarization criteria.

### 2.17.12.3 MATERIALS

#### 2.17.12.3.1 Titanium Mixed Metal Oxide Tubular Anode

Anode material shall be LIDA Tubular Anodes with a diameter of 1-inch and a length of 40-inches or equivalent. Other anodes, which have a proven track record of 20 year service life, may be proposed if suitable for this application and are easier to maintain.

A string of anodes shall be provided for each anchor cable. The top of the first anode shall be locatedat least 5 feet below the pontoon bottom.. The space between anodes shall be 10 feet. At the bottom of the third anode a 5 lb. or requisite weight shall be attached. Each string shall be assembled at the factory. Based on the actual surface area of the anchor cables used, one or more anodes may be required to be added to the string.

Similarly, string anodes can be used to protect the reinforcing steel. The number of anodes and number of strings required will be determined by the Design-Builder.

Anode Material Specifications shall be as follows:

1. Base material shall be Titanium Grade 1 per ASTM B265.
2. Catalyst shall be Mixed Metal Oxide.
3. Current Rating at 11 amps for a design life of 20 years.
4. Cable to be HMWPE #8 AWG rated for 27 amps.
5. Cable shall be routed through the tubular anode and the connection between the cable and the anode to be accomplished by a 50 ton hydraulic crimp. No mastic or resin to be used to seal the ends. The ends are to be watertight.

A nylon rope shall be used to carry the dead weight of the anode and shall be used for placing and removing the anode from the water. The nylon rope must be specifically designed for use in a marine environment. It shall be double braided with premium high tenacity nylon fibers which conform to MIL-R-24050E.

The anode shall be mounted with a stainless steel 316 mounting bracket, stainless steel 316 bolt chain shackle, and stainless steel 316 thimble. The anode connection assembly shall have provision to allow it to be disconnected and removed for maintenance. In the future the anodes may also have to be disconnected and removed when additional SSP's are to be installed.

### 2.17.12.3.2 Rectifier

A rectifier specifically designed for use in cathodic protection systems with the required number of independent circuits shall be installed inside the Pontoons. All Pontoons with the exception of Pontoons A and W shall have a minimum of three circuits in the rectifier. Two rectifiers, each with a minimum of five circuits, shall be installed in Pontoons A and W. The required number of circuits shall be determined by the Design-Builder. Each circuit shall be independently controlled and monitored. Each circuit shall meet the following:

1. Control Type: Constant Voltage and/or constant current constrained by a maximum instant-off potential.
2. Maximum Output Voltage: 100 V or as needed
3. Maximum Output Current: 30 A.
4. Input: The AC input shall be 115 VAC – single phase- 60 cycles. The overall efficiency shall exceed 65%.
5. Output Control: +/- 5% of the set voltage or current over entire load range.
6. Output Waveform: Full wave
7. Cooling Type: Air cooled
8. Rectifying Element: The rectifying element shall be a silicon bridge module. Its current rating for continuous operation shall be for 50 degrees C ambient and the PRV rating of the diodes shall be at least 1200 PIV. The heat sink will be sized to keep module temperature below 100-deg. C. The modules shall be protected against high voltage surges with a Metal Oxide Varistors (MOV's). Silicon stack rectifying element shall not be allowed as they can pose a health hazard when they fail in an enclosed space.
9. Transformer: The transformer shall be specifically designed for use in a cathodic protection rectifier, having separate primary and secondary copper windings. Wire size on both windings is to be based on a minimum of 1,000 circular mils per ampere. The material used in the core of the transformers shall be of such quality that core losses do not exceed 0.62 watts per pound.
10. Tap Settings: To have a minimum of 4 course and 5 fine settings allowing for a minimum of 20 equal steps of adjustment. Tap changing studs shall be a minimum of 5/16" diameter.

11. Shunts: Each circuit shall have a DC shunt readily accessible for accuracy checks. They shall be plainly marked and mounted on the rectifier panel. The shunts shall be placed in the negative circuits. The shunt shall be rated at 50 mV and 120 percent of circuit current (maximum), and have uninsulated ring tongue terminals, positioned for easy connection of test equipment or meters, fastened to the calibrated test points.

12. Terminal Strips: A 600 volt AC input terminal block with "dead front" shall be located on the insulated control panel for connection of the input AC wiring. Additionally, solderless, compression lugs, spaced a minimum of 2 inch apart, sized to accommodate up to #6 AWG wire, shall be provided for the positive and negative output terminals of each circuit of the rectifier and mounted on the control panel. Binding posts, suitable for attaching No. 10 AWG wire, shall be provided for each zone to accommodate four reference electrodes and structure test leads. Test jacks shall be provided to enable external monitoring of each voltage, current, or potential reading being taken. All terminals shall be clearly identified on the panel.

13. Each rectifier will be equipped with mercury solenoid relay to interrupt the secondary side of the AC of each circuit. The solenoid shall interrupt the AC input to all circuits in the rectifier. If individual transformers are used for each circuit, a solenoid relay shall be provided on the secondary side of each AC circuit. The solenoid(s) shall interrupt all circuits simultaneously. The solenoid(s) shall be used to interrupt the rectifier for instant-off potential measurements.

14. Binding posts shall be provided for the measurement of output voltage and current from each circuit. These binding posts shall also be used to connect to the monitoring cards located in the PLC Panel. All terminals shall be clearly identified on the panel. Requisite number of binding posts shall be provided for the solenoid relay signal input and connection to the output card in the PLC Control Panel. In zones, where reference cells are to be installed, binding posts for monitoring the potential of the reference cells shall also be provided.

The rectifier enclosure shall be NEMA Type 3R and shall be:

1. The enclosure shall be constructed using 11 gauge hot dipped galvanized case with front and side opening doors. All fabrication welds shall be clean and smooth.

2. Dimensions for the enclosures shall be as follows:

   a. Two circuit enclosures: 22 (width) x 21(depth) x 24 (height) inches.

   b. Four circuit enclosures: 28 (width) x 22 (depth) x 23 (height) inches unless a larger dimension is required to accommodate the requisite number of circuits.

3. The enclosure shall have provisions for locking

4. Entries for wiring shall be located in the bottom of the enclosure and shall be of adequate number and size to provide for input and output connections.

5. Ventilation openings at the top and the bottom shall be screened with perforated metal with a maximum opening size of 0.1 inch.

6. A grounding lug shall be provided to accommodate a #6 wire shall be provided on the inside of the enclosure.

7. The enclosure shall be wall mounted.

One D.C. voltmeter and one D.C. ammeter shall be provided. Both meters shall be switchable to allow readings from all circuits housed in the same enclosure. The DC Meters will have a full scale accuracy of 2%. The ammeter shall be connected to the external shunts.

All wiring within the rectifier, except the meter circuits, shall be of the high temperature motor lead wire with a minimum of 105 degrees C rating. Wire size shall be based on not less than 500 circular mils per ampere. All current carrying bolts, terminals and connections made through the panel shall be either soldered to the bolt head or made by use of double nut method, so as not to depend on the compression strength of the panel to maintain a tight connection.

The entire rectifier unit shall be protected against overload and short circuit by a thermal magnetic type circuit breaker of the proper voltage rating and sized to hold 100 percent of the rated load current. The circuit breaker shall be connected between the AC supply and transformer primary. The circuit breaker shall be the manual reset type and must trip at between 110 and 125 percent of rated input current. The breaker shall be positioned and labeled to meet the requirements of NEC article 240, sections 80 through 83C. If each individual circuit is equipped with an individual transformer, then each circuit shall have its own individual AC supply protected by a properly sized fuse in addition to the breaker. A quick acting magnetic breaker rated at 120 percent of the circuit capacity shall be placed in one leg of the AC secondary of each circuit.

The enclosure shall be provided with a stamped or engraved metal nameplate with the information shown below.

1. Name of Manufacturer
2. Serial Number
3. Model Code
4. AC Input Volts
5. AC Input Amps
6. No. of Phases
7. Frequency
8. DC Output Volts
9. DC Output Amps
10. Maximum Ambient Temperature
11. Designed to Operate In Wet Environments

The unit shall be equipped with properly sized AC and DC lightning protection. Each controlled output, as well, as every input to the rectifier shall be protected against voltage surges, using properly sized surge suppressers. Metal oxide varistors (MOVS) used to protect the AC input and DC output shall be rated at 500 joules and have a voltage rating which provides adequate protection to the internal circuitry.

### 2.17.12.3.3 Remote Monitoring Unit

A PLC based remote monitoring unit shall be provided to monitor every cathodic protection zone on the entire floating structure. This system shall be capable of monitoring output voltages and currents, reference electrode potentials, and interrupting the output of rectifiers for user defined lengths of time for measurement of "instant-off" potentials.

The PLC Remote Monitoring Unit shall be comprised of a Supervisory Control and Data Acquisition (SCADA) system installed in the Sheds Type I (Maintenance Sheds) and a communication, control, and user interface elements integrated in the PLC Control Panels in each Pontoon.

The Remote Monitoring system shall perform the following functions:

1. Monitor the output voltage of each circuit
2. Monitor the output current of each circuit
3. Interrupt the output of all circuits of all rectifiers for a user specified length of time.
4. Provide Alarm when voltage and current levels fall below or go above specified limits
5. Monitor reference electrode potential and provide Alarm when the reference electrode potential is outside a defined range.

#### 2.17.12.3.3.1 Equipment

A SCADA System installed in the Sheds Type I (Maintenance Sheds) shall be provided to communicate with the PLC Control Panels, acquire data, and provide a user interface to program, review, and analyze data.

Each PLC Panel in a Pontoon shall have the following:

1. One input card per circuit in the rectifier to monitor output voltage. The input card shall be capable of reading voltages in the range of 0 to 100 volts
2. One input card per circuit in the rectifier to monitor voltage drop across the shunt. It shall be capable of reading voltages in the range of 0 to 100 mV
3. Output card(s) to provide a signal to energize all solenoids in the rectifier when triggered
4. An input card(s) to monitor the reference cell potential from 0 to 4 volts in select Pontoons which will have reference cells installed for monitoring purposes

#### 2.17.12.3.3.2 Remote Monitoring Schedule Functions

1. Two different types of monitoring functions shall be provided, one for regular monitoring and one for depolarization testing. The functions shall be labeled as "Regular Monitoring" and "Depolarization Testing." Both of these functions shall be programmable in the SCADA and shall be initiated from SCADA.
2. The Regular Monitoring schedule will measure the voltage, current, and reference cell "on" and/or "instant-off" potential. The user shall have the ability to select which measurements will be made during Regular Monitoring. The interval for measurement shall be user definable in hours, days, weeks, and months. It shall have a definable start and end times. The end time shall have an option to run indefinitely. It shall have ability to pause and restart the monitoring when required.

3. The Depolarization Testing schedule will only measure the reference cell potential. The Depolarization testing shall start with a measurement of "instant-off" potential. After which a Depolarization Interrupt, described below, shall be sent to all rectifiers. During the Depolarization Interrupt the static potential of the reference cells shall be measured at user defined intervals. The measurement interval during the Depolarization Interrupt shall be definable in minutes and hours. It shall have definable start and end times and the ability to pause and restart the monitoring when required.
4. The pause and re-start functionality for both schedules shall be available at each PLC Control Panel. The pause and restart functionality shall have an option to either select all or some of the zones for the action. Each PLC Control Panel shall show the status of these two functions.
5. The SCADA user interface shall allow the user to selectively apply the Regular Monitoring and Depolarization Schedule to select cathodic protection zones. However, whenever Depolarization Testing is been performed on any zone, all zones will receive the Depolarization Interrupt and thus Regular Monitoring on any zone cannot occur during Depolarization Testing.
6. The Depolarization Testing schedule shall be applicable to all zones and not only zones with installed reference cells as depolarization testing can be performed with portable reference cells.

#### 2.17.12.3.3.3 Measurements

1. For "instant-off" measurements, all circuits in all rectifiers shall be interrupted for a user selected period of time and the reference cell potential shall be measured at an interval selected by the user. The interval selection for output interruption and measurement shall vary from 0 to 1000 milliseconds. The DC TRMS value of the reference cell shall be measured and recorded.
2. The "on" potential measurement shall measure the DC TRMS potential of the reference cell.
3. The static potential is the DC measure of the reference cell potential.

#### 2.17.12.3.3.4 SCADA Requirements

4. The scheduling interface at SCADA shall allow the user to program all rectifiers simultaneously or to perform the scheduling for select rectifiers only.
5. The scheduling interface at each PLC control panel in a Pontoon shall allow the user to program the schedule for the local rectifier.
6. The data collected from each rectifier shall be stored in a database maintained on SCADA system located in the Sheds Type I (Maintenance Sheds).
7. The SCADA system shall have a reporting function to allow the user to view the monitoring data in a tabular or graphical form for each rectifier or for all rectifiers simultaneously.
8. The SCADA system shall have an option to export all or select data to various text and spreadsheet formats.
9. The SCADA system shall have a reporting function to allow the user to view all rectifiers in the Alarm State. This report shall have links to detailed data of each alarmed rectifier.
10. The SCADA user interface shall be user friendly and allow the user all options necessary to perform regular monitoring and maintenance tasks. The user shall have the ability to remove select zones, rectifiers, or Pontoons from Regular Monitoring so that maintenance can be performed on those zones.

#### 2.17.12.3.3.5 Output Interruption Functionality

1. The following three types of output interruption shall be provided:
    a. IO Interrupt
    b. Depolarization Interrupt
    c. Power Off
2. The IO and Depolarization Interrupts shall be implemented simultaneously on all rectifiers on the structure. The Power Off Interrupt shall have an option to be implemented on all or select rectifiers.
3. The IO Interrupt will send a signal to the mercury solenoids in all rectifiers simultaneously for the user selected interval. Therefore, this interrupt shall bring the output current of all circuits to zero for the specified interval and then return it back to its previous level. This interrupt shall be implemented from SCADA and/or from any one of the PLC Control Panels. Each PLC Control Panel shall have a function to perform IO Interrupt. This interrupt will also be used by the Regular Monitoring schedule.
4. The Depolarization Interrupt shall have a start time and an end time and shall be implemented simultaneously on all rectifiers from either the SCADA or any one of the PLC Control Panel. Each PLC Control Panel shall have a function to perform the Depolarization Interrupt. This interrupt will send a signal to the mercury solenoids in all rectifiers and maintain the signal from the start time to the end time defined by the user. This interrupt will also be called by the Depolarization Testing Function. When a user triggers the Depolarization Testing Function it will in turn trigger the Depolarization Interrupt.
5. The Power Off interrupt shall have two functions, one “OFF” and one “ON”. The OFF function will send a signal to all solenoids and maintain that signal until the ON function is selected by the user. SCADA and each PLC Control Panel shall implement this function and the function shall have the option to select all or some of the rectifiers.

### 2.17.12.3.4 Reference Cells

The reference cells shall be copper-copper sulfate specifically designed for permanent installation in freshwater with a service life of 20 years. The same type of reference cell shall be furnished throughout the project. The cells catalog cuts and data history (5 years stability in freshwater) submittals shall be submitted for review and comment by WSDOT. All comments shall be addressed to the satisfaction of WSDOT before the cell shall be furnished to the project.

The reference cell shall be housed in ABS plastic high impact tube and shall be connected to a #22 AWG one conductor shielded cable with HMWPE outer insulation.

### 2.17.12.3.5 Special Wire and Cable Requirements

Anode and Structure Ground Connection Cables: Single-conductor Type HMWPE, insulated cable specifically designed for DC service in cathodic protection installations.

1. Conductor: Stranded, annealed, uncoated copper, complying with ASTM B 3 and ASTM B 8.
2. Insulation: High-molecular-weight polyethylene, complying with NEMA WC 70.
3. Connectors: Copper compression type or exothermic welds.

4. Cable splicing shall be approved by the Electrical Design Lead Engineer prior to installation.

### 2.17.12.4 EXOTHERMIC WELDING

The exothermic weld kit shall consist of a mold and powder charge of suitable size for the wire and surface of the weld. The surface of the saddle block shall be cleaned before welding. The surface and wire shall be cleaned of oil and grease with a solvent and clean cloth. The exposed copper in the wire shall be inserted in a properly sized copper sleeve and the sleeve shall be welded to the surface. The mold shall rest on the surface and securely hold the wire/sleeve in place. When ignited, the charge in the mold shall burn and result in a mechanically secure and electrically conductive weld of the wire/sleeve to the surface. The finished weld shall be cleaned of any slag. The weld and any exposed copper of the wire shall be coated with two coats of 100% solid insulating epoxy. The second coat of epoxy shall be applied after the first coat has completely cured.

Welding of reference cell ground wires and system negative wires to the saddle block shall be accomplished by a commercially available exothermic weld kit.

### 2.17.12.5 EPOXY FOR COATING WELDED CONNECTIONS, EXPOSED STEEL, AND EXPOSED COPPER

The epoxy material shall be non-conductive, 100 percent solid, and moisture and chemical resistant. The epoxy shall initially cure in 20 minutes at 70° F and cure to an ultimate compressive strength of at least 8000 psi in 24 hours at 70° F.

### 2.17.12.6 SPLICE ENCAPSULATION KIT

The splice encapsulation kit shall be a Raychem Splice Encapsulation kit or equivalent, specifically designed to provide electrical insulation on mechanical wire splices on impressed current cathodic protection system cables. The kit shall consist of a heat shrinkable sleeve internally coated with a self-encapsulating adhesive, locking channel, and wire ties. The encapsulation made by the kit shall be mechanically strong, have a dielectric constant of 300 volts and completely sealed against moisture and other contaminants.

### 2.17.12.7 GENERAL INSTALLATION REQUIREMENTS

The cathodic protection system installation shall be complete, with the exception of the anode, prior to deployment of the Pontoon at the project site.

The anode string shall be placed in the water immediately after the installation of each high strength cable.

The cathodic protection system shall be energized no later than one week after the installation of the high strength cable.

Energization of the cathodic protection system shall be performed by a NACE certified cathodic protection specialist.

Each system shall be energized at the design current listed in the project drawings and the system tested to ensure that protection criteria is met. If the protection criteria is not met, the system shall be adjusted until the protection criteria is met.

### 2.17.12.8 ASSEMBLY AND INSTALLATION OF ANODE

The pre-assembled string anodes shall be supported by the nylon ropes and hung from the shackle installed for the purpose.

Attach a thimble to end of the nylon rope which will connect to the shackle. Route the rope and anode wire through the protective hose. Apply heat shrink at both ends of the protective hose to seal it.

Attach the thimble to the shackle and lower the anode string into the water.

The free end of the string anode wire shall be routed through the wall penetration and connected to a junction box inside the Pontoon and terminated on a corresponding terminal block.

The wall penetration shall be sealed to a watertight condition.

The other end of the nylon rope shall be attached to the 5 lb weight at the end of the anode string. The nylon rope shall be secured to the anode header cable at regular interval to ensure that the nylon rope is transmitting the weight of the anode string to the shackle and minimum load is carried by the anode header cable.

### 2.17.12.9 REFERENCE CELL INSTALLATION

The Design-Builder shall design the reference cells installation zones and depths. The design shall be reviewed by WSDOT and all comments shall be resolved to the satisfaction of WSDOT prior to proceeding with construction. The reference cells shall be attached to the anchor cable such that the measuring tip is within 1 inch of the cable surface. The reference cell wire shall be routed back to the rectifier along the cable up to the Pontoon wall and then through the wall penetration for the anode connection to the rectifier. It will be fastened to the cable at regular intervals such that relative movement between the anchor cable and the reference cell wire is possible.

### 2.17.12.10 RECTIFIER INSTALLATION

The rectifier shall be wall mounted with bolts at the required locations.

Concrete inserts for the wall mounting shall be provided to the Pontoon manufacturer to be cast in place.

### 2.17.12.11 GROUNDING

The rectifier shall be to the grounding system in accordance with local and electrical codes.

### 2.17.12.12 SPLICING CATHODIC PROTECTION WIRES

When splicing is necessary mechanical splicing of cathodic protection wires shall be permitted in junction boxes. The splice shall be encased in an encapsulation kit.

### 2.17.12.13 STRUCTURE GROUND CONNECTION

Two structure grounds shall be installed for each anchor cable on the respective saddle block by exothermic welding.

The two grounds shall be routed through the junction box to the rectifier. One ground shall be connected to the rectifier output and the other shall be used for measuring potentials.

The supplied Pontoons shall have grounding plates installed. One of which can be used for the reinforcing steel zone. The rest shall be used for stray current mitigation.

## 2.17.13 STRAY CURRENT MONITORING

A monitoring system to monitor stray current will be provided. The system shall provide an alarm if the magnitude of the stray current exceeds defined levels in the reinforcement of the Pontoon.

## 2.17.14 GROUNDING AND BONDING

The Design-Builder shall design and provide a complete grounding and bonding system for the WCB, floating bridge and landings, and Bridge Maintenance Facility and Dock. All wire and cable shall be in accordance with Standard Specification Section 8-20.3(9) as supplemented in this section.

The Design-Builder shall design the east side (Puget Sound Energy) service grounding and bonding to the equipment and structure from the Bridge Maintenance Facility and Dock through the floating bridge and east approach up to the West Transition Span.

The Design-Builder review and integrate the design of the west side (Seattle Power and Light) service and WCB. The design shall augment the grounding and bonding performed on the WCB as required. This Work shall be performed from the connection bridge up to Pier 36.

The Design-Builder shall be fully responsible for designing the connections between the east and west side service grounding and bonding systems that will occur at the transition span. The connections shall prevent any stray current or ground imbalance from either service from damaging the structure, creating an unsafe condition, interfering with the electrical system, or interfering with the Cathodic Protection System and Stray Current Mitigation System.

The grounding and bonding shall integrate the requirements of the Sound Transit Link Light Rail such that the grounding and bonding system shall allow rail installation on the structure without any additional bonding and grounding work.

### 2.17.14.1 GROUNDING

The system shall be solidly grounded with a dedicated ground wire all metallic enclosures, raceways, and electrical equipment. The Design-Builder shall design the grounding system located at the Bridge Maintenance Facility, in accordance with the requirements of the National Electric Code, Article 250 and electrical utility. Expand the ground system as required to achieve the correct ground resistance. This ground connection shall maintain a resistance to ground of 25 ohms in accordance with the NEC. Equipment ground conductors shall be provided in each raceway, conduit, and flexible cable or cord. The Design-Builder shall design the grounding system throughout the Pontoons and Sheds (Type I, II, and III). No equipment ground conductors shall be smaller than #12 AWG.

Ground system conductors shall be continuous unspliced connections between welds and terminal lugs. Paint, rust, and scale shall be removed over the entire contact area. All connections shall be made up as tightly as possible, and any bare metal or paint

undercoat remaining exposed shall be spot painted to restore the surface with the same coating and number of coats as applied to the adjacent metal.

Ground all equipment in accordance with the manufacturer's recommendations and NEC Section 250 requirements. Care shall be taken to ground the transformers neutrals in accordance with the NEC Section 250 and the Utility requirements.

All control enclosures, limit switches, conduits, boxes, and all other metal parts in the proximity of current carrying conductors or equipment installed on the bridge shall be bonded and solidly connected together via equipment ground conductors and connected to the existing grounding electrode conductor.

### 2.17.14.2 CONNECTION TO THE GROUND BUS

Furnish and install connections in accordance with the codes; including but not limited to conduit system, electrically operated equipment and devices. Neutral conductor and ground conductor shall be separate in all equipment and shall be bonded at service panel only.

### 2.17.14.3 CONNECTION TO THE GROUND ROD, PLATES, OR GRID

Furnish and install ground plates and connection in all new Supplemental Stability Pontoons supplied as part of the Work. Furnish and install connections in accordance with the codes. All cable routed to the ground rods, plates, or grid shall be bonded with code compliant methods. All bonding shall be made by molded fusion exothermic welds, unless specified otherwise. Exothermic welds for bonding of equipment shall be molded fusion type, with molds as required. Where physical limitations prevent exothermic welding, mechanical solderless bonding lugs shall be installed.

### 2.17.14.4 BONDING

All steel, including structural steel, reinforcing and post tensioning steel in the approach spans, transition spans and Pontoons shall be bonded unless otherwise indicated.

All exposed embedments and their anchor bolts shall be electrically isolated from reinforcing steel, both conventional and prestressed, and other metallic embedments that are required to be electrically continuous with the reinforcing steel. The minimum distance between all such exposed embedments and the reinforcing steel shall be 1½ inches for cast in place and 2" for drilled-in embedments. Cast-in-anchor bolts and other embedments shall be held in place with external steel jigs and template system. Prior to drilling holes for resin-bonded anchors, the embedded wall reinforcement shall be located to ensure that the drilled holes provide the specified clearance.

All reinforcing steel, both conventional and prestressed, shall form one continuous electrical system. Wire tying of reinforcement will not be acceptable for establishing electrical continuity. In each rebar mat, one bar in each direction shall be welded to all bars in the other direction. Rebar splices shall be welded as necessary to ensure electrical continuity of all reinforcing steel and post-tensioning systems. All mats in the walls and slabs shall be welded to each other to form one continuous electrical system. At all intersections of walls and/or slabs, the reinforcement in both elements shall be made continuous to each other by welding two reinforcing bars in each element to two reinforcing bars in the other element.

All isolated steel reinforcing bars, such as post-tensioning bursting reinforcement and other secondary reinforcing bars, shall be bonded as necessary to provide electrical

continuity through adjacent transverse and longitudinal steel reinforcing bars as required. Post-tensioning tendon anchorages and metal ducts shall be bonded as necessary to provide electrical continuity through adjacent transverse and longitudinal steel reinforcing bars as required.

Bonding shall be made by fillet welds per AWS D 1.4 or molded fusion exothermic welds. Fillet welds shall be 1" long. Exothermic welds shall be molded fusion type, with molds as required. Where physical limitations prevent exothermic welding, NEC approved pressure crimps shall be installed.

The post-tensioning tendon anchorages and metal ducts, and steel work, except for the Pontoon railing, anchor cables, saddles and supports shall be bonded as necessary to provide electrical continuity through adjacent transverse and longitudinal steel reinforcing bars using at a minimum No. 2/0 AWG bare, stranded, tinned copper cable. The anchor cables, saddles and supports shall be connected to the cathode of the rectifiers and this shall control their grounding situation to minimize the cathodic protection.

All embedments for columns of the Elevated Structure installed in the Pontoon and the frames on the end walls for securing the Pontoons together shall be made continuous with the reinforcing steel.

Provide a fully enclosed connection to the fully bonded rebar in each Pontoon.

Provide a bonding conductor(s) for the entire length of each approach bridge and the floating bridge sized for the connected equipment and the Future Six-Lane Plus Two HCT Configuration LRT stray current loading. Provide survey and calculations to verify the bonding conductor's conductivity is greater than any other path to ground.

All metallic components of the Pontoon anchor assembly, including the hawse pipe in each Pontoon, shall be electrically isolated from the electrically continuous reinforcing steel in the walls and the slabs of the Pontoon. The isolation shall be accomplished by using non-conductive membranes between the metallic components and the reinforced concrete elements supporting them by encapsulating the metallic embedments in the supporting reinforced concrete elements in non-conductive epoxy or resin. The isolation of the anchor assembly shall be field-verified by performing the continuity testing using the current method described below. A 12-Volt minimum power source shall be utilized to provide the current for the isolation testing. The resistance between the anchor assembly and the electrically continuous reinforcement shall be in excess of 10 ohms.

The Design-Builder shall provide two external connectors located along gridline 4L as shown in the Pontoon Minimum Technical Requirements (Appendix M22). These connectors shall be bonded to the reinforcing steel and shall be located on the inner surface of the exterior wall. These connectors shall be used to provide a mechanism to connect the reinforcing steel to the grounding system. The grounding system shall be as described in Section 2.17.

Each steel reinforcing bar cage and all steel reinforcing bar mats shall be checked for electrical continuity prior to concrete placement to allow for corrections as necessary. Electrical continuity testing shall be performed by applying a current between the two elements or points to be tested and then measuring the voltage drop due to the current between those two elements or points. The measured resistance between the two points must be less than 0.1 ohms. . For a segment, acceptable resistance shall be no more than 1.10 times the theoretical resistance of the longitudinal reinforcing bar and all copper bonding cables within that segment. The two-point resistance test method shall be used with standard cathodic protection equipment for testing continuity or resistance.

The Design-Builder shall develop a plan for implementation and testing of electrical continuity to coordinate with construction activities. Continuity testers common to the electrical trades will not be permissible for continuity testing on the reinforcing steel. Non-permissible equipment in this category includes, but is not limited to, the following:

- DC Ohmmeter
- Diode Tester
- Continuity Test Light

#### 2.17.14.5 CONNECTION TO THE REBAR

Furnish and install a connection from the connection plate at the wall surface that is bonded to the rebar on the abutting areas of the Pontoons. The connection plate shall be bonded to the connection bolt between Pontoons. This shall serve to bond the Pontoons contiguously to one another and these connections are to be used as test stations to monitor stray currents.

Provide a connection plate bonded to the rebar adjacent to each Cathodic Protection Panel location.

### 2.17.15 ELECTRICAL INCOMING SERVICE, GENERATOR, AND AUTOMATIC TRANSFER SWITCH EQUIPMENT

The Design-Builder shall design and furnish a complete medium voltage power distribution system for the Bridge, Bridge Maintenance Facility, and Dock. The system shall consist of:

- A medium voltage service and medium voltage distribution panel at the Bridge Maintenance Facility upper parking level.
- A medium voltage step down transformer and 480V power distribution panel located at the Bridge Maintenance Facility and at a minimum of four locations along the bridge on the Pontoon decks.
- A medium voltage generator and fully rated automatic transfer switch(ATS)

The design criteria shall be to minimize the voltage drop and power loss of the electrical power distribution along the bridge by providing a medium voltage service and power distribution. No power feeder on the project shall be larger than 500kcmil per phase, and no more than one 500kcmil conductors per phase. The medium voltage shall be stepped down to 480V to supply power to the Bridge Maintenance Facility at the service point, and shall be stepped down to 480V to supply power to individual Pontoons, Sheds (Type I, II, and III), and ITS equipment. The Design-Builder shall verify all locations and voltage drops in the power distribution system.

In the event of a power loss, the generator shall be fully rated to power the entire bridge and the ATS shall safely isolate the bridge from the service while the generator is being used to power the bridge. The ATS shall be configured to not retransfer to normal utility service until it has been restored for 20 minutes without interruption.

The Design-Builder shall coordinate the diesel generator selection with the Bridge Maintenance Facility diesel tank and piping system as required in Section 2.30.

All equipment shall be either installed in a building that meets code requirements for safe access or in a factory provided weather proof enclosure. The Design-Builder shall

determine the best approach to resolve this issue. It is acceptable that a building room on the Mechanical Level of the Bridge Maintenance Facility is provided for the medium voltage equipment. The generator shall be provided in a proofweatherproof enclosure or room in the parking level.

Provide leveling concrete pad and connection to inserts in the floor. Refer to Section 2.12 for the boundary conditions in the plans and the wind/wave analysis. If the medium voltage equipment and superstructure located on the Pontoons fall outside the boundary conditions for weight, sail area, and center of gravity, an updated wind/wave analysis will need to be performed. All required enclosures, buildings, access, fences, safety equipment, etc. shall be provided as a part of this section.

The service shall be sized to properly power all loads on the floating bridge and landings, roadway equipment, and Bridge Maintenance Facility and Dock. Refer to Sections 2.16, 2.18, and 2.32 for the loading of those systems. The electrical system loadings shall assume the worst case emergency, a night time operation that requires full pumping in one Pontoon and work in all other Pontoons, consisting of:

- All eight portable pumps shall operate on any one Pontoon at a time.
- All Pontoon, navigation, flood, and under deck lights are energized.
- All Pontoon receptacles are 20% loaded.
- All control and CCTV loads are fully energized.
- The system shall be sized for all Future Six-Lane Plus Two HCT Configuration Pontoon SSPs not provided as part of this Project and a spare 20% capacity.
- Both jib cranes on the Pontoons are operating.
- All Shed equipment is in service.
- The Bridge Maintenance Facility is fully loaded, both jib cranes/hoists, overhead crane, both elevators, and all control loads are fully energized. All lights and receptacles are energized.
- Include worst case loading for the HVAC, roadway illumination, ATM signs, CCTV, etc. Sections 2.16 and 2.18 provide guidance for their loading and spare capacity requirements.
- Include the worst case loading that one of each pair of 300hp Bridge Fire Protection pumps, for a total of two 300hp pump motors, are energized. One control valve per Bridge Fire Protection pumps shall operate at a time to select the direction of the flow.

The equipment shall comply with the following standards:

- ANSI/IEEE C37.20.2 - Standard for Metal-Clad Switchgear.
- ANSI/IEEE C37.04 and .06 - Standard ratings and preferred ratings for Indoor AC Medium-Voltage Circuit Breakers used in Metal-Clad Switchgear.
- ANSI/IEEE C37.11 - Requirements for electrical control for AC High-Voltage Circuit Breakers rated on a symmetrical current basis or a total current basis.
- ANSI/IEEE C37.09 - Standard Design and Production Testing.
- ANSI Z55.1 - Gray Finishes for Industrial Apparatus and Equipment.

- ANSI/IEEE C57.13 - Requirements for Instrument Transformers.
- NEMA SG4 - Alternating Current High Voltage Circuit Breakers.
- NEMA SG5 - Power Switchgear Assemblies.

### 2.17.15.1 INCOMING SERVICE

The Design-Builder shall be fully responsible for designing and sizing the equipment, and securing all Work with the electrical service provided. The Design-Builder shall meet all electrical service requirements, codes, and requests for the installation. The Design-Builder shall provide all metering equipment and meet all metering requirements from the electrical service. The Design-Builder shall perform utility coordination with the power company.

All electrical service Work shall be coordinated with the technical requirements in Sections 2.16 and 2.18.

The Design-Builder shall design the east side (Puget Sound Energy) service for the equipment and structure from the Bridge Maintenance Facility and Dock through the floating bridge and east approach up to the West Transition Span.

The Design-Builder shall be fully responsible for designing the services, their associated equipment, and all electrical service requirements. The Design-Builder shall coordinate and prepare all service agreement documents required for the temporary services and new permanent services. The Design-Builder shall provide all documentation and agreements to WSDOT for review and comment. Once all comments have been resolved the Design-Builder shall submit the service agreement documentation to WSDOT. The Design-Builder shall meet with WSDOT and the service providers to get final approval and agreements completed. All work required to complete the service agreements and meet the requirements of the service providers shall be provided.

### 2.17.15.2 MEDIUM VOLTAGE EQUIPMENT

The Design-Builder shall provide the final design and construction of a complete medium voltage power distribution system for the floating bridge and Bridge Maintenance Facility. Final design and construction shall conform to NFPA 70 (National Electrical Code) and industry standards listed below. The system shall be composed of a free standing 12.47 kV metal-clad switchgear assembly with vacuum circuit breakers located at the Bridge Maintenance Facility.

The selected manufacturer shall be a company specializing in medium voltage metal-clad switchgear with at least five years documented experience. The manufacturer of the switchgear must be the same as the manufacturer of the circuit breakers.

The metal-clad switchgear containing circuit breakers and all necessary accessory components shall be factory assembled (except for necessary shipping splits) and operationally checked prior to shipping. The assembly shall be a self-supporting and floor mounted on a level concrete pad. The integrated switchgear assembly shall withstand the effects of closing, carrying and interrupting currents up to the assigned maximum short circuit rating.

The equipment ratings shall be as follows:

- System Voltage: 12.47 kV nominal, three-phase, solidly grounded, 60 Hz.
- Maximum Design Voltage: 15.0 kV

- Impulse Withstand (Basic Impulse Level): Minimum 60 kV.
- Power Frequency Withstand: 19 kV, 1 minute test.
- Main Bus Ampacity: 1200 amps, continuous.
- Momentary Current Ratings: Equal to the circuit breaker close and latch rating.

Each switchgear compartment shall be assembled to form a rigid self-supporting completely enclosed structure providing steel barriers between sections. The sections shall be divided by metal barriers into the following separate compartments: circuit breaker, instrument, main bus, auxiliary device and cable. Each feeder section may have up to two circuit breaker compartments.

1. Each circuit breaker compartment shall be designed to house a horizontal drawout metal-clad vacuum circuit breaker. The stationary primary disconnecting contacts are to be silver-plated copper and mounted within porcelain support bushings. The movable contacts and springs shall be mounted on the circuit breaker element for ease of inspection/maintenance.

2. Entrance to the stationary primary disconnecting contacts shall be automatically covered by metal shutters when the circuit breaker is withdrawn from the connected position to the test or disconnected position or removed from the circuit breaker compartment. Extend a ground bus into the circuit breaker compartment to automatically ground the breaker frame with high-current spring type grounding contacts located on the breaker chassis when in the test and connected positions. Guide rails for positioning the circuit breaker and all other necessary hardware are to be an integral part of the circuit breaker compartment. Blocking devices shall interlock breaker frame sizes to prevent installation of a lower ampere rating or interrupting capacity element into a compartment designed for one of a higher rating. It shall be possible with indoor or outdoor walk-in switchgear to install a circuit breaker into a bottom compartment without use of a transport truck or lift device.

Compression type cable lugs shall be furnished for all cable compartment and ground bus connections. The ground bus shall extend through this compartment for the full length of the switchgear. Auxiliary bus, if needed, and load bus support NEMA Class A-20 standoff insulators shall be epoxy.

The main bus is to be fully insulated for its entire length with an epoxy coating by the fluidized bed process. The conductors are to be silver-plated copper and be of a bolted design. Access to this compartment is gained from the front or rear of the structure by removing a steel barrier. Provide standard provisions for future extension, as applicable.

Relays, meters, control switches, etc., shall be mounted on a formed front-hinged panel for each circuit breaker compartment.

The circuit breakers shall be rated 12470 nominal volts, 15000 maximum volts, 60 Hz, with a continuous current rating and a maximum symmetrical interrupting rating as determined by the Design-Builder. Furnish Type VR circuit breakers with one vacuum interrupter per phase. Breakers of same type and rating shall be completely interchangeable. The circuit breaker shall be operated by means of a stored energy mechanism which is normally charged by a universal motor but can also be charged by the manual handle supplied on each VR breaker for manual emergency closing or

testing. The closing speed of the moving contacts is to be independent of both the control voltage and the operator. Provide a full front shield on the breaker. Secondary control circuits shall be connected automatically with a self-aligning, self-engaging plug and receptacle arrangement when the circuit breaker is racked into the connected position. Provision shall be made for secondary control plug to be manually connected in test position. A minimum of 4 auxiliary contacts (2a 2b), shall be provided for external use. Provisions shall be made for 10 additional cell-mounted auxiliary contacts both MOC and TOC type for external use. The racking mechanism to move the breaker between positions shall be operable with the front door closed and position indication shall be visible with door closed.

An interlocking system shall be provided to prevent racking a closed circuit breaker to or from any position. An additional interlock shall automatically discharge the stored-energy operating mechanism springs upon removal of the breaker out of the compartment.

The circuit breaker control voltage shall be: 120 volts ac - provide one capacitor trip unit for each circuit breaker when ac control power is required.

- The following accessories shall be provided:
- Current transformers: Each breaker compartment shall have provision for front-accessible mounting of up to four current transformers per phase* (ANSI standard relay accuracy), two on bus side and two on cable side of circuit breaker. The current transformer assembly shall be insulated for the full voltage rating of the switchgear. The current transformers wiring shall be Type SIS #12 AWG. Relaying and metering accuracy shall conform to ANSI Standards.
- Voltage transformers are drawout mounted with primary current-limiting fuses. The transformers shall have mechanical rating equal to the momentary rating of the circuit breakers and shall have metering accuracy per ANSI Standards.
- The switchgear shall be wired with type SIS #14 AWG, except where larger size wire is required. The switchgear shall be provided with terminal blocks for outgoing control connections. Wire markers shall be provided for each end of all control wires.
- Protective Relays: Provide relays as required for each circuit breaker.
- Ammeters: ANSI C39.1; indicating ammeter with 4.5 in square recessed case and 250° scale, white dial with black figures and pointer, 5 amp, 60 Hz movement, 1% accuracy.
- Voltmeters: ANSI C39.1; indicating voltmeter with 4.5 in square recessed case and 250° scale, white dial with black figures and pointer, 120 volt, 60 Hz movement, 1% accuracy.
- Ammeter Transfer Switch: Rotary multistage type with 600 volt ac-dc silver plated contacts, engraved escutcheon plate, pistol-grip handle and four positions including OFF.
- Voltmeter Transfer Switch: Rotary multistage type with 600 volt ac-dc silver plated contacts, engraved escutcheon plate, pistol-grip handle, and four positions including OFF.
- Watt-hour Meters and Wattmeters: ANSI/IEEE C12.1; three-phase induction type with 3 stators, each with current and potential coil, rated 5 amp and 120

volts at 60 Hz. Meter suitable for connection to 3 wire circuits. Include potential indicating lamps; adjustments for light and full load, phase balance, and power factor; four-dial clock register; removable meter with draw-out test plug; semi-flush mounted case with matching cover, integral demand indicator.

With each circuit breaker, provide a power circuit monitor with digital display multi-function microprocessor-based metering/data acquisition device. Also, provide a tripped indication input to the PLC system for each circuit breaker.

Each equipment bay shall be a separately constructed cubicle assembled to form a rigid freestanding unit. Minimum sheet metal thickness shall be 11 gauge steel on all exterior surfaces. Adjacent bays shall be securely bolted together to form an integrated rigid structure. The rear covers shall be removable to assist installation and maintenance of bus and cables. Each individual unit shall be braced to prevent distortion.

The metal-clad switchgear shall be fully assembled, inspected and tested at the factory prior to shipment.

All steel parts, except galvanized (if used), shall be cleaned and a zinc-phosphate (outdoor equipment) or iron phosphate (indoor equipment) pre-treatment applied prior to paint application.

Install in accordance with manufacturer's instructions, applicable requirements of the NEC and in accordance with recognized industry practices.

Install cables, as provided by the switchgear manufacturer, to connect the primary surge arresters.

Bending of high-voltage cables shall be avoided or minimized. All necessary bends shall meet at least the minimum radii specified by the cable manufacturer.

### 2.17.15.3 MEDIUM VOLTAGE UNIT SUBSTATIONS

The Design-Builder shall design and construct unit substations located on the bridge Pontoon decks, the final quantity and locations to be determined by the Design-Builder. Final design and construction shall conform to NFPA 70 (National Electrical Code) and industry standards listed below. Each unit substation shall combine a primary switch, dry-type transformer (12.47 kV - 480V), and 480 volt distribution section into a single compact unit with components close coupled.

The equipment shall comply with the following standards:

- IEEE C57.12.01 - Standard General Requirements for Dry-Type Distribution and Power Transformers Including Those with Solid Cast and/or Resin-Encapsulated Windings
- ANSI C57.12.28 - Switchgear and Transformers, Pad-Mounted Equipment - Enclosure Integrity
- ANSI C57.12.50 - Requirements for Ventilated Dry-Type Distribution Transformers, 1-500 kVA Single-Phase and 15-500 kVA Three-Phase, with High Voltage 601-34,500 Volts, Low Voltage 120-600 Volts
- ANSI C57.12.51 - Requirements for Ventilated Dry-Type Power Transformers, 501 kVA and Larger Three-Phase, with High Voltage 601-34,500 Volts, Low Voltage 208Y/120-4160 Volts

- ANSI C57.12.55 - Conformance Standard for Transformers - Dry-Type Transformers Used in Unit Installations, Including Unit Substations
- IEEE C57.12.56 - Standard Test Procedure for Thermal Evaluation of Insulation Systems for Ventilated Dry-Type Power and Distribution Transformers
- IEEE C57.12.58 - Guide for Conducting a Transient Voltage Analysis of a Dry-Type Transformer Coil
- IEEE C57.12.59 - Guide for Dry-Type Transformer Through-Fault Current Duration
- IEEE C57.12.70 - Terminal Markings and Connections for Distribution and Power Transformers
- IEEE C57.12.80 - Standard Terminology for Power and Distribution Transformers
- IEEE C57.12.91 - Test Code for Dry-Type Distribution and Power Transformers
- IEEE C57.94 - Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type General Purpose Distribution and Power Transformers
- IEEE C57.96 - Guide for Loading Dry-Type Distribution and Power Transformers (ANSI).
- IEEE C57.105 - Guide for Application of Transformer Connections in Three-Phase Distribution Systems
- IEEE C57.124 - Recommended Practice for the Detection of Partial Discharges and the Measurement of Apparent Charge in Dry-Type Transformers
- CSA-C88 - Power Transformers and Reactors

The selected manufacturer shall be a company specializing in distribution transformers and substation equipment with at least five years documented experience. The substation shall be provided as a complete unit and all components shall be from the same manufacturer.

The transformers shall be the unit substation type with side-mounted primary and side-mounted secondary terminations.

Primary terminations shall be designed for close coupling to a metal enclosed air load break switch section. Secondary terminations shall be designed for close coupling to a switchboard section.

Orientation shall be primary on the left when facing the transformer front.

The transformers shall be rated as required. Primary voltage 12.47 kV wye, Secondary voltage 480 volts wye, 3-wire, 60 Hz with two 2-1/2% full capacity above normal and two 2-1/2% full capacity below normal primary taps. The Design-Builder shall design the transformer windings for step-down functionality. Impedance shall be manufacturer's standard impedance, ±7-1/2%. All transformers shall have an average temperature rise of 150° C above a 40° C maximum, 30° C average ambient.

The basic impulse levels (BIL) shall be a minimum of 60 kV for the 15 kV class.

The coils shall be wound with copper conductors.

All insulating materials are to be in accordance with IEEE Standard C57.12.01 for 220° C UL insulation system.

All cores to be constructed of high grade, grain-oriented, non-aging silicon steel with high magnetic permeability, and low hysteresis and eddy current losses. Magnetic flux densities are to be kept well below the saturation point. Core laminations shall be step-lap miter cut at the core corners to reduce hot spots, core loss, excitation current, and sound level.

The transformer enclosures shall be ventilated and fabricated of heavy gauge, sheet steel construction. Enclosures are to be provided with lifting provisions on the base structure and shall have jacking pads designed to be flush with the enclosure. The base is to be constructed of steel members to permit skidding or rolling in any direction. Rubber vibration isolation pads shall be installed by the manufacturer between the core and coil and the enclosure.

Transformer sound levels shall be warranted by the manufacturer not to exceed the values specified in IEEE Std. C57.12.01.

Metal-oxide, gapless-type distribution class lightning arresters shall be installed by the manufacturer on the high voltage side of the transformer to provide additional protection against high voltage lightning or switching surges.

Provide all monitoring as input to the PLC to safely monitor the unit substations.

Fan cooling equipment shall include 3-phase electronic winding temperature monitor controlled automatically by a Type K thermocouples placed in the low voltage air duct. The temperature monitor must contain yellow and red indicating lights. The yellow lamp indicates fan power, while the red lamp signals that alarm and trip contacts have been activated. A 0-1 milliampere output is required for remote indication. Alarm contacts shall be provided for fans, alarm, and trip function. An audible alarm must sound when the highest phase temperature exceeds a preset point. The fans must be able to operate in either manual or automatic mode. Minimum six fans shall be provided. Forced air cooling system shall include: fans, control wiring, controller with test switch, current limiting fused in the power supply to the controller, indications lights, alarm silencing relay, auto/manual switch, and necessary accessories to properly control the system.

Install in accordance with manufacturer's instructions, applicable requirements of the NEC and in accordance with recognized industry practices.

Install safety labels to NEMA 260.

Perform start-up tests in accordance with manufacturer's instruction manual.

Touch-up paint all chips and scratches with manufacturer-supplied paint and leave remaining paint with owner.

### 2.17.15.4 MEDIUM VOLTAGE GENERATOR AND ATS

The medium voltage generator and ATS shall be fully rated to provide emergency power to the entire bridge and Bridge Maintenance Facility at the service voltage of 12.47kV. The generator and the ATS shall be supplied by the same manufacturer. The generator shall be provided a load bank for maintenance and cool down. The generator shall be designed to accommodate the large transformer in-rush current and damage curves. The Design-Builder shall coordinate the in-rush requirements with the generator and provide staging as required for a stable and consistent transfer to generator power.

The Design-Builder shall provide all air intake louvers and controls for the generator. The system shall be integrated such that the generator automatically operates any louvers or air in-take equipment when started. The generator exhaust shall be routed through the roadway median. This shall be coordinated with the generator enclosure and location. Refer to Section 2.30 for local noise codes and requirements. The Design-Builder shall design the enclosure such that the noise when any equipment is operating in accordance with the City of Medina requirements.

The generator shall:

- Operate at 60 Hz.
- Be UL listed; meet NFPA 110, Level 1; comply with ISO 8528-5, Class G3.
- Meet Environmental Protection Agency (EPA) to conform to Tier 2 nonroad emissions regulations.
- The alternator shall be a pilot-excited, permanent magnet (PM) alternator.
- Provides superior short-circuit capability.
- Have brushless, rotating-field alternator has broad range reconnectability.
- Be direct-mounted to the skid.
- Have electronic engine controls manage the engine, and display alarms.
- The generator shall be provided an outdoor weather proof enclosure and sound mitigating equipment to keep the generator noise level at or below the City of Medina legal requirements. Provide a complete exhaust system to provide the noise level and comply with environmental air quality requirements of the EPA CI NSPS standard
- The generator and ATS shall provide a full suite of operating data to the PLC, either by direct Ethernet communication or discrete inputs to PLC cards.
- Be equipped with heaters and batteries.
- The generator and ATS shall automatically test the generator and transfer it to the bridge load as part of its maintenance program.
- The generator shall be provided a day tank to provide at a minimum of four hours operation.

In accordance with Washington State Executive direction, the Design-Builder shall design and furnish a generator that can operate on a bio-diesel to diesel percentage of 20% to 40%. The Design-Builder shall work with the generator manufacturer to determine the safe level of bio-diesel, if any, and requirements for bio-diesel storage.

## 2.17.16 BRIDGE POWER DISTRIBUTION EQUIPMENT

The Design-Builder shall design and furnish in each Pontoon the equipment to safely step down the 480VAC distribution voltage and distribute the power the equipment. The Design-Builder shall assume the worst case loading and conditions used to size the incoming service when sizing the equipment.

## 2.17.16.1 CIRCUIT BREAKER DISCONNECT SWITCHES

The Design-Builder shall design and furnish one circuit breaker disconnect switch for each transformer. The Design-Builder shall coordinate the transformer in-rush requirements and damage curves and upstream protection.

All breakers shall have quick-make, quick-break contacts and the mechanism shall be trip-free and trip indicating. Frame sizes shall be not less than 100 amperes. The breakers shall be equipped with thermal-magnetic trips. Molded case circuit breakers shall meet the requirements of NEMA Standard AB1, latest revision.

The switches shall be rated in accordance with the NEC for the transformer they protect and disconnect. Each switch shall be 3 phase circuit breaker switches in watertight and dust-tight NEMA-4X, 316 stainless steel enclosures with a lockable handle. The Design-Builder shall perform short circuit analysis to determine the short circuit current interrupting rating. The Design-Builder shall size the circuit breaker for the current connect loading and shall rate circuit breaker frame for the Future Six-Lane Plus Two HCT Configuration loading.

The disconnect switch operating handle shall be an integral part of the box, not the cover. Switches shall have a dual cover interlock to prevent opening the of the switch door while in the 'on' position or placing the switch in the 'on' position while the door is open. The door interlock shall include a bypass method and the switch shall be pad lockable in the 'off' position.

Each disconnect switch shall be equipped with one auxiliary contacts. The auxiliary disconnect shall be used as an input to the PLC to monitor the circuit breaker status.

Boxes shall be bonded and grounded with ground stud fitting. Boxes shall be provided with drain fitting to maintain the NEMA-4X enclosure rating, but shall allow for proper drainage.

## 2.17.16.2 DRY TYPE TRANSFORMERS

The Design-Builder shall design, furnish and install transformers that shall each be:

Type 1: One transformer in each Pontoon, for a total of 23 transformers, 480-120/208V, three phase, UL listed transformers. Provide a minimum of four 2.5% taps, two above and two below rated primary volts. The transformer kVA rating shall be calculated by the Design-Builder.

Type 2: One transformer in each Pontoon, for a total of 23 transformers, rated for 480-240V, three phase, UL listed transformers. Provide a minimum of four 2.5% taps, two above and two below rated primary volts. The transformer kVA rating shall be calculated by the Design-Builder.

Type 3: One transformer in each Shed Type I (Maintenance Sheds), for a total of 2 transformers, rated for 480-240V Delta Secondary with a 120V Center Tap (High Leg Delta), three phase, UL Listed transformers. Provide a minimum of two 5% taps, below rated primary volts. The transformer kVA rating shall be calculated by the Design-Builder.

The transformers core shall be constructed from high grade electrical steel and all windings shall be copper. Coil and core shall be mounted on rubber insulation mounting pads. Sound levels are not to exceed 45db as measured by NEMA ST20. The windings and core and coil assembly shall be treated and built to resist the effects of dirt and moisture. The enclosure is to be rated NEMA-3R with a weather shield.

The transformers shall meet the following specifications:

1. Temperature rise: 150 Degree C rise.
2. Cycles: 60 Hz.
3. Phase: 3
4. Primary voltage rating: 480 Volts
5. Impedance ratings: under 5.0% on rated KVA base with a maximum tolerance of 7.5%.
6. The Design-Builder shall size the transformer for the current connected loading and shall rate circuit breaker frame for the Future Six-Lane Plus Two HCT Configuration loading.

For the Type 1 and Type 2 Transformers in the anchor galleries, provide a wall mounted bracket supplied by the manufacturer (if possible), to mount the transformer to the Pontoon wall. If the manufacturer does not provide a mounting bracket for the transformer, provide a concrete pad for the transformer in the Pontoon anchor gallery to elevate the electrical equipment portion of the transformer at least 10 inches above the anchor gallery floor. All supports and hardware shall be 316 stainless steel.

The equipment required in the Sheds Type II and III shall be coordinated with Section 2.16 and the requirements of the medium voltage substation requirements.

## 2.17.16.3 PANELBOARDS

The Design-Builder shall design and furnish panelboards for distribution of the service lighting circuits.

The panelboards shall be rated NEMA 4X stainless steel and be of the dead-front type and shall be provided with circuit breakers. Each panelboard enclosure shall be code gauge galvanized steel with ANSI 61 light gray enamel finish. Each panelboard shall have a screw cover with a hinged door and flush lock.

The panelboards shall be provided with copper lugs in the mains, copper bus and with a full-sized copper neutral bar. The panelboards shall be provided a copper ground bus. All branch circuits shall be numbered, and a typewritten directory shall be provided on the inside of each door.

Each circuit breaker shall be a quick-make, quick-break, thermal-trip, ground fault current interrupting, branch circuit breakers. Each breaker shall trip free of the operating handle, and the handle shall indicate the position of the breaker. Circuit breakers shall meet the requirements of UL Standard 489.

The panelboards shall be furnished with a 20% spare spaces and with number of circuit breaker interrupting capability in accordance with the design circuit breakers. The Design-Builder shall size the panelboard for the current connected loading and shall rate circuit breaker frame for the Future Six-Lane Plus Two HCT Configuration loading. The panelboards shall be:

1. Provide 23 panels, one in each Pontoon rated: 120/208-Volt, 3-phase, 4-wire panel.
2. Provide 2 panels, one in each Shed Type I (Maintenance Sheds) rated: 240/120-Volt High Leg Delta, 3-phase, 4-wire panel.

3. Provide 23 Panels, one in each Pontoon rated: 240-Volt, 3-phase, 3-wire panel.

4. Provide 4 panels, one at each medium voltage drop, rated: 480/277-Volt, 3 phases, 4 wire.

The equipment required in the Sheds Type II and III shall be coordinated with Section 2.16 and the requirements of the medium voltage substation requirements.

### 2.17.16.4 TESTING

The Design-Builder shall visually inspect the panelboards for any damage, proper alignment, anchorage and grounding. Check for proper installation and tightness of connection for circuit breakers and switches.

Prior to energizing the panelboards, check the insulation resistance (each phase to phase and each phase to ground), electrical continuity, and for short circuits. Record the measurements and submit the tabulated information to the Electrical Design Lead Engineer for approval.

Record the current loading on each phase, and reconnect loads as required to correct for unbalanced loads. Submit the final loading information to the Electrical Design Lead Engineer for approval.

## 2.17.17 WIRE AND CABLE

The Design-Builder shall design and furnish a complete wire and cable system. All wire and cable shall be in accordance with Standard Specification Sections 8-20.3(8), 8-20.3(9) and 9-29.3 as supplemented here-in.

Except where otherwise noted, wiring in conduits shall be as follows:

- Single-conductor wire
- Two conductor shielded cable (or twisted shielded pair)
- RG 59/U 75ohm Coaxial cable
- Fiber Optic Cable
- Allen-Bradley 1786-RG6 Coaxial ControlNet Cable
- Multi-Conductor Flexible Cable
- Shielded Medium Voltage Cables

All wire and cable shall be of a nationally recognized brand, acceptable to the Electrical Design Lead Engineer. All wire and cable shall be factory labeled or marked in the standard manner of that manufacturer, with the minimum information to identify the wire gauge and insulation type. Before wire and cable orders are placed with any manufacturer, the Design-Builder shall submit for approval, typical published test data for the type of insulation proposed, showing that it meets the requirements of NEMA Pub. No. WC7. Single conductor wiring, including the insulating material, shall have been factory-tested to demonstrate that it meets the specified requirements. The copies of the test reports shall indicate that the testing was performed as stipulated in NEMA Pub. No. WC7, Part 6 and shall be submitted for approval.

No conductors larger than 500kcmil shall be allowed on the project and parallel 500kcmil conductors shall not be allowed.

### 2.17.17.1 SINGLE CONDUCTOR WIRE

All wire and cable shall conform to the requirements of NEMA Pub. No. WC7 - 1988.

All conductors shall be soft annealed copper wire conforming to the requirements of NEMA Pub. No. WC7. All conductors shall have Class B stranding.

The insulation shall be a chemically cross-linked polyethylene compound conforming to the requirements of NEMA Pub. No. WC7. The conductor insulation shall be rated for 600VAC. The conductor type for all conductors except shop wiring installed within the confines of control panel enclosures shall be Type XHHW. The conductor type for all shop-wired conductors installed within the confines of the control panel enclosures shall be Type SIS.

### 2.17.17.2 TWISTED SHIELDED CONDUCTORS

All twisted shielded pair wiring shall be two conductor shielded cable with an overall shield (twisted shielded pair). The shields shall be grounded in accordance with the manufacturers requirements for proper operations. The cables shall be equipped with 600VAC insulation suitable for installation in conduits with single conductor wires as specified herein. The cable shall be provided with an overall shield, jacket and a #18 AWG drain wire.

### 2.17.17.3 GROUND CONDUCTORS

Equipment ground conductors shall be bare, stranded, coated copper conforming to the requirements of NEMA Pub. No. WC7, Part 2. When required by the National Electrical Code, equipment ground conductors shall be provided with XHHW insulation.

### 2.17.17.4 COAXIAL CABLES

RG 59/U video signal cable shall be splice-free, 75 ohm coaxial, 95 percent copper braid shield, copper center conductor, 100 percent sweep tested from 5-300 MHZ. No splices are permitted. Coaxial cables shall be used with the CCTV system. Each coaxial cable shall have an outer jacket and be rated for 300VAC, one coaxial #20 AWG solid wire, foam polyethylene insulation, bare copper braid shield.

The coaxial cables shall be equipped with 300VAC insulation and shall be routed in separate conduits from all other conduits with single conductor wires as specified herein.

### 2.17.17.5 FIBER OPTIC CABLES

The CCTV fiber optic cable shall be a fiber cable with heavy duty with strain relief, and quantity of fibers as required. The cable construction shall be heavy duty, fibers encased in fully water blocked water swellable yarns and tapes, buffer tubes stranded around a dielectric central member. The outer jacket shall be black polyethylene. The cable shall have an attenuation of 5 dB/Km @ 850 NM and an environmental operating range of -40 °F to 158 °F. The cables shall have a minimum bend radius of 8 inches during installation and 5 inches for long term. The cables shall be suitable for installation in the flexible conduit connection between the transition span and the floating span.

The Design-Builder shall coordinate the fiber optic requirements with the Control System Vendor to verify the fiber optic cables are compatible with the PLC network. The Design-Builder shall coordinate the fiber optic requirements with the CCTV system to verify the fiber optic cables are compatible with the PLC network.

Each cable shall have the sufficient number of fibers to be routed from the end pieces of equipment without requiring splices in the cables.

CCTV system fiber optic splices shall only be allowed in panels. No more than two splices shall be allowed in a run of fiber optic cable for the CCTV cables, but the cables shall still be required to meet the testing requirements so it is recommended that the Design-Builder not splice the cables except when absolutely necessary for pulling requirements.

Refer to Section 2.16 for fiber optic splicing and panel requirements. The Design-Builder shall use vendor-approved installation tools.

The PLC fiber optic system shall not have any splices between the PLC Panels.

### 2.17.17.6 ALLEN-BRADLEY 1786-RG6 COAXIAL CONTROLNET CABLE

Coaxial ControlNet Cable shall be used for all connections between PLC communication cards. Allen Bradley ControlNet Taps shall be used for all connections in the cable. Allen Bradley approved wire cutters, crimp tools, cable strip tools, and connectors shall be used on the ControlNet Cable when tapping the cables.

### 2.17.17.7 MEDIUM VOLTAGE CABLES

All wire and cable shall conform to the requirements of NEMA Pub. No. WC74, ICEA S-93-693, and UL Standard 1072.

All conductors shall be soft annealed copper in accordance with ASTM B-3 and have Class B stranding in accordance with ASTM B-8(compressed) or ASTM B-496(compact).

The insulation shall be a chemically cross-linked polyethylene (XLP) compound conforming to the requirements of ICEA S-97-682. The conductor insulation shall be rated for 15kVAC. All medium voltage cables shall be shielded.

### 2.17.17.8 WIRE TAGS

Wire tags for marking the conductors shall be as specified in the Standard Specifications. Each wire tag shall be permanently, mechanically printed with the wire number. No hand written tags shall be allowed.

### 2.17.17.9 BRIDGE WIRING

All wire and cable shall be in accordance with Standard Specification Sections 8-20.3(8), 8-20.3(9), and 9-29.3.

Field wiring for alternating current circuits shall not be smaller than No. 12 AWG, except as noted here-in. Field wiring for control circuits or requiring twisted shielded pairs shall not be smaller than No. 14 AWG. Internal shop wiring for control panels and the control stations shall not be smaller than No. 14 AWG.

Field wiring for direct current circuits shall not be smaller than No. 14 AWG, except as noted here-in. Internal shop wiring for control panels and the control stations shall not be smaller than No. 14 AWG.

Sufficient slack shall be left in all cables to permit proper connections in boxes, cabinets and enclosures. Conductors inside terminal boxes, control panels, control stations and other enclosures shall be neatly formed into cables and laced with cable ties with the individual conductors leaving the bundled cable at their respective termination points. Each conductor shall be looped to allow not less than three inches of free conductor

when disconnected from its respective terminal. The bundled cables shall be held securely away from the terminals and from contact with the enclosure by means of insulating supports and ties.

Equipment ground conductors shall be installed in all multi-conductor cables in accordance with the NEC and in all conduits.

Both ends of every single length of conductor shall be permanently and clearly tagged in accordance with the same numbers or designations appearing on the wiring diagrams.

## 2.17.17.10 TERMINATIONS

For all conductors No. 8 AWG and smaller:

A. Each terminal of all terminal blocks shall be permanently marked to show the same number or designation as appears on the wire connected thereto.

B. Splicing of wires will not be permitted, except for ground wires, receptacle circuits, and service lighting circuits (this does not include navigation and Pontoon lighting). Wherever it becomes necessary to join or branch conductors, terminal blocks shall be used and wires shall be clearly tagged. Wire nuts shall not be used for any circuit except in the lighting and receptacle circuits.

C. Splicing of ground conductors, receptacle and lighting circuits in the Pontoons and underdeck area shall be made NEC approved, epoxy filled, water resistant compression splices.

D. Terminal blocks in junction and pull boxes shall use ring-tongue terminal lugs shall be compressed on each end of said conductors.

E. Terminal lugs shall be installed in accordance with lug manufacturer recommendations using a properly sized tool. The crimping tool shall provide a uniform crimping force throughout a controlled cycle with an automatic release when the desired compression is achieved. All crimping tool shall be as approved by the manufacturer of the terminal lug.

For all conductors No. 6 AWG and larger:

A. Use power terminal blocks for wires No. 6 AWG and larger.

B. The terminal blocks for all wires in terminal boxes, control panels, control stations and other enclosures shall be connected to terminal blocks specified in these Technical Requirements.

C. Each terminal of all terminal blocks shall be permanently marked to show the same number or designation as appears on the wire connected thereto.

D. Splicing of wires will not be permitted. Wherever it becomes necessary to join or branch conductors, terminal blocks shall be used and wires shall be clearly tagged.

All Medium Voltage conductors shall be run continuously between medium voltage equipment and splices shall not be allowed. All terminations shall be made with load break elbows or cold shrink terminal kits rated for medium voltage, 15kV minimum in a manner approved by the equipment manufacturer.

A. All load break elbows shall have a shield terminator and shield adapter clip. The elbow shall be operable with a hot stick under load and the elbow shall be fully submersible. The elbows shall meet ANSI/IEEE Standard 386.

B. Each cold shrink termination kit shall be comprised of at least 4 skirts, designed for the specific cable size and ampacity, use a silicone rubber termination material, a stem connector, silicone rubber tape, neutral wire ground clip, and silicone grease. All terminations shall be outdoor rated to meet the wet marine environment.

### 2.17.17.11 CABLE SUPPORTS

Furnish and install conductor support devices as required by code in vertical cable runs.

### 2.17.17.12 COLOR CODING

Conductor identification of each phase shall be by color coded insulation. The color of the insulation of the ungrounded conductors of different voltage systems shall be as follows:

- 120/208-240V Black, Red, Blue, White (Neutral)
- 277/480V Brown, Orange, Yellow, Gray (Neutral)
- Equipment grounding conductors shall be bare or green insulation as required

Control Panel wiring shall be color coded as required by NFPA 79 Electrical Standard for industrial machinery.

- AC Controls – Red
- DC Controls – Blue
- Interlock and controls from an external source – Yellow
- Grounding conductors shall be bare or green insulation as required

## 2.17.18 RACEWAY

The Design-Builder shall design and furnish a complete raceway system. All conduit and fittings shall be in accordance with Standard Specification Sections 8-20.3(5), 20.3(9), and 9-29.1 as supplemented in this Section.

Conduit shall be:

- Rigid non-metallic Polyvinyl Chloride (Type PVC) Schedule 80 conduit conforming to NEC Article 352.
- Liquidtight Flexible Nonmetallic Conduit (Type LFNC) conforming to NEC Article 356.
- Rigid Galvanized Steel (Type RGS) conduit, conforming to NEC Article 344.

Rigid conduit bodies, where permitted, shall be provided with gasketed covers of the same material, and fastened with stainless steel cover screws.

Conduit drain fittings shall be of stainless steel and shall be capable of passing 25 cc of water per minute. Conduit drain fittings shall be located at all low points in the conduit runs and shall be field determined.

At any point where a conduit crosses an expansion joint longitudinally, or where movement between adjacent sections of conduit can be expected, conduit expansion fittings shall be installed. The fittings shall permit a total 8-inches of movement minimum. At any point where a conduit crosses a joint laterally, or where an offsetting type movement between adjacent sections of conduits can be expected, expansion and deflection fittings shall be installed. The fittings shall permit a movement of ¾ inch from the normal in any direction.

Conduit sealing bushings shall be used where required to provide a seal between SOW-A cords and conduits. The fittings shall be constructed as follows: Thick steel disks and a neoprene sealing ring shall be factory drilled to accommodate the cables, and the disks shall be PVC coated after fabrication. Stainless steel hardware shall compress the two disks against the neoprene sealing ring. The sealing assembly shall be affixed to the end of the conduit with a malleable iron hot dip galvanized threaded locking collar. The collar shall be provided with gaskets to ensure a complete seal.

All medium voltage conductors shall be kept in separate conduits and junction boxes at all times. The conduits shall be clearly marked as medium voltage and shall be kept at least four feet from all other conduits and equipment operating at 600V or less.

### 2.17.18.1 PVC SCHEDULE 80 CONDUIT

PVC conduit shall be Schedule 80, heavy wall, rigid conduit conforming to the requirements of NEMA TC-3 and UL 651. PVC conduit shall only be used inside the Pontoons or cast in place in concrete.

PVC conduit hubs shall use a conduit to box bushing and an O-ring type threaded PVC hub box adapter and bushing.

### 2.17.18.2 LIQUIDTIGHT FLEXIBLE NONMETALLIC CONDUIT

Flexible conduit shall be corrugated flexible PVC coated, flexible, liquid-tight conduit. Flexible conduit shall be secured at a maximum of 48-inch intervals, and within 12-inches of termination points. Flexible conduit shall be used when terminating from rigid conduit to any equipment that requires regular adjustment to its position.

Flexible conduit shall be suitably sized to conform to standard dimension PVC couplings, bushings, hubs, adapters, end bells, and plugs.

### 2.17.18.3 RIGID GALVANIZED STEEL CONDUIT

Rigid metallic conduit shall be used in all locations, except when use of PVC conduit is permitted or flexible nonmetallic conduit is required. The conduit shall be hot dipped galvanized, rigid metal conduit as specified in the Standard Specifications. Rigid conduit bodies, where permitted, shall consist of malleable iron, hot dipped galvanized castings with gasketed covers of the same material, and fastened with stainless steel cover screws. Connectors for rigid to flexible conduit shall be malleable iron or steel, hot-dip galvanized. Conduit hubs for making connections to boxes or enclosures shall be malleable iron, hot-dip galvanized hubs providing watertight connections. Conduit hubs to be used with any stainless steel enclosure shall be stainless steel. Insulated bushings shall be provided for the ends of all conduits projecting into boxes and equipment enclosures. Insulated bushings shall be bronze insulated grounding bushings. The insulated portion shall be of molded phenolic compound, and each fitting shall have a screw type combination lug for bonding and grounding. The ends of all conduits projecting into all boxes and enclosures shall be provided with bronze insulated

grounding bushings, each bushing furnished with a screw type combination lug for bonding. All bushings in any box or enclosure shall be bonded together and to the equipment ground conductor with bare copper wire.

### 2.17.18.4 WIRING TROUGH

Ceiling-mounted, feed-through wiring trough may be furnished and installed to provide for termination of conduits and cables and to distribute the wiring to the various motor control cabinets and control cabinets. Wiring trough will be fully bonded to the raceway system. The trough shall be equipped with dividers to separate the high voltage control, low voltage control, and power wiring.

A drawing showing the assembly and complete construction details of the trough shall be prepared and submitted for approval before the trough is fabricated.

Wiring trough and dividers shall be rated NEMA-4x stainless steel. Trough shall have a removable cover on one side to provide access to the interior. Covers shall be secured by stainless steel screw clamps spaced no more than eight (8) inches apart.

The wiring trough shall be painted inside and out with one coat of primer followed by one coat of gray or white enamel on the inside surfaces and two coats of gray enamel on the outside. The finish coat shall be ANSI 61 Light Gray.

### 2.17.18.5 PONTOON DECK VERTICAL CONDUIT SUPPORTS

When routing conduit from under the roadway to the Pontoon deck the Design-Builder shall design and furnish a rigid vertical structure that shall support and protect the conduit. The supports shall be at a minimum hot dipped galvanized steel channels bolted to the Pontoon deck with right angle channels and bolted to the roadway underdeck. Strut shall be bolted to the channels and the support shall be placed every 5 feet, and within 3 feet of the top and bottom of the support. The strut shall be stainless steel, and shall be provided a neoprene pad between the stainless steel material and the hot dipped galvanized channel.

The support shall have reflective striping placed on the support. The striping in the mesh shall be sized to fit the openings and placed every 3 feet diagonally. The reflective striping shall be metal strips bolted to the channel from the lowest portion on the channel to 8 feet high.

### 2.17.18.6 GROUT PROTECTION

In general, conduit shall not be routed along the Pontoon deck. If field conditions require a conduit to be routed on the Pontoon deck, then from the conduit penetration to the equipment shall be protected in a permanent manner with a grout ramp. The Design-Builder shall design and furnish grout to provide a protective ramp around the conduit.

The grout pads to protect the conduit shall not bury or cover the conduits, merely be built up on either side of the conduit to protect it. The Design-Builder shall design and furnish a form for the grout to set at the correct angle.

### 2.17.18.7 CONDUIT IDENTIFICATION

Both ends of each conduit run shall be provided with a brass tag having a number stamped thereon in accordance with the conduit diagrams. The tags shall be securely

fastened to the conduit ends with No. 20 AWG brass wire. The numbers shall correspond to the Design-Builder's conduit and wire As-Built drawings.

### 2.17.18.8 CAST IN PLACE LOOP FERRULE INSERTS

Supports for the electrical conduit runs shall use cast in place inserts to support the ½-inch threaded rod or bolts. The Design-Builder shall field verify the locations of the supports to ensure the proper spacing between supports, maximum 5-feet for conduits larger than 1-inch and spacing of 3-feet for conduit that are 1-inch. Longitudinal runs shall use conduits of a minimum size of 1.5 – inch conduits to allow the 5-foot spacing; and transverse runs shall use 1-inch conduits which require the 3-foot spacing.

It is crucial for the Design-Builder to coordinate the inserts with post tensioning ducts. Multiple cells will have the post tensioning ducts, and the inserts need to be coordinated to not interfere with the ducts.

### 2.17.18.9 PENETRATIONS

Coordinate all locations for wall or floor penetrations with the structural development of the Shed floors and concrete Pontoons. The Design-Builder shall not install any new penetration locations. All penetration locations through block-outs or where a penetration conduit was displaced during the concrete pour shall be identified and submitted to the WSDOT for review and comment. All methods for cast in place conduit and blockouts and all methods and materials for drilling through concrete and through steel shall be submitted to the Electrical Design Engineer for review and comment. No Work shall commence in the field until all locations and procedures are provided for review and comment by WSDOT, and all comments are resolved.

The WSDOT PFS will have cast in place penetrations in interior Pontoon walls or block outs for drilling into the Pontoon exterior walls and top slabs. See this section for field measuring to locate the existing penetrations and blockouts for the conduit installation.

There are three types of Pontoon penetrations on the project, either existing in the PFS or work to be designed and furnished by the Design-Builder in any new Supplemental Stability Pontoons and each shall be treated as follows:

1. Pontoon Interior Wall Penetrations: All Pontoon interior wall penetrations shall be PVC conduits the length of the wall with couplings at the wall surface for connection to the complete run of conduit. The penetrations shall not be installed in the chamfer portions of the walls where they intersect with the ceilings. The penetrations shall be routed in between rebar in the walls.
2. Ceiling and Floor Pontoon Penetrations: All Pontoon ceiling and floor penetrations shall be 5-inch corrugated HDPE pipe. After the concrete has been poured around the pipe, the corrugated pipe shall be filled with grout to prevent water leakage. When the penetration location is required to be used, the Design-Builder shall drill through the grout to install the conduit of the correct size. Once installed the conduit shall be sealed with grout around the external conduit. .
3. Pontoon Exterior Wall Penetrations: The penetrations between the longitudinal Pontoons and the supplemental stability Pontoons shall be provided a tapered pocket in the form for the wall to the SSP and in the longitudinal Pontoon wall. The locations of the pockets shall be

coordinated by the Design-Builder to ensure that they line up. The tapered pocket shall be a minimum of 1 inch diameter at the tapered portion of the form pocket. Once installed the conduit shall be sealed with grout around the external conduit.

The Design-Builder shall coordinate the locations of penetrations, on new SSPs and within the block out drilling, with the other structural rebar, tendons, and post tensioning duct to prevent interference. Further the locations of the penetrations are to be coordinated with the supports, such as the penetration adjacent to the support platform for the jib crane, and any changes in the equipment location shall be coordinated.

Install conduit that stubs up through the floor or walls such that the embedded raceway is straight through the concrete and no curved section of the conduit is hidden in the Pontoon walls.

All penetrations, at the Sheds and Bridge Maintenance Facility, wall and floor shall be sealed and made watertight.

Special requirements for sealing conduit penetration are required in the Pontoon cells. The requirements and materials are clearly called out on the Conceptual Plans and shall be as shown.

Refer to Section 2.12 for requirements pertaining to drilling into existing slabs and wall. Where supports are allowed in existing slabs and walls use a drilled-in threaded insert, installed as recommended by the manufacturer and the drilling procedures. Sleeves shall be furnished and installed on all wall penetrations.

### 2.17.18.10 Flexible connection at Transition Spans

The Design-Builder shall design, furnish, and install a flexible connection at the east and West Transition Spans. These locations are where the roadway transitions from the fixed approach to the floating span. The expansion joint in the roadways is capable of allowing movement between the floating span relative to the fixed span, and the raceway installation must also allow movement. The electrical design criteria shall provide movement both vertically and horizontally between the spans. Refer to Section 2.12 for expansion joint requirements and dimensions of movement. The connection shall consist of junction boxes at the end of the transition span, a run of flexible conduit with the capacity for movement, and then a junction box on the floating span.

As an alternative, it is acceptable to use flexible cables for the medium voltage system at the flexible connection. The flexible droop cable shall be provided a heavy duty jacket and rated for exposed service. This alternative is provided because the flexible conduit for the medium voltage wiring shall be UL listed for the medium voltage installations, and recent installation have had difficulty supplying this material.

### 2.17.18.11 Spare Capacity

All locations where conduit supports for multiple conduits are provided, provide spare capacity on the rack for future use. Spare capacity shall consist of space on the rack to mount and install additional conduits in the future. Locations include, but are not limited to, the under deck conduit racks and routes in the Pontoon cells.

Underdeck racks shall have a spare capacity of 30%, with a minimum spare capacity of 2 – 4 inch conduits.

Pontoon cell racks shall have spare capacity to allow the maximum use of penetrations in the Pontoon walls. When installing conduit rack supports in Pontoon cells, the rack shall be sized for all cast in place penetrations into the cell that also exit the cell so future conduit can utilize the installed rack.

### 2.17.18.12 MOUNTING AND SUPPORTING CONDUITS

No conduit shall be mounted on walkways, gratings, etc. such that a tripping hazard is created. Also, conduit and boxes shall not be mounted in direct contact with structural steel or concrete. Steel stand-offs shall be furnished and installed by the Design-Builder for said equipment such that accumulation of debris between the structure and mounted component is minimized. A minimum of two-inches of air space shall be maintained between surface and the mounted device for outdoor installations and a minimum surrounding air space of 1/4 inch for all installations in controlled environments, such as inside the Sheds and the Bridge Maintenance Facility.

The use of J-bolts or beam clamps to fasten structural supports or to clamp conduits, boxes, or other electrical equipment will not be permitted.

Coordinate the Pontoon clear path and height restriction with all conduits mounted to the underdeck. When multiple conduits are routed along the roadway underdeck, the conduits shall be grouped together on a support system. Conduit supports along the underdeck shall be trapeze style supports. The conduits shall be located above the support, such that the conduit shall be supported even if the conduit clamp fails. The conduit shall be located between the down rods and on top of the support such that the conduit shall be kept on the rack if the conduit clamp fails.

When multiple conduits are routed in the Pontoons along the same path the conduits shall be grouped together on a support system. Conduit support can be mounted directly along the ceilings in most cells or mounted on a trapeze system (as described above in item A). Certain cells will have post tensioning strands along the ceiling of the cells. In these locations the conduits shall be lowered and mounted on trapeze style supports. Pontoon cells with post tensioning ducts will have a minimum two foot clearance between the ducts and the ceiling. In cells with post tensioning or cells that may have post tensioning ducts in Future Six-Lane Plus Two HCT Configuration, the conduit shall be routed above the ducts.

## 2.17.19 JUNCTION BOXES, PULL BOXES AND CABINETS

The Design-Builder shall design and furnish all conduit and fittings in accordance with Standard Specification Sections 8-20.3(6), 8-20.3(9), and 9-29.2 as supplemented in this RFP Section and Section 2.16 and 2.18.

All junction and pull boxes and cabinets installed shall be NEMA 4X, 14-gauge, type 316 stainless steel enclosures with hinged, 14-gauge, stainless steel doors supported by a continuous stainless steel hinge with removable pin. All boxes installed inside the Pontoons shall be PVC, fiberglass NEMA-4X, or stainless steel enclosures.

Surface mounted interior and exterior boxes shall be provided with external mounting lugs. No box shall be drilled for more conduits or cables than actually enter it. No conduits shall enter the top of an enclosure. All conduit entries shall be bottom entry if possible. Exterior boxes shall be provided with one-half inch combination drain and breather fittings. Fitting shall not affect the NEMA-4X enclosure rating of the enclosure.

Cabinets shall be used to provide field terminations for branching or joining cables. Cabinets shall be of sufficient size to provide ample room for the terminal blocks and interior wiring, and for the installation of conduit terminations and multi-conductor cable fittings. Interior panels shall be provided for mounting the terminal blocks. Terminal blocks shall be provided in each terminal box for the connection of all conductors including spare conductors entering the box plus at least 10 percent spare terminals.

The interior of all boxes shall be provided with insulated supports from which bundled cables may be supported.

### 2.17.19.1 TERMINAL BLOCKS

Terminal blocks in junction and pull boxes for conductors of Size No. 8 AWG and smaller shall be one-piece blocks of phenolic material recognized under the UL Component Recognition Program. Barriers shall be not less than 1/2 inch high and 1/8 inch thick and shall be spaced 5/8 inch center-to-center. Straps and screws shall be of brass, nickel plated for use in highly corrosive atmospheres, and shall be rated for 50 amperes. The blocks shall provide a withstand voltage rating of 750 volts per IEEE switchgear standards. The terminal blocks shall be provided with strap screws suitable for use with ring tongue wire connectors. Terminal block screws shall have Phillips straight blade combination heads not less than ¼ inch wide. Corrosion resistant marking strips shall be provided for conductor identification. At least 10 percent spare terminals shall be provided.

Terminal connectors shall be seamless, heavy-duty compression ring tongue terminals manufactured from pure electrolytic copper tubing. Terminals shall be tin plated and provided with a double-thick tongue and insulation grip. Terminals and compression tools shall be as approved by the Electrical Design Lead Engineer.

All terminal blocks and boards shall be mounted on suitable straps or structural steel brackets in such a manner as to permit routing the conductors behind the terminal blocks. Terminal blocks shall be one-piece blocks suitable for use in highly corrosive atmospheres and shall conform to the requirements herein specified. Each terminal block shall be equipped with a cover to make the terminal block finger safe.

Power terminal blocks in junction and pull boxes for wires No. 6 AWG and larger shall be included in each terminal box as required for such conductors. Each terminal shall be a one-piece power distribution block of molded phenolic compound and shall conform to the requirements specified herein elsewhere. A cover of insulating material shall be provided for each block.

## 2.17.20 HARDWARE AND SUPPORTS

Mounting bolts, nuts, washers and other detail parts used for fastening boxes, panels, cabinets, brackets, conduits, and other electrical equipment shall be of stainless steel conforming to the requirements of ASTM A593, Type 316. Bolt heads and nuts shall be hexagonal, and shall be provided with medium series lock washers. Bolts smaller than ½ inch in diameter shall not be used except when necessary to fit the mounting holes in small limit switches, boxes and similar standard devices.

Supports for boxes, panels, cabinets, and other separately mounted items of electrical equipment shall be fabricated from stainless steel not less than ¼ inch in thickness.

Stainless steel brackets, boxes and other equipment mounted on concrete surfaces shall be provided with a full neoprene gasket not less than 1/8-inch thick, between the equipment and the surface of the concrete.

Anchors for fastening equipment or brackets to concrete surfaces shall be epoxy resin bonded anchors in accordance with Standard Specification Sections 6-02.2, 6-02.3(18) and 9.26 as supplemented in these Technical Requirements.

The use of J-bolts or beam clamps to fasten structural supports or to clamp conduits, boxes, or other electrical equipment will not be permitted.

## 2.17.21 LIGHTS, SWITCHES, AND RECEPTACLES

### 2.17.21.1 LIGHTS

The Design-Builder shall design and furnish a complete lighting design. Refer to Section 2.16 and 2.18 for lighting requirements. New fixtures shall be provided in the Pontoons, underdeck, access columns, and Sheds in each location as follows:

- Each Pontoon cell shall be provided at least one long life, low maintenance induction fixture that shall be accessible from the platforms. The design criteria shall be to provide a minimum number of fixtures, but allow safe ingress and egress from the cells. Provide a 200lx (20fc) illumination level at the platform and cell access.

  All the cell lights (as well as those in the anchor galleries) in a single Pontoon shall be operated through the control system PLC by activating lighting contactors. The lights in each Pontoon shall be capable of being energized or de-energized remotely at any PLC touchscreen on the project, so individual Pontoons can be illuminated prior to entering the Pontoons. Further, each Pontoon deck access hatch shall have a control switch that shall be wired to the PLC to have the PLC energize all lights inside the Pontoon. The PLC panels shall be equipped with a bypass switch to manually operate the lights in the event of a PLC failure.

  The lights shall be mounted on the walls over or adjacent to the catwalks in the cells to allow easy access. When this requires a light to be located next to an access hatch, it shall be located in on the side of the hatch opposite from the hinge. This will prevent the door from obstructing the light illumination.

- Each Pontoon anchor gallery area shall be supplied multiple fixtures to provide an illumination level to work on equipment. The design criteria shall be to provide an illumination level of 500lx (50fc) at the electrical panels and the anchor cable jacking locations, and 200lx (20fc) at all other locations.

  See the above item for light operation parameters.

- Each Pontoon underdeck area shall be provided at least eight fixtures to provide minimum illumination, but cut off the light prior to entering the water.

  The design criteria shall be to provide the maximum illumination on the Pontoons, while keeping the light spillage into the water to 0.2lx (0.02fc) at the Pontoon edge into the water.

  All the underdeck lights on a single Pontoon shall be operated through the control system PLC by activating lighting contactors. The underdeck lights on each Pontoon shall be capable of being energized or de-energized remotely at any

PLC touchscreen on the project, so individual Pontoons can be illuminated prior to accessing the Pontoon decks. The PLC panels shall be equipped with a bypass switch to manually operate the lights in the event of a PLC failure.

- Each boat moorage area shall be provided floodlights that can fully illuminate the area to allow for night work and loading/unloading the boat.

  The floodlights shall provide an illumination level centered at the boat moorage location of at least 120lx (12fc) along the moorage area. The installation shall be limited to mounting the floodlights along the columns and bridge structure.

  All the floodlights on a single Pontoon shall be operated through the control system PLC by activating lighting contactors. The floodlights for each Pontoon moorage locations shall be capable of being energized or de-energized remotely at any PLC touchscreen on the project, so individual Pontoon moorage locations can be illuminated prior to accessing the mooring location. The PLC panels shall be equipped with a bypass switch to manually operate the lights in the event of a PLC failure.

- The Sheds Type I, II, and III shall be provided interior and exterior lighting. The exterior storage areas and entry door shall be provided lighting. The interior rooms and shops shall also be provided lighting.

- The Sheds Type I, II, and III shall be illuminated to 500lx (50fc) in the work areas and 200lx (20fc) in the entrance hall. One light shall be provided for the entrance into the Shed and the Shed with LP gas storage shall be provided lighting to illuminate the area to 200lx (20fc). All lights shall be operated by one, two, or three way switches in the Sheds. The access columns shall be provided lighting in the stairwell and interior rooms.

  The access columns shall be illuminated to 200lx (20fc) in all locations.

  All lights shall be operated by one, two, or three way switches in the Sheds.

Lights have been selected with the minimum specification for the locations on the bridge and in the Pontoons. Qualified fixture types are listed below. The Design-Builder may propose equal fixtures that comply with the requirements in this section.

A. Lighting Schedule Label: W

The light shall be low maintenance and high life units. The units shall be mounted such that they are accessible from the access platforms in the cells. The purpose of the lights is to illuminate the walkways and allow entry and exit.

- Locations Used: Pontoon Cell / Pier Column Box
- Catalog Number: Holophane W4 55QL 12 S G or equal
- Description: Wallpack IV, Standard Optics, Gray
- Lamp Type: 55W Induction
- Power: 60 Watts

B. Lighting Schedule Label: A1

- Locations Used: Pontoon Anchor Gallery Ceiling Lights
- Catalog Number: Holophane EMW 432 or equal

- Description: Hi-Bay Enclosed Gasketed Luminaire, W/ 4-32W Lamps White Ballast Cover & Clear Acrylic Drop Lens
- Lamp Type: (4) T8 32 Watts Sylvania Lamps
- Power: 102.3 Watts

C. Lighting Schedule Label:B1

- Locations Used: Underdeck Luminaire / Girder Bearings
- Catalog Number: Holophane EMS04XXBBMPO40 or equal
- Description: 4' Industrial Luminaire W/ Miro 4 Broad Beam Reflector Lens
- Lamp Type: (1) T8 32 Watts Sylvania Lamp
- Power: 39.1 Watts

D. Lighting Schedule Label: B1E

- Locations Used: Girder Bearings
- Catalog Number: Holophane EMS04XXBBMPO40 or equal
- Description: 4' Industrial Luminaire W/ Miro 4 Broad Beam Reflector Lens
- Lamp Type: (1) T8 32 Watts Sylvania Lamp
- Power: 39.1 Watts

E. Lighting Schedule Label: C1

- Locations Used: Sheds
- Catalog Number: Holophane CCP4XTNNNK42MK11 or equal
- Description: 4' Industrial Luminaire W/ Miro 4 Task Beam Reflector
- Lamp Type: (2) T8 54 Watts Sylvania Lamps
- Power: 119.7 Watts

F. Lighting Schedule Label: F1

- Locations Used: Shed Door Entrance and LPG Area / Pier Box Column Entrance
- Catalog Number: Holophane PD050HP00XN0X or equal
- Description: Small Predator Floodlight With Wire Guard For "PD" Unit, 120V, UL Wet Locations Listed. Narrow Vertical, Wide Horizontal Distribution, 2 Inches Knuckle Fitter, Gray Finish, Single Fusing Fusekit. (Provide battery pack for emergency power operation as required for safe egress.)
- Lamp Type: 50W Clear HPS
- Power: 63 Watts

G. Lighting Schedule Label: F2

- Locations Used: Jib Crane Floodlight

- Catalog Number: Holophane PF400HP00XS0X or equal
- Description: Medium Predator Floodlight With Wire Guard For "PF" Unit, 120V, UL Wet Locations Listed, Spot Distribution, 2 Inches Knuckle Filter, Gray Finish, Single Fusing Fusekit
- Lamp Type: 400W CLEAR HPS
- Power: 444 Watts

### 2.17.21.2 SWITCHES

The switches for the lighting fixtures in the Pontoon Cells are PLC control inputs described in this Section and are to be provided by the Control System Vendor and do not directly control the lighting fixtures.

At all other locations, switches shall be specification grade, single pole or double pole, 3 or 4 way as required, non-mercury quiet, 20 amperes, 120VAC, UL Listed, silvered contacts, ivory nylon body, tumbler switch with endurance of 10,000 make-breaks. Indoor switches (installed in the control house or the electrical building) shall be flush mounted in new outlet boxes and shall be provided with Type 304 stainless steel plates. Outdoor switches shall be mounted in waterproof, cast iron, hot dipped galvanized, equipped with gaskets, and surface mounted boxes with covers. Switches shall be mounted three and half (3.5 feet) above the adjacent floor or platform.

Switches to operate lights shall be located at all entrances into rooms or stairwells, which will require two or three way switches.

### 2.17.21.3 RECEPTACLES

All receptacles shall be 20-ampere, 125-volt, three-wire, grounding type, polarized, ground duplex convenience outlets. Each receptacle shall be provided with waterproof cover plate and shall be mounted in a waterproof, UL Listed, cast-iron, hot-dipped galvanized, equipped with gaskets, surface mounted boxes with stainless steel spring loaded, gasketed, weather proof lid. Stab-in connection shall not be used. Receptacles shall be specification grade.

One receptacle shall be provided for every two adjacent accessible Pontoon cells, including the anchor gallery areas. Receptacles in the Sheds shall be installed in accordance with the NEC.

Care shall be taken to keep the receptacles on separate circuits, at least one circuit for the anchor galleries, one circuit for each SSP, one circuit for the cells west of the anchor galleries, and one circuit for the cells east of the anchor galleries. Receptacles shall also be located in the underdeck area in the same enclosures as the pump receptacles.

The receptacles shall be mounted on the walls over or adjacent to the catwalks in the cells to allow easy access. When this requires a receptacle to be located next to an access hatch, it shall be located in on the side of the hatch opposite from the hinge. This will prevent the door from impacting the receptacle or cord while opening.

It is brought to the Design-Builders attention that GFCI receptacles with ‘push to test’ and ‘reset’ pushbuttons deteriorate in the harsh environment in the Pontoon cells and exposed areas. WSDOT Maintenance crews will be supplied power cords with built in GFCI protection and use these cords while in the Pontoons and on the bridge to meet the

safety requirements for working in wet areas. Provide GFCI receptacles inside all controlled environments, all Sheds and the Bridge Maintenance Facility.

Design, furnish, and install receptacles in each Shed Type I, II, and III. Provide 120VAC receptacles in the Sheds in accordance with the NEC, with a minimum of one receptacle per room.

Provide dedicated receptacles for the microwave and refrigerator in the crew room. Coordinate providing space for the equipment in the crew room.

Provide at a minimum power receptacles, 208VAC two phase and 208 three phase receptacle, and 240VAC two (2) phase and 240VAC three (3) phase in the shop area of the Type I Sheds. The circuit breakers in the shop areas shall be on separate circuit breakers such that multiple stations can be in use simultaneously. Coordinate the layout with the workstations and workbenches. The Design-Builder shall design and coordinate the receptacles with the WSDOT Maintenance Crew.

### 2.17.21.4 WELDING RECEPTACLES

All receptacles shall be 30-ampere, 208-volt, three-wire, grounding type, pin and sleeve receptacle outlets. Outlets shall be grounded through both the shell and a grounding wire connection. Receptacles shall be mounted in new outlet boxes and shall be provided with a waterproof cover plate and shall be mounted in a waterproof, UL Listed, cast-iron, hot-dipped galvanized, equipped with gaskets, surface mounted boxes with stainless steel spring loaded, gasketed, weather proof lid. Receptacles shall be suitable for rough usage and “ship to shore” applications. One welding receptacles shall be provided adjacent to each Pontoon anchor cable and in each Shed Type I (Maintenance Sheds).

### 2.17.21.5 ELECTRIC VEHICLE CHARGING RECEPTACLES

Two charging receptacles shall be provided in each Shed Type I (Maintenance Sheds) to charge the electric vehicles. The voltage rating and style shall be selected to coordinate with the supplied electric vehicles. The Design-Builder shall design, furnish, and coordinate the charging receptacles in the Shed Type I (Maintenance Sheds). Receptacles shall be mounted in new outlet boxes and shall be provided with a waterproof cover plate and shall be mounted in a waterproof, UL Listed, cast-iron, hot-dipped galvanized, equipped with gaskets, surface mounted boxes with stainless steel spring loaded, gasketed, weather proof lid.

## 2.17.22 JIB HOIST

The Design-Builder shall design and construct two complete free standing jib hoist system, including pedestal, anchor bolts, trunnion roller assembly, safety channel and pivot assembly, bottom collector ring, tagline and festooning, exterior/marine duty paint, motorized rotation package, cabling, controls and associated components, to match the jib cranes provided on the Bridge Maintenance Facility and Dock. Each jib hoist shall be located as on the Conceptual Plans (Appendix M1).

Provide full web gussets plates, welded to the mast and base plate, about the mast for stability and reinforcement. Provide round, structural steel pipe stationary mast welded to steel base plate. I-beam or wide flange boom, reinforced for lateral stability if required, in accordance with manufacturer’s standard design. Design jib crane system for load capacity plus 25% of rated load for impact and plus 15% of rated load for weight of hoist and trolley. Design mast with sufficient strength to resist bending, buckling,

crushing, and wear of the trunnion roller assembly. Coordinate the Jib Hoist selection and mounting requirements with the Pontoon design.

Code Compliance: Comply with requirements of the latest revision of the following standards with respect to jib crane manufacturing, installation, and use.

- OSHA Occupational Safety and Health Administration
- CMAA Crane Manufacturer's Association of America
- HMI Hoist Manufacturer's Institute
- ANSI American National Standards Institute
- NEMA National Electric Manufacturer's Association

The jib hoist requirements are as follows:

- Span: 14'
- Mounting plate to under boom height: 12'
- Boom to dock height: 14'
- Capacity: 2 Tons
- Hoist Type: Jib Crane, 65 FPM, stepless.
- Hoist Speed: 3.3 and 20 FPM, two-speed.
- Hoist Type: Electric wire rope CXT4410050P
- Hoist Lift Required: 20 Ft.
- Power Supply: Three Phase Voltage Supply at 230V
- Collector: Bottom entry
- Beam Steel ASTM A36 or A992.
- End Trucks Steel: ASTM A36.
- Trolley Steel: ASTM A36.
- Wheels: Cast iron or steel.
- Hooks: Forged steel.

Design the jib hoist to withstand dead load, live load, wind load, hoist load, and inertia forces caused by movement of the crane, components and loads during standard operation. Standard capacity ratings will represent the net rated load at the hook of any type of hoist with the same load rating installed on the crane having a hoist and trolley weight within the established limits. Base design load for stress calculations upon capacity plus 15% for the weight of the hoist and trolley and an additional 25% for impact (capacity x 1.4). Design load for deflection calculations will be based upon the capacity plus 15% for the weight of the hoist and trolley (capacity x 1.15). Design allowance must also accommodate removal of items from water such as a 20' work boat. Clearly label the load capacity of each crane easily read from the dock level.

The electric chain hoist shall be equipped with a high duty motor to tolerate voltage fluctuations. The hoist shall be equipped with brakes that automatically lock during a power failure. All equipment shall be rated NEMA-4X for outdoor, wet installations. The hoist shall be provided a control station pendant that provides 120VAC control operation

of the hoist. The hoist shall internally convert the three phase, 230VAC supply power to 120VAC control power. Provide a strip heater to prevent condensation and corrosion.

## 2.17.23 BRIDGE CONTROL SYSTEM

The Design-Builder shall design and furnish a new complete electrical control system for the bridge operation. The extent of the work shall include but not be limited to the following:

- Provide a complete PLC based control system and multiple Alarm panel interactive screens. A PLC remote I/O panel with an alarm panel screen shall be provided in each Pontoon and each Shed Type I (Maintenance Sheds) on the Pontoons. The primary PLC processors shall be located in the Bridge Maintenance Facility PLC panel with an alarm panel. An additional alarm panel shall be provided in the crew area to provide alarming and notifications. All PLC equipment shall be Allen-Bradley Control Logix line.
- Provide a float switch in each Pontoon cell to provide alarm if a leak occurs. Each sensor shall be wired to the local PLC remote I/O panel to monitor and provide alarming.
- Provide sixteen (16) portable pumps.
- Provide, at a minimum, eight (8) pumping station receptacles panels on each of the Pontoon decks. The stations shall be located to use the deck penetration blockouts provided on the PFS. Each station shall allow for powering the 240V portable pumps and 120V receptacle loads.
- Provide motion sensors in each anchor gallery, Shed (Type I, II, and III), access column, and any other access point to monitor unauthorized access. Access points are any location, such as a door, where a person can gain entry into buildings or Pontoon anchor galleries. Each sensor shall be wired to the PLC remote I/O panel to monitor and provide alarming.
- Provide lighting contactors to allow the remote operation of the lights in each Pontoon, underdeck, and floodlights at the boat dock locations. Each light switch in the Pontoon cells shall be a spring return control switch, and shall be wired to the local PLC remote I/O panel to allow local control of the lights in the Pontoon through the PLC. Each PLC remote I/O panel shall be provided a manual bypass switch to allow the lights to be energized if there is a PLC failure.
- Provide lighting contactors to allow PLC operation of the navigation lights on each Pontoon, east approach and piers, and transition spans. Provide a photoelectric controller to be wired as an input to the PLC. The PLC will activate the navigation lights when the external illumination drops. Each PLC remote I/O panel shall be provided a manual bypass switch to allow the lights to be energized if there is a PLC failure.
- The PLC remote I/O panels shall monitor the voltage and current outputs of the cathodic protection panels. Provide control relays in the PLC remote I/O panels to de-energize each of the cathodic protection panels remotely.
- Provide spare equipment.
- Coordinate, integrate, furnish, install, and test all other equipment as listed in this Section.

## 2.17.23.1 CONTROL APPARATUS AND MISCELLANEOUS EQUIPMENT

Control apparatus shall conform to the applicable requirements of NEMA Pub. No. ICS Industrial Controls and Systems, latest revision, and to the following:

A. Circuit Breakers: All branch circuits from the buses shall be protected by molded-case circuit breakers mounted in the control panels on DIN rails. All breakers shall have quick-make, quick-break contacts and the mechanism shall be trip-free and trip indicating. The breakers shall be equipped with thermal-magnetic trips or adjustable instantaneous magnetic trip units. Molded case circuit breakers shall meet the requirements of NEMA Standard AB1, latest revision. Instantaneous magnetic trip circuit breakers, when used, shall only be used for motors and shall be part of a listed combination controller in accordance with NEC Article No. 430-52.

B. Industrial Control Relays: Industrial control relays shall be multicontact magnetic machine tool relays with contacts rated at 10 amperes or 20 amperes, 600 volts on a continuous basis. The contact rating shall be selected to coordinate with the rating of the protection device on the wiring diagrams. Each control relay shall be equipped with surge suppression.

C. Lighting Contactors: Lighting contactors shall be multipole lighting contactors with either two or six poles. All contactors shall have field convertible contacts with normally open and normally closed indicators.

D. Control Switches, Selector Switches and Push-buttons: Control switches, selector switches and push-buttons on the control panels shall be heavy-duty NEMA type, 1.2 inch diameter base, oil-tight contact blocks operated by glove handle (pistol grip) selector knobs, selector knobs, or push-buttons. All switches and pushbuttons shall be equipped with escutcheon plates identifying the switch by its alphanumeric identifier and descriptive operation. Key operated switches shall be wired and configured such that the key can only be removed in the off position.

The switches used for the interior Pontoon light control switches shall be two position, spring return, selector knob, switches mounted in NEMA-4X enclosure. The switches shall be wired to be energized in the spring return position and operating the selector knob to the maintained position will de-energize the PLC input.

E. Indicating Lights: Indicating lights shall be heavy-duty NEMA type, 1.2 inch diameter base, oil-tight sockets. All lenses shall be glass, with color and escutcheon plates identifying the light by its alphanumeric identifier and descriptive operation.

F. Field Terminal Blocks: Terminal blocks for conductors of Size No. 10 AWG and smaller shall be one-piece blocks of phenolic material recognized under the UL Component Recognition Program. Barriers shall be not less than 1/2 inch high and 1/8 inch thick and shall be spaced 5/8 inch center-to-center. Straps and screws shall be of brass, nickel plated for use in highly corrosive atmospheres, and shall be rated for 30 amperes. The terminal blocks shall be provided with strap screws suitable for use with ring tongue wire connectors. Terminal block screws shall

have Phillips straight blade combination heads not less than ¼ inch wide. Corrosion resistant marking strips shall be provided for conductor identification. At least 10 percent spare terminals shall be provided.

G. PLC Panel Terminal Blocks: Terminal blocks in the PLC panel shall be modular, DIN rail mounted, corrosion resistant, tubular screw clamp type with vibration proof pressure plates. Conducting parts shall be nickel plated copper and insulating material shall be flame retardant thermo plastic. Corrosion resistant marking strips shall be provided for conductor identification. At least 10 percent spare terminals shall be provided.

H. Terminal Connectors: Connectors shall be seamless, heavy-duty compression ring tongue terminals manufactured from pure electrolytic copper tubing. Terminals shall be tin plated and provided with a double-thick tongue and insulation grip. Terminals and compression tools shall be as approved by the Electrical Design Lead Engineer.

I. Nameplates: Nameplates shall be made of laminated phenolic plastic with white front and back and black core and shall be not less than 3/32 inches thick. All electrical equipment shall be provided with a nameplate. The lettering shall be etched through the front layer to show black engraved letters on a white background. Lettering shall be not less than one-quarter inch high. Nameplates shall be securely fastened to the equipment with a waterproof epoxy.

J. Indoor Receptacles: All indoor receptacles shall be 20-ampere, 125-volt, three-wire, grounding type, polarized, ground fault current interrupting (GFCI) duplex convenience outlets. Each indoor receptacle shall be flush mounted in a new stainless steel outlet box and shall be provided with a Type 304 stainless steel cover plate. Receptacles shall be specification grade.

K. Power Supplies: Provide all 12VDC and 24VDC power supplies as required for the design. The power supplies shall be single output, regulated linear DC power supply. The power supply shall be convection cooled, constant voltage, short circuit proof, current limiting (automatic reset) unit with an output voltage adjustment of +/- 5%, and input/output isolation of 1,000 mega-ohms DC. The power unit shall operate over a temperature range of 0° Celsius through 55° Celsius. Units shall be DIN rail mountable, finger safe for mounting in the PLC panels.

N. Door Switch Operated Lamp: Provide a door switch operated lamp in each panel. The light shall be rated to operate at 120VAC and shall energize when the panel door is opened. One lamp shall be provided for each door in the panel. The lamp shall be rated to full illuminate the panel interior.

O. Motion Sensors: Motion sensors shall be rated NEMA-4X and rated for 120VAC contacts.

P. Uninterruptible Power Supply: An uninterruptible power supply shall be furnished and installed in the Bridge Maintenance Facility PLC panel. The UPS shall have an internal battery. The unit shall be rated for 120VAC input, rated for a minimum of 10 minute operation at full load. The UPS shall be rated for 120VAC input and 120VAC output. The UPS output shall be a sine wave with less than 3% distortion. Each UPS unit shall provide automatic bypass and an audible alarm upon UPS failure. Each UPS shall

have provisions for hardwired connections and shall be wired to the UPS to provide UPS status alarm for failed condition. The unit shall have a self test function, a display screen, an audible alarm for when the unit is on battery power, overload condition, or a UPS fault.

Q. Signal Conditioner: Signal conditioners shall be DIN rail mounted units that are powered with 120VAC. The conditioners shall be rated for the input from the Cathodic Protection Rectifier Panels and these inputs shall be coordinated by the Control System Vendor. The output of the conditioners shall be 4 to 20 mA signals.

R. Photo-Electric Cell: Photo electric cells shall meet the requirements of the WSDOT Standard Specifications (Appendix D18) and be rated for outdoor NEMA-4X duty.

### 2.17.23.2 ANEMOMETER AND TEMPERATURE SENSOR

The Design-Builder shall provide an anemometer on Pontoon G that shall have a wind direction sensor and wind speed sensor. The wind speed sensor shall be a four blade helicoid propeller. The wind direction sensor shall be a durable molded vane. Vane angle shall be sensed by a precision potentiometer housed in a sealed chamber. All materials shall be corrosion resistant and provide maximum durability in the harsh marine environment. Stainless steel bearings shall be used throughout with special waterproof lubricant.

The anemometer shall be mounted on a standard 1 inch pipe and be pre-wired with a factory seal pigtail cord that is at least 9 feet long. Provide a weatherproof NEMA-4X junction box with the signal conditioning circuits to provide analog 4-20mA current signals outputs to the PLC that provide the wind speed and the wind direction. The anemometer shall be loop powered by the PLC cards. If the selected manufacturer requires a separate power supply, provide a power supply located in the Pontoon G Shed PLC Panel.

The anemometer information shall be transmitted to the TMC for monitoring.

The anemometer shall meet the following requirements:

- Wind speed: 0-100 m/s (224 mph)
- Azimuth: 360° mechanical, 355° electrical (5° open)
- Wind speed accuracy: ±0.3 m/s (0.6 mph) or 1% of reading
- Wind direction accuracy: ±3 degrees

The Design-Builder shall provide an environmental monitoring embedded roadway temperature sensor. The sensor shall be weatherproof and designed to be encased in the roadway overlay. The sensor shall transmit the real time temperature information wirelessly to a data collection system.

The Design-Builder shall provide an outdoor barometer, antennae, and radio transmitter. The Design-Builder shall mount the data collection system adjacent to the radio transmitter. The data collection system shall collect the wireless temperature and the barometer information and provide it to the local PLC control system. The data collection shall also provide a radio transmission to the remote monitor. The system shall be a Zydax Intelligent Environmental Sensor RoadCast Wireless Sensor system or

approved equal. The Design-Builder shall locate the sensor in the roadway and the radio antennae supports.

### 2.17.23.3 AUTODIALER

The autodialer shall be a solid state component capable of dialing up to 16 phone numbers, each up to 60 digits in length. Phone numbers and Standard pulse dialing or Touch Tone® DTMF dialing are user programmable via the system's keyboard or Touch Tone phone. Connection to the telephone is through a four-pin modular jack (RJ-11). Further, the autodialer shall be capable of connecting, via a single serial interface cable, to the PLC systems. Serial interfacing methods shall use Ethernet communication. The Control System Vendor shall coordinate the communication method with the autodialer.

The unit shall have two different categories of speech message capability, all implemented with permanent non-volatile solid state circuitry with no mechanical tape mechanisms. The unit shall allow for message recording from a remote telephone as well as from the front panel.

The user may record and re-record his own voice messages, for each input channel and for the Station ID.

a. There shall be no limit on the length of any particular message, within the overall available message recording time, which shall be 409 seconds for 36 total channel units and 651 seconds for 57 total or more channel units.

b. The unit shall allow selective recording of both Normal and Alarm advisory messages for each input channel.

c. The unit shall provide for automatic setting of the optimum speech memory usage rate for the total set of messages recorded, in order to achieve optimum recording sound quality.

d. Circuit board switches or jumper straps shall not be acceptable means of manipulating message length or recording rates.

User-entered programming and voice messages shall be kept intact even during power failures or when all power is removed for up to 10 years.

Acknowledgement of an alarm phone call is to be accomplished by pressing a Touch Tone "9" as the alarm call is being received, and/or by returning a phone call to the unit after having received an alarm call.

The unit shall continuously scan all properly configured remote channels. The unit shall monitor remote channels which physically reside in other industrial equipment via the serial interface. The unit shall be capable of interfacing to at least two PLC networks simultaneously. The unit shall be capable of monitoring any PLC data register regardless of register type, whether digital, analog, input, output, or status point. Alarm criteria shall be settable according to data register type. For digital remote channels, alarm criteria shall be settable for normally ‘0’ or normally ‘1’. For analog remote channels, both a high setpoint and a low setpoint alarm criteria shall be settable. Violation of alarm criteria at any remote channel shall cause the unit to go into alarm state and begin dial-outs. All remote channel alarm criteria shall be settable either at the front panel of the unit or over the telephone using touch-tone commands. The unit shall be capable of writing data to any PLC data register to which writing data is a legal operation. The unit shall monitor any failure of the active serial communications channels. Upon failure of any communications channel the unit shall enter the alarm state and begin dial-outs.

The unit shall be capable of transferring data between one remote channel on one serial communications network and another remote channel on a second serial communications network. The unit shall also be capable of transferring data between remote channels on a serial communications network and physical channels within the unit.

All power, phone line, dry contact, and analog signal inputs shall be protected at the circuit board to IEEE Standard 587, category B (6,000 volts open circuit/3,000 amps closed circuit). Gas tubes followed by solid state protectors shall be integral to the circuit board for each such line. Protectors mounted external to the main circuit board shall not be an acceptable substitute. The installer shall provide a good electrical ground connection point near the unit to maximize the effectiveness of the surge protection.

All keyboard and front panel switches shall be sealed to prevent contamination. Front panel LED's shall indicate: Normal Operation, Program Mode, Phone Call in Progress, Status for each channel, AC Power Present, AC Power Failure, and Low, Discharging or Recharging Battery. On any Inquiry telephone call or On Site status check, the voice shall provide specific warning if no dialout phone numbers are entered, or if the unit is in the "alarm disable" mode, or if AC power is off or has been off since last reset. A built-in microphone shall allow anyone at a remote phone to listen to local sounds and have a two-way conversation with personnel at the autodialer.

### 2.17.23.4 PROGRAMMABLE LOGIC CONTROLLER

The programmable logic controller (PLC) shall be an Allen Bradley (AB) ControlLogix brand PLC with components, hardware and remote input/output drops. No substitutions shall be accepted. The PLC shall be of fully modular construction, provide high speed peer-to-peer networking, and be programmable with ladder logic.

The PLC system will consist of two redundant CPU's. Only one CPU will be in use at a time, and the other CPU will be offline and de-energized. A selector switch mounted on the door of the control cabinet will select the CPU in use.

The PLC shall be provided with the following features:

1. 1.5M of battery backed static RAM.
2. 1.5M of Nonvolatile RAM.
3. ControlNet communication
4. EtherNet communication

Each PLC remote input/output rack will be connected to both CPU's by means of a fiber optic communication bus that will use Ethernet as the method of communication.

For any in panel connections that do not use fiber optic cable, the Design-Builder shall furnish one ControlNet cable terminating kit. Provide Allen Bradley line terminators. Provide cable taps as required to route the cable, using the straight T-tap, a straight Y-tap, a right-angle T-tap, and a right-angle Y-tap. Provide a ControlNet Network Access Cable that allows temporarily connection of a programming device at any ControlNet node through the network access port (NAP) and gain full access to the network.

Each PLC I/O rack shall be supplied with a 4 slot ControlLogix chassis (Allen Bradley Part Number 1756-A4), 7 slot ControlLogix chassis (Allen Bradley Part Number 1756-A7), 10 slot chassis (Allen Bradley Part Number 1756-A10), or a 13 slot chassis (Allen

Bradley Part Number 1756-A13) as required. Each rack shall provide 20% spare I/O points.

Each input and output card shall be equipped with cage clamp removable terminal blocks wiring arms, oversized housings, and covers. The Design-Builder shall provide Allen Bradley terminal blocks as needed.

The primary PLC processors shall each be provided with an Allen Bradley Part Number 1756-PAR redundant power supply bundle. The 1756-PAR consists of two Allen Bradley Part Number 1756-PA75R power supplies, one Allen Bradley Part Number 1756-PSCA chassis adapter module, and two Allen Bradley Part Number 1756-CPR cables. The processors in each Pontoon PLC panel have been provided redundant power supplies in order to keep the width of the panel to a minimum.

The Design-Builder shall verify that all the requirements of the system are provided in their PLC design and all required additional work based upon their selected equipment is included in the design.

The alarm panels shall be, at a minimum, PanelView Plus 1000 (Allen Bradley) terminal shall be mounted on or the near PLC panel door. The panels shall be color and provide a display for alarm messages. The panel view shall be equipped with a keypad and a touch screen. The Alarm panel shall have a real time clock to time and date stamp alarms. It shall communicate via ControlNet and have dual ControlNet terminals. The Alarm panel shall be equipped with a serial port for connection to the Alarm Printer. The Alarm panel shall be fully programmed by the Control System Vendor, and alarm messages shall be programmed into the Alarm panel memory and displayed on the screen in response to receiving individual bits from the defined bit arrays from the PLC processor. Upon receiving an individual bit from the defined bit array the Panel View will display the alarm, store the alarm in the internal register, and print the alarm in order that the alarms are received.

The alarm printer shall be an Epson LX-300+ or compatible, 300 cps, printer with a tractor drive for continuous feed. The printer shall be rated for 120VAC, equipped with a power cord, and equipped with a RS-232 port printer cable to connect to the Alarm panel unit. The printer shall be compatible with Alarm panel unit and shall connect with the unit to print reports directly from the Alarm panel unit. The printer shall be supplied with a printer stand and paper supply.

Provide one UPS units in the Bridge Maintenance Facility PLC Panel. The UPS shall be as specified here-in and wired to the PLC for monitoring purposes.

### 2.17.23.5 COMPUTER AND SOFTWARE

A laptop computer with specified software shall be provided, suitable for programming the PLC and Alarm panel systems. The computer shall be the latest commercially available unit and contain, as a minimum requirement, Pentium processor operating at 2.53 GHz or faster. The random access memory (RAM) shall contain a minimum capacity of 8 G-bytes and be expandable to 16 G-bytes minimum. The hard disk drive shall have a storage capacity of 500.0 G-bytes or better. The CD drive shall be a 24x RW/DVD combo drive. The unit shall have 17-inch WXGA wide color display, 9 pin RS232 serial port, 2 PCMCIA slots, Allen Bradley Part Number 1784-PCC PCMCIA communication card and programming cables for the PLC and Alarm panel, 56k-baud telephone modem, and be IBM compatible. The laptop shall be heavy duty, such as the Panasonic 'Tough Book' or equal. The unit shall be an intelligent terminal, functioning both as a PLC programming and data monitoring terminal. It shall permit PLC

programming, including loading, editing, and monitoring ladder diagram programs in memory by entering through the keyboard and monitoring on the display. PLC program instructions shall be in ladder logic.

A portable printer, that shall be both battery and AC operated, shall be provided. The portable computer shall be a Cannon Bubble Jet BJC-55 or equal. The portable computer shall be equipped with a paper feeder. A "Starter" kit including at a minimum serial/parallel connection cables, surge protector, diskettes, compact disks, tool kit, etc. shall be provided.

The following software applications shall be loaded onto the computer and made fully operational by the Design-Builder:

1. Windows operating system. Design-Builder shall verify all software can operate properly on the operating system and coordinate with the software vendors and the operating platform requirements to select the proper software version.
2. RSLogix 5000 – Latest programming software for Allen Bradley ControlLogix Processors.
3. RSNetworks for ControlNet – Allen Bradley 32-bit graphical network management configuration tool for the ControlNet network. The software shall configure network-wide parameters such as network update time (NUT), schedules I/O data transfers and peer-to-peer messaging for PLC processors.
4. PanelBuilder32 – Allen Bradley PanelView programming software.

The Design-Builder shall demonstrate operation and use of the software as part of the personnel training as specified in Section 01820.

### 2.17.23.6 ENCLOSED CONTROL PANELS

Control panels shall be enclosed in free standing cabinets that shall be furnished and installed in the Bridge Maintenance Facility, and where required. Control panels shall be enclosed in wall mounted cabinets that shall be furnished and installed in the Pontoons, Bridge Maintenance Facility, and Sheds. All circuit breakers, drives, switches, contactors, starters, relays, and other apparatus for control of the equipment shall be mounted on these enclosed panels.

All equipment in each control cabinet shall be mounted on sheet-steel back plates, and each device shall be front-connected, front-wired, and removable from the front. The equipment in all cabinets shall be arranged for ease of access and for safety and convenience of operation. Special care shall be taken to obtain a systematic and neat arrangement of the equipment. Each device shall be suitably named and plainly marked by a laminated nameplate mounted near the device on the panel. Each nameplate shall show a descriptive title for the apparatus, together with the device designation appearing on the schematic wiring diagrams.

Each control cabinet shall be a NEMA 4X stainless steel. The NEMA-4X stainless steel enclosures shall be constructed of 316 stainless steel and shall be reinforced with steel angles or channels so as to provide a rigid, free-standing structure. The control cabinets shall be provided with hinged doors on the front of each panel section. Door panels shall be gasketed and shall be provided with three-point, vault-type latches. All hardware shall be corrosion resistant. Thermostatically controlled strip heaters shall be provided in each

cabinet to prevent build up of excess moisture. The strip heater shall be rated for 120VAC and sized for the required power rating. Each panel shall be provided with suitable interior light fixtures and a duplex receptacle.

Each control panel enclosure shall be sized to fit all equipment and meet Code requirements. The length of each assembly shall be such as to permit mounting in the available space along the walls of the Pontoon cells, Sheds, and Bridge Maintenance Facility. If the final cabinet dimensions, as established by the manufacturer, should necessitate rearrangement or modification of the equipment in order to fit in the available space, such rearrangement or modifications shall be made and at no extra cost to WSDOT. The final arrangement of all equipment shall be subject to the approval of the Electrical Design Engineer.

The control panel enclosures, back plates, and all metal reinforcing shall be painted inside with two coats and outside with three coats, consisting of one coat of primer followed by one coat of gray or white enamel on the inside surfaces and two coats of gray enamel outside. The finish exterior coat shall be ANSI 61 light gray enamel.

All contactors, relays, and other devices shall be of required current carrying and interrupting capacity. All apparatus shall be of substantial construction and shall conform to the requirements of NEMA Standards Publications ICS 1 and 2, latest revision, for industrial control devices.

All wiring installed within the control cabinets shall be flame-retardant, ethylene-propylene insulated, switchboard wire, Type SIS. Conductors shall be stranded copper not smaller than No. 14 American Wire Gauge.

For each assembled control panel, all outgoing wire, No. 8 AWG or smaller, shall be connected to terminal blocks installed in the cabinet. The control panels shall also provide sufficient extra terminals to allow connection of all wires coming from limit switches and other devices that are routed to other locations as required, even though these wires do not connect to apparatus on the control panels. Spare terminals totaling at least 10 percent of those actually used shall be provided. Each terminal shall be identified per wire number shown on the Design-Builder's schematic wiring diagrams.

All panel wiring shall be arranged systematically so that circuits can be readily traced. The wiring shall be installed in a network of troughs consisting of horizontal and vertical sections securely bolted to the panels. The troughs shall be fabricated from heavy duty Noryl plastic shaped into a channel cross-section. After installation of the wiring, an insulated, flanged cover shall be fitted over the open side of each trough section.

Provide locks on the panels.

### 2.17.23.7 LIMIT SWITCHES

A float switch shall be installed in each cell in each Pontoon, including the supplemental stability Pontoons. The mounting height from the Pontoon cell floor to the float switch shall be one inch; the switch shall be mounted beyond any chamfer in the Pontoon cell wall; and each float switch shall require a protective shield that allows for maintenance access and protection of the switch from ballast gravel. The Design-Builder’s design for the float switch mounting brackets and shield shall address all these requirements, and meet all applicable electrical and structural codes.

Each switch shall be wired to the PLC remote I/O rack for monitoring of the Pontoon cell and to alarm if water accumulates in the Pontoon cell.

The float switches shall be water sensors, submersible type, miniature float vertical switches Model M8000 as manufactured by Madison Company, or equal. Each limit switch shall be furnished with normally closed (N.C.) contacts. The enclosure shall be provided with five feet of factory-installed submersible cable.

### 2.17.23.8 PORTABLE PUMPS

The Design-Builder shall furnish 16 electrical submersible portable pumps. The pumps shall be Grindex Catalog Number No. PD604180-INT Major Electrical Submersible Drainage Pump or equal. Each pump shall be capable of pumping 550 gallons per minute at a 30 foot head. The pumps shall be rated 230VAC and be equipped with a 53 foot power cable and pin style plug. The pin style plug shall be coordinated with the Pumping Receptacle Stations. Eight pumps shall be located in the Shed Type I on Pontoon G and eight pumps shall be located in the Shed Type I on Pontoon Q.

### 2.17.23.9 PUMPING RECEPTACLE STATIONS

The pumping receptacle station shall be a NEMA-4X stainless steel enclosure. Each station shall contain a 230VAC pin style receptacle to power a potable pump as specified herein. Each station shall also contain a 120VAC receptacle as specified herein. Each station shall have a back plate and a ground bar. The equipment shall be located such that the receptacle can easily be accessed with the plugs.

### 2.17.23.10 SOFTWARE PROGRAMMING

The Design-Builder shall provide a complete program for the equipment and shall designate the Control System Vendor to be fully responsible to generate a complete operating system and develop the PLC program and alarm messages using:

- The Software Programming, Sequence of Operation, Other PLC Functions, and Alarm sections provided in this section
- All logic and wiring
- The testing requirements shown in Start Up And Commissioning Requirements.

Allowing for specific requirements of the Allen-Bradley PLC as supplied, the program ladder logic shall follow the above items and these requirements as closely as possible.

The control system vendor shall furnish a laptop computer, interconnection cables, power supplies, software, Alarm panel programming, and PLC programming to accomplish the specified operation of the bridge and its auxiliaries. Software for the PLC, Alarm panel, and laptop computer shall be loaded and coordinated by the Design-Builder to achieve the correct operation of all software.

The control system vendor shall be fully responsible for developing the PLC and Alarm panel program to accomplish the specified operation of the bridge and its associated equipment. The Design-Builder shall assume software debugging will occur in the shop as well as in the field during start-up and subsequent testing.

The PLC program shall be in accordance with the following items:

A. The ladder logic shall be easy to understand and troubleshoot.

B. The ladder logic shall be fully documented, including rung comments and address comments.

C. The ladder logic shall be written with regards to the operational requirements of the bridge, containing separate sections for each of the major equipment areas such as cathodic protection, float switches, etc.

D. The ladder logic shall not utilize or contain the following flaws:

1. Latched coils: PLC logic shall be based upon real world conditions and reset when required. When the PLC loses power, and then power is returned, the PLC will determine the status of float switches and other electrical equipment, but not expect the equipment to be in the exact same position. If any equipment was operated, the PLC program will determine the new position of the equipment and operate normally.

2. Unnecessary internal coils: PLC logic shall be as simplified as possible and not use multiple relays for a single function. The intent of this is to make the program easy to troubleshoot and understand.

3. Improper bypass logic: When bypass switches are utilized the bypass will bypass only the required interlocks. The intent of this item is to provide programming that will utilize the bypasses and only bypasses the correct interlock, but does not remain active in the logic or bypass other interlocks in the program.

E. All timer settings shall be clearly documented in the program. They shall be adjusted to match the selected equipment and adjusted during shop and field testing for proper operation.

F. Add alarm messages and associated alarm ladder logic as required.

G. In the event of CPU failure, all outputs shall turn off.

The Design-Builder shall submit a fully documented and cross-referenced copy of the new PLC program for review and comment.

The Alarm panel alarm panel shall be programmed to time-stamp, print, and store each PLC alarm. The alarms shall be stored in chronological order and the operator shall be able to scroll through the alarm screen to review alarms. The alarms shall be stored in the Alarm panel and be identified by a numerical identifier. When the PLC processor transmits the alarm bit to the Alarm panel the Alarm panel shall display the alarms, print the alarms, and store the alarms in an alarm history screen.

The alarms shall activate an autodialer as described in the PLC operation herein. The autodialer shall have a set of numbers to dial and preset alarms that it will identify. The autodialer shall be activated by discrete outputs from the PLC. During the factory testing of the equipment the Control System Vendor shall use phone numbers that allow the testing to be completed. After the factory testing has been completed the Control System Vendor shall submit a sheet identifying each alarm and requesting the correct phone number for the final system. The minimum autodialer announcements shall be:

- Leak Detection Alarm – Float Switch Activated: If any float switch is activated for more than 3 seconds, the autodialer shall be activated.
- Cathodic Protection Rectifier Failure – Panel Output Lost: If any cathodic protection rectifier panel has an output failure for more than 30 seconds, then the autodialer shall be activated.

- Bridge Maintenance Facility UPS Failure
- Bridge Maintenance Facility PLC Processor Failure: If either processor fails, then the autodialer shall be activated.
- PLC Fiber Optic Communication Failure: If there is a fiber optic communication failure at the bridge, then the autodialer shall be activated.
- PLC Communication Failure: If there is a PLC communication failure (at any PLC) that lasts for more than 10 seconds, then the autodialer shall be activated.
- Pontoon Motion Sensor Alarm: If there is a motion sensor alarm activation at any location, then the autodialer shall be activated.
- Pontoon Equipment Circuit Breaker Trip: If there is an equipment circuit breaker trip at any location, then the autodialer shall be activated.
- Pontoon PLC Panel Fuse Failure: If there is a fuse failure at any Pontoon, then the autodialer shall be activated.
- Bridge Fire Protection Pumps have been energized.

### 2.17.23.11 PLC MODES OF OPERATION

There will be two modes of operation. The first mode shall be normal operation, operated as called out below and providing all alarms and autodialer activation. The second mode shall be test mode in which the maintenance crew can test and operate equipment without having the autodialer call out an alarm condition.

### 2.17.23.12 SEQUENCE OF OPERATION AND MONITORING

The operation for the bridge shall be as described below:

When the PLC is required to generate an alarm, this means to send a bit from the defined bit array to the Alarm panel. When the Alarm panel receives the alarm bit the Alarm panel will display the alarm, provide the time and date of the alarm, print the alarm, and store the alarm in an alarm history screen. A screen will be provided to allow the operator to scroll down the alarm history.

The operation examples are for bridge operator to activate lights, navigation lights, and energize/de-energize the cathodic protection panels.

A. Password Access

The alarm panel screens shall be equipped with screens that allow the operator to view screens and alarms. In order to clear any alarm or activate any operation the operator shall have to enter a 4 digit identification alphanumeric string and 4 digit alphanumeric string password to access those screens. The PLC program shall be capable of storing 30 identifications and associate passwords. Setting the identifier shall be performed easily form either the alarm panel screen or the laptop computer.

B. Cathodic Protection Monitoring

The PLC based remote monitoring system for the cathodic protection system shall monitor the voltage and current output of each rectifier circuit, and shall be capable of interrupting the output of the cathodic protection.

The Design-Builder shall furnish and install DC signal conditioners in either the Cathodic Rectifier Panels or PLC panels to provide the cathode DC Voltage (from 0 to 100VDC) as an input into the PLC as a 4 to 20mA signal for each circuit of the cathodic protection panel, two signal conditioner voltmeters on Pontoons with only two anchor cables and four signal conditioner voltmeters on Pontoons with four anchor cables.

The Design-Builder shall furnish and install DC signal conditioners in in either the Cathodic Rectifier Panels or PLC panels to provide the anode DC Current. The DC current shall be measured across the shunt on the rectifier as a 0 to 100mVDC output, which represents 0 to 10 Amps DC. The 0 to 100mVDC output shall be conditioned as an input into the PLC as a 4 to 20mA signal for each circuit of the cathodic protection panel, two signal conditioner voltmeters on Pontoons with only two anchor cables and four signal conditioner voltmeters on Pontoons with four anchor cables

The Design-Builder shall furnish and install DC signal conditioners in the PLC panels to provide the reference cell potential DC Voltage (from 0 to 10VDC) as an input into the PLC as a 4 to 20mA signal. Provide four signal conditioners, one in each Pontoon PLC Panel on Pontoons A, E, L, and W.

The PLC shall scan and monitor all the inputs during normal operation, except during testing operations (I/O Interrupt, Depolarization Interrupt, and Power Off). The PLC shall store the values once every 12 hours. The PLC shall organize the data in monthly blocks to allow the information to be downloaded to the laptop computer. The PLC shall keep no more than a single years worth of data, and the process to download the data will be simple and use the laptop computer.

The PLC shall scan and monitor all the inputs during normal operation, except during testing operations (I/O Interrupt, Depolarization Interrupt, and Power Off). It shall check for an alarm condition at least every 10 minutes. The PLC shall provide an alarm when either the voltage input or the current input from the cathodic protection panel remains at zero for more than 30 seconds. The set point of zero shall be the initial setting in the PLC program and shall be easily adjustable in the PLC program. If the PLC provides an alarm, then the autodialer shall dial an alarm announcing a Cathodic Protection Rectifier Failure. The Alarm panel shall graphically identify the alarm location on a screen identifying all the Pontoons on the Bridge, identifying which Pontoons have a Cathodic Rectifier Failure.

C. Cathodic Protection Operations

The PLC shall provide the following remote operations of the cathodic protection rectifier:

1. I/O Interrupt: I/O Interrupt shall remotely de-energize the Cathodic Protection Panel outputs for one second.

   - The operator shall place the PLC in Test Mode.
   - The operator shall select the test from the alarm panel screen.
   - The PLC shall energize the outputs in the PLC panel in all Pontoons simultaneously. The contact in each PLC panel shall be wired to the Cathodic Protection Panel, and it shall activate the solenoid in the

Cathodic Protection Panel to de-energize the Cathodic Protection Panel outputs.

- The PLC shall keep the output energized such that the Cathodic Protection Panel outputs are de-energized for 1 second. Then length of the PLC output shall be field tested and adjusted during field testing the PLC to get a full one second of de-energization.
- This setting will allow the technician to take field measurements.
- The operator shall then place the PLC in Normal Mode to exit the testing mode.

2. Depolarization Interrupt: Depolarization Interrupt shall remotely de-energize the Cathodic Protection Panel outputs for 4 hours, during which the PLC will monitor the reference cell potential values.

- The operator shall place the PLC in Test Mode.
- The operator shall select the test from the alarm panel screen. While selecting the test, the operator shall enter the sample time. The sample time shall either be 10 to 60 seconds, or 1 to 60 minutes. The screen shall be configured to select the unit of time and then the frequency of sampling.
- The PLC shall energize the isolated output in the PLC panel in all Pontoons simultaneously. The contact in each PLC panel shall be wired to the Cathodic Protection Panel, and it shall activate the solenoid in the Cathodic Protection Panel to de-energize the Cathodic Protection Panel outputs.
- The operator shall have the option to select to continue test during normal mode. The operator shall place the PLC in Normal Mode. The PLC shall keep the selected Cathodic Protection Panel outputs de-energized and not monitor their outputs for alarm conditions, but shall monitor all other bridge equipment. The PLC shall provide a continual announcement on the Alarm panel screens that the test is still being performed.
- The PLC shall keep the output energized such that the Cathodic Protection Panel outputs are de-energized for four hours. Then length of the PLC output shall be field tested and adjusted during field testing the PLC to get the full four hours of de-energization.
- The PLC shall monitor and store the four reference cell potential inputs in Pontoons A, E, L, and W at the frequency selected at the beginning.
- The PLC shall provide an alarm to notify the Operator that the test is done.
- The operator shall acknowledge the alarm, and the PLC shall automatically place the PLC in normal mode. The PLC shall operate all Cathodic Rectifier Panel equipment normally, to protect the equipment.

3. Power Off: Power Off shall remotely de-energize the Cathodic Protection Panel outputs until the operator selects power on.

- The operator shall place the PLC in Test Mode.

- The operator shall select the test from the alarm panel screen.
- The operator shall select be provided a screen to select which Cathodic Protection Panels to de-energize. The selection shall allow the operator to select either all Cathodic Protection Panels or multiple individual Cathodic Protection Panels.
- The PLC shall energize the isolated output in the PLC panels in the selected Pontoons. The contact in each PLC panel shall be wired to the Cathodic Protection Panel, and it shall activate the solenoid in the Cathodic Protection Panel to de-energize the Cathodic Protection Panel outputs.
- The PLC shall keep the outputs energized such that the selected Cathodic Protection Panel outputs are de-energized until the operator ends the Power Off test.
- The operator shall have the option to select to continue test during normal mode. If the operator selects this option, the operator shall then place the PLC in Normal Mode. The PLC shall keep the selected Cathodic Protection Panel outputs de-energized and not monitor their outputs for alarm conditions, but shall monitor all other bridge equipment, such as float switches, motion sensors, and Cathodic Protection Panels whose outputs are not de-energized. The PLC shall provide a continual announcement on the Alarm panel screens that the test is still being performed.
- When the operator is finished with the testing, the operator shall select the test from the alarm panel screen. The operator shall select to end the Power Off Test.
- The PLC shall de-energize the isolated output in the PLC panels in the selected Pontoons. Allowing the Cathodic Protection Panel to energize the Cathodic Protection Panel outputs.
- The operator shall place the PLC in Normal Mode.

D. Leak Detection Operations

The PLC based remote monitoring system for the leak detection system shall monitor each float switch. When any float switch is activated for more than 3 seconds, the PLC shall sound an alarm, and then the autodialer shall dial an alarm announcing a Leak Detection Alarm. The alarm panel shall graphically identify the alarm location on a screen identifying all the Pontoons on the Bridge, identifying which Pontoons have an alarm. Then the alarm panel shall allow the operator to select the specific Pontoon and provide a graphical display showing each cell on the Pontoon and identifying the cells which have an alarm.

Due to the critical nature and large quantity of inputs for the leak detection system it shall be treated as a separate system from the other items that the PLC monitors.

E. PLC Monitoring

The PLC based remote monitoring system shall monitor multiple inputs, including but not limited to:

- Motion Sensor Inputs
- Bypass Switch Floodlight Operation Status
- Bypass Switch Underdeck Light Operation Status
- Bypass Switch Pontoon Light Operation Status
- Bypass Switch Navigation Light Operation Status
- PLC Panel Fuse Check Operation
- Pontoon Service Equipment Circuit Breaker Status

When any of the above inputs is activated for more than 3 seconds, the PLC shall sound an alarm. If the condition is one of the autodialer announcements, then the autodialer shall dial an alarm announcing an alarm. The Alarm panel shall graphically identify the alarm location on a screen showing all the Pontoons on the Bridge, identifying which Pontoons have an alarm. Then the alarm panel shall allow the operator to select a specific Pontoon and provide a graphical display showing each cell on the Pontoon and identifying the cells which have an alarm.

F. PLC Interior Pontoon Cell Lighting Operation

The PLC shall operate the interior Pontoon cell lights under normal conditions, and shall be equipped with a hardwired bypass switch to operate the lights if there is a PLC failure.

In order to operate the lights, the PLC monitors the manual switches and the alarm panel screen. In order to operate the lights from the alarm panel screen:

- The operator shall select the lighting operation from the alarm panel screen.
- The operator shall be provided a screen showing all the Pontoons and shall be able to select which Pontoons activate the interior lights.
- The PLC shall energize the lighting contactors in PLC panels in the selected Pontoons.
- The PLC shall keep the outputs energized until the operator selects to turn off the lights (at the alarm panel screen or switch).
- The operator shall select the lighting operation from the alarm panel screen. The operator shall be provided a screen showing all the Pontoons and shall be able to select which Pontoon to de-activate the interior lights.

Alternately, there are light switches located in each cell in a Pontoon that has a hatch on the surface of the Pontoon deck. These switches are wired into the PLC in series, and are spring return. The switch circuit is energized, and when the operator operates the switch, the input to the PLC will de-energize momentarily. The PLC shall monitor the switch input, and when the input de-energizes the PLC will change the state of the lighting contactor; if the lights are energized, the PLC will de-energize the lights and if the lights are de-energized the PLC will energize them.

The PLC shall be capable of monitoring both alarm panel screen controls and the manual switches, and the operator shall be able to operate either to operate the lights. For example, if the lights have been energized manually, the lights can be de-energized by using the alarm panel screens.

The PLC shall have the 'auto' position of each manual bypass switch wired as an input to the PLC. The PLC shall monitor when a bypass switch is not in the 'auto' position, and provide an alarm identifying the Pontoon where this occurs. When the PLC is not in the 'auto' position, the PLC shall not attempt to operate the lighting contactor in that Pontoon.

G. PLC Lighting Operation

The PLC shall operate the lights under normal conditions, and shall be equipped with a hardwired bypass switch to operate the lights if there is a PLC failure.

In order to operate the lights, the PLC monitors the alarm panel screen. In order to operate the lights:

- The operator shall select the lighting operation from the alarm panel screen.
- The operator shall be provided a screen showing all the Pontoons and shall be able to select which Pontoons activate the underdeck lights.
- The PLC shall energize the lighting contactors in PLC panels in the selected Pontoons.
- The PLC shall keep the outputs energized until the operator selects to turn off the lights.
- The operator shall select the lighting operation from the alarm panel screen. The operator shall be provided a screen showing all the Pontoons and shall be able to select which Pontoon to de-activate the underdeck lights.

The PLC shall have the 'auto' position of each manual bypass switch wired as an input to the PLC. The PLC shall monitor when a bypass switch is not in the 'auto' position, and provide an alarm identifying the Pontoon where this occurs. When the PLC is not in the 'auto' position, the PLC shall not attempt to operate the lighting contactor in that Pontoon.

H. PLC Boat Mooring and Jib Crane Floodlight Operation

The PLC shall operate the floodlights under normal conditions, and shall be equipped with a hardwired bypass switch to operate the floodlights if there is a PLC failure.

In order to operate the lights, the PLC monitors the alarm panel screen. In order to operate the lights:

- The operator shall select the lighting operation from the alarm panel screen.
- The operator shall be provided a screen showing all the Pontoons and shall be able to select which Pontoons activate the underdeck lights.
- The PLC shall energize the lighting contactors in PLC panels in the selected Pontoons.
- The PLC shall keep the outputs energized until the operator selects to turn off the lights.
- The operator shall select the lighting operation from the alarm panel screen. The operator shall be provided a screen showing all the Pontoons and shall be able to select which Pontoon to de-activate the underdeck lights.

The PLC shall have the 'auto' position of each manual bypass switch wired as an input to the PLC. The PLC shall monitor when a bypass switch is not in the 'auto' position, and provide an alarm identifying the Pontoon where this occurs. When the PLC is not in the 'auto' position, the PLC shall not attempt to operate the lighting contactor in that Pontoon.

I. PLC Navigation Lighting Operation

The PLC shall operate the navigation lights under normal conditions, and shall be equipped with a hardwired bypass switch to operate the navigation lights if there is a PLC failure.

Normal PLC operation shall monitor the photo-electric cell. When the photo-electric cell de-energizes, then the PLC shall energize the contactors in each PLC Panel to energize the navigation lights. When the photo-electric cell energizes, then the PLC shall de-energize the contactors in each PLC Panel to de-energize the navigation lights.

In the event of a photo-electric cell failure or for testing, in order to operate the navigation lights, the PLC monitors the alarm panel screen. It shall not be necessary to place the PLC in Test Mode to turn on the navigation lights. In order to operate the lights:

- The operator shall select the lighting operation from the alarm panel screen.
- The operator shall be provided a screen providing the option to energize all navigation lights or place the navigation lights in auto.
- When the operator selects the option to energize all navigation lights, the PLC shall energize the lighting contactors in PLC panels in all Pontoons.
- The operator shall select the navigation lighting operation from the alarm panel screen. The operator shall be able to select the option to place the navigation lights back in auto.
- The PLC shall operate the navigation lights in accordance with the photo-electric cell.

The PLC shall have the 'auto' position of each manual bypass switch wired as an input to the PLC. The PLC shall monitor when a bypass switch is not in the 'auto' position, and provide an alarm identifying the Pontoon where this occurs. When the PLC is not in the 'auto' position, the PLC shall not attempt to operate the navigation light contactor in that Pontoon.

J. Bridge Fire Protection Pump Operation

The PLC shall monitor inputs from the Bridge Fire Protection pump control system. The Bridge Fire Protection pump system shall provide the following control points:

- Bridge Fire Protection Pump 1 Energized
- Bridge Fire Protection Pump 2 Energized
- Bridge Fire Protection Pump 3 Energized
- Bridge Fire Protection Pump 4 Energized
- Bridge Fire Protection Pump 1 De-energized

- Bridge Fire Protection Pump 2 De-energized
- Bridge Fire Protection Pump 3 De-energized
- Bridge Fire Protection Pump 4 De-energized
- Zone 1 motorized control valve energized to the north side
- Zone 1 motorized control valve energized to the south side
- Zone 2 motorized control valve energized to the north side
- Zone 2 motorized control valve energized to the south side
- Zone 1 Bridge Fire Protection Pipe Water Flow and Pressurization Detected to the north side
- Zone 1 Bridge Fire Protection Pipe Water Flow and Pressurization Detected to the south side
- Zone 2 Bridge Fire Protection Pipe Water Flow and Pressurization Detected to the north side
- Zone 2 Bridge Fire Protection Pipe Water Flow and Pressurization Detected to the south side.

The PLC shall provide an alarm if any of these conditions occur. The PLC shall provide an alarm panel screen showing the status of the Fire Protection Pumps, motorized valves, and the direction of water flow. The operator shall be able to energize or de-energize the motorized valves and the pump motors through the PLC alarm panel screen.

Further, the PLC shall monitor the run time for each of the fire pumps. This information shall be accessible by the operator to determine how many hours of operation each the pumps have been running for determining maintenance on each pump motor.

### 2.17.23.13 ALARMS

The PLC program shall generate alarms when they occur. The alarm shall be sent once to the Alarm panel and shall not be sent again until the next time the alarm condition occurs. The Alarm panel shall provide an audible tone with each alarm until the Alarm Panel acknowledge button is pressed.

All the standard PLC processor and equipment fault conditions and alarms, provided as part of the PLC equipment, shall generate an alarm.

All the standard fiber optic equipment fault alarms and conditions, provided as part of the fiber optic equipment, shall generate an alarm.

The Design-Builder shall be prepared to add an additional 250 alarms during the Factory Testing and another 250 during Start Up and Commissioning as directed by the Electrical Design Lead Engineer or WSDOT.

The following is a list of the minimum alarms required for the Bridge Maintenance Facility:

1. PLC Processor A Rack fault.
2. PLC Processor B Rack fault.

3. PLC Communication Fiber Optic Cable Fault Tracking Alarm
4. PLC Communication Fiber Optic Cable Failure
5. Bridge Maintenance Facility UPS Fault
6. Bridge Maintenance Facility UPS in Bypass
7. Autodialer Fault
8. Alarm from Alarm Panel
9. Alarm from Fire Panel
10. Alarm from Freight Elevator
11. Alarm from passenger Elevator
12. Bridge Maintenance Facility 480V Circuit Breaker Trip
13. Medium Voltage Circuit Breaker Trip
14. Generator Running
15. Generator Alarm
16. Generator Maintenance
17. ATS Normal Power Available
18. ATS Generator Power Available
19. ATS switched to Normal Power
20. ATS switched to Generator Power
21. Diesel Fuel Level Low
22. Diesel Fuel Leak Sensor
23. Sanitary Waste Water Leak Sensor
24. Snow Melt System Alarm – Dock
25. Snow Melt System Alarm – Concrete Drive

The following is a typical list of the minimum alarms required for each Pontoon. Pontoon A is shown for reference, provide an alarm list for each Pontoon.

1. PLC Communication fault to Remote I/O Rack in Pontoon A.
2. PLC Communication Fiber Optic Cable Fault Tracking Alarm Pontoon A.
3. PLC Communication Fiber Optic Cable Failure Pontoon A.
4. Pontoon A Cell 1A float switch FS-A1A has tripped, water alarm.
5. Pontoon A Cell 1B float switch FS-A1B has tripped, water alarm.
6. Pontoon A Cell 1C float switch FS-A1C has tripped, water alarm.
7. Pontoon A Cell 1D float switch FS-A1D has tripped, water alarm.
8. Pontoon A Cell 1E float switch FS-A1E has tripped, water alarm.
9. Pontoon A Cell 1F float switch FS-A1F has tripped, water alarm.
10. Pontoon A Cell 1G float switch FS-A1G has tripped, water alarm.

11. Pontoon A Cell 1H float switch FS-A1H has tripped, water alarm.
12. Pontoon A Cell 1I float switch FS-A1I has tripped, water alarm.
13. Pontoon A Cell 1J float switch FS-A1J has tripped, water alarm.
14. Pontoon A Cell 1K float switch FS-A1K has tripped, water alarm.
15. Pontoon A Cell 1L float switch FS-A1L has tripped, water alarm.
16. Pontoon A Cell 2A float switch FS-A2A has tripped, water alarm.
17. Pontoon A Cell 2B float switch FS-A2B has tripped, water alarm.
18. Pontoon A Cell 2C float switch FS-A2C has tripped, water alarm.
19. Pontoon A Cell 2D float switch FS-A2D has tripped, water alarm.
20. Pontoon A Cell 2E float switch FS-A2E has tripped, water alarm.
21. Pontoon A Cell 2F float switch FS-A2F has tripped, water alarm.
22. Pontoon A Cell 2G float switch FS-A2G has tripped, water alarm.
23. Pontoon A Cell 2H float switch FS-A2H has tripped, water alarm.
24. Pontoon A Cell 2I float switch FS-A2I has tripped, water alarm.
25. Pontoon A Cell 2J float switch FS-A2J has tripped, water alarm.
26. Pontoon A Cell 2K float switch FS-A2K has tripped, water alarm.
27. Pontoon A Cell 2L float switch FS-A2L has tripped, water alarm.
28. Pontoon A Cell 3A float switch FS-A3A has tripped, water alarm.
29. Pontoon A Cell 3B float switch FS-A3B has tripped, water alarm.
30. Pontoon A Cell 3C float switch FS-A3C has tripped, water alarm.
31. Pontoon A Cell 3D float switch FS-A3D has tripped, water alarm.
32. Pontoon A Cell 3E float switch FS-A3E has tripped, water alarm.
33. Pontoon A Cell 3F float switch FS-A3F has tripped, water alarm.
34. Pontoon A Cell 3G float switch FS-A3G has tripped, water alarm.
35. Pontoon A Cell 3H float switch FS-A3H has tripped, water alarm.
36. Pontoon A Cell 3I float switch FS-A3I has tripped, water alarm.
37. Pontoon A Cell 3J float switch FS-A3J has tripped, water alarm.
38. Pontoon A Cell 3K float switch FS-A3K has tripped, water alarm.
39. Pontoon A Cell 3L float switch FS-A3L has tripped, water alarm.
40. Pontoon A Power Panel 2 Circuit Breaker CB-PA4 has tripped.
41. Pontoon A Power Panel 1 (Pump Panel) Circuit Breaker CB-PA3 has tripped.
42. Pontoon A Anchor Gallery Motion Sensor Alarm.
43. Pontoon A North Cell Light Switches Activated.
44. Pontoon A South Cell Light Switches Activated.
45. Pontoon A PLC Panel Fuse Check FU-A1 alarm.

46. Pontoon A PLC Panel Fuse Check FU-A2 alarm.
47. Pontoon A PLC Panel Fuse Check FU-A3 alarm.
48. Pontoon A PLC Panel Fuse Check FU-A4 alarm.
49. Pontoon A Cathodic Protection Panel CP-A1 Voltmeter VM1 failure, zero output.
50. Pontoon A Cathodic Protection Panel CP-A1 Voltmeter VM2 failure, zero output.
51. Pontoon A Cathodic Protection Panel CP-A1 Ammeter AM1 failure, zero output.
52. Pontoon A Cathodic Protection Panel CP-A1 Ammeter AM2 failure, zero output.
53. Pontoon A Cathodic Protection Panel CP-A2 Voltmeter VM1 failure, zero output.
54. Pontoon A Cathodic Protection Panel CP-A2 Voltmeter VM2 failure, zero output.
55. Pontoon A Cathodic Protection Panel CP-A2 Ammeter AM1 failure, zero output.
56. Pontoon A Cathodic Protection Panel CP-A2 Ammeter AM2 failure, zero output.
57. Pontoon A Cathodic Protection Panel CP-A1 de-energized.
58. Pontoon A Cathodic Protection Panel CP-A2 de-energized.
59. Pontoon A Underdeck Lights Energized.
60. Pontoon A Pontoon Cell Interior Lights Energized.
61. Pontoon A Cell Interior Lights Bypass Activated.
62. Pontoon A Underdeck Lights Bypass Activated.
63. Pontoon A Navigation Lights Bypass Activated.

The following is a typical list of the minimum alarms required for each Shed Type I (Maintenance Sheds). The Shed Type I (Maintenance Shed) on Pontoon Q is shown for reference, provide an alarm list for each shed.

1. PLC Communication fault to Remote I/O Rack in Pontoon Q Maintenance Shed.
2. PLC Communication Fiber Optic Cable Fault Tracking Alarm Pontoon Q Maintenance Shed.
3. PLC Communication Fiber Optic Cable Failure Pontoon Q Maintenance Shed.
4. Pontoon Q Maintenance Shed Power Panel 2 Circuit Breaker CB-PA4 has tripped.
5. Pontoon Q Maintenance Shed Power Panel 1 (Pump Panel) Circuit Breaker CB-PA3 has tripped.
6. Pontoon Q Maintenance Shed Motion Sensor Alarm.
7. Pontoon Q Maintenance Shed Floodlight Activated.
8. Pontoon Q Maintenance Shed Floodlight switch activated.
9. Pontoon Q Maintenance Shed PLC Panel Fuse Check FU-MSQ1 alarm.
10. Pontoon Q Maintenance Shed Floodlight Bypass Activated.

The following is a typical list of the alarms required that are not specifically located on a PLC input, but will be located by the Design-Builder:

1. Roadway Temperature Sensor indicates the roadway is at 32° or lower.

2. Roadway Barometer Sensor low pressure threshold is met. (Design-Builder to determine the low pressure threshold for alarm.)
3. Wind speed has been greater than 45 miles per hour and maintained for over 60 seconds. The wind direction shall be provided in the alarm. (The actual wind speed and length of time required to activate the alarm shall be field adjustable.)

The PLC shall display current temperature, atmospheric pressure, wind speed and direction on a screen on the Alarm panel. The PLC shall store historical data for the weather station.

## 2.17.24 NAVIGATION AND PONTOON LIGHTING

Navigation lights shall be provided in accordance with the rules and regulations of the United States Coast Guard. The Design-Builder shall design and furnish a complete navigation, Pontoon, and pier lighting system from the Bridge Maintenance Facility, East Transition Span up to and including the West Transition Spans.

### 2.17.24.1 PONTOON AND PIER LIGHTS

There shall be provided vandal resistant warning red lights mounted on the Pontoons and pier columns. These lights are called Pontoon lights when located on the Pontoons and pier lights at all other locations. They provide warning to a boater that impact is imminent.

- A minimum of two red lights on each Pontoon and three red lights on Pontoons A and W.
- A minimum of two lights each on parallel columns between Pontoon W and the shore.

Each Pontoon and pier light shall be a single unit, 8 inch outside diameter, 180 or 360 degree, red fresnel lens, and shall be mounted on a section of stainless steel pipe with a flange at the bottom mounted on a junction box supplied by the manufacturer. A single medium base 120V, 100,000 hour LED lamp shall be provided in a color to match the lens. The housing shall be of cast aluminum or cast silicon bronze. Casting alloy used shall be suitable for marine environment. Construction shall be rain-tight and fully gasketed. The light assembly shall be designed for heavy duty, long life service. Design shall provide ready access for lamp service.

### 2.17.24.2 NAVIGATION LIGHTS

At the middle of each transition span on the outboard sides (total of four (4) locations), there shall be mounted a green navigation light. One of the navigable channels shall be located between the west edge of Pontoon A and the nearest pier columns. The other navigable channel is located between the east edge of Pontoon W and the nearest east pier column.

There is an area between the east pier column (nearest to the east edge of Pontoon W) and the next pier column that is not a navigable channel, and any boat entering the area may impact the Bridge Maintenance Facility and Dock. At the middle of the span on the outboard sides (total of two (2) locations), there shall be mounted a red navigation light to indicate the channel is not navigable.

Each unit shall have a either a green lens or a red lens. A single medium base 120V 100,000 hour LED lamp shall be provided in a color to match the lens. The each light

shall have an 8-inch, 360 degree, fresnel lens. There shall be four green navigation lights indicating the navigable channel and two red navigation lights indicating that the channel is not navigable. Each transition span light shall be suspended by a stainless steel pipe hanger from a pivot bracket mounted on the span.

For all navigation lights, the doors and lenses shall be gasketed, and each entire unit shall be completely weatherproof. Fittings shall be non-corroding, and the sockets shall be of porcelain mounted on shock absorbers. The housings for all units shall be cast-bronze, and a 120-volt, 100,000 hour LED lamp with brass base shall be installed in each socket. A bronze retriever chain shall be provided for each pivoted transition span light. All fender and bascule span lights shall be equipped with bronze or stainless steel junction boxes. The housing shall be of cast aluminum or cast silicon bronze. Casting alloy used shall be suitable for marine environment. Construction shall be rain-tight and fully gasketed. The light assembly shall be designed for heavy duty, long life service. Design shall provide ready access for lamp service.

### 2.17.24.3 WEST APPROACH

The west approach span 36 shall require two temporary red pier lights mounted on the columns.

There shall be provided vandal-resistant temporary warning red lights mounted on the west approach pier columns. These pier lights provide warning to a boater that impact is imminent.

- A minimum of two lights each on parallel set of columns between the shore and the transition span.

Once the WCB is completed and turned over to the Design-Builder, the Design-Builder shall maintain the pier light system along the WCB and the Existing West Approach.

### 2.17.24.4 COAST GUARD APPROVAL

The Design-Builder shall be responsible for meeting with the Coast Guard and getting final approval of the lighting system. A preliminary meeting was held with the Coast Guard for the purposes of verifying that the conceptual plan layout was generally acceptable. The Coast Guard will not provide approval for the navigation and Pontoon lighting until the equipment is installed and viewed in the field. The Design-Builder shall make any modifications as directed by the Coast Guard to gain approval for the navigation and Pontoon lighting system.

## 2.17.25 SECURITY CLOSED CIRCUIT TELEVISION

The Design-Builder shall provide a complete security Closed Circuit Television (CCTV) system, consisting of:

- A minimum of sixteen pan-tilt-zoom security cameras located on the Pontoons, each equipped with dome housings, lenses, power supplies, fiber optic transmitter, and fiber optic receiver. The cameras shall be capable of viewing the navigation channels, the end Pontoons, waterway along the north and south sides of the Pontoon bridge, and all the Pontoon underdeck locations on the bridge.
- A minimum of eight standard 40 foot tapered poles. Proposed locations are coordinated with the PFS blockouts for conduit penetrations. There shall be two

cameras on each pole and the Design-Build shall determine the mounting heights based upon the final roadway configuration.

- A minimum of three security cameras located at the Bridge Maintenance Facility, each equipped with dome housing, lens, power supply, fiber optic transmitter, and fiber optic receiver. The cameras shall provide a clear view of the Dock, the parking lot area, and the roadway approach gate and card reader.
- A control desk equipped with at least two flat screen color monitors, computer, fiber optic receiver for each camera, a code distribution transmitter, a digital video recorder combination multiplexer unit, fiber optic transmitter for each camera, and a pan tilt zoom keyboard to control all 19 cameras.
- Patch Panels as required to mount power supplies, and install and pull the fiber optic cables.
- The system shall be coordinated with the TMC. The system shall be controlled from both the control desk and remotely. There shall be capability for at least two additional locations where the video feeds and controls can be remotely viewed and operated. The Design-Builder shall fully coordinate the system to ensure proper operation at the TMC by providing equipment or compatible systems.

### 2.17.25.1 CCTV CAMERAS, LENSES, AND CAMERA HOUSING

The security camera shall be complete with zoom lens, solid state CCD image device, power supply, and outdoor camera housing with environmental controls. The security camera with housing shall be suitable for mounting to the tapered poles.

The security cameras shall be equipped with pan, tilt, zoom capability using remote control from the CCTV Work Station. The communication shall be through fiber optic cable. The security camera system shall be capable of detecting target movement and automatically zooming in on the motion. The security camera shall be a day/night rated camera, rated to 0.01 lux (0.001 foot-candles). This is specifically critical for the monitoring the Dock which will not be continuously illuminated due to environment concerns.

The security camera housing shall be a pressurized back box and lower dome. The dome shall be diffused and meet NEMA Type 6P standards. The dome shall be pressurized to 8 psig with dry nitrogen and be provided sensors for internal temperature, pressure, and dew point. The back box shall be stainless steel and equipped with a sun shroud, heater, and fan to maintain a constant operating environment. The back box shall be pre-wired for all equipment and be equipped with a single mode fiber optic cable feed through that allows for fiber optic transmission.

### 2.17.25.2 MOUNTING BRACKETS

The security camera mounting brackets shall be constructed of aluminum suitable for supporting the camera and its housing. Each pole mount security camera shall be furnished and installed with a pole mount adapter, two 316 stainless steel mounting straps (sized for the pole), and aluminum mounting arm equipped with an access plate. It shall have an adjustable mounting bracket capable of supporting a 75-pound load.

To prevent electrolytic action and corrosion due to the making of dissimilar metals, a 1/8-inch thick neoprene gasket shall be furnished and installed between all dissimilar metals.

### 2.17.25.3 POLES

Provide aluminum poles as required. Coordinate the placement and installation of the poles and the installed foundation supports and Pontoon deck blockouts for conduit penetrations. Coordinate the mounting height of the cameras with the final roadway height to provide an accurate view of the underdeck. Poles shall conform to the WSDOT Standard Specifications (Appendix D18) and be equipped with handholes, 'J' hooks, and penetrations for the cameras.

### 2.17.25.4 CCTV WORK STATION (CD-CCTV)

Provide one workstation control desk made from 11 gauge sheet steel properly formed and reinforced to provide adequate strength located in the Bridge Maintenance Facility. Mount two 23" flat screen monitors and the pan-tilt-zoom control keyboard on the station desk to provide all controls to operate the cameras and select the camera displays on the monitors.

Provide a fluorescent lamp operated by a door switch in each panel. The light shall be rated to operate at 120VAC and shall light when the panel door is opened. One lamp shall be provided for each door in the panel. The fluorescent lamp shall be rated to completely illuminate the panel interior.

Provide a permanent location in the workstation for the lap top computer and sufficient cabling to allow slide in/slide out for the computer to be brought out of the workstation to use. The cables shall have a storage device to neatly store the excess lengths cables while not in use.

Provide duplex receptacles as required for the monitor, computer, receivers, and multiplexer. All receptacles shall be 20-ampere, 125-volt, three-wire, grounding type, polarized, ground fault current interrupting (GFCI) duplex convenience outlets. Each indoor receptacle shall be flush mounted in existing outlet box and shall be provided with a Type 304 stainless steel cover plate. Receptacles shall be specification grade.

### 2.17.25.5 CABLES

Video signal cables shall be as specified in Section 16120. The video transmission wiring in the workstation shall be RG 59/U 75ohm coaxial cables. The video transmission wiring to the cameras shall be single mode fiber optic cables.

### 2.17.25.6 FIBER OPTIC VIDEO TRANSMITTER AND RECEIVERS

Provide in the CCTV Work Station a rack with communication network cards that provide bi-directional data. There shall be one communication card per camera. The communication network card shall transmit the broadcast quality video transmission camera signal from each camera to workstation; and transmit the pan, tilt, zoom commands from the workstation to each individual camera. The Control System Vendor shall coordinate the selection of fiber optic cables and the network card requirements. The rack chassis shall have 14, one inch rack slots with an integral current limiting 120VAC input, 9VDC output, power supply.

Provide in each dome housing a communication network card. The card shall plug directly into the dome housing and be compatible with the network card rack mounted in the CCTV Work Station.

### 2.17.25.7 MONITOR

The monitors shall be solid-state, high resolution color, high contrast picture, 23 inch diagonal flat screen LCD monitors. The power supply shall be 120 VAC. The monitor shall be equipped with the correct standard connectors to match the digital multiplexer. Front panel controls include brightness, contrast, vertical hold, horizontal hold an AC power on/off.

The monitor shall be flush mounted to the workstation surface.

### 2.17.25.8 COMPUTER AND SOFTWARE

Provide all required digital video management system software required for the CCTV system on the new desktop computer. Coordinate the software requirements with the computer to ensue the correct operating system and memory is provided to properly operate the software. The computer shall be dedicated to the CCTV system and be mounted in the CCTV Work Station.

The computer software shall be a graphical user interface that allows the user to monitor and manage any combination of analog and internet protocol (IP) devices through digital surveillance software. The software shall use tabs to easily switch between work spaces and live or record images. The software will provide a tab to manage critical data and allow the data to be accessed from multiple locations with safety password control. The software shall display the alarms and status from the individual cameras. The software shall be able to support multiple monitors, allowing each monitor to display independent camera feeds or multiple feeds on a single screen. Provide the interface and security system to WSDOT for review and comment.

The computer software shall allow at least two additional third parties to access and monitor the camera feeds and control the camera views through a safe, secure network.

Provide laptop computer with specified software, suitable for programming the CCTV systems. The computer shall be the latest commercially available unit and contain, as a minimum requirement, Intel Core 2 Duo 2.4 Ghz processor operating at or faster. The random access memory (RAM) shall contain a minimum capacity of 8 G-bytes and be expandable. The video system shall be a dual-head, 256MB Ram with Direct X 9.0c or better. The hard disk drive shall have a storage capacity of 500.0 G-bytes or better. The CD drive shall be a 24x RW/DVD combo drive. The unit shall have 17 or 19-inch WXGA wide color display, 9 pin RS232 serial port, 2 PCMCIA slots, communication card and programming cables for the CCTV system, wireless network communication, and be IBM compatible.

The system digital video recorder shall have sufficient memory to store 30 days of video per camera at the standard frame rate. The digital recordings shall be accessible remotely. The system shall be secure and use passwords to protect the recordings and prevent unauthorized acces of the cameras.

### 2.17.25.9 CCTV CABLE INSTALLATION

All coaxial and fiber optic cables shall be pulled and installed using special care not to exceed the maximum pulling force and minimum bending radius specified by the manufacturer. Only two in line splices per fiber optic cable shall be permitted. Each cable end shall be sealed during installation to exclude moisture. All cable runs which have damaged jackets or do not pass cable tests will be rejected and shall be replaced by the Design-Builder.

The panels for splicing the fiber optic cables are shown on the drawings as patch panels. The Design-Builder shall locate the patch panels in the Pontoon cells as required to complete the fiber optic cable installation. Patch panels shall be mounted on the walls in an accessible location. The Design-Builder shall locate the panels as required based upon field conditions.

Wiring for the power supplies shall be as specified in the Section 16120. Use insulated spade type terminals when connecting wires to terminal blocks. All cables shall be tagged in accordance with Section 16120. Cables shall be tagged at both ends.

### 2.17.25.10 CCTV TESTING

Tests shall be performed by the Design-Builder in the presence of the Electrical Design Lead Engineer. The Design-Builder shall provide all test equipment and other devices necessary for such tests. The following tests shall be performed to demonstrate compliance with the technical requirements. Proposed test procedures shall be submitted to the Electrical Design Lead Engineer for approval 14 calendar days prior to testing. All tests shall be documented, signed and submitted to the Electrical Design Lead Engineer.

Each camera shall be sweep tested to monitor path, i.e. generator at input to optical fiber transmitter (before camera and transmitter housing installation) at the camera, and input to the monitor in the control room.

Each camera shall have the resolution, contrast and sensitivity tested to monitor path using the CCTV monitor in the control room.

Each camera shall be verified that it is properly adjusted for tilt, pan, zoom remote control. Each monitor shall be tested to verify that it can provide quad view and single camera view, and each monitor must be capable of providing independent cameras. The cameras shall be adjusted to the Electrical Design Lead Engineer's approval.

The Design-Builder shall demonstrate that all software has been provided. The Design-Builder shall demonstrate that all passwords and command codes have been provided to allow the client to fully operate and configure the system as required.

## 2.17.26 ELECTRICAL DEMOLITION

The Design-Builder shall completely demolish the existing Floating bridge electrical system and refer to Sections 2.16 and 2.18 (Intelligent Transportation Systems) for additional demolition requirements. Demolition work shall include the disconnection and/or removal of equipment. Equipment to be demolished shall include, but shall not be limited to, all electrical junction boxes, pull boxes, conduit and wire, control panels, control desk, lights, receptacles, motors, brakes, generator sets, gates, traffic signals, navigation lights, submarine cables, service equipment, and supports for all existing electrical equipment removed. This includes the temporary medium voltage electrical services for the bridge. The Design-Builder shall remove and deliver existing electrical equipment in accordance with the Mandatory Standards and the requirements included in this section.

The Design-Builder shall notify WSDOT at least four weeks prior to the start of demolition of the bridge and verify no additional equipment shall be salvaged by WSDOT. No demolition of the bridge shall start until written NTP 2 is provided by WSDOT stating that the equipment has been salvaged and the Design-Builder may

proceed with demolition. At a minimum the following equipment will be salvaged by WSDOT:

- Weather station and related hardware
- Radios 800 meg and Marine
- PLC including CPU's, IO's, UPS's and related hardware
- Center lock cameras, monitor and related hardware
- Desk top computer, printer and related hardware
- Refrigerator and microwave oven
- All tools, equipment and supplies from four sheds. Two at the drawspan and two on the lower decks
- All pumping equipment and related hardware
- Life rings and cabinets
- Shore power supply cord for work boat
- Signal horns and compressors
- The radio repeater system. The radio repeater shall be protected, salvaged by the WSDOT, stored, and then installed on the new floating bridge in the proposed Shed Type I on Pontoon G.

The Design-Builder shall salvage existing equipment at the direction of WSDOT. The Design-Builder shall coordinate with the WSDOT Northwest Region Bridge Maintenance Office for removal, salvage and delivery of the existing equipment associated with the existing SR 520 floating bridge systems. The Design-Builder shall notify WSDOT at least two weeks prior to the start of demolition of the bridge and verify no additional equipment shall be salvaged by the Design-Builder. At a minimum the following equipment shall be salvaged by the Design-Builder:

- 2 Emergency generators and 2 ATS switches from the drawspan
- 58 Hydraulic rams and 20 hydraulic pumps from the cableways
- 1 Main control panel from the tower
- 25 Dupline (water alarms) P-5 panels including UPS's
- 4 Signal heads from the drawspan
- 4 Traffic gates from the drawspan
- 1 Jib crane from the drawspan
- 4 Pendulum mounted channel markers from the high rises
- Card readers

The WSDOT Northwest Region Bridge Maintenance Office may be contacted at the following address:

10833 Northup Way NE
Bellevue, Washington 98004
Telephone: (425) 739-3700

Seven days written advance notice shall be given to both WSDOT and the electrical parts specialist at the address listed above prior to delivery. 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 WSDOT's satisfaction at no cost to WSDOT.

It is brought to the Design-Builder's attention that there are requirements in this Section for the requirements in maintaining navigation warning lights at all times. Coordinate demolition of this item with the installation of temporary navigation lights.

It is brought to the Design-Builder's attention that it is the Design-Builder's responsibility to de-energize the existing Utility power. The Design-Builder shall maintain the existing Utility service until the new service equipment and distribution equipment is completed. Then the Design-Builder shall de-energize the existing service. The Design-Builder shall provide temporary power as required.

Fire protection is required in areas where welding or flame cutting will be performed. All areas shall be dust free before flame cutting will be permitted. Furnish protective blankets to protect combustible materials. Provide dry chemical fire extinguishers and train personnel in their use.

## 2.17.27 EMERGENCY RESPONSE SYSTEM FOR STRANDED BOATERS

The Design-Builder shall design, furnish and install and emergency response system for stranded boaters. The system shall be coordinated with the City of Seattle Fire Department and City of Belleview Fire Department requirements. Call stations shall be located along the underdeck at the ladder access points on each Pontoon at easily accessible locations. Each location shall have clear signage and illumination to make the station easy to find. Quantities and locations shall be determined by the Design-Builder and coordinated with the Fire Department and shall be approved by the Fire Department. All equipment shall be outdoor, weatherproof rated equipment. The Design-Builder shall provide an innovative design, minimizing any conduit and wire to the equipment. The Design-Builder shall fully detail the system.

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 temporary and permanent Intelligent Transportation Systems (ITS) in accordance with these Technical Requirements.

The Design-Builder shall maintain electrical power and communications between all ITS devices and the WSDOT Northwest Region Traffic Management Center (TMC), located at Shoreline, Washington, at all times during construction unless otherwise specified in these Technical Requirements.

The Design-Builder shall design and construct complete permanent Intelligent Transportation Systems including, but not limited to, the following elements:

- Closed Circuit Television (CCTV) cameras and associated control and communication equipment.
- Induction loops for traffic data accumulation and ramp metering system.
- Data stations and associated control and communication equipment.
- Active Traffic Management (ATM) systems including furnishing and installation of new Variable Message Signs (VMS), Side-Mounted Dynamic Message Signs (SDMS) and Lane Control Signs (LCS); and all associated control and communication equipment to make the permanent ATM system fully operational.
- A complete fiber optic communication system that ties into the existing system on Foster Island to the west and the system installed by the SR 520 Eastside Transit and HOV Project to the east; and the communication system fiber optic mainline and distribution cables, conduits, NEMA enclosures, pull boxes, cable vaults and communication equipment.
- Complete electrical power distribution systems to all ITS devices including electrical services, service cabinets, transformers, conduits, junction boxes, wirings and ancillary equipment.
- All ITS cabinets, controllers, conduits, junction boxes, cabling, software and any ancillary equipment required to create a fully functioning ITS.
- System and equipment testing as required.
- ITS support structures, foundations, property restoration and incidental Work.

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

- Provide additional communication equipment inside the Northup and Roanoke communication hubs and TMC, as required to support all new field equipment;
- Provide lateral fiber optic conduits, cables and associated equipment to the Bridge Maintenance Facility Building;
- Modifications to the existing ramp meter at the 84$^{th}$ Avenue NE westbound on-ramp.

- Adjust existing LCS placement horizontally on the existing ATM sign structures to accommodate the new roadway geometry and lane markings;
- Install induction loops, piezoelectric axle sensors, cabinet, Ethernet communications, and control equipment for a complete Permanent Traffic Recorder (PTR) system that collects data in every lane;
- Provide fiber optic communications for the permanent and temporary toll facilities and maintain and protect the electrical power and communications infrastructures to the existing toll facility in accordance with Section 2.23 (All Electronic Tolling Infrastructure);
- Remove and salvage the existing ITS as required; and
- Commissioning of all ITS and electrical systems in accordance with Section 2.34 (Commissioning).

The Design-Builder shall design and construct the electrical power distribution systems in accordance with additional requirements in Section 2.16 (Illumination and Roadway Electrical Systems).

The Design-Builder shall design and construct the temporary ITS in accordance with additional requirements in Section 2.22 (Maintenance of Traffic).

#### 2.18.1.1 COORDINATION WITH ADJOINING PROJECTS

The Design-Builder shall obtain available ITS design plans and As-Builts from WSDOT for any adjacent projects, and determine the coordination requirements for continuous operations 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. Projects WSDOT anticipates will be under construction at the same time as the Project are identified in Section 2.1 (General Information).

##### 2.18.1.1.1 SR 520 Eastside Transit and HOV Project

The new SR 520 Eastside corridor will be constructed by the SR 520 Eastside Transit and HOV Project at the same time of this Project, and the SR 520 Eastside Transit and HOV Project's western terminus will connect to the existing floating bridge. The following existing ITS equipment near the existing floating bridge abutment will remain upon completion of the SR 520 Eastside Transit and HOV Project:

- The existing westbound ATM signs (LCS and SDMS), cabinet and associated control equipment;
- The existing Permanent Traffic Recorder (PTR) cabinet and control equipment; and
- The existing CCTV camera, cabinet, and control equipment.

The Design-Builder shall remove and salvage the above existing ITS equipment in accordance with this section.

The Eastside Design-Builder will furnish and install additional ITS infrastructure between the existing floating bridge abutment and 84th Avenue NE. The following new ITS field devices and conduit infrastructure will be installed as part of the SR 520 Eastside Transit and HOV Project:

- One ramp meter at the 84th Avenue NE westbound on-ramp including all signals, induction loops, cabinets and associated control equipment;
- One eastbound ATM gantry between Evergreen Point Road and 84th Avenue NE including all LCS, SDMS, cabinets and associated ATM equipment;
- Upstream and downstream data stations, induction loops and associated control equipment for the eastbound ATM;
- CCTV cameras to provide coverage for traffic surveillance west of 84th Avenue NE and the eastbound ATM signs;
- One westbound ATM gantry between Evergreen Point Road and 84th Avenue NE including maintenance pullout, cabinet foundations, junction boxes, and underground conduits between electrical service, cabinet foundations, and the ATM gantry. All ATM signs, cabinets, transformer, and associated ATM equipment are not provided;
- One upstream data station, induction loops and associated control equipment, east of 84th Avenue NE, for future operation of the westbound ATM;
- Induction loops and piezometer axle sensors for the existing PTR at the existing floating bridge abutment;
- One data station and associated control equipment next to the existing PTR cabinet;
- Fiber communication conduits and lateral fiber optic cables to the permanent Evergreen Point Road in-line transit stop;
- Under-lid lighting and traffic control equipment for the Evergreen Point Road lid;
- One empty four-inch communication conduit with four innerducts and intermittent pull boxes along the north side of SR 520 mainline roadway between the western portal of the Evergreen Point Road lid and 84th Avenue NE. This conduit will be placed under the future outside shoulder in the westbound direction at a depth compatible with this Project; and
- Two four-inch communication conduits with four innerducts in each conduit along the south side of SR 520 mainline roadway between the existing floating bridge abutment and 84th Avenue NE. One 96-strand fiber optic mainline cable and one 48-strand distribution cable will be installed in one conduit, and one 48-strand distribution cable will be in the other conduit. The distribution cables will provide interconnection between the existing and new ITS equipment in a collapsed ring configuration as part of the ITS distribution network on the Eastside corridor.

The Design-Builder shall closely coordinate with WSDOT and the Eastside project to determine the reusability of the above new ITS devices and conduit infrastructure, and shall design and construct the ITS in accordance with the requirements in this section.

#### 2.18.1.1.2 SR 520 West Connection Bridge Project

The WCB and RSUP west of the floating bridge west transition span will be constructed by a separate WCB project to connect the new floating bridge with the existing west approach bridge, and to connect the RSUP on the new floating bridge to the vicinity area

of the intersection of Lake Washington Blvd and the eastbound on-ramp. The WCB project will be constructed at the same time as this Project. The following ITS devices and conduit infrastructure will be installed as part of the WCB project:

- Two empty four-inch conduits with four innerducts in each conduit on the WCB that connect to the existing ITS conduit on the existing west approach bridge; and
- CCTV cameras, cabinets, and associated control equipment along the RSUP that will connect to the floating bridge from the west.

The Design-Builder is notified that fiber optic communication cables are not provided by the WCB project. The Design-Builder shall closely coordinate with WSDOT and shall design and construct the fiber optic communication network and integrate the CCTV camera equipment using the new empty conduits on the WCB and the existing conduit on the existing west approach bridge in accordance with the requirements in this section.

#### 2.18.1.2 MAINTENANCE REQUIREMENTS

All ITS devices shall be designed and constructed so they are accessible and maintainable using the current maintenance methods and materials specified in the WSDOT *Maintenance Manual* (Appendix D9), WSDOT *Roadside Manual* (Appendix D16), and WSDOT Northwest Region ITS Design Guide Supplement (Appendix I8).

Refer to Section 2.11 (Roadway Design) for additional requirements related to maintenance access.

### 2.18.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- WSDOT Northwest Region Special Provisions for ITS (Appendix B10).
- WSDOT Northwest Region Special Provisions for DMS (Appendix B11)
- WSDOT Northwest Region Special Provisions for Illumination, Traffic Signal Systems, and Electrical (Appendix B9).
- WSDOT Northwest Region ITS Design Guide Supplement (Appendix I8).
- WSDOT Northwest Region ITS Design Guide (Appendix I9).
- WSDOT Northwest Region ITS Details (Appendix I3).
- WSDOT ITS Device Naming Scheme (Appendix I10).
- WSDOT Northwest Region Illumination and Signal Details (Appendix I2).
- WSDOT Power Supply Design for Transportation Applications (Appendix I4).

- WSDOT Northwest Region Sign Design *Current Practices Manual* (Appendix T13).
- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT *Traffic Manual* (M51-02) (Appendix D19).
- *Manual on Uniform Traffic Control Devices* (MUTCD) – *Washington State Modifications* (M24-01) (Appendix D25).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D9).
- WSDOT *Roadside Manual* (M25-30) (Appendix D16).
- WSDOT *Bridge Design Manual* (M23-50) (BDM) (Appendix D1).
- WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- National Transportation Communications for ITS Protocol (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)*.
- NTCIP 1101, Simple Transportation Management Framework (STMF), Conformance Level 1, Simple Network Management Protocol (SNMP).
- NTCIP 2001, Class B Profile.
- NTCIP 2101, SP-PMPP/RS232 Point-to-Multipoint Protocol (PMPP).
- NEMA Standards Publication TS 4, *Hardware Standards for Dynamic Message Signs (DMS), with NTCIP Requirements*, 2005.
- NEMA Standards Publication TS 2-2003, v02.06, Traffic Controller Assemblies with NTCIP requirements.
- Caltrans Transportation Electrical Equipment Specifications (TEES), 2009.
- International Code Council (ICC) *International Building Code* (IBC), 2009.
- National Fire Protection Association (NFPA), *National Electrical Code* (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 Edition with Revisions 1 and 2 Incorporated, December 2007.
- AASHTO *Roadside Design Guide*, 3rd Edition, 2002, and 2006 Chapter 6 Update.
- USDOT National ITS Architecture.
- EIA/TIA *Fiber Optic Test Procedure* (FOTP) *Standards*.
- FHWA *Traffic Control Systems Handbook*, 2005.
- USDA Rural Utilities Service (RUS) Specifications and Drawings.

#### 2.18.2.1 DESIGN-BUILD MODIFICATIONS TO THE WSDOT NORTHWEST REGION SPECIAL PROVISIONS

The WSDOT Northwest Region Special Provisions for Illumination, Traffic Signal Systems, and Electrical (Appendix B9), the WSDOT Northwest Region Special Provisions for ITS (Appendix B10), and the WSDOT Northwest Region Special Provisions for DMS (Appendix B11) included in these Technical Requirements are mandatory design documents to be used on all WSDOT Northwest Region projects. For purposes of this Project, the Design-Builder shall perform all Work in accordance with the following:

- When the Special Provisions refer to "Contracting Agency," it shall mean WSDOT;
- When the Special Provisions refer to "Contractor" or "Contractors," it shall mean the Design-Builder;
- When the Special Provisions refer to an "Engineer," it shall mean the Design-Builder unless otherwise specified in these Technical Requirements;
- When the Special Provisions refer to an activity that "shall" be done or that "must" be done, the Design-Builder shall assume those activities are mandatory;
- The Design-Builder shall ignore the provisions in the Special Provisions with regard to "Measurement" and "Payment."
- Variable project data, or "fill-ins," shall be determined and documented by the Design-Builder.

In some cases, it may not be clear whether rights or responsibilities in these special provisions are applicable to the Design-Builder. If it is unclear whether specific provisions are applicable to the Design-Builder, the Design-Builder shall raise the issue with WSDOT and WSDOT will make that determination at its sole discretion.

### 2.18.3 PERFORMANCE REQUIREMENTS

#### 2.18.3.1 DESIGN-BUILDER PERSONNEL

The Design-Builder shall provide an ITS Design Lead Engineer with a minimum of 10 years of supervisory experience in design and construction including five years of

experience with highway Intelligent Transportation Systems including CCTV cameras, ramp metering, traffic signals, highway advisory radio signs, detection stations, dynamic message signs, fiber optic communication systems, electrical power distribution systems and other highway-related electrical and communication elements. The ITS Design Lead Engineer shall have at least two years of experience working in Washington State, and shall be familiar with the WSDOT Northwest Region design and construction standards. The ITS Design Lead Engineer shall have met the minimum work experience requirements within the last 10 years. The ITS Design Lead Engineer shall be a Professional Engineer, licensed under Title 18 RCW, and shall be responsible for the ITS design elements of the Project.

### 2.18.3.2 WSDOT PERSONNEL

The Design-Builder shall coordinate ITS Work with the following WSDOT staff:

#### 2.18.3.2.1 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 recommend the required documentation for WSDOT acceptance, including specifications, shop drawings, and all measured and recorded values for the system and for each cabinet;
- Review the cable vault, CCTV cameras, ATM signs, vehicle detectors and cabinet locations once surveyed and staked in the field;
- Oversee connections to the existing and new ITS communication network;
- Review plans, design submittals, shop drawings and all other required submittals;
- Review all testing, test results, and test documentation; and
- Make recommendations to WSDOT for the acceptance of ITS components based on the submittals, test results and other documentation packages.

#### 2.18.3.2.2 WSDOT Electrical Inspector

Refer to Section 2.16 for requirements for the WSDOT Electrical Inspector.

#### 2.18.3.2.3 WSDOT Software Engineer

The WSDOT Software Engineer will verify NTCIP requirements for all equipment that these Technical Requirements require to be NTCIP compliant, including, but not limited to, LCS, SDMS, VMS and Programmable Logic Controller (PLC) controllers.

The WSDOT Software Engineer will perform the following:

- Review results of NTCIP tests;
- Verify the implementation of all required NTCIP features;
- Verify that each device has the correct version of the manufacturer's software;

- Verify that each device is fully compatible with the existing TMC system;
- Accept each device at the conclusion of system acceptance testing; and
- Oversee NTCIP compliance testing and work with the Design-Builder to correct non-compliance issues.

### 2.18.3.3 ITS Design and Construction Progress Meetings

The Design-Builder shall prepare and conduct ITS Design and Construction Progress Meetings as part of the Traffic Design Task Force meetings in accordance with the requirements in Section 2.16.

### 2.18.3.4 ITS Testing and Commissioning

The Design-Builder shall perform all testing for existing, temporary and permanent ITS in accordance with the Mandatory Standards and these Technical Requirements. Refer to Sections 2.25 (Control of Materials) and 2.28 (Quality Management Plan) for additional requirements. The Design-Builder shall perform all commissioning of the ITS in accordance with these Technical Requirements and Section 2.34.

The Design-Builder shall have current training and certification on all testing equipment used. The certification shall consist of documentary evidence that staff performing tests are familiar with and able to perform the test procedures. The Design-Builder shall have all testing equipment calibrated annually and have in its possession a certification of test device calibration in accordance with the American National Standards Institute (ANSI) guidelines for the duration of the Project. Test measurements shall be supplied to WSDOT in accordance with this section.

Permanent ITS components may be installed and made operational at temporary locations, and relocated to their permanent locations at a later time. All ITS components shall undergo the entire series of tests prior to making them operational at temporary locations, and after they are relocated to their permanent locations. Relocated signs shall be cleaned to like-new condition prior to reinstallation.

The Design-Builder shall incorporate all testing and commissioning in the Baseline Contract Schedule and Monthly Contract Schedule Updates, and shall provide these schedules to WSDOT for review and comment. Time and location for all tests shall be provided to WSDOT a minimum of 14 Calendar Days in advance of any test.

The Design-Builder shall develop test plans, testing procedures, and pass/fail requirements for all tests that the Design-Builder is responsible for as required in the Mandatory Standards and this section. At a minimum, the test plans shall include the following:

- Testing and staging locations;
- Method of transport between testing and installation locations;
- Specific schedule dates of all types of testing;
- Tests to be performed;
- Equipment to be used for the testing;
- Calibration results of testing equipment; and

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

The Design-Builder shall submit all test plans, testing procedures, pass/fail requirements, and equipment documentation to WSDOT for review and comment a minimum of 14 Calendar Days prior to any testing, and shall submit test reports upon completion of each test in accordance with this section and Section 2.28.

The test reports shall include:

- A list of all equipment used to perform the tests;
- Testing equipment calibration records;
- Evidence of testing staff training and certification;
- A record of each test step and associated pass/fail requirements, who performed the tests, who witnessed the tests, and the test results; and
- A record of test failures, corrective actions taken, and results of the retest.

WSDOT reserves the right to observe any tests and audit the test results.

#### 2.18.3.4.1 Testing of Existing Equipment

Before any Work is performed, the Design-Builder may request a meeting with WSDOT and, if applicable, the agency with current maintenance responsibility at each Work site in order to determine that all existing equipment is in proper working order. At the time of this meeting, the Design-Builder may test all CCTV cameras, ATM signs, controllers, communication equipment, loops, cabling, connectors and cabinet operations.

The Design-Builder shall be responsible for requesting, coordinating and conducting the meeting, and for providing all labor, materials, test equipment and test documentation. All testing shall be non-destructive. WSDOT, the maintenance agency and the Design-Builder shall mutually agree upon the test results. The Design-Builder shall submit a copy of the test documentation and test reports to WSDOT upon completion of the testing.

If the Design-Builder begins Work at a Project site without arranging this pre-testing, WSDOT will assume that all existing ITS components and operations were in proper working order prior to the Work, and the Design-Builder shall be responsible that all cabinet components and operations are in proper working order during and upon the completion of the Work. If no pre-testing is conducted, WSDOT will assume that any equipment that is not functioning upon the completion of the Work was in proper working order as of the date of NTP 1, and it shall be replaced at the Design-Builder's expense.

#### 2.18.3.4.2 Testing of New ITS Equipment

All new ITS equipment shall undergo all required testing in accordance with the Mandatory Standards and the requirements specified in this section. The testing shall include, but is not limited to, the following:

- Factory acceptance testing by the Design-Builder;
- Shop testing of all ITS cabinet assemblies by WSDOT;

- Shop testing and NTCIP acceptance testing of new ATM signs and control equipment by WSDOT;
- Communication cables and interface equipment acceptance testing by the Design-Builder;
- Field acceptance testing of all ITS equipment by the Design-Builder upon completion of field installations, including induction loops, traffic data stations, CCTV cameras, ATM signs, video and data communication equipment, and all associated equipment to make the system fully operational; and
- System acceptance testing of all ITS equipment by WSDOT.

The Design-Builder shall be responsible for requesting and coordinating all testing. The Design-Builder shall provide all labor, materials, test equipment and test documentation required to complete the testing for which the Design-Builder is responsible. If defective equipment is found, the Design-Builder shall repair, replace or reconfigure it at no additional cost to WSDOT, and restart the full test period on the repaired, replaced or reconfigured equipment. The Design-Builder will not be granted an extension of time for delays caused by defective equipment.

The Design-Builder shall provide required documentation and facilitate the testing that will be performed by WSDOT. The Design-Builder shall supply all equipment and personnel required to deliver, unload, assemble, and install all equipment required to undergo testing at WSDOT facilities. Upon completion of the testing by WSDOT, the Design-Builder shall dissemble and pick up all equipment in accordance with this section. The Design-Builder shall replace rejected equipment at no additional cost to WSDOT, and resubmit the equipment to WSDOT for the full test period. The Design-Builder will not be granted an extension of time for delays caused by rejected equipment.

#### 2.18.3.4.2.1 Factory Acceptance Testing

The Design-Builder shall perform factory acceptance testing on all new ITS components including, but not limited to, the following:

- CCTV cameras;
- ATM signs including VMS, LCS and SDMS;
- Cabinet assemblies;
- Control and data accumulation equipment for CCTV, ATM signs, induction loops and traffic signals;
- Communication equipment and communication protocols, including NTCIP, for ATM signs and control equipment; and
- Control software including firmware.

The Design-Builder shall submit test plans, test procedures, pass/fail requirements, test reports, Manufacturer's Certificate of Compliance, and equipment documentation to WSDOT for comment, and shall resolve all WSDOT comments on this documentation prior to shipment from the factory. The factory acceptance test shall demonstrate that each component is fully functional and conforms to industry standards including, but not limited to, electrical, environmental, functional and operational testing requirements in accordance with NEMA TS 2, NEMA TS 4, and Caltrans TEES.

As part of the factory acceptance testing, the Design-Builder shall perform complete NTCIP and control software testing for all ATM signs and their control equipment in accordance with the NTCIP standards included in the Mandatory Standards. The Design-Builder shall be responsible for developing NTCIP test scripts based on the sample checklists included in the Sample ATM NTCIP Acceptance Testing Checklists (Appendix I17). The test scripts shall be submitted to WSDOT for review and comment as part of the test documentation a minimum of 14 Calendar Days prior to the factory acceptance testing. The Design-Builder shall perform all required testing to ensure that the ATM sign equipment fully complies with NTCIP standards and WSDOT requirements. The Design-Builder shall coordinate with WSDOT for additional testing requirements to ensure the ATM sign control software is fully compatible with the existing system.

All components that fail a test shall be repaired, reconfigured or replaced, and shall be retested. The Design-Builder will not be granted an extension of time for delays caused by defective equipment.

The WSDOT Engineer reserves the right to perform any independent inspections or tests deemed necessary to ensure that all ITS equipment and software complies with the requirements of this section.

#### 2.18.3.4.2.2 WSDOT Shop Testing

Upon successful completion of the factory acceptance testing, the Design-Builder shall deliver all ITS cabinet assemblies, ATM signs including VMS, LCS and SDMS, and associated equipment to WSDOT for shop testing prior to field installations.

All ITS cabinet assemblies, controllers, and ATM signs shall be subject to shop testing conducted by WSDOT in accordance with the two-stage testing as required for Model 330 & 334 Cabinet in the WSDOT Northwest Region Special Provisions for ITS (Appendix B10) unless otherwise specified in this section. The two stages are:

- Stage 1 - Notification, Delivery and Assembly.
- Stage 2 - Hardware and System Test.

The shop testing shall include, but not be limited to, the following:

- All data station cabinets including controllers, loop detector cards, load switches, power distribution assembly and all other cabinet assemblies;
- All CCTV cabinets including power distribution assembly and all other cabinet assemblies;
- All ATM cabinets including ATM controllers, power distribution assembly and all other cabinet assemblies; and
- All ATM signs and associated control equipment including VMS, LCS, SDMS, beacons, cable, wiring and accessories.

The Design-Builder shall submit the following documentation to WSDOT a minimum of 14 Calendar Days before any equipment is delivered to the WSDOT Northwest Region Signal Maintenance Office for testing:

- Design-Builder's representative for tests: name, title, address and telephone number.
- Inventory of items to be delivered including:

- The quantity of each item to be delivered;
- The number of maintenance and operations manuals to be delivered;
- The number of cabinet prints, equipment schematics, and equipment manuals to be delivered; and
- The contract number for which the equipment is being tested.

- Manufacturer's Certificate of Compliance for traffic controller cabinets including data station and HAR sign cabinets. If applicable, the certificate shall confirm that the Type 170 Traffic Signal Control Hardware Specification FHWA IP-79-16, as currently amended, has been met. 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.
- Manufacturer's Certificate of Compliance for double wide ATM cabinets constructed in accordance with the requirements in this section.
- Scheduled delivery date of equipment to the Shop.

Sample checklists of the Stage 2 - Hardware and System Test are included in the Sample ITS Cabinet/Controller Acceptance Testing Checklist (Appendix I18).

For data station and CCTV cabinet assemblies and controllers, 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. For ATM signs, controllers and cabinet assemblies, the Design-Builder shall allow 30 Calendar Days for each item, which does not include the time required for NTCIP acceptance testing.

All ITS cabinet assemblies, controllers and ATM signs shall be subject to the same pass/fail requirements for hardware, software and communication testing as required for Stage 2 testing in the WSDOT Northwest Region Special Provisions for ITS (Appendix B10). In order to pass the Stage 2 testing, all components must have no failures during the last seven Calendar Days of the test period. If a component fails, the Design-Builder shall replace it and submit the replacement item for testing.

The Design-Builder shall pick up equipment from the WSDOT Northwest Region Signal Maintenance Office within 7 Calendar Days following notice of final approval and acceptance of the equipment by WSDOT. The Design-Builder shall not start field installation until all equipment is accepted by WSDOT.

#### 2.18.3.4.2.3 WSDOT NTCIP Acceptance Testing

Upon successful completion of the WSDOT shop testing, each type of ATM sign and controller is subject to NTCIP acceptance testing conducted by WSDOT. In addition to the time required for the shop testing, the Design-Builder shall allow 14 Calendar Days for WSDOT to conduct NTCIP acceptance testing for each type of ATM sign and controller. WSDOT will randomly select the number of ATM signs and controllers on which to conduct NTCIP acceptance testing, and may test all signs if desired.

The WSDOT Software Engineer shall arbitrate any differences in the interpretation of NTCIP Standards. The Design-Builder shall be responsible for ensuring that the ATM sign and controller equipment fully complies with the NTCIP standards specified in this section.

If WSDOT detects any software failures during the NTCIP acceptance testing, the test and test time shall be stopped. The test will not restart until the Design-Builder corrects the problem. The test time will then be reset for a new 14-day test period.

The Design-Builder shall pick up all ATM signs, controllers and cabinet assemblies from the WSDOT Northwest Region Signal Maintenance Office within 7 Calendar Days following notice of final approval and acceptance of the equipment by WSDOT. The Design-Builder shall not start field installation until all ATM sign equipment is accepted by WSDOT.

#### 2.18.3.4.2.4 Communication Cables and Interface Equipment Acceptance Testing

The communication cables and interface equipment acceptance testing shall include, but is not limited to, the following:

- Fiber optic cables including mainline, distribution and preterminated fiber optic cables and patch cords;
- Preterminated patch panels;
- Fiber optic connectors; and
- Fiber optic splice enclosures.

The Design-Builder shall submit the following, at a minimum, for WSDOT acceptance prior to field installations:

- Manufacturer's specifications for all communication system cables, connectors, splice enclosures, patch panels and accessories;
- A material staging plan;
- Samples of each type of cable, connector, splice enclosure, cable management tray, patch panel and accessory; and
- Detailed installation procedures for all communication cables and interface equipment to be furnished and installed as part of the Project.

##### *2.18.3.4.2.4.1 Fiber Optic Splicing and Testing Plan*

The Design-Builder shall prepare and submit a Fiber Optic Splicing and Testing Plan prior to beginning work on the ITS. The Plan shall be submitted as part of the Preliminary ITS Design Submittal. An updated version of the Plan shall be submitted as part of the Final ITS Design Submittal. The Fiber Optic Splicing and Testing Plan shall include the following:

- Location of all proposed fiber optic splices, including all fiber strands to be spliced;
- Location of all temporary fiber optic splices;
- Scheduled dates of splicing and testing;
- Tests to be performed;
- Equipment to be used for the testing;
- Calibration results for testing equipment; and

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

During testing, the Fiber Optic Splicing and Testing Plan shall be updated with each design change that affects the testing type and location.

Upon completion of the fiber optic splicing and testing, the Design-Builder shall submit the completed Fiber Optic Splicing and Testing Plan as part of the fiber optic cable test documentation.

#### *2.18.3.4.2.4.2 Fiber Optic Cable Testing*

The Design-Builder shall perform, at a minimum, the following fiber optic cable testing in accordance with the provisions specified in these Technical Requirements and the fiber optic cable testing requirements in the WSDOT Northwest Region Special Provisions for ITS (Appendix B10):

- Power meter testing; and
- Optical Time Domain Reflectometer (OTDR) testing.

The Design-Builder shall take corrective actions on portions of the fiber installation if WSDOT determines it is out of compliance.

Within 30 Calendar Days of submitting the test reports in accordance with this section, the Design-Builder, in the presence of WSDOT, shall retest a minimum of 5% of the previously-tested locations to validate the test results. WSDOT will randomly select test samples from any terminal device locations as determined by WSDOT.

#### *2.18.3.4.2.4.3 Fiber Optic Cable Test Documentation*

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 testing documentation required in accordance with this section.

The Design-Builder shall use WSDOT's file naming convention for all test files, and shall provide all test documentation in accordance with the WSDOT Northwest Region Special Provisions for ITS (Appendix B10).

The Design-Builder shall also provide a test summary describing the final measurements that are out of compliance, any WSDOT-approved changes in specified methods, and the actual dates of both power meter and OTDR tests.

### 2.18.3.4.2.5 Field Acceptance Testing

The Design-Builder shall submit all documentation and perform all field acceptance testing as required by the WSDOT Northwest Region Special Provisions for ITS (Appendix B10) and this section.

For the equipment furnished as part of the Project, the Design-Builder shall submit the following documentation for WSDOT acceptance a minimum of 14 Calendar Days prior to field installations and acceptance testing:

- Documentation for all ITS equipment provided by the Design-Builder, including the model number and manufacturer's name; serial number when available; materials and operating specifications; wiring schematic and parts list; owner's manuals; factory service manuals; factory testing procedures and results; and Manufacturer's Certificate of Compliance;

- Three copies of the documentation specified above prior to the field installation of the cable or components; and
- Three copies of an overall system wiring schematic and termination chart for all system elements.

All documentation for each individual element shall be neatly bound so the information is secured together and legible without removing pages from the binding.

The Design-Builder shall submit all test plans, testing procedures and pass/fail requirements to WSDOT for review and acceptance a minimum of 14 Calendar Days prior to any field acceptance testing, and shall submit test reports upon completion of each test in accordance with this section and Section 2.28. All testing shall be conducted in accordance with the Mandatory Standards, manufacturer's specifications and the requirements in this section. WSDOT may observe any tests and will audit test results.

The field acceptance testing shall consist of two phases:

- Phase I field acceptance testing through the Northup communication hub; and
- Phase II field acceptance testing through the Roanoke communication hub.

The Design-Builder shall make the ITS communication network fully operational prior to each phase of the field acceptance testing. During the Phase I field acceptance testing, the ITS distribution network shall provide primary communications from every ITS field device within the Project limits to the TMC through the Northup communication hub. The Design-Builder shall perform the controller turn-on tests and all tests at the TMC through the Northup communication hub. During Phase II field acceptance testing, the ITS distribution network shall provide secondary communications from every ITS field device on the new floating bridge to the TMC through the Roanoke communication hub. The Design-Builder shall design the Phase II field acceptance test for testing the secondary ITS distribution network and associated communication equipment installed by the Design-Builder for the new floating bridge. The Design-Builder shall perform all tests at the TMC through the Roanoke communication hub to demonstrate the communication fail-over capability between the Northup and Roanoke communication hubs.

The Design-Builder shall clearly document this two-phase field acceptance testing in its test plans, testing procedures, pass/fail requirements and test schedules for WSDOT review and comment.

If the floating bridge systems as required in Sections 2.17, 2.30, 2.32 and 2.35 require communication with the TMC through the ITS mainline cables, these systems shall be tested in accordance with the requirements in their respective section.

Upon successful completion of the field installations and field acceptance testing, the Design-Builder shall notify WSDOT for field inspection by the WSDOT Electrical Inspector.

#### *2.18.3.4.2.5.1 Traffic Data Accumulation Testing*

The field acceptance testing of the data accumulation equipment shall include, but is not limited to, the following:

- All induction loops, piezoelectic axle sensors and lead-in cables;
- All communication equipment in association with data station operation;
- Controller turn-on test; and

- Performance testing that consists of testing and fine-tuning all detectors.

If non-intrusive detectors are temporarily used during construction, the Design-Builder shall perform all field testing to ensure the non-intrusive detectors are fully functioning.

The Design-Builder shall coordinate with the WSDOT Engineer and TMC personnel to perform the controller turn-on test and demonstrate the ability of the controller and communication equipment to transmit and receive commands from the central computer.

#### *2.18.3.4.2.5.2 CCTV Equipment Testing*

The field acceptance testing of the CCTV equipment shall include, but is not limited to, the following:

- Bench CCTV test prior to field installations;
- Local CCTV test after field installations;
- Hub CCTV test after field installations; and
- TMC CCTV test after field installations.

The Design-Builder shall perform hub CCTV testing using a video monitor and a camera control device supplied by the Design-Builder in the presence of the WSDOT Engineer and other TMC personnel. The Design-Builder shall arrange a time with the WSDOT Engineer and TMC personnel for the TMC CCTV testing performed by WSDOT through an existing control console at the TMC.

For the existing CCTV cameras that the Design-Builder is responsible for integrating onto the new fiber distribution network, the Design-Builder shall perform the hub CCTV testing and arrange a time with WSDOT Engineer for TMC CCTV testing described above.

#### *2.18.3.4.2.5.3 ATM Sign Equipment Testing*

The Design-Builder shall perform field acceptance testing on all new ATM equipment after installation, and existing ATM equipment after reinstallation or adjustments including, but not limited to, the following:

- All existing ATM signs and controllers that are reused as a temporary ATM system;
- All existing LCS that are adjusted horizontally on ATM sign structures and their controllers;
- All new LCS, SDMS and VMS hardware;
- All new ATM sign controllers;
- All ATM cabinet assemblies and wiring;
- ATM control software including firmware; and
- All communication equipment required to make the ATM signs fully operational.

The Design-Builder shall coordinate with the WSDOT Engineer and TMC personnel to verify that the remote control, located at the existing TMC control consoles, can control the ATM signs and beacons. The remote control testing will be performed by WSDOT.

#### *2.18.3.4.2.5.4 Video and Data Distribution and Transmission Equipment Testing*

The field acceptance testing of the video and data distribution and transmission equipment shall include, but is not limited to, the following:

- Ethernet switches; routers; terminal servers; video transmitters and receivers; RS-232 and EIA-422 data communication units; color video monitors; computers; and other network equipment;
- Interconnection cables including all data; video; power; control and ancillary cables; connectors; and termination panels;
- Power supplies, mounting chasses, adapters and transformers; and
- Equipment operating software including firmware.

The Design-Builder shall perform the field acceptance testing of the video and data transmission equipment as part of field acceptance testing performed for each of the ITS components included in this section. The Design-Builder shall install, configure and integrate all communication equipment to make each of the ITS components fully operational.

### 2.18.3.4.2.6 WSDOT System Acceptance Testing

Upon successful completion of the field inspection by the WSDOT Electrical Inspector, all ITS equipment is subject to system acceptance testing performed by WSDOT.

The system acceptance testing will consist of three phases:

- Phase I – 20-Calendar Day system acceptance testing through the Northup communication hub before Substantial Completion;
- Phase II – 10-Calendar Day system acceptance testing through the Roanoke communication hub, between Phase I and Phase III testing; and
- Phase III – 30-Calendar Day live traffic testing within 90 Calendar days after Substantial Completion.

Upon successful completion of the Phase I field acceptance testing and WSDOT inspection, the Design-Builder may proceed with the Phase I system acceptance testing without completion of the Phase II field acceptance testing. However, the Phase II system acceptance testing shall not begin until successful completion of all field acceptance testing and Phase I system acceptance testing.

The Design-Builder shall verify remote monitoring and control of all ITS equipment from the TMC before scheduling any testing. The Design-Builder shall demonstrate to the satisfaction of the WSDOT Engineer that all field equipment and communication systems are fully operational before each phase of the acceptance testing. Each testing phase shall not begin until all functions of the systems have been demonstrated to the satisfaction of the WSDOT Engineer.

When the WSDOT Engineer is satisfied that all functions of the systems are operational, the Design-Builder shall notify the WSDOT Engineer that the systems are ready for the system acceptance testing. Notification shall take place a minimum of 14 Calendar Days prior to each phase of the system acceptance testing. WSDOT has the right to reject the Design-Builder's request or modify the testing start date at its sole discretion. WSDOT

will provide the Design-Builder with a written notice of the system acceptance testing start date.

The system acceptance testing will be performed by the WSDOT Engineer, TMC personnel, and WSDOT representatives. The Design-Builder shall make its personnel available during the test period and provide assistance with facilitating the testing when required by WSDOT.

When the three system acceptance testing phases are not scheduled consecutively, the ITS shall remain in operations between any two testing phases and after completion of the Phase III live traffic testing. The Design-Builder shall not disrupt the ITS unless the disruptions meet the requirements in these Technical Requirements and are approved by WSDOT.

During the Phase I system acceptance test period, all ITS equipment shall be communicating with the TMC central system through the Northup communication hub and shall be monitored for 20 consecutive Calendar Days by WSDOT TMC personnel. Upon successful completion of 20 consecutive Calendar Days of failure-free operation as determined by WSDOT, WSDOT will notify the Design-Builder that the ITS field equipment is operational through the primary communications to the Northup communication hub. The Design-Builder shall not open the new floating bridge to traffic until the Phase I system acceptance testing is completed successfully.

The Design-Builder shall not start the Phase II system acceptance testing until the Phase I system acceptance testing is completed successfully. To initiate the Phase II testing, the Design-Builder shall reconfigure the ITS distribution network in the westernmost shed on the new floating bridge and in the fiber terminal cabinet to provide secondary communications between every floating bridge ITS device and the TMC through the Roanoke communication hub. During the Phase II system acceptance test period, all ITS equipment shall be communicating with the TMC central system through the Roanoke communication hub and shall be monitored for 10 consecutive Calendar Days by WSDOT TMC personnel. WSDOT will notify the Design-Builder if the Phase II system acceptance testing is successful at the end of 10 consecutive Calendar Days of failure-free operation as determined by WSDOT.

Upon successful completion of the Phase II system acceptance testing, the Design-Builder shall restore the ITS distribution network to provide primary communications to the Northup communication hub.

The Phase III system acceptance system will not begin until construction of six lanes on the new floating bridge is complete and all traffic is switched from the existing floating bridge to the new floating bridge in the permanent channelization. During the 30 Calendar Day test period, WSDOT will test the entire ITS in a live traffic environment such that the accuracy of the traffic data accumulation system can be validated. The Design-Builder shall not perform any construction activities that will disrupt the ITS operations or affect the traffic data accumulation system. Any system malfunction or reduced data accuracy under the “live traffic” condition as identified by WSDOT shall be considered a failure and cause for termination of the Phase III system acceptance testing.

For the purposes of all three system acceptance test periods, a failure is defined as any functional, software, hardware or communication failure of any ITS field equipment, communication cables and interface components, hub and TMC equipment, and any software including controller firmware, that the Design-Builder is responsible for installing. Any loss of communication between the TMC and field equipment shall be

considered a failure unless it is caused by a failure outside the Design-Builder's responsible area as determined by WSDOT.

All equipment shall be in working order at the beginning of each phase of the system acceptance testing. Any adjustment or replacement of system components or field equipment during each test shall also be considered a failure and cause for termination of the test period.

When informed of a failure, the Design-Builder shall respond within 48 hours with a representative who is thoroughly familiar with the operation of all parts of the system. The Design-Builder's response shall include, but is not limited to, field adjustment of induction loop sensitivity level, correction of hardware malfunctions, upgrade of controller firmware, field adjustment of controller parameters and configurations, fine tuning communication equipment, replacement of the faulty hardware and software, and retesting the hardware and software after the correction. Upon detection of a failure, the test and test time shall be stopped. Upon the Design-Builder's correction of the failure and successful verification of proper operations of the entire system, the test time will be reset and a new test period shall begin. The Design-Builder shall be fully responsible for correcting the failure, without any additional cost to WSDOT, including replacement of any ITS hardware and software that does not meet these Technical Requirements and Mandatory Standards.

#### 2.18.3.4.3 Test Samples and Testing Documentation

In addition to other test samples and documentation specified in this section, the Design-Builder shall furnish and submit the following items, at a minimum, for WSDOT acceptance prior to field installations of the communication conduit system:

- Manufacturer's specifications for junction boxes, NEMA enclosures, cable vaults and pull boxes;
- Detailed shop drawings of junction boxes, NEMA enclosures, cable vaults and pull boxes;
- Manufacturer's specifications for all conduits, innerducts, fittings and accessories;
- A three-foot sample of each type of conduit, bend, fitting and accessory; and
- Manufacturer's Certificate of Compliance.

The Design-Builder shall prepare and submit all test samples and testing documentation in accordance with these Technical Requirements. The testing documentation shall include test plans, test procedures, equipment documentation and test reports in a completed form on both a CD-ROM and a hard copy. Unless otherwise specified, two sets of test samples and testing documentation shall be submitted to WSDOT for acceptance in accordance with this section.

All junction boxes, cable vaults and pull boxes supplied by the Design-Builder shall be in accordance with the load rating requirements in Section 9-29.2 of the WSDOT Standard Specifications (Appendix D18). All junction boxes, cable vaults and pull boxes in the current WSDOT Qualified Products List (QPL) (Appendix D13) will be accepted in accordance with the QPL approval code. For any junction boxes, cable vaults and pull boxes not listed in the QPL, the Design-Builder shall perform load testing and submit all testing documentation to WSDOT in accordance with Section 9-29.2 of the WSDOT Standard Specifications (Appendix D18).

### 2.18.3.5 MAINTENANCE AND OPERATION OF ITS COMPONENTS

WSDOT will be responsible for maintaining all existing ITS components on the existing floating bridge until the decommissioning of these components. The Design-Builder shall not disrupt any existing ITS equipment and communication systems on the existing floating bridge until all traffic is switched onto the new floating bridge in accordance with the requirements in this section.

Upon NTP 2, the Design-Builder shall be responsible for maintaining all new and temporary ITS constructed by the Design-Builder until Physical Completion of the Project.

New ITS will be constructed by the Eastside and WCB projects at the same time of this Project, or existing ITS will remain upon completion of these projects. Appendix M7 includes the allowable access and control areas for the Design-Builder and the anticipated timeline for each area that will be available for the Design-Builder. Upon notification by WSDOT, the Design-Builder shall provide maintenance of the following new or existing ITS within the Project limits until Physical Completion of the Project or the decommissioning of the existing ITS, at no additional cost to WSDOT:

- New ITS constructed by the Eastside project;
- New ITS constructed by the WCB project; and
- Existing ITS east of the existing floating bridge abutment that will remain upon completion of the Eastside project.

Refer to Section 2.29 (Maintenance During Construction) for additional maintenance requirements. The Design-Builder shall provide support to WSDOT as directed by the WSDOT Engineer, in operating the ITS components listed above until Physical Completion of the Project.

Upon successful completion of the WSDOT Phase I system acceptance testing, the Design-Builder shall ensure all new ITS and any existing ITS that remains within the Project limits is fully operational for the primary communications to the Northup communication hub prior to the traffic switch onto the new floating bridge.

Maintenance shall include the Design-Builder's response to faults upon notification by WSDOT. 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:
  - Communication links and equipment, including communication connections to all existing and permanent toll facilities and temporary toll facilities, if any;
  - CCTV facility;
  - Local control unit for ATM signs or the ATM sign itself;
  - Detection failure; or
  - Ramp metering facility.

  The response time for urgent faults of ITS components shall be less than two hours. The repair time for urgent faults of ITS components shall be less than four hours.

- Priority – Any fault that causes a failure or disruption of an operator workstation. The Design-Builder shall respond prior to noon (12:00 p.m.) of the next Calendar Day. The repair time shall be less than four hours.
- Minor – Any other fault. The Design-Builder shall respond prior to midnight (12:00 a.m.) of the next Calendar Day. The repair time shall be less than four hours.

The Design-Builder shall be responsible for repairing, to WSDOT's satisfaction and at no cost to WSDOT, any damage the Design-Builder causes to the ITS during the life of the Project.

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.

All replaced equipment shall be tested in accordance with the requirements included in these Technical Requirements.

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.

#### 2.18.3.5.1 ITS Maintenance and Operation Plan

The Design-Builder shall prepare and submit to WSDOT an ITS Maintenance and Operation Plan a minimum of 21 Calendar Days before performing Work on any portion of the ITS. The Plan shall provide maintenance and operation details for all existing ITS equipment, and temporary and new ITS components installed by the Design-Builder. The ITS Maintenance and Operation Plan shall be submitted as part of the Temporary ITS Plans in the MOT Plans packages. The Design-Builder shall comply with Section 2.22 for temporary ITS requirements.

The Design-Builder shall ensure that the Work causes no disruptions to the existing systems, whether inside or outside of the Project limits, except those disruptions that are planned and approved in advance in accordance with these Technical Requirements.

The ITS Maintenance and Operation Plan shall include, at a minimum, the following:

- Details of the proposed preventive maintenance program, including frequency, for each ITS component and other existing systems included above.
- A general description of the proposed emergency maintenance and operation response program for each ITS component. This description shall include the categories of faults and how the faults will be detected as described in this section.
- Maintenance and operation activities.

#### 2.18.3.5.2 Allowable Working Hours on the ITS

With the exception of pre-approved planned disruptions, the Design-Builder shall maintain the operations of all ITS devices inside and outside the Project limits through all phases of construction.

WSDOT will define normal hours of operation of active ITS devices that do not operate continuously, such as ramp meters.

Unless otherwise specified in these Technical Requirements, the Design-Builder shall contact WSDOT a minimum of 7 Calendar Days before performing any Work on active ITS devices, and 30 Calendar Days before performing any Work in the communication hubs. The Design-Builder shall perform all Work in a manner ensuring the proper performance of all ITS components.

The Design-Builder shall not work on active ITS devices within the Project limits from 4:00 a.m. to 8:00 p.m., with the exception of the communication hubs. The Design-Builder may perform Work in the communication hubs at any time, provided that proper notice has been given and the WSDOT Engineer directly supervises the Work. All Work to be performed in the communication hubs shall not be disruptive to any of the existing ITS equipment and communication systems unless the disruption occurs during the allowable working hours (8:00 p.m. to 4:00 a.m.) and pre-approved by WSDOT. The Design-Builder shall limit the Work inside the hubs to no more than 10 visits during the duration of the Project.

#### 2.18.3.5.3 Continuous Operation of Existing ITS

The Design-Builder shall ensure continuous operation of the existing ITS and toll systems during construction. Refer to Section 2.22 for temporary ITS requirements.

##### 2.18.3.5.3.1 Disruption and Restoration

###### *2.18.3.5.3.1.1 Planned Disruptions*

If the Work requires disruptions to the ITS, the Design-Builder shall submit a Disruption Request for approval. All planned disruptions must be approved by WSDOT prior to performing the Work. Planned disruptions shall only occur during the allowable working hours identified in this section. The Design-Builder shall restore the disrupted system upon completion of the Work within the pre-proved working hours. The Design-Builder shall remain on site until WSDOT notifies that the disrupted systems are fully operational. Failure of the Design-Builder to restore disrupted systems and equipment within the allowable working hours will constitute an unplanned disruption.

###### *2.18.3.5.3.1.2 Disruption Request*

The Design-Builder shall submit a written Disruption Request to the WSDOT Engineer for approval at least 14 Calendar Days before planned disruptions of any existing system, circuit or equipment.

The Design-Builder shall submit a separate, sequentially numbered Disruption Request for each planned disruption. Each Disruption Request shall include the system(s) to be affected, the disruption start date and time, and the estimated duration required. Multiple systems affected by one disruption shall be submitted as one disruption request. The WSDOT Engineer will approve or reject the Disruption Request in writing at least 7 Calendar Days before the proposed start of the disruption. The WSDOT Engineer may verbally recommend an alternate time or duration agreeable to both the Design-Builder and WSDOT.

#### *2.18.3.5.3.1.3 Unplanned Disruptions*

Any unplanned disruptions determined by the WSDOT 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.

In the case of an unplanned disruption and subsequent notification by the WSDOT Engineer, the Design-Builder shall immediately stop all other ITS work in progress and shall expend all of its 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 repairing disrupted systems. Unplanned disruptions shall result in the assessment of liquidated damages in accordance with Section 1-08.9 of the General Provisions**.**

## 2.18.3.6 REMOVAL AND DELIVERY

### 2.18.3.6.1 Removal, Salvage, and Delivery of Existing ITS Equipment

The Design-Builder shall remove, salvage and deliver existing ITS equipment in accordance with the Mandatory Standards and the requirements in Section 2.16.

### 2.18.3.6.2 Delivery of New ITS Equipment

Initial delivery and movement of ITS 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 ITS components in accordance with these Technical Requirements.

## 2.18.3.7 ITS TRAINING

For all ITS equipment furnished and installed as part of this Project, the Design-Builder shall demonstrate the full functionality and conduct a minimum of two eight-hour training sessions by a manufacturer-certified instructor for up to 10 WSDOT personnel.

The Design-Builder shall provide a schedule, syllabus, product manuals and documentation for all training sessions a minimum of 7 Calendar Days in advance of each training session. The training shall be provided at a WSDOT facility as determined by the WSDOT Engineer. At a minimum, the training shall focus on removal and replacement of equipment components and the manufacturer's standard operating and troubleshooting procedures, including all hardware and software.

All training sessions must be provided prior to Physical Completion of the Project.

## 2.18.3.8 ITS ACCEPTANCE

The Design-Builder shall notify WSDOT when all ITS requirements have been met in accordance with these Technical Requirements, including training, documentation, field installations and all testing requirements. WSDOT will accept the ITS after verifying the proper operation of all ITS components at Physical Completion of the Project.

## 2.18.3.9 WARRANTY

The Design-Builder shall provide an ITS Warranty commencing on the day of Physical Completion and ending a minimum of one year later for all equipment furnished and installed as part of this Project. The Warranty shall include both product and workmanship. A complete Materials Certification Package shall be submitted to WSDOT

for acceptance in accordance with Section 2.25 prior to commencement of the ITS Warranty.

The ITS Warranty shall be in accordance with Section 1-05.16 of the General Provisions.

## 2.18.4 DESIGN REQUIREMENTS

### 2.18.4.1 GENERAL

The Design-Builder shall provide all ITS components including, but not limited to, the following ITS systems in accordance with the Mandatory Standards:

- Traffic data accumulation systems;
- CCTV system;
- ATM system;
- Communication conduit system;
- Communication cables and interface system;
- Video and data distribution and transmission system; and
- All associated equipment interconnecting the above systems with the communication hubs and TMC.

In addition to the ITS systems, the Design-Builder shall provide the floating bridge systems in accordance with Section 2.17 (Electrical Bridge and Services).

The Design-Builder shall provide a complete, operational and maintainable ITS and components within the Project limits including modifications to any ITS components constructed as part of the SR 520 Eastside Transit and HOV Project and the WCB Project.. The ITS and its components shall be compatible with the existing system. The Design-Builder shall design and construct all electrical power services 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 the WSDOT ITS Device Naming Scheme (Appendix I10). The Design-Builder shall provide an ITS that meets the following requirements:

- Expandability in accordance with the WSDOT Northwest Region Special Provisions for ITS (Appendix B10), the WSDOT Northwest Region ITS Design Guide Supplement (Appendix I8), and the provisions included in these Technical Requirements;
- Cabinet layouts in accordance with the WSDOT Northwest Region ITS Design Guide Supplement (Appendix I8) and the WSDOT Northwest Region ITS Details (Appendix I3);
- Compliance with the National and Regional ITS Architecture;
- Support for standalone operation of all field devices using backup software components;
- Protection from power surges and lightning. All cabinets and electronic devices shall be provided with transient current protection;

- Weather-resistant components capable of operating in rain, snow and wind conditions, and in temperature and humidity ranges encountered in the Project area based on 30-year historical temperature and humidity data;
- Hazard-free ITS components mounted along the side of the road outside the clear zone or in protected areas. Maintenance personnel shall be able to fully open, access and work in or on ground-mounted equipment while standing outside of the clear zone or within a protected area;
- If ITS components are mounted in the clear zone, they shall be constructed and protected in accordance with the WSDOT Roadside Manual (Appendix D16) and AASHTO *Roadside Design Guide*; and
- Field cabinets and devices with standard WSDOT locking devices.

The Design-Builder shall not mount ITS equipment on sign structures, with the exception of the ATM signs.

The Design-Builder shall comply with Section 2.11 maintenance access requirements. If the site is protected by an existing barrier, any maintenance pullout shall be sited such that removal of the barrier does not result in clear-zone violations. Any break in the barrier shall be retrofitted to meet all roadside safety requirements.

The Conceptual ITS Plans in Appendix M1 identify the fiber optic communication network and approximate locations of some of the ITS equipment, but the plans do not address all required ITS design for the Project. Where additional ITS equipment is required to meet the Technical Requirements, the Design-Builder shall coordinate with the WSDOT ITS Implementation Engineer for the optimal locations of ITS equipment. The Design-Builder shall prepare and submit the proposed ITS locations in the Preliminary ITS Design Submittal to WSDOT for review and comment.

#### 2.18.4.1.1 Connection to the SR 520 Eastside Corridor

The Design-Builder shall coordinate with WSDOT and the Eastside project to determine the design requirements between the new floating bridge abutment and 84th Avenue NE. The Design-Builder shall perform the following:

- Any new ITS devices and conduit infrastructure constructed by the Eastside project within the permanent pavement area shall not be removed or relocated;
- Any new ITS devices and conduit infrastructure constructed by the Eastside project within the pavement area for interim operations may be reused, field adjusted or removed. Any reused or field adjusted ITS devices and conduit infrastructure shall meet the requirements in the Mandatory Standards and this section. Existing cables in the reused conduits shall be removed and abandoned. Reused junction boxes, pull boxes or cable vaults shall be adjusted, as needed, to match the finished pave surface or one inch above grade in unpaved areas. Should the conduits, junction boxes, pull boxes or cable vaults fail to meet the Mandatory Standards and this section, the Design-Builder shall replace them with new equipment in accordance with the Mandatory Standards and this section; removed conduits shall not be reused. The Design-Builder shall replace the ITS devices, if removed, with new ITS devices that provide the same functions and conform to the requirements in the Mandatory Standards and this section;
- If induction loops constructed by the Eastside project within the permanent pavement area need to be replaced due to channelization changes for the new

floating bridge, the Design-Builder shall use saw-cut induction loops. New loop wires shall be connected to the loop lead-in cables in the junction boxes installed by the Eastside project;

- No open trench is allowed in the permanent pavement area constructed by the Eastside project unless approved by WSDOT;
- Field adjust LCS and SDMS signs on the eastbound ATM gantry, constructed by the Eastside project, so that each LCS is centered over each lane;
- Furnish and install four new LCS, one per each mainline lane, and one large VMS on the westbound ATM gantry constructed by the Eastside project. The Design-Builder shall furnish and install the transformer, transformer cabinet, ATM cabinet, all associated ATM control and communication equipment, and cabling to make this ATM fully operational;
- Design and construct new additional permanent induction loops and data stations to make the westbound and eastbound ATM fully functional;
- Furnish and install new additional induction loops and modify the ramp meter constructed by the Eastside project to make the ramp meter fully operational;
- Furnish and install additional CCTV cameras to provide fully coverage of the mainline roadway, on/off ramps, arterial streets, ramp meter signal heads, and all ATM signs in accordance with this section;
- Design and construct a new permanent ITS mainline and distribution communication network that shall expand the same ring structure constructed by the Eastside project east of 84th Avenue NE, to the new floating bridge abutment, in accordance with this section;
- Maintain and protect the communication conduits and lateral fiber optic cables to the Evergreen Point Road in-line transit stop;
- Furnish and install additional preterminated fiber optic patch panel stubs, fiber splice enclosures, and fiber patch cords to interconnect all existing (if remains) and new ITS onto the new ITS distribution network and make them fully operational; and
- All existing ITS, that either remains or is modified by the Eastside project, west of Evergreen Point Road shall be removed and salvaged in accordance with the requirements in this section.

#### 2.18.4.1.2 Connection to the SR 520 WCB

The Design-Builder shall coordinate with WSDOT to determine the design requirements between the new floating bridge and Foster Island via the existing west approach bridge and the new WCB. The Design-Builder shall perform the following:

- Install one new permanent ITS mainline cable and one new permanent ITS distribution cable on the WCB via two new empty conduits (installed by the WCB project) and on the existing west approach bridge via one existing conduit;
- Splice the new ITS mainline cable to the new mainline cable on the new floating bridge and to the existing mainline cable at Foster Island;

- Connect and terminate the new ITS distribution cable to the westernmost shed on the new floating bridge, and splice to the existing ITS distribution cable at Foster Island;
- Connect the ITS distribution cable to the CCTV camera cabinet installed by the WCB project; and
- Integrate and test the CCTV equipment onto the new ITS distribution network to make the CCTV camera and control equipment fully operational.

### 2.18.4.2 FIELD REVIEW AND AS-BUILT VERIFICATION

As-Built Plans for existing illumination, signal, ITS and electrical systems are provided, refer to Appendix A-B. The Design-Builder shall coordinate with WSDOT personnel in obtaining additional As-Built Plans for existing illumination, signal, ITS and electrical systems affected by construction activity.

The Design-Builder shall be responsible for field verifying the As-Built Plans against the existing facilities that will be affected by the construction of the Project.

The following inventories of existing ITS are included in the appendices:

- Existing ITS Inventory (I-5 to Medina) (Appendix I11); and
- Existing ITS Inventory (Medina to 108th Ave NE) (Appendix I12).

The Design-Builder shall be solely responsible for verifying the accuracy of content and the completeness of all information in the existing inventories used in the design and construction of the Project.

### 2.18.4.3 TEMPORARY ITS

The Design-Builder shall design and construct a temporary ITS in accordance with the requirements in this section and Section 2.22.

### 2.18.4.4 CONTROL CABINETS AND SHEDS

#### 2.18.4.4.1 Maintenance and Control Sheds on Pontoons

On the floating bridge, the Design-Builder shall install all ITS and electrical equipment in sheds that would otherwise be located in roadside cabinets. The Design-Builder shall comply with Section 2.12 (Floating Bridge) for the Type 1, 2, and 3 shed structure requirements and Section 2.32 (Bridge Mechanical) for the shed ventilation and heating requirements.

The Design-Builder shall supply and install the following ITS equipment in the ITS/Lighting room of each shed:

- Two side-by-side EIA 19-inch racks, 42u, 4-post server racks with rails set to a minimum depth of 21.2 inches. The racks shall include front and back doors with keys, a top cover with cable knockouts, and two side panels;
- Fiber management system; and
- Cable management kits for power and control cables.

The Design-Builder shall provide additional space adjacent to the two racks for one additional EIA rack to be installed by WSDOT in the future. The Design-Builder shall

provide a minimum of 36 inches of clearance for maintenance access on the front, back, and at least one of the sides of the row of three racks (two racks installed by the Design-Builder plus the one additional rack space provided for future use).

Distribution fiber cable splices will not be allowed inside the shed. The distribution cables shall be spliced to the preterminated fiber optic patch panel cables in a NEMA enclosure mounted to an exterior wall of the shed.

For sheds that house camera equipment, the Design-Builder shall supply and install all the equipment shown in the camera cabinet details of the WSDOT Northwest Region ITS Details (Appendix I3) with modifications, as needed to comply with the requirements in Sections 16 and 2.32, to the electrical and ventilation/heating.

For sheds that house data station equipment, the Design-Builder shall supply and install all the equipment shown in the model 334 cabinet details of the WSDOT Northwest Region ITS Details (Appendix I3) with modifications, as needed, to rack mount the equipment and to comply with the electrical and ventilation/heating requirements in Sections 16 and 2.32.

For sheds that house ATM equipment, the Design-Builder shall supply and install all the equipment in accordance with this section.

#### 2.18.4.4.2 Roadside Control Cabinets

The Design-Builder shall locate roadside 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;
- Cabinets shall be ground-mounted on a concrete pad; and
- Cabinet foundations installed on slopes shall be in accordance with the WSDOT Northwest Region ITS Design Guide Supplement (Appendix I8).

### 2.18.4.5 Traffic Data Accumulation and Ramp Meter Systems

The Design-Builder shall design and construct the following traffic data accumulation systems:

- Vehicle detection;
- Permanent Traffic Recorder (PTR) vehicle detection; and
- Data stations.

#### 2.18.4.5.1 Vehicle Detection

The Design-Builder shall provide permanent vehicle detection that meets the Mandatory Standards and the following requirements:

- Induction loop detectors shall be used at all permanent detection locations.

- Induction loop detectors shall be placed in all on/off-ramps, auxiliary lanes, and mainline lanes; and shall measure, at a minimum, vehicular volume and lane occupancy.
- At ramp metering locations, two induction loop detectors configured in a speed trap configuration shall be placed in every freeway mainline lane at the end of the physical separation and beginning of the painted gore between the mainline and the on-ramp.
- Two induction loop detectors configured in a speed trap configuration shall be placed in every freeway mainline lane halfway between every two successive ATM sites in each direction. If the speed loops for a ramp meter are located approximately halfway between two successive ATM sites, no less than 1000 feet from either ATM site, then the loops shall be used for both ATM and ramp metering operations. An ATM site is defined as a location where the ATM sign structure is located.
- The mainline speed loops shall measure, at a minimum, vehicular volume, lane occupancy and speed.

The Design-Builder shall maintain or re-establish operation of all vehicle detections outside the Project limits if they lead to a new controller within the Project limits.

#### 2.18.4.5.1.1 Induction Loop Detectors

The Design-Builder shall furnish and install R1, R2 and Wide Round (WR) induction loop detectors in accordance with these Technical Requirements and the WSDOT Northwest Region ITS Details (Appendix I3). WR loops shall be used on all lanes wider than 12 feet.

The Design-Builder shall use preformed round induction loops in new pavement. The preformed loops shall be placed between the subgrade and the new pavement sections on land. For bridge decks, the preformed loops shall be installed in accordance with the manufacturer's specifications. The Design-Builder shall use saw-cut induction loops with existing pavement. In cement concrete pavement, the Design-Builder shall locate induction loops at least three feet from transverse panel joints.

The Design-Builder shall provide new induction loops, lead-in cables and ancillary items in order to provide fully-functioning loop installations at all permanent vehicle detection locations.

If existing loops outside the Project limits will be reused and routed into a new data station or ramp meter cabinet, the Design-Builder shall ensure that all existing loops are connected to the new cabinet location. To achieve this, the Design-Builder shall comply with these Technical Requirements and the following provisions:

- No splices will be allowed in the loop lead-in wires; if these wires are damaged, the Design-Builder shall replace the existing lead-in wires with new ones;
- The lead-in wires shall be contained within a continuous conduit/junction box run from the loop to the new cabinet; and
- All existing loops connected to the new cabinet location shall be tested in accordance with the Mandatory Standards and this section. Non-functional loops shall be replaced.

All loops shall be connected to the cabinet or shed in the order provided to the Design-Builder by the WSDOT 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 or shed, and a maximum of eight pairs of speed loop detector inputs per cabinet.

#### 2.18.4.5.1.2 Non-Intrusive Vehicle Detection

The Design-Builder shall use only non-intrusive microwave vehicle detectors manufactured by Wavetronix LLC, Provo, UT, for temporary data collection during construction. No other non-intrusive vehicle detection technologies are allowed. Wavetronix non-intrusive vehicle detectors shall not be used for temporary ramp meter operations; instead, induction loops shall be provided in accordance with the Mandatory Standards and this section.

If non-intrusive vehicle detector units are used, the Design-Builder shall provide, install, test and connect them in accordance with the WSDOT Northwest Region Special Provisions for ITS (Appendix B10). At each location where a non-intrusive vehicle detector is installed, the 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 for installation of the components, connections and splices in order to create a fully-functioning and operable system. Detector units and all related equipment shall be designed in accordance with the Mandatory Standards and the manufacturer's specifications.

### 2.18.4.5.2 Permanent Traffic Recorder (PTR) Vehicle Detection

The Design-Builder shall replace the existing PTR vehicle detection system in both directions, at approximately STA MR 225+00 as shown in the Conceptual Plans (Appendix M1), with an entire new system, including induction loop detectors, Measurement Specialties Roadtrax BL Piezoelectric axle sensors, lead-in cables, control cabinets, a counter/classifier, a Digi International TS 1 H Terminal Server, a RuggedCom RS900 Ethernet switch and associated equipment in accordance with the WSDOT Standard Specifications (Appendix D18) and WSDOT Standard Plans (Appendix D17). The traffic recording counter/classifier shall have the following features:

- Eight contact closures or open collector to ground pulse inputs;
- 16 loop inputs with presence style contact closure or open collection emulations;
- Eight piezo inputs with BNC connection;
- Four optically isolated programmable outputs;
- 16 optically isolated loop presence outputs;
- Washington State class bins firmware preinstalled onto the EEPROM by the manufacturer;
- 4GB expanded memory on SD/MMC flash card; and

- Rack mount enclosure with one RS-232 serial port on the front panel and loop/BNC piezo inputs on the back panel.

The Design-Builder shall notify the WSDOT Transportation Data Office (TDO) a minimum of 7 Calendar Days prior to the scheduled site installation. The TDO contact is Ken Lakey.

Ken Lakey – Electronics Supervisor
WSDOT – Transportation Data Office
7345 Linderson Way SW
Tumwater, WA 98501-6504
Phone: (360) 570-2374

An inspector from the TDO will be on site for all phases of the PTR installation. All sensors are to be tested by the TDO electronics personnel. The Design-Builder shall be responsible for the replacement of any sensors that do not meet the minimum performance specifications identified in the WSDOT Standard Specifications (Appendix D18) and the manufacturer's specifications.

The Design-Builder may use the vehicle detection from the PTR for data station vehicle detection. If the vehicle detection is shared, the Design-Builder shall install the PTR and data station cabinets on a shared foundation and connect the loop lead-in cables from the data station cabinet to separate terminal strips in the PTR cabinet. WSDOT personnel from the TDO will connect the contact closure output of the counter/classifier to the terminal strips. The Design-Builder shall notify the TDO a minimum of 7 Calendar Days in advance to complete the connection.

#### 2.18.4.5.3 Data Stations

The Design-Builder shall install data stations for ATM operations where the mainline speed loops at ramp meter locations are not situated halfway between two successive ATM sign structures. The supplemental data station mainline speed loops shall be installed approximately halfway between the two successive ATM sites, but no less than 1,000 feet from either ATM site, and shall be connected to the data station control cabinet or shed. The mainline speed loops shall be placed in all freeway mainline lanes in both directions.

The Design-Builder shall install a data station for ATM operations approximately 1,320 feet to the west of the westernmost ATM site on the floating bridge. At this location, the Design-Builder shall install induction loop detectors in a speed trap configuration in every eastbound and westbound lane for this Project's and for future projects' channelization as follows:

- The WCB (built by others) lane configuration which uses the south structure of the west transition span (four lanes only);
- Future interim lane configuration which uses the north structure of the west transition span (four lanes only) during the construction of the southern West Approach Bridge; and
- Future lane configuration which uses both the north and south structures of the west transition span (six lanes on transition spans, three on the north and three on the south).

At this location, the Design-Builder shall install a loop lead-in cable for each loop, identified above, and terminate it in the control shed on the terminal block. All loops and lead-in cables, including those installed for future use, shall be tested in accordance with the Mandatory Standards and this section.

### 2.18.4.6 CLOSED CIRCUIT TELEVISION (CCTV) TRAFFIC SURVEILLANCE SYSTEM

The Design-Builder shall provide a complete, real-time NTSC CCTV traffic surveillance system in accordance with the Mandatory Standards and meet all design requirements specified in this section. Refer to Section 2.17 for the CCTV bridge security surveillance system requirements.

A CCTV traffic surveillance system consists of a CCTV camera(s); camera control cabinet/mounting pad or shed; video transmitter; video receiver; AC/DC adaptor; cabling; camera pole; foundation; and all other conduits, accessories and components to make the camera fully functional and operable. CCTV cameras and all related equipment shall be designed in accordance with the WSDOT Northwest Region ITS Details (Appendix I3).

The Design-Builder shall ensure that all accessories and components are fully compatible with the existing ITS equipment.

CCTV cameras shall also provide the following:

- Pan, Tilt and Zoom (PTZ) functionality;
- 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;
- Placement of at least one CCTV camera no more than 2000 feet upstream from any ATM sign;
- Verification of all ATM sign messages on LCS, SDMS and VMS such that fonts as small as nine inches high are legible by TMC operators;
- Complete visibility of all roadway pavement surfaces (no blind spots);
- Suitable maintenance access for maintenance vehicles and personnel based on the geometric layout of the area;
- Minimum obstructions to the view caused by landscaping, trees, billboards, buildings, fixed freeway signs or topography;
- Power, communication and underground utility considerations; and
- Placement that allows for future roadway widening, wherever possible.

The Design-Builder shall coordinate with WSDOT regarding the placement of CCTV camera poles and equipment. All pole-mounted CCTV cameras shall be mounted on top of the camera poles in accordance with WSDOT Northwest Region ITS Details (Appendix I3). Camera views, accessibility and maintainability are typical issues of concern from an operation standpoint. Prior to installation of CCTV poles and cameras over land, the Design-Builder shall field verify and inspect the camera view from a bucket truck and provide video and still images of a 360° view to WSDOT for review and comment.

All CCTV cameras shall be manufactured by Cohu Inc., San Diego, CA as specified in the WSDOT Northwest Region Special Provisions for ITS (Appendix B10).

All existing cameras, poles, cabinets and associated hardware to be removed shall be removed and salvaged to WSDOT in accordance with these Technical Requirements.

The CCTV camera shall be located such that the CCTV control cable is no longer than 750 feet from the CCTV control cabinet or shed. Multiple CCTV cameras may share the same cabinet or shed given that all CCTV control cables are within 750 feet. No more than four CCTV cameras shall be allowed per cabinet or shed.

#### 2.18.4.6.1 CCTV Camera Pole

The CCTV cameras shall be mounted on top of camera poles approximately 50 feet above the roadway surface unless a lower camera mounting height is required by the field condition and approved by WSDOT. New camera poles shall be used for all new camera installations. The CCTV camera pole shall be galvanized finish and shall not be painted or powder-coated.

The Design-Builder shall review the Geotechnical Baseline Report (Appendix G1) and the GDR (Appendix G2), and perform additional geotechnical analysis for each CCTV pole as required. The Design-Builder shall design the foundation in accordance with the Mandatory Standards.

##### 2.18.4.6.1.1 Access to CCTV Camera Pole

The Design-Builder shall construct access to allow maintenance vehicles such as bucket trucks to back up adjacent to the pole for camera repairs, and to provide access back onto the freeway.

Refer to Section 2.11 for maintenance access requirements.

### 2.18.4.7 Active Traffic Management (ATM) System

The existing ATM sign structure and foundations located at STA MR 225+00, as shown in the Conceptual Plans (Appendix M1), shall be removed. The existing ATM sign structure shall become the property of the Design-Builder. The Design-Builder shall remove, salvage and deliver all existing LCS and SDMS signs, ATM cabinets, mounting brackets, control equipment and cables to WSDOT in accordance with the requirements in this section.

The Design-Builder shall be responsible for relocating existing LCS if they are more than one foot off-centered from the center of the travel lane to the center of the sign. Upon completion of any Work, including relocation, removal, and reinstallation,of an existing piece of the ATM equipment, the Design-Builder becomes responsible to maintain all ATM equipment, including the equipment to remain, until the Physical Completion. The Design-Builder shall bear all costs associated with repair and replacement of any defective items comprising the existing ATM equipment and hardware, including the relocation, removal and reinstallation of equipment, until the Physical Completion. The Design-Builder shall maintain and protect the existing ATM equipment and associated electrical and communication infrastructures to provide continuous operation during construction in accordance with Section 2.22.

The Design-Builder shall design and construct a complete ATM system for both directions on the SR 520 freeway mainline between the west floating bridge transition span and 84$^{th}$ Avenue NE. Successive ATM sites per direction, including the existing

ATM sites to remain, shall be placed approximately every ½ mile. Final ATM sites, sign types (VMS or SDMS), and sign mounting locations will require WSDOT approval.

Each of the ATM sites shall consist of the following:

- WSDOT standard monotube sign structure;
- LCS above each freeway mainline lane; and
- One VMS or two SDMS per direction of travel.

One VMS shall be provided for each direction on the new floating bridge. The new westbound and eastbound VMS shall be a minimum of 6,000 feet east of the existing VMS sign on the existing west approach bridge. VMS and SDMS shall not be placed at the same ATM site per direction.

The Design-Builder shall position all ATM signs in order to achieve the optimum sight line and maximum visibility for vehicles approaching the sign. A minimum of 1000 feet tangent sight distance shall be provided for each ATM sign.

The Design-Builder shall consider the half-power sign-viewing angle (no more than 15° vertically and horizontally) for placement of each ATM sign in accordance with the manufacturer's specifications and these Technical Requirements. All pixels on each ATM sign shall be viewable from a CCTV camera.

All ATM signs shall comply with the requirements in the WSDOT Northwest Region Special Provisions for DMS (Appendix B11). All ATM signs on the same ATM gantry shall be from the same manufacturer, including any existing ATM signs, if remaining, on the gantry. The Design-Builder shall not mix ATM signs from different manufacturers at the same ATM location.

#### 2.18.4.7.1.1 Spare Parts

The Design-Builder shall supply the following spare equipment prior to Substantial Completion:

- 2 LCS and 1 LCS Controller
- 1 LCS Mounting Bracket
- 1 SDMS and 1 SDMS Controller

The spare equipment shall be subject to the same delivery and testing procedures and the same warranty requirements as the installed equipment.

### 2.18.4.7.2 Lane Control Signs (LCS)

The Design-Builder shall mount an LCS above each general-purpose, HOV, and transit-only lane in order to display speed and lane usage information to drivers. Signs shall be centered over the lane on the sign structure.

For any ATM sites located west of STA MR 160+00 on the floating bridge, as shown in the Conceptual Plans (Appendix M1), the Design-Builder shall furnish and install an additional LCS above the westbound outside shoulder for future use.

### 2.18.4.7.3 Side-Mounted Dynamic Message Signs (SDMS)

SDMS shall be side-mounted adjacent to the roadway in order to display the speed limit and supplementary information to drivers. Sight distance and viewing angles will affect

the mounting location of the SDMS. In hierarchical order, with the highest priority mounting location appearing at the top of the list, the SDMS shall be mounted:

- On the sign structure's post.
- On the sign structure's horizontal member with a bracket to lower the sign to the required height. The Design-Builder shall comply with Section 2.19 (Signing) for mounting heights and clearance requirements.
- Within 200 feet of the front of the sign structure on a pole mounted to a concrete barrier or a retaining wall if the required sight distance and viewing angle can be provided. If one of the two signs is required to be pole-mounted in front of the sign structure, then both signs shall be pole-mounted in front of the sign structure.

#### 2.18.4.7.4 Variable Message Signs (VMS)

The Design-Builder shall mount each VMS above the outside shoulder on the WSDOT sign structure. A minimum of three feet of spacing shall be provided between the VMS and adjacent LCS on the same sign structure to allow for emergency egress.

Small VMS will not be allowed.

The VMS sign shall provide walk-in access from both sides of the VMS housing with the access doors designed to swing outward. The Design-Builder shall design and construct a maintenance walkway or a landing area on the sign structure adjacent to the access door on both sides of the VMS housing, wherever possible, in accordance with the Mandatory Standards. At a minimum, a five-foot by five-foot landing area shall be provided at the shoulder-side access door such that maintenance access is possible from the shoulder side. If the landing area cannot be provided at the other access door, attachment points used for fall protection equipment shall be provided on the outside of the VMS housing, and between 18 and 24 inches from the top of the sign.

Three flashing beacons, each with a 12-inch amber LED lamp, shall be furnished and installed on top of each VMS.

#### 2.18.4.7.5 ATM Power and Control Cables

The Design-Builder shall furnish and install the power and control cables in separate conduits and junction boxes. The power and control cables shall be in accordance with the manufacturer's specifications. The power and control cables for each LCS shall be equipped with a quick disconnect at the back of the sign.

Both power and control cables may be directly installed inside the ATM sign structures. The Design-Builder shall provide strain relief grips and J-hooks for installing power and control cables inside the monotube sign structures.

The Design-Builder shall provide a minimum of 10 feet of coiled slack power and control cables for each ATM sign in the junction boxes or inside the sign structures.

#### 2.18.4.7.6 ATM Control Cabinet and Sheds

The Design-Builder shall furnish and install roadside ground-mounted ATM cabinets for all locations other than on the floating bridge Pontoons, in accordance with the "Double-wide Controller Cabinet" requirements in the WSDOT Northwest Region Special Provisions for ITS (Appendix B10). The Design-Builder shall install the ATM controller equipment in sheds for the locations on the floating bridge Pontoons in accordance with

these Technical Requirements. The ATM rack-mounted equipment, whether in a cabinet or a shed, shall meet the following requirements:

- The control cabinets and sheds shall contain all equipment necessary to control the ATM signs. ATM equipment shall be housed on the rack on the left side of the cabinets and sheds, and all other equipment such as power distribution assemblies, shelves, power strips, patch panels and other communications equipment shall be housed in the right side rack.
- The cabinets and sheds shall have two serial communication ports per controller, each with a permanent label. 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 ATM sign installed in this Project. The second communication port interface shall be wired as a 9-pin, EIA-232 DTE port.
- A reset button shall be provided in the cabinets and sheds that, when pressed, resets the ATM sign controllers and all other ATM electronics.
- Two standard EIA 19-inch power strips with a minimum of eight receptacles each shall be provided. The power strips shall be mounted on the back side of the rack and face inward into the interior of the rack.
- An aluminum shelf with pullout drawer shall be mounted to the front and rear rails to accommodate future rack-mounted equipment.

#### 2.18.4.7.7 Access to ATM Signs

The Design-Builder shall provide access for maintenance vehicles such as bucket trucks to park adjacent to sign structures on land for repairs to the ATM signs, and to provide access back onto the freeway in accordance with the maintenance access requirements in Section 2.11.

#### 2.18.4.7.8 ATM Sign Structures and Foundations

The Design-Builder shall design and construct monotube sign structures, maintenance walkways, landing areas, poles and foundations for installation of the LCS, SDMS and VMS required in this section. The handhole and nipple locations on the sign structures shall be in accordance with the WSDOT Northwest Region ITS Details (Appendix I3) and the Mandatory Standards.

The Design-Builder shall review the GBR (Appendix G1) and the GDR (Appendix G2) and perform additional geotechnical analysis, as needed, for each on-land sign structure location. The Design-Builder shall design and construct the sign structures and foundations in accordance with the Mandatory Standards.

Wherever applicable, the sign structure foundations shall be placed behind a concrete barrier, or constructed integral with the concrete barrier or retaining/noise wall in a manner that the foundations do not encroach into the adjacent roadway shoulder. Sign structure posts and foundations shall not be placed behind retaining or noise walls.

The Design-Builder shall design the sign structure foundations and barrier systems to minimize shoulder width reductions.

Refer to Section 2.11 for additional requirements for concrete barrier design.

Sign structures on the floating bridge shall be supported by the Elevated Structure or by the Supplemental Stability Pontoons, as defined in Section 2.12. Refer to Section 2.12, Section 2.13 (Bridges and Structures) and Appendix M23 (Outfitting and Assembly Minimum Technical Requirements) for sign structure support locations on the pontoons. Refer to Section 2.19 for sign mounting height and spacing requirements.

### 2.18.4.8 FIBER TERMINAL CABINET

The Design-Builder shall furnish and install one roadside ground-mounted fiber terminal cabinet at approximately STA MR 224+00 (as shown in the Conceptual Plans, Appendix M1) in accordance with the "Double-wide Controller Cabinet" requirements in the WSDOT Northwest Region Special Provisions for ITS (Appendix B10).

The Design-Builder shall install two 96-port preterminated fiber optic patch panels. The two 96-port patch panel cables shall be spliced to the four 48-strand SMFO distribution cables in the cable vault.

### 2.18.4.9 COMMUNICATION CONDUIT SYSTEM

The Design-Builder shall design and construct a complete communication conduit system; including all associated conduits, cables, NEMA enclosures, pull boxes and cable vaults; that creates a fully redundant self-healing ring connecting the fiber optic distribution network between the communication hubs and the following:

- Existing and new ITS equipment;
- Toll facility;
- Under-lid lighting PLC; and
- Evergreen Point Road freeway in-line transit stop's equipment room.

Junction boxes shall not be used for conduit runs containing fiber optic cable. The Design-Builder shall not install pull boxes or cable vaults (existing or new) in any portion of the traveled way. If final re-striping will cause the communication conduit system to encroach the traveled way, the Design-Builder shall relocate the system to eliminate encroachment. If temporary striping causes encroachment of the traveled way with pull boxes, junction boxes or cable vaults, these items shall be relocated outside of the traveled way or protected in place to the satisfaction of the WSDOT Engineer in order to provide a safe roadway for the public.

The Design-Builder shall provide the following new four-inch ITS conduits with four 1.12-inch factory silicon-lined, smooth-walled innerducts:

- Two conduits between the easternmost NEMA enclosure on the West Connection Bridge, across the southern West Transition Span, floating bridge, East Transition Span, and East Approach Bridges to a new cable vault located near the floating bridge east abutment.
- Two conduits, for future use, on the northern West Transition Span. The conduits shall be between a new NEMA enclosure installed on the west end of the transition span and the nearest floating bridge NEMA enclosure that connects the conduit systems together.
- Two conduits crossing SR 520 near the floating bridge east abutment between two new cable vaults.

- One conduit on the north side of SR 520 between a new cable vault located near the floating bridge east abutment and the existing cable vault located approximately at STA MR 227+70.
- Two conduits on the south side of SR 520 between a new cable vault located near the floating bridge east abutment and the existing cable vault located approximately at STA MR 227+70.

Innerduct conduit shall be used only for fiber optic communication cables.

The mainline and distribution conduits on the south side of the freeway east of the floating bridge shall be installed using a shared trench, and the same pull boxes and cable vaults.

The Design-Builder shall furnish and install a three-inch diameter conduit and a spare two-inch conduit from the cable vault adjacent to the fiber optic terminal cabinet to the Bridge Maintenance Facility building's communications room.

All conduits shall be a minimum of two inches in diameter, except where a smaller diameter is required at the entry of pole foundations such as ramp meter poles, "ramp meter ahead" flashing signs and poles with slip bases. Existing conduits shall be replaced with new conduits if they do not meet this requirement.

A minimum of one spare three-inch conduit shall be provided between each cabinet or field device to the nearest pull box or cable vault. The ITS conduits, junction boxes, NEMA enclosures, pull boxes and cable vaults shall be separated from illumination conduits and traffic signal conduits; although a shared trench, shared power service and shared cabinet pads may be used. Communication cables shall be kept separate from all other wiring.

The Design-Builder shall comply with Section 2.17 conduit requirements on bridges.

#### 2.18.4.9.1 NEMA Enclosures

All NEMA enclosures installed on bridge structures shall be NEMA 4X, 14-gauge, type 316 stainless steel enclosures with hinged, 14-gauge, stainless steel doors supported by a continuous stainless steel hinge with removable pin. NEMA enclosures shall be of sufficient size to provide ample room for the installation of conduit terminations, cable splices and cable coiling.

Surface-mounted NEMA enclosures shall be provided with external mounting lugs. No enclosure shall be drilled for more conduits or cables than actually enter it. No conduits shall enter the top of an enclosure. Exterior boxes shall be provided with half-inch combination drain and breather fittings. Fittings shall not affect the NEMA-4X enclosure rating of the enclosure.

The interior of all boxes shall be supplied with insulated supports from which bundled cables may be supported.

NEMA enclosures shall be used at pull points, splice locations, and where there are major changes in mainline conduit direction. The enclosures shall be located to maximize accessibility. The maximum spacing allowed between two adjacent enclosures along the mainline conduit run is 1,000 feet.

The Design-Builder shall install a 36" x 36" x 18" NEMA enclosure adjacent to all sheds on the Pontoons. The Design-Builder shall only use the enclosure to install splice enclosures for splicing the distribution and the preterminated patch panel fiber cables.

The Design-Builder shall coil and rack a minimum of 50 feet of each fiber optic cable at all NEMA enclosures.

#### 2.18.4.9.2 Cable Vaults and Pull Boxes

Cable vaults and pull boxes located on the mainline conduit system shall contain only mainline and distribution communication cables. All pull boxes and cable vaults shall be installed with a two-inch drain pipe with the outlet screened and covered in rock. The lid of pull boxes and cable vaults shall not be higher than the base of the cabinet foundation when they are connected directly to a cabinet foundation. Pull boxes and cable vaults shall be placed one inch above grade in unpaved areas.

The Design-Builder shall install a new cable vault adjacent to all cabinet foundations. The Design-Builder shall only use the cable vaults to install splice enclosures for splicing the mainline, distribution and preterminated fiber cables.

Existing cable vaults may be used for fiber splices if they are on the same side of the road as the cabinet and within 75 feet of the cabinet, provided the existing cable vaults meet all the other provisions in these Technical Requirements and the Mandatory Standards. The Design-Builder shall clean existing vaults prior to installing cable in accordance with the Mandatory Standards.

Cable vaults and pull boxes shall not be placed in the traveled way. Pull boxes shall not be placed in paved areas unless there are no other alternatives. Cable vaults shall not be placed within paved areas under any circumstances.

Pull boxes placed in paved areas shall have load-bearing lids. However, load-bearing lids shall not be installed on pull boxes or cable vaults that are outside of paved areas.

Pull boxes shall be used for intermediate pull points where cable vaults are not needed. No splices shall be allowed in pull boxes.

Cable vaults shall be used at pull points, splice locations, freeway mainline conduit crossings and where there are major changes in mainline conduit direction. Cable vaults shall be located to maximize accessibility.

The Design-Builder shall coil and rack a minimum of 50 feet of each fiber optic cable at all cable vaults and pull boxes.

The maximum spacing allowed between two adjacent pull boxes and between a pull box and an adjacent cable vault in a mainline and distribution conduit run is 1,000 feet. The maximum spacing allowed for cable vaults is one mile along the mainline conduit system.

Cable vaults and pull boxes shall be furnished and installed in accordance with the Mandatory Standards.

### 2.18.4.10 Communication Cables and Interfaces

The Design-Builder shall provide a complete communication cable and interface system in accordance with the Mandatory Standards.

All fiber optic cables and patch cords shall be Single-Mode Fiber Optic (SMFO) cable including mainline, distribution, lateral and preterminated fiber optic cables. All fiber optic cables and patch cords must be tested prior to connection to any equipment.

Communication interfaces shall consist of fiber optic transceivers, servers, network connections, cables, connectors and switches to establish a fully-functional fiber optic communication system.

The Design-Builder shall furnish and install materials and equipment such that the ITS communication network operates continuously throughout the Project and provides a smooth transition to existing communication networks at each end of the Project.

The Design-Builder shall perform the following, at a minimum:

- Ensure the continuous operation of existing communications at all times during construction except the allowable working hours specified in this section;
- Design and construct a fully-functioning and operable communication network to serve all ITS components to be integrated on the communication network; and
- Propose solutions to achieve design objectives based on WSDOT functional, technical, operational and maintenance requirements.

The Design-Builder shall not use or substitute any part, or attach any piece of equipment, contrary to the manufacturer's recommendations and WSDOT standard practices.

The Design-Builder shall not use leased telephone lines, microwaves or other wireless communications for permanent communications systems. However, these types of communications may be used for the temporary ITS during construction if they meet the provisions in these Technical Requirements.

### 2.18.4.10.1 Communication Cut-Over Plan

The Design-Builder shall prepare and submit a Communication Cut-Over Plan for all connections of temporary or permanent communication systems to existing communication systems or equipment, including the toll system, prior to beginning the cut-over Work. The Communication Cut-Over Plan shall include the following:

- Number of planned cut-over events;
- Location of all existing devices and fiber cables to be cut-over and the devices and fiber cables to which they will be connected;
- Scheduled date and duration of each cut-over and testing;
- Tests to be performed;
- Equipment to be used for the testing;
- Description of Work to be performed during each cut-over;
- Contingency plan to restore electrical and communication services on short notice; and
- List of Project contacts (including phone numbers) for the Design-Builder and WSDOT staff.

The Communication Cut-Over Plan shall be submitted to WSDOT along with the Final ITS Submittal. The Design-Builder shall update the Plan when design changes are made that affect the testing type and location. The Communication Cut-Over Plan must be approved by WSDOT before the final cut-over.

Communication cut-over for ITS shall only be performed during the allowable working hours as specified in this section. The Design-Builder shall coordinate with WSDOT for allowable working hours for the communication cut-over for the toll system.

#### 2.18.4.10.1.1 Existing Communication System for the Existing Floating Bridge

The approximate location of the existing communication cable, interface system and ITS equipment on the existing SR 520 floating bridge is shown in the Conceptual Plans (Appendix M1) and is described below:

- 1-24 SMFO cable for mainline (backbone) communications;
- 1-25 TWP for data distribution;
- Bridge alarm system which includes a bridge alarm cabinet, bridge alarm control equipment, and UPS cabinet located on the mid-span of the existing floating bridge; and
- Bridge security system which includes CCTV cameras, motion sensors, a Wavetronix sensor, and associated cabinets and control equipment.

The Design-Builder shall maintain and protect the SMFO and TWP cables on the existing floating bridge at all times, except during the allowable working hours identified in these Technical Requirements. The communication systems to the bridge alarm system and bridge security system shall remain fully functional until the pontoons are dismantled and ready to be transported away in accordance with Section 2.26 (Removal of Existing Floating Bridge). The existing communication system on the existing floating bridge shall be removed.

#### 2.18.4.10.1.2 Existing Communication Connections to the Toll System

The existing toll system and equipment is being installed by WSDOT at the following locations:

- The East Transition Span truss structure of the existing floating bridge (overhead equipment);
- East of the existing floating bridge (cabinets); and
- Toll signing throughout the SR 520 corridor.

The Design-Builder shall maintain and protect the communication connections to the existing roadside toll cabinet, as needed, to provide continuous operation during construction outside the allowable working hours identified in these Technical Requirements.

### 2.18.4.10.2 Fiber Optic Cables for ITS

The Design-Builder shall furnish, install and test new fiber optic cables for interconnecting all existing ITS devices to remain and all new ITS devices onto the fiber communication network. The Design-Builder shall provide a temporary fiber optic cable system as necessary to ensure continuous and complete operation of the ITS throughout construction.

The Design-Builder shall furnish, install, test and maintain the SMFO mainline and distribution cables. The Design-Builder shall install all fiber communication cables within the conduit innerducts, with a maximum of one cable per each innerduct.

Direct-buried or exposed cables will not be permitted. The mainline and distribution cables shall be installed in the following conduits:

- One new 96-strand SMFO mainline cable and one new 48-strand SMFO distribution cable in existing conduit between the existing cable vault on Foster Island and the east end of the WCB. The first 24 strands of the new 96-strand mainline cable shall be spliced to the existing 24-strand mainline cable in the Foster Island cable vault. The new 48-strand distribution cable shall be spliced to the existing 48-strand distribution cable in the Foster Island cable vault.
- One new 96-strand SMFO mainline cable and one new 48-strand SMFO distribution cable in the two new conduits between the easternmost NEMA enclosure on the WCB to the westernmost shed on the floating bridge Pontoons. All distribution cable fibers in both the eastbound and westbound directions (a total of three distribution cables) shall be spliced to three 48-port preterminated patch panel stubs outside the westernmost shed in a NEMA enclosure. Every strand of each distribution cable shall be through-spliced to each of the preterminated patch panel stubs.
- One new 96-strand SMFO mainline cable and two new 48-strand SMFO distribution cables in the two new conduits between the westernmost shed on the floating bridge Pontoons and the new fiber terminal cabinet located at approximately STA MR 224+00. The distribution cables shall be installed in different conduits.
- One 96-strand SMFO mainline cable and one 48-strand SMFO distribution cable in the two conduits on the south side of SR 520 between the fiber terminal cabinet and the existing cable vault installed by the Eastside Design-Builder, near 84th Avenue NE. The new mainline cable shall be spliced to the mainline cable installed by the Eastside Design-Builder, and the new distribution cable shall be spliced to the distribution cable installed by the Eastside Design-Builder, at the existing cable vault.
- One 48-strand SMFO distribution cable in the conduit on the north side of SR 520 between the fiber terminal cabinet and the existing cable vault installed by the Eastside Design-Builder, near 84th Avenue NE. The new distribution cable shall be spliced to the distribution cable installed by the Eastside Design-Builder at the existing cable vault.

The Design-Builder shall calculate the fiber loss for every communication path of mainline and distribution cables, splices, patch cords, patch panels, and all connectors based on the signal budget available for the communication equipment provided by the Design-Builder, and shall regenerate the fiber signals, if necessary, to provide a fully functioning communication network.

The Design-Builder shall design, install and configure the fiber optic communication network in accordance with the following requirements:

1) Roadway segment between the new floating bridge east abutment and the eastern terminus of the Project

    - All ITS devices on the north side of SR 520 mainline roadway shall be interconnected by the distribution cable on north side of SR 520 mainline roadway. The northern distribution cable shall not cross the SR 520 mainline roadway at any locations;

- All ITS devices on the south side of SR 520 mainline roadway shall be interconnected by the distribution cable on south side of SR 520 mainline roadway. The southern distribution cable shall only cross the SR 520 mainline roadway where the fiber terminal cabinet is located near the new floating bridge east abutment;
- To the east, both of the northern and southern distribution cables shall be spliced to its respective distribution cable installed by the Eastside project, east of the Project;
- To the west, both of the northern and southern distribution cables shall be installed and terminated in the fiber terminal cabinet using the perterminated patch panel stubs in accordance with this section;
- The Eastside project will install a self-healing ring network for data communications and two communication paths (one primary and one secondary for redundant purpose) for CCTV video communications and camera controls, east of the Project. The Design-Builder shall expand the distribution network using the same ITS communication network architecture.
- All ITS devices shall communicate with the TMC through the Northup communication hub. Both of the northern and southern distribution cables shall be configured to provide a self-healing ring network for data communications and two communication paths (one primary and one secondary for redundant purpose) for CCTV video communications and camera controls. The two communication paths for CCTV video communications and camera controls shall be routed separately using the northern and southern distribution cables. Patch cords in the fiber termination cabinet shall be used to establish such network configuration; and
- The mainline cable shall be installed on the south side of SR 520 and spliced to the mainline cable installed by the Eastside project, east of the Project. To the west, the mainline cable shall not be connected to the fiber terminal cabinet. The mainline fiber shall continue on the new floating bridge as required by this section.

2) New floating bridge

- All ITS devices other than the CCTV cameras on the new floating bridge shall be interconnected using one distribution cable in a multi-drop circuit;
- The other distribution cable shall not be connected to any ITS devices on the new floating bridge, and shall be routed between the westernmost shed on the pontoon deck and the fiber termination cabinet located near the new floating bridge east abutment;
- To the east, both distribution cables shall be installed and terminated in the fiber terminal cabinet using the preterminated patch panel stubs in accordance with this section;
- To the west, both distribution cables shall be installed and terminated in the westernmost shed using the preterminated patch panel stubs in accordance with this section;

- The distribution cable on the existing west approach bridge and WCB, that is spliced to the existing distribution cable at Foster Island, shall connect to the same shed (the westernmost shed on the pontoon deck) where the other two distribution cables are terminated;
- The communication network must be able to provide a fail-over mechanism between the two communications hubs. At a minimum, the two distribution cables shall be able to be configured to the following network configurations for data and video communications by using patch cords in the westernmost shed on the pontoon deck and the fiber terminal cabinet:
    - A self-healing ring network for data communications that expands the self-healing ring network from the Eastside corridor onto the floating bridge. In this configuration, all ITS data devices on the floating bridge shall communicate with the Northup communication hub. The four distribution cables in the fiber terminal cabinet shall provide through connections between the Eastside corridor and the floating bridge distribution cables, i.e., one distribution cable from the east shall connect to one of the distribution cable from the new floating bridge, and the other distribution cable from the east shall connect to the other distribution cable from the new floating bridge;
    - A multi-drop circuit for data communications that connects all ITS data devices on the floating bridge to the Roanoke communication hub by using one distribution cable only. The two distribution cables in the fiber termination cabinet from the floating bridge shall be terminated at the preterminated patch panels;
    - A ring structure for data communications to the Roanoke communication hub using both distribution cables (one distribution cable shall be used as a return path to the westernmost shed). The Design-Builder shall coordinate with WSDOT to determine if the ring structure or multi-drop circuit is required by WSDOT for connection to the existing ITS distribution network between Foster Island and the Roanoke communication hub;
    - A primary communication path for CCTV video communications and camera controls from the westernmost shed to the Northup communication hub using either distribution cable on the new floating bridge and the Eastside corridor; and
    - A secondary communication path for CCTV video communications and camera controls from the westernmost shed to the Roanoke communication hub using the distribution cable on the existing west approach bridge and WCB.
- For ITS data communications on the new floating bridge, the Design-Builder is highly encouraged to design and install an automated routing system in the westernmost shed and the fiber terminal cabinet to provide an automated fail-over mechanism between the two communication hubs. This automated fail-over system may expedite the testing process and provide quicker responses to communication failures. Should the Design-

Builder decide to propose such automated fail-over system, the Design-Builder shall submit the fail-over design as part of the preliminary ITS design submittals for WSDOT review and comment. WSDOT may consider to reduce duration for the Phase II system acceptance testing if the Design-Builder can demonstrate that the automated fail-over system is fully functional during the Phase II field acceptance testing; and

- The mainline cable shall continue on the new floating bridge to Foster Island, where the mainline cable is spliced to the existing mainline fiber. The mainline fiber shall not connect to any ITS devices or sheds on the new floating bridge.

The Design-Builder shall furnish and install all ancillary fiber optic cables to make the system functional.

When fiber optic mainline cable parallels overhead electrical transmission lines, the Design-Builder shall locate the fiber optic cable as far from the transmission lines as possible. The Design-Builder shall not place the fiber optic cable within a ditch or near culvert clean-out areas.

All fiber optic cable shall be designed and routed through NEMA enclosures, pull boxes and cable vaults. Fiber optic cable shall not be routed through junction boxes.

The Design-Builder shall remove all existing and temporary fiber optic cables and twisted wire pair cables that are no longer needed to operate the ITS. All removed cables shall not be reused.

Splices to the distribution cables or mainline cables shall be performed inside cable vaults or NEMA enclosures. The splices to the distribution cables shall be connected to new control cabinets or sheds where preterminated cables are terminated.

The Design-Builder shall coordinate with the WSDOT ITS Implementation Engineer to determine the final fiber assignment and splice requirements. No fiber splice shall take place until WSDOT approves the fiber assignment for each type of ITS device.

### 2.18.4.10.3 Intentionally Omitted

### 2.18.4.10.4 Fiber Optic Cables for SR 520 Toll System

Refer to Section 2.23 for fiber communication requirements for the toll system.

### 2.18.4.10.5 Fiber Optic Cables for Bridge Maintenance Facility Building

The Design-Builder shall furnish and install a new 24-port preterminated fiber optic patch panel in the Bridge Maintenance Facility Building's communications room described in Section 2.30 (Bridge maintenance Facility and Dock). In the nearest cable vault, the Design-Builder shall terminate the patch panel's preterminated fiber cable to the last 12 strands of the 96-strand SMFO mainline fiber optic cable in both directions.

### 2.18.4.10.6 Fiber Optic Connection Components

The Design-Builder shall provide all fiber optic connection components in accordance with the Mandatory Standards to ensure connections and splices within the communication system, including, but not limited to, the following:

- Indoor patch cords;

- LC/UPC fiber connectors;
- Preterminated patch panels; and
- Outdoor fiber splice enclosures.

At a minimum, the Design-Builder shall furnish the number of patch cords that match the total number of ports on all fiber optic patch panels at every ITS location. Unused patch cords shall be provided to WSDOT upon completion of the field acceptance testing.

The outdoor fiber splice enclosures shall allow re-entry of fiber optic cable and selective fiber splicing (i.e., a cable can loop in and out with only the selected fibers cut).

#### 2.18.4.10.6.1 Fiber Optic Preterminated Patch Panels

The Design-Builder shall provide new preterminated patch panels at the following locations:

- Control cabinets and sheds. If ITS cabinets are grouped on a shared foundation, the preterminated patch panel shall connect to only one of the cabinets. The WSDOT Northwest Region ITS Design Guide Supplement (Appendix I8) requirement provides the hierarchical order specifying in which cabinet the patch panel shall be installed.
- Roadside toll cabinet where preterminated fiber optic cable is terminated.
- Bridge Maintenance Facility building communications room.

A 12-port preterminated fiber optic patch panel shall be used at all locations where 12 or fewer fibers are being terminated.

A 24-port preterminated fiber optic patch panel shall be used at all locations where 13-24 fibers are being terminated.

A 48-port preterminated fiber optic patch panel shall be used at all locations where 25-48 fibers are being terminated.

A 72-port preterminated fiber optic patch panel shall be used at all locations where 49-72 fibers are being terminated.

A 96-port preterminated fiber optic patch panel shall be used at all locations where 73-96 fibers are being terminated.

The Design-Builder shall provide all matching fiber distribution components including, but not limited to, splice trays, patch panels and patch cords.

### 2.18.4.11 Video and Data Distribution and Transmission System

The Design-Builder shall provide a video and data distribution and transmission system in accordance with the Mandatory Standards.

The Design-Builder shall furnish and install all fiber optic distribution and transmission system equipment to provide a fully-functioning ITS, including, but not limited to:

- Fiber optic communications between each communication device and the communication hubs;
- Fiber optic communications between the communication hubs and the TMC in Shoreline, Washington; and

- New communications equipment to provide a fully-functioning ITS.

The Design-Builder shall furnish and install separate RuggedCom RS900 units for devices on different physical networks – such as ITS, toll, transit facility, and Bridge Maintenance Facility devices – in the ITS cabinet, sheds, the equipment room in the Bridge Maintenance Facility, both communication hubs, and the TMC.

#### 2.18.4.11.1 Video and Data Equipment in Control Cabinets and Sheds

The Design-Builder shall supply the equipment and all accessories, including all mounting hardware and cabling, to provide a fully-functional system. One RuggedCom RS900 Ethernet switch for every five devices connected, or part thereof, shall be installed in the same control cabinets and sheds that have preterminated fiber optic patch panel(s) installed. One Ethernet port on the RS900 unit shall be reserved for use by WSDOT maintenance laptop computers.

The Design-Builder shall install one RuggedCom RMC30 serial device server in the Data Station control cabinets and sheds. If the Data Station control cabinet or shed is standalone, a RuggedCom RS910 serial device server and Ethernet switch may be used in place of both the RS900 and RMC30 units.

The Design-Builder shall install one Optelecom 9225DT digital video transmitter per camera or one Optelecom 9442DT digital video transmitter for up to four cameras in the CCTV control cabinets and sheds.

The Design-Builder shall install one Digi International TS 1 H Terminal Server in the PTR cabinet.

All materials and equipment shall be connected to the SMFO system and shall be fully compatible with the existing ITS.

#### 2.18.4.11.2 Communication Hubs

The Design-Builder shall be responsible for furnishing and installing all communication equipment in the Northup and Roanoke communication hubs to support all equipment, including the existing equipment that is to remain. This shall include, but is not limited to: Ethernet switches; video/data transceivers; video multiplexors; combiners; and all cabling, mounting hardware and accessories required to complete a fully-functional system.

In addition, the Design-Builder shall supply the following at each of the two communication hubs:

- One RuggedCom RS 900 unit for each direction of communication into or out of the hub for each physical network for ITS, Toll, transit facility, and Bridge Maintenance Facility;
- Optelecom 9221DR digital video receivers equaling the number of installed Optelecom 9225DT digital video transmitters served by the hub;
- Optelecom 9442DR digital video receivers equaling the number of installed Optelecom 9442DT digital video transmitters served by the hub;
- One DeciMux transmitter per set of 10 cameras or part thereof served by the hub;
- One Vicon RS-422 combiner per set of 10 cameras or part thereof served by the hub;

- One Optelecom hub chassis per set of 10 video/data transceivers or part thereof;
- Two Optelecom hub chassis power supplies per set of 10 video/data transceivers or part thereof; and
- One Optelecom NIC card for each Optelecom chassis provided.

#### 2.18.4.11.3 Traffic Management Center

The Design-Builder shall be responsible for providing all equipment necessary in the TMC to support the new field equipment, existing equipment, and communication hub equipment. This shall include, but not be limited to: Ethernet switches; video/data receivers; video multiplexors; data modems; and all cabling, mounting hardware and accessories required to complete a fully-functional system.

In addition, the Design-Builder shall supply and deliver to the WSDOT Engineer the following equipment for installation at the TMC:

- One DeciMux receiver for every new DeciMux transmitter installed at the communication hubs; and
- Serial-to-Ethernet protocol converters to support all field serial devices including, but not limited to, CCTV camera controllers and terminal servers.

### 2.18.4.12 Electrical Design

The Design-Builder shall design and construct the electrical systems for ITS in accordance to the requirements in Section 2.16.

### 2.18.4.13 Equipment Provided by WSDOT

The Design-Builder shall provide all equipment and materials required for the entire ITS.

### 2.18.4.14 Aesthetics

The Design-Builder shall design and construct all Work in accordance with the WSDOT SR 520 Eastside Urban Design Criteria (Appendix L1), Section 2.15 (Landscape and Aesthetics Design) and the requirements below.

All CCTV and signal poles shall be galvanized finish and shall not be painted or powder-coated. Sign structures shall be painted or powder-coated in the color specified in Section 2.15. Painted, powder-coated or anodized aluminum for cabinets is not allowed.

## 2.18.5 CONSTRUCTION REQUIREMENTS

The Design-Builder shall design the ITS as a whole before installation of any individual field components, including temporary and permanent ITS. The Design-Builder shall furnish and install all ITS in accordance with the Mandatory Standards.

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 ITS until receiving approval from WSDOT.

### 2.18.5.1 MATERIALS AND FABRICATION

The Design-Builder shall furnish all materials in accordance with Section 2.25 and the Mandatory Standards. The "Buy America" requirements apply to ITS materials and equipment.

The Design-Builder shall use stainless steel mounting hardware such as bolts, nuts, washers and external hinges on ITS cable vaults, pull boxes, cabinets, shelters, junction boxes and NEMA enclosures. The Design-Builder shall use only components designed for 10 or more years of industrial use.

All materials, 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.

If any equipment specified in these Technical Requirements 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 that meets the same performance and material specifications as the discontinued one.

The Design-Builder shall round and smooth sharp corners and edges on all ITS components it installs.

### 2.18.5.2 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 four hours of a request. The Design-Builder shall provide a list of vendors to WSDOT within 60 Calendar Days of execution of the Contract.

### 2.18.5.3 ELECTRICAL SERVICES

The Design-Builder shall perform the electrical services Work for ITS in accordance with the requirements in Section 2.16.

### 2.18.5.4 UTILITY LOCATES

The Design-Builder shall perform the utility location Work for ITS in accordance with the requirements in Section 2.16.

### 2.18.5.5 TRAFFIC DATA ACCUMULATION SYSTEM

The Design-Builder shall install induction loop detectors for permanent detection in accordance with the requirements specified in these Technical Requirements.

In areas where new pavement will be constructed on land, the Design-Builder shall install the loops in the pavement base in advance of the pavement surfacing. The Design-Builder shall coordinate installation of the detector loop with the base and paving operations.

When installing queue detection loops, the Design-Builder shall evaluate the site conditions and determine the locations of queue detection loops and advance queue detection loops. The Design-Builder shall coordinate with WSDOT to determine the

distance when the distance is specified as "varies" in the WSDOT Northwest Region ITS Design Guide (Appendix I9).

All loop lead-in wires shall be labeled with the loop name in accordance with the WSDOT Standard Specifications (Appendix D18).

### 2.18.5.6 Closed Circuit Television (CCTV) Traffic Surveillance System

The Design-Builder shall furnish and install all CCTV cameras, controller cabinets, cabling and other accessories required to make the CCTV traffic surveillance system fully functioning and operable, in accordance with these Technical Requirements. The Design-Builder shall notify WSDOT when the installation of the CCTV hardware is complete.

### 2.18.5.7 Active Traffic Management (ATM) System

The Design-Builder shall furnish and install LCS, SDMS and VMS; all new sign structures and foundations; associated data stations; controller cabinets; cabling; and all other accessories required to make the ATM fully functioning and operable in accordance with these Technical Requirements. The Design-Builder shall adjust existing LCS placement horizontally on existing ATM sign structures to accommodate the new roadway geometry and lane markings as needed.

The new ATM system shall be fully compatible with the existing ATM system at the communication hubs and the TMC.

The Design-Builder shall notify WSDOT when installation of the ATM hardware is complete.

The Design-Builder shall supply all equipment and personnel needed to load, transport and unload the ATM hardware. The Design-Builder shall provide electrical power to each ATM location within 10 Calendar Days of delivery of the ATM hardware, otherwise it shall house the ATM hardware in a controlled atmosphere facility.

The Design-Builder shall provide sign control software and documentation in accordance with the WSDOT Northwest Region Special Provisions for DMS (Appendix B11). The Design-Builder shall furnish five printed copies of the ATM sign control software user manuals for each type of ATM sign (LCS, SDMS and VMS) to the WSDOT Engineer. In addition, three sets of the software, installation program, instructions and user manual for each type of ATM sign shall be furnished on CD-ROM to the WSDOT Engineer.

### 2.18.5.8 Conduit System

#### 2.18.5.8.1 Electrical Conduits

Refer to Section 2.16 and Section 2.17 for requirements for electrical conduits.

#### 2.18.5.8.2 Communication Conduits

The Design-Builder shall not direct-bury fiber optic cable. The Design-Builder shall install fiber optic cable in conduit for the entire length of the Project in accordance with this section.

The Design-Builder shall install warning tape and a trace wire in conduit trenching in accordance with the Mandatory Standards.

All innerducts shall be sealed with an approved mechanical plug. Innerducts containing cables shall utilize split mechanical plugs. Duct seal is not allowed.

The type and minimum depth requirements for conduits shall be in accordance with the WSDOT Northwest Region Special Provisions for ITS (Appendix B10) and the WSDOT Northwest Region ITS Details (Appendix I3).

Where the PVC schedule 80 conduit is trenched in a paved area (including shoulder or freeway mainline conduit crossing), the Design-Builder shall place the conduit a minimum of two feet below the bottom of the pavement wherever possible, and shall ensure it meets the minimum clearance requirements for adjacent underground facilities in accordance with the Mandatory Standards. Where it is not possible to place the conduit two feet below the bottom of the pavement, the PVC schedule 80 conduit shall be placed a minimum of two feet under the top of the pavement surface, and shall be encased in Class 3,000 concrete, followed by orange-tinted controlled density fill (CDF). The CDF shall be placed level to, and three inches below, the surface of the pavement, followed by three inches of paving material. The PVC schedule 80 conduit shall include a warning tape and trace wire.

The Design-Builder shall comply with Section 2.17 for conduits on the floating bridge. The Design-Builder shall not install any communication conduit to the top deck of the Pontoons.

#### 2.18.5.8.3 Existing Conduit Systems

All existing conduits, junction boxes, NEMA enclosures, pull boxes and cable vaults used for communication, loop lead-in and control cables within the Project limits shall be removed or abandoned with the following exceptions:

- Any part of the conduit system installed as part of the SR 520 Eastside Transit and HOV Project that can be reused and meets all of the Technical Requirements of this section; and
- Existing conduit system on the WCB and on the existing west approach bridge that connects to Foster Island.

The Design-Builder shall not relocate or use salvaged conduits.

When installing fiber optic cables in existing conduits through existing NEMA enclosures, pull boxes or cable vaults, the Design-Builder shall ensure there is a smooth transition between exit and entrance elevations in the cable route, and that the horizontal angle is not so sharp as to cause damage to the cable when it is pulled through the existing conduit. If the Design-Builder encounters sharp bends, it shall install new conduit to provide a smooth transition in accordance with the Mandatory Standards and this section.

The Design-Builder shall clean the existing conduit of any debris that could impede pulling fiber optic or copper cable through it, or that could damage the cable if the debris remains.

#### 2.18.5.8.4 Junction Boxes

Refer to Section 2.16 for additional requirements for junction boxes.

#### 2.18.5.8.5 NEMA Enclosures

Refer to Section 2.17 for additional requirements for NEMA Enclosures.

#### 2.18.5.8.6 Cable Vault and Pull Boxes

The Design-Builder shall include a drainage system, grounding provisions, an enclosure hanger bracket assembly and a ground rod marker in the construction of all pull boxes and cable vaults in accordance with the Mandatory Standards.

Fiber optic cable vaults shall protect the outdoor fiber splice enclosure and shall meet the following requirements:

- The vault and lid material shall meet UL requirements for Tier 10 heavy-duty splice vaults;
- The vault lid shall have a non-slip surface;
- For every three vaults the Design-Builder furnishes and installs, it shall provide one ferrous device to lift the cover from the body; and
- Where applicable, the fiber optic cables/conduits shall sweep up near the vault to meet the conduit entrance to the vault.

The Design-Builder shall drain and clean all existing pull boxes and cable vaults that have new cable installed or existing cable removed. All existing cable vaults and pull boxes shall be retrofitted with a drain pipe in accordance with the WSDOT Northwest Region ITS Details (Appendix I3).

### 2.18.5.9 COMMUNICATION CABLES AND INTERFACES

The Design-Builder shall furnish and install materials and equipment such that the ITS communications network is continuous throughout the Project and provides a smooth transition to the existing communication network at each end. Identical sub-components shall be defined as components of the same manufacturer, model and installation configuration. The ITS communications sub-components shall include the following:

- Fiber optic cable;
- Communication equipment; and
- Cable vaults, NEMA enclosures, splice enclosures and fiber optic connection components.

All locations containing identical sub-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 configurations, and panel and equipment mounting and locations.

#### 2.18.5.9.1 Fiber Optic Cable

The Design-Builder shall replace each fiber optic cable that is nicked, severed or otherwise rendered unusable due to Work performed as part of the Project. Spliced fiber optic cable shall be replaced with new, unspliced cable. If fiber optic cable damage is discovered, the Design-Builder shall notify the WSDOT Electrical Inspector immediately.

When exposing an existing fiber optic cable, the Design-Builder shall exercise caution and excavate manually using handheld tools. The Design-Builder shall report all nicks or abrasions to WSDOT prior to replacement. The Design-Builder shall not exceed the manufacturer's specified bending radius while handling and re-routing the cable.

The Design-Builder shall use stock, WSDOT-approved splice kits to repair any WSDOT fiber optic cable damaged by construction activities. If a cable is severed or otherwise rendered unusable because of Work preformed as part of the Project, the Design-Builder shall perform the following activities:

- Use fusion splices to make the emergency repair to fiber optic cable.
- Install the splices in existing splice vaults using all of the materials WSDOT requires for splicing fiber optic cable. The fusion splices shall meet the WSDOT requirements for splices made by the Design-Builder, and the Design-Builder shall use fiber optic cable approved by WSDOT for installation.
- Install new cable between existing terminations or splices.
- If nicks or abrasions occur, the Design-Builder shall replace the entire fiber optic cable run with new fiber optic cable approved by WSDOT.

#### 2.18.5.9.1.1 Fiber Optic Cable Installation

The Design-Builder shall install fiber optic cable in accordance with the WSDOT Northwest Region Special Provisions for ITS (Appendix B10) and manufacturer's specifications.

The Design-Builder shall distribute the pulling force by securing the cable to the main pulling device. Damage to the cable from any source that exceeds the manufacturer's recommended tensile strength limits or cable-bending radius is cause for the cable to be rejected. The Design-Builder shall remove the cable and replace the entire cable run with new fiber optic cable.

The Design-Builder shall use lubricants during cable-pulling operations to reduce tension, in accordance with the manufacturer's specifications. The lubricants shall be compatible with cable insulation materials and shall not deteriorate the cable insulation.

#### 2.18.5.9.1.2 Fiber Optic Cable Splicing

The Design-Builder shall fusion-splice the fiber optic cable only. Cable splices will be allowed only 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 or NEMA enclosures; on bridge structures; and using splice enclosures approved by WSDOT.

The Design-Builder shall adhere to the fiber optic cable manufacturer's methods, specifications, materials and techniques for splicing.

The Design-Builder's splicing equipment shall be in good working order, properly calibrated, and shall meet all industry standards and safety regulations. The cable preparation, enclosure installation and splicing shall be performed in accordance with industry standards.

To minimize the amount of mechanical stress and the number of splicing locations, cables shall be trained into final position using minimum bending radii of not less than 20 times the diameter of the cable, or as specified in the manufacturer's requirements, whichever is greater.

Cleanliness and freedom from contamination shall be strictly enforced 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, remove it from the job site, and dispose of it in accordance with State and federal laws.

#### 2.18.5.9.1.3 Patch Panel Labels

Each port on the preterminated patch panel shall be labeled with the names of the distribution cable strands that are connected to it. Label maker labels inside the panel will be sufficient. For example, a 24-port preterminated patch panel with the first 12-strand of the distribution fiber optic cable in and out of the cabinet shall be labeled as "ports 1-12: distribution fibers 1-12 east" and "ports 13-24: distribution fibers 1-12 west".

#### 2.18.5.9.1.4 Fiber Optic Patch Cords

The Design-Builder shall provide and install fiber optic patch cords between the fiber optic patch panel and the communication equipment specified in these Technical Requirements where single-mode fiber optic cable is used as the transmission medium. Patch cord length shall not exceed one foot beyond the length required to make a connection. Patch cords between a patch panel and a device shall be contained inside appropriately-sized yellow split loom. Patch cords shall not be installed between cabinets.

#### 2.18.5.9.1.5 Fiber Optic Cable Identification Requirements

The Design-Builder shall identify all fiber optic cables at all terminals, and wherever the cable enters or leaves a cable vault or splice enclosure. The Design-Builder shall use permanent black on yellow plastic labels with the words "CAUTION: Fiber Optic Cable" following a description printed in permanent marker including fiber type (mainline SMFO or distribution SMFO) and fiber count. If the fiber is not located in the mainline conduit, the description shall also include the direction (for example, east or west).

The Design-Builder shall develop a fiber optic identification scheme using letter and number cable designations and submit it to WSDOT for acceptance. The identification scheme shall indicate fiber strand, location, circuit, device, cable number, terminal branch and position.

The surface of the outer jackets shall be printed with the manufacturer's identification, date of manufacture and part number.

#### 2.18.5.9.1.6 Outdoor Fiber Splice Enclosure

The Design-Builder shall install sufficient desiccant (packaged silica) in each enclosure to reduce possible damage from moisture, in accordance with the manufacturer's specifications.

#### 2.18.5.9.1.7 Splice Protection

The Design-Builder shall mount all splices on a splice tray. Polyethylene tubes shall protect the fibers, and ethylene vinyl acetate sleeves with stainless steel rods shall protect the splices. Vinyl markers shall identify each fiber in the enclosure.

### 2.18.5.10 Video and Data Distribution and Transmission System

The Design-Builder shall exercise caution when working near existing electric, electronic, ATM sign control, video and telephone cables. When exposing existing cables, the Design-Builder shall excavate manually using only handheld tools. If damaged by construction activities, the existing cables shall be repaired or replaced with new cables in accordance with the Mandatory Standards, manufacturer's specifications and the provisions in these Technical Requirements.

The Design-Builder shall stock splice kits meeting the WSDOT 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 provide a means to protect the splices above ground until the permanent splices are installed.

The Design-Builder shall use rubber splicing tape to seal all nicks or abrasions caused by hand-digging to expose a cable. The Design-Builder shall seal nicks that penetrate 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 WSDOT requirements for cable jacket repair. The Design-Builder may also use an equivalent sealant approved by WSDOT.

If a damaged cable is replaced, the Design-Builder shall install new cable between existing terminations or splices.

Industry-accepted lubricants used during cable pulling operations shall be compatible with cable insulation materials and shall not degrade the cable insulation.

All cable connections shall conform to the equipment manufacturer's specifications, the Mandatory Standards and the provisions in these Technical Requirements. Conductors shall consist of all-copper construction.

The Design-Builder shall provide a mounting bracket where RuggedCom equipment or an Optelecom transmitter is being installed, in accordance with the WSDOT Northwest Region ITS details (Appendix I3).

#### 2.18.5.10.1 Electric and Electronic Cable

The Design-Builder shall not splice electric or electronic cables. The Design-Builder shall use one-piece cables between termination points for power, communications control, video and Ethernet cables.

When using crimp-on connectors, the Design-Builder shall install the electrical cable insulation deep enough into the lug so the insulation acts as a strain relief.

The Design-Builder shall maintain the electrical continuity of the cable shields, and shall comply with the USDA RUS Splicing Standard PC-2 for shield bonding. The Design-Builder shall use bonding connectors that comply with RUS Standard PE-33 (Cable Shield Connectors).

#### 2.18.5.10.2 ATM Sign Control Cable

The Design-Builder shall furnish and install control cables, other necessary cables, and accessories in accordance with the manufacturer's specifications in order to make the ATM signs fully operational.

The control cable shall be installed between the ATM ground-mounted control cabinet and the sign housing, and terminated in accordance with the manufacturer's specifications in order to create a fully-functioning system.

#### 2.18.5.10.3 Video and Control Cables for CCTV Camera

The Design-Builder shall furnish and install CCTV video and control cables, all other necessary cables, and accessories in accordance with the manufacturer's specifications in order to make the CCTV cameras fully operational.

### 2.18.5.11 BONDING AND GROUNDING

The Design-Builder shall furnish and install a grounding system and protection devices that are suitable for the specific installation and equipment installed for this Project, in accordance with the Mandatory Standards and manufacturer's specifications.

### 2.18.5.12 CONTROL CABINETS

The Design-Builder shall furnish and install the control cabinets and foundations, and make them fully functional in accordance with the Mandatory Standards.

The Design-Builder shall ensure that the existing control cabinets are operational at all times, except during the allowable working hours identified in these Technical Requirements.

The Design-Builder shall use industry-standard fiber management practices and techniques in all control cabinets.

The Design-Builder shall supply all equipment needed to load, transport and unload the cabinets.

The Design-Builder shall perform all control cabinet installation, which includes mounting the cabinet on its foundation, terminating the power cables, grounding the cabinet and terminating the communications cables.

A three-foot level work zone shall be provided around all sides of the cabinets for ease of maintenance.

All existing cabinet foundations shall be removed except where this section specifies the existing ITS cabinets are required to remain. The existing cabinet foundations at these existing cabinet locations can only be reused if the existing foundation meets all requirements in the Mandatory Standards and this section, including conduit fill and spare conduits. The existing cabinet foundations shall be removed and replaced with new cabinet foundations if the existing foundations do not meet the requirements.

### 2.18.5.13 MAINTENANCE SHEDS AND CONTROL SHEDS

The Design-Builder shall construct the Type 1, 2, and 3 sheds and foundations on the Pontoons in accordance with Section 2.12.

The Design-Builder shall use industry-standard fiber management practices and techniques in all sheds. The Design-Builder shall provide a minimum of 36 inches of clearance for maintenance access on the front and back sides of the server racks and a minimum of 36 inches of clearance on at least one of the rack's sides. The server racks shall be mounted plumb and level and shall be bolted to the top of the Pontoon deck in accordance to the drilling requirements in Section 2.12.

All Work on the ITS equipment in the sheds shall meet manufacturer's specifications, the Mandatory Standards, and the provisions in these Technical Requirements.

### 2.18.5.14 COMMUNICATION HUBS

All Work on the equipment in the communication hubs shall meet manufacturer's specifications, the Mandatory Standards, and the provisions in these Technical Requirements.

All Work shall be performed under the direct supervision of the WSDOT Engineer. Working hours within the hub shall conform to those specified in this section.

#### 2.18.5.15 TRAFFIC MANAGEMENT CENTER

All Work in the TMC shall meet manufacturer's specifications, the Mandatory Standards and the provisions in these Technical Requirements.

The Design-Builder shall furnish all the required equipment and provide it to the WSDOT Engineer for installation at the TMC. If requested by WSDOT, the Design-Builder shall perform testing at the TMC to ensure the ITS is fully operational end-to-end from the TMC to all field equipment. All Work shall be performed under the direct supervision of the WSDOT Engineer. Working hours within the TMC shall conform to those specified in this section.

### 2.18.6 SUBMITTALS

The Design-Builder shall provide all documents and information required for the Design Documentation Package in accordance with Sections 2.2 (Project Documentation), 2.25 and 2.28.

The Design-Builder shall design the ITS as a whole for the entire Project. The Design-Builder shall submit a Preliminary ITS Design Submittal for review and comment, and prepare a Final ITS Design Submittal prior to issuance of the Released For Construction Documents. The Preliminary and Final ITS Design Submittals shall be submitted for the whole Project.

The Design-Builder shall comply with Sections 2.2 and 2.28 for all submittals, test plans, reports, reviews and other administrative processes unless otherwise specified.

#### 2.18.6.1 PRELIMINARY ITS DESIGN SUBMITTAL

The Preliminary ITS Plans, Fiber Optic Splicing and Testing Plan, and other test plans described in these Technical Requirements shall be submitted to WSDOT for review and comment as part of the Preliminary Design Submittals described in Section 2.28.

The Preliminary ITS Plans shall include, but are not limited 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;
- Calculations showing that each ATM sign's cone of vision is in accordance with the requirements in this section;
- Proposed channelization;
- Proposed fiber optic cable/conduit location plan;
- Cabinet locations; and
- All identified non-standard design items, if any.

### 2.18.6.2 FINAL ITS DESIGN SUBMITTAL

The Design-Builder shall provide a Final ITS Design Submittal as part of the Final Design Submittals described in Section 2.28. The Final ITS Design Submittal shall address the comments received from the Preliminary ITS Design Submittal review and any issues raised during the ITS design progress meetings.

The Final ITS Design Submittal shall include all of the items in the Preliminary ITS Design Submittal, in addition to the following:

- All ITS details in accordance with the WSDOT Northwest Region ITS Details (Appendix I3);
- All ITS labels;
- Junction box, NEMA enclosure, pull box, and cable vault locations and details;
- Fiber communication schematics and diagrams, including a one-line fiber diagram and a network diagram;
- Fiber optic splice details;
- Loop termination schedule;
- Panel service details;
- Transformer/breaker schedule;
- Power service locations;
- Power distribution schematics and one-line diagrams;
- Cabinet foundation details;
- ITS equipment in the sheds details;
- Fiber termination cabinet details;
- 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 overcurrent protection devices;
- Conduit fill and junction box capacity calculations;
- Service load calculations;
- Voltage drop calculations;
- Fiber optic signal budget calculations;
- Wind load calculations for monotube sign structures/foundations; and
- ITS cabinet layout and wiring diagrams, including end-to-end connections between components.

The Design-Builder shall submit the following plans along with the Final ITS Design Submittal:

- Final Fiber Optic Splicing and Testing Plan;
- Maintenance and Operation Plan; and
- Communication Cut-Over Plan.

### 2.18.6.3 SHOP DRAWINGS

Shop drawings and product data shall include, but are not limited to, the following:

- ATM signs including LCS, SDMS and VMS furnished by the Design-Builder;
- ATM sign mounting brackets;
- ATM sign control cabinets;
- Monotube sign structures, including maintenance walkways and foundations;
- CCTV cameras;
- CCTV camera control cabinets;
- CCTV camera poles;
- CCTV camera mounting brackets;
- Data station controller and cabinets;
- Service cabinets;
- Electrical panels;
- Conduits and fittings;
- Junction boxes, NEMA enclosures, pull boxes and cable vaults;
- All fiber optic cables; and
- Any other ITS components furnished by the Design-Builder.

Refer to Section 2.28 for submittal and review requirements for shop drawings.

### 2.18.6.4 RELEASED FOR CONSTRUCTION DOCUMENTS

The Design-Builder shall include the following items with the Released For Construction Documents:

- All elements required for the Final ITS Design Submittal;
- All resolved comments from the Final ITS Design Submittal; and
- Additional design elements addressed.

Refer to Sections 2.2 and 2.28 for submittal and review requirements.

### 2.18.6.5 OTHER SUBMITTALS

The Design-Builder shall submit testing and software documentation, test samples and operating software (including firmware) to the WSDOT Engineer upon completion of each test as specified in these Technical Requirements.

The Design-Builder shall submit the following items upon Physical Completion of the Project:

- All final testing documentation including all test plans, procedures, documentation and test reports;
- Software and software documentation on CD-ROM;
- List of repair part vendors; and
- 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 cameras;
- LCS, SDMS and VMS;
- Data stations;
- Communication conduit systems;
- Communication cable and interface systems;
- Video and data distribution and transmission systems;
- Permanent traffic recorder stations;
- Loop detectors;
- Non-intrusive vehicle detectors;
- Control cabinets and sheds;
- All junction boxes, NEMA enclosures, pull boxes and cable vaults;
- Mainline fiber optic cable (every 50 feet); and
- Standalone electric service pads.

The Design-Builder shall also provide WSDOT with the x, y, and z GPS coordinates of existing components that 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 temporary and permanent signing for the Project in accordance with these Technical Requirements.

The Design-Builder shall design and construct all temporary and permanent signing in all required areas within the Project limits. The Design-Builder shall be responsible for any signing outside the Project limits that is impacted by the Project, including the West Connection Bridge (WCB). Signing includes, but is not limited to:: regulatory, warning, guide, High Occupancy Vehicle (HOV), motorist information, parking, street identification, construction and work zone signs, roadway markers and their supporting structures. The supporting structures include sign bridges, cantilever sign structures, sign posts and mounting brackets.

The Design-Builder shall design and construct the Active Traffic Mangement (ATM) signs, which are Lane Control Signs (LCS), Side-Mounted Dynamic Message Signs (SDMS), and Variable Message Signs (VMS) in accordance with Section 2.18 (Intelligent Transportation Systems).

The Design-Builder shall design and construct temporary, construction and work zone signing in accordance with Section 2.22 (Maintenance of Traffic).

The Design-Builder shall design and construct signing for shared pedestrian/bike trails in accordance with Section 2.15 (Landscape and Aesthetics Design).

### 2.19.1.1 COORDINATION WITH ADJOINING PROJECTS

The following projects will occur within the immediate vicinity of, and at the same time as, the Project, and will directly affect the signing on the Project:

- SR 520 Eastside Transit and HOV Project; and
- SR 520 Evergreen Point Floating Bridge Toll Signing Project.
- SR 520 West Connection Bridge and Shared Use Path

The conceptual plans for the SR 520 Eastside Transit and HOV Project included in Appendix M13 are subject to revision, and the construction plans for the SR 520 Evergreen Point Floating Bridge Toll Signing Project are included in Appendix T12. The Design-Builder shall coordinate with the WSDOT Engineer to obtain additional plans and design documents for the above projects, and determine the requirements for temporary and permanent signing for this Project.

The Design-Builder shall field-verify the signs constructed as part of these projects within the Project limits, and relocate or replace these signs in accordance with the Mandatory Standards. The Design-Builder shall provide safe, continuous and effective signing throughout the Project during construction, and it shall meet the permanent signing requirements in accordance with these Technical Requirements.

## 2.19.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- WSDOT Northwest Region Signing Current Practices (Appendix T15).
- WSDOT *Northwest Region HOV Design Guide* (Appendix D33).
- WSDOT Northwest Region Traffic Operations Redbook (Appendix T14).
- WSDOT Northwest Region Sign Details (Appendix T16).
- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT *Traffic Manual* (M51-02) (Appendix D19).
- *Manual on Uniform Traffic Control Devices (*MUTCD*) – Washington State Modifications* (M24-01) (Appendix D25).
- FHWA *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD), 2003 Edition with Revisions 1 and 2 Incorporated, December 2007.
- FHWA *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD), Chapter 2F, Toll Road Signs, 2009 Edition, December 2009.
- WSDOT *Sign Fabrication Manual* (M55-05) (Appendix D26).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D9).
- WSDOT *Roadside Manual* (M25-30) (Appendix D16).
- WSDOT *Bridge Design Manual* (M23-50) (BDM) (Appendix D1).
- 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 convert files to MicroStation DGN format without additional software.

The Design-Builder may use the latest version of GuidSIGN software to perform the signing design. If GuidSIGN is used, the Design-Builder shall adjust the configuration, spacing, margin and size of all signs generated by the software to ensure they are designed in accordance with these Technical Requirements and the Mandatory Standards. The GuidSIGN software is available from Transoft Solutions, Inc., Suite 250 - 13575 Commerce Parkway, Richmond, BC, Canada V6V 2L1, (888) 244-8387.

Sign specifications shall be prepared using Sign Specifications WinXP or Sign Specification Version 2 (for Windows 2007), which is a Microsoft Excel program (sheet tab *INS Page 1*) developed by the WSDOT Northwest Region Traffic Design Office. The program can be downloaded from the WSDOT Web site at

www.wsdot.wa.gov/northwest/trafficdesign

The Design-Builder shall coordinate with WSDOT to verify the correct version of the software to use.

### 2.19.3.2 DESIGN AND CONSTRUCTION PROGRESS MEETINGS

The Design-Builder shall prepare and conduct weekly Traffic Design Task Force meetings, in accordance with Section 2.16 (Illumination and Roadway Electrical Systems), to discuss signing design and construction signing issues.

### 2.19.3.3 REMOVAL, SALVAGE AND DELIVERY

#### 2.19.3.3.1 Removal, Salvage and Delivery of Existing Signs and Structures

All sign panels, truss style sign structures, posts and associated sign lighting fixtures and ballasts that are within the WSDOT limited access Right-of-Way, maintained by WSDOT, and are conflicting with or not applicable to the Project shall be removed and shall become the property of the Design-Builder.

All monotube sign structures shall be inspected by WSDOT and delivered to WSDOT upon request; otherwise, they will become the property of the Design-Builder. Upon WSDOT request, the Design-Builder shall provide all labor and equipment to transport, load and unload those monotube sign structures to WSDOT Northwest Region Bridge Maintenance. Monotube sign structures damaged during removal or delivery shall be repaired or replaced to WSDOT's satisfaction at no cost to WSDOT.

The Design-Builder shall notify local agencies a minimum of 7 Calendar Days in advance of removing any existing signs and sign structures maintained by the local agencies within the Project limits. If the local agencies request that the items be salvaged, the

Design-Builder shall make arrangements to deliver the items to the location the local agencies specify.

#### 2.19.3.4 WSDOT INSPECTION AND ACCEPTANCE

All signs will be inspected and accepted in accordance with the Mandatory Standards and Section 2.25 (Control of Materials).

All companies listed in the current WSDOT Qualified Products List (QPL) (Appendix D13) will be accepted in accordance with the QPL approval code. Companies that are not listed in the QPL will be accepted based on the Manufacturer's Certificate of Compliance for reflective sheeting and a mill test certificate for aluminum sign panels, in accordance with the WSDOT Standard Specifications (Appendix D18). The Manufacturer's Certificate of Compliance shall be a Contract-specific letter from the manufacturer stating the sign is NCHRP 350 Test Level 3-compliant.

### 2.19.4 DESIGN REQUIREMENTS

#### 2.19.4.1 GENERAL

The Design-Builder shall design all necessary temporary and permanent signing (including signs within the Project limits and outside the Project limits impacted by the Project) for the roadways and facilities within the WSDOT limited access Right-of-Way in accordance with the Mandatory Standards.

#### 2.19.4.2 TEMPORARY, CONSTRUCTION AND WORK ZONE SIGNING

Refer to Section 2.22 for design requirements for temporary, construction and work zone signing.

#### 2.19.4.3 PERMANENT SIGNING

The Design-Builder shall remove all existing static signs and associated sign lighting fixtures, sign structures, sign supports and mounting brackets within the Project limits that conflict with or are not applicable to the Project. The Design-Builder shall remove all signs and associated supports on the floating bridge in accordance with the Mandatory Standards.

For existing signs outside the Project limits, the Design-Builder shall coordinate with WSDOT to determine the ones rendered inaccurate, ineffective, confusing or unnecessary as a result of the Project and shall remove, replace and modify those accordingly. The Design-Builder shall be responsible for making such sign modifications or replacements. A minimum of 800 feet of sign spacing on freeway mainline roadways shall be used whenever possible between all primary and supplemental guide signs as well as ATM signs, MIS, general motorist service signs and natural, historic and cultural attraction signs. Where the overall sign density is too high for the 800-foot spacing to be maintained, the minimum spacing between these signs may be reduced to 500 feet.

The minimum sign spacing on freeway mainline roadways between regulatory and warning signs, and between these signs and guide signs, shall be 500 feet. The minimum sign spacing on ramps shall be 100 feet between signs.

The minimum vertical clearance between the bottom of overhead signs (including all LCS, VMS and static signs) and the roadway wearing surface shall be 20 feet, and the

maximum clearance shall be 21 feet. All LCS shall be center-mounted on the monotube horizontal members.

The SDMS shall be mounted outside the roadway, behind traffic barrier, with a minimum vertical clearance of 14 feet measured between the bottom of the SDMS and the roadway wearing surface. Where it is not feasible to mount the SDMS outside the roadway, the SDMS may encroach over the shoulder but not the travel way. If any part of the SDMS is over the shoulder, the SDMS minimum vertical clearance shall be 16.5 feet and the LCS mounting height shall not exceed 23 feet. Both SDMS shall be mounted at the same height at each ATM location.

SDMS mounted on sign bridge structures shall be mounted such that the top of the sign is 2.5 ft below the top of the sign structure cross member. The SDMS shall not be mounted more than 30 feet away from the travel way. If SDMS is pole mounted, the pole and foundation shall be placed behind the traffic barrier. The SDMS shall not be mounted on a cantilever sign structure.

Static signs mounted on a traffic barrier adjacent to the shoulder shall be mounted a minimum of 10 feet above the roadway wearing surface. The vertical and lateral clearance requirements for all other signs are included in the WSDOT *Design Manual* (Appendix D3).

All new guide signs shall be mounted overhead on WSDOT standard monotube sign bridges or cantilever sign structures. All ground- and barrier-mounted signs shall be installed on new steel sign posts. Ground-mounted signs shall be installed on new foundations.

The Design-Builder shall not mount signs to the north rail of the regional shared use path on the floating bridge.

The Design-Builder shall not place any overhead sign structures within 200 feet of lid portals or underpass structures on the SR 520 mainline roadways.

The Design-Builder shall not mount signs for SR 520 mainline traffic on lid portals or underpass structures except for street identification signs and emergency traffic signals and associated signs for roadways crossing SR 520.

The Design-Builder shall include the locations of all signs and sign structures in the Preliminary Signing Design Submittal, which shall be submitted to WSDOT for review and comment.

#### 2.19.4.3.1 Toll Signing

All toll signs shall be designed and constructed in accordance with Chapter 2F of the MUTCD 2009 Edition and the Mandatory Standards. The new toll signs shall be consistent with those as shown on the engineering plans for the SR 520 Evergreen Point Floating Bridge Toll Signing Project (Appendix T12). The Design-Builder shall not reuse existing toll signs or retrofit the existing guide signs for toll signing purposes.

The Design-Builder shall prepare and submit a Conceptual Toll Signing Plan within 90 Calendar Days of NTP 1 to WSDOT for review and comment as part of the Toll Transition Plan in accordance with Section 2.23 (All Electronic Tolling Infrastructure).

#### 2.19.4.3.2 Permanent Signing within Local Jurisdictions

The Design-Builder shall replace and/or modify all signs within local jurisdictions that are impacted by this Project. It is the Design-Builder's responsibility to coordinate with

the local agencies regarding permanent signing requirements within the local agencies' Right-of-Way in accordance with the sign maintenance responsibility in Table 2-5 of the WSDOT *Traffic Manual* (Appendix D19).

#### 2.19.4.3.3 Sign Structures and Foundations

The Design-Builder shall design and construct the sign structures and foundations in accordance with the Mandatory Standards, Section 2.6 (Geotechnical Design) and Section 2.13 (Bridges and Structures). Wherever applicable, the sign structure foundations shall be placed behind a concrete barrier, or constructed integral with the concrete barrier or retaining/noise wall in a manner that the foundations do not encroach into the roadway shoulder or the RSUP. Sign structure posts and foundations shall not be placed behind retaining or noise walls.

Sign structure support locations on the floating bridge shall be constructed integral with the Pontoon or the elevated structure such that the foundations do not encroach into the roadway shoulder or the RSUP.

The Design-Builder shall design the sign structure foundations and barrier systems to minimize shoulder width reduction. Any shoulder width deviation shall require pre-approval from WSDOT. Refer to Section 2.11 (Roadway Design) for additional requirements for concrete barrier design.

#### 2.19.4.3.4 Design Documentation

The Design-Builder shall prepare Preliminary and Final Permanent Signing Plans and submit them to WSDOT for review and comment prior to furnishing and installing the signs.

The Permanent Signing Plan shall include all signs, sign structures, sign posts and mounting brackets required in these Technical Requirements, as well as the locations of the ATM (including LCS, SDMS and VMS) and the Electronic Tolling signs.

The Permanent Signing Plans shall be prepared in accordance with the WSDOT Northwest Region Signing Current Practices (Appendix T15) and the Mandatory Standards.

The Design-Builder shall prepare and submit a Signing Design Checklist together with the Preliminary and Final Signing Design Submittals in accordance with this section. A copy of the Signing Design Checklist can be found in the WSDOT Northwest Region Sign Design *Current Practices Manual* (Appendix T13).

### 2.19.4.4 EQUIPMENT PROVIDED BY WSDOT

The Design-Builder shall furnish all equipment and materials.

### 2.19.4.5 AESTHETICS

The Design-Builder shall design and construct all Work in compliance with Section 2.15.

All monotube sign structures shall be galvanized and painted or powder-coated in the color specified in Section 2.15. Steel sign posts shall be galvanized finish and shall not be painted or powder-coated.

#### 2.19.4.6 OVERHEAD SIGN ILLUMINATION

Overhead sign illumination shall be provided in accordance with the WSDOT *Design Manual* (Appendix D3). When required, sign luminaires shall be 85-watt induction type and shall be designed in accordance with the WSDOT Northwest Region Illumination and Signal Details (Appendix I2).

## 2.19.5 CONSTRUCTION REQUIREMENTS

### 2.19.5.1 GENERAL

All existing, temporary, construction, work zone and permanent signs installed as part of this Project that are inappropriate for the traffic configuration at any given time shall be removed or completely covered in accordance with Section 8-21.3(3) of the WSDOT Standard Specifications (Appendix D18).

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.

### 2.19.5.2 TEMPORARY, CONSTRUCTION AND WORK ZONE SIGNING

Refer to Section 2.22 for construction requirements for temporary, construction and work zone signing.

### 2.19.5.3 MATERIALS AND FABRICATION

The Design-Builder shall furnish all materials in accordance with Section 2.25 and the WSDOT Standard Specifications (Appendix D18).

The Design-Builder shall use stainless steel mounting hardware such as bolts, nuts, locknuts and washers for signs mounted on overhead sign structures. The Design-Builder shall use only components designed for 10 or more years of industrial use. The mounting hardware shall consist of the same material for each attachment, including the ground-mounted signs.

All materials including sign sheeting, sign panels, posts, structures, foundations and mounting hardware furnished by the Design-Builder shall be new (within 12 months of the date of manufacture) and of the latest design and manufacture at the time of delivery and installation.

#### 2.19.5.3.1 Sign Sheeting

All permanent signs shall be fabricated in accordance with this section and the Mandatory Standards. The Design-Builder shall comply with the urban classification requirements in the WSDOT *Traffic Manual* (Appendix D19) for determining the minimum sheeting requirements.

#### 2.19.5.3.2 Structural Steel for Sign Support Structures

The Design-Builder shall furnish structural steel for sign support structures in accordance with the requirements in Section 2.25 and the WSDOT Standard Specifications (Appendix D18).

#### 2.19.5.3.2.1 Perforated Steel Square Sign Posts

Steel sign posts shall be used for all ground- or barrier-mounted signs, and shall be made of square, pre-punched galvanized steel tubing that is NCHRP 350 Test Level 3-Certified and FHWA-approved. The steel sign posts shall include all anchor sleeves and other hardware required for a complete sign installation.

The WSDOT Standard Plans (Appendix D17) list several steel sign support types. These supports are patented devices and many are sole-source. All of the sign support types and manufacturers listed below are acceptable.

| Steel Sign Support Type | Manufacturer |
|---|---|
| Type TP-A & TP-B | Transpo Industries, Inc. |
| Type AS | Transpo Industries, Inc. |
| Type AP | Transpo Industries, Inc. |
| Type 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. |

## 2.19.6 SUBMITTALS

The Design-Builder shall provide all documents and information required for the Design Documentation Package in accordance with Sections 2.2 (Project Documentatin), 2.25 and 2.28 (Quality Management Plan).

### 2.19.6.1 CONCEPTUAL TOLL SIGNING PLAN

The Design-Builder shall prepare and submit a Conceptual Toll Signing Plan as part of the Toll Transition Plan to WSDOT for review and comment. Refer to Section 2.23 for Toll Transition Plan requirements.

The Design-Builder shall submit the Conceptual Toll Signing Plan within 90 Calendar Days of NTP 1.

The Conceptual Toll Signing Plan shall include, but is not limited to, the following:

- Existing toll signs to remain;
- Existing toll signs to be replaced;
- New toll sign locations and panel legends; and
- Type and location of new sign structures.

### 2.19.6.2 PRELIMINARY SIGNING DESIGN SUBMITTAL

The Design-Builder shall prepare and submit the Existing Sign Inventory Report, Preliminary Permanent Signing Plan and Signing Design Checklist as part of the Preliminary Design Submittal.

The Preliminary Permanent Signing Plan shall include, but is not limited to, the following:

- Sign locations;
- Panel legends;
- Proximity to ITS devices and light standards;
- Types and locations of proposed sign structures;
- Types and locations of existing structures on which proposed signs will be mounted;
- Permanent signing proposed on bridge portals;
- Identification of all existing signs and structures to remain, to be removed or to be relocated; and
- All identified non-standard design items, if any.

The Design-Builder shall update the Conceptual Toll Signing Plan to develop the Preliminary Toll Signing Plan including all above items, and shall submit it to WSDOT for review and comment. The Preliminary Toll Signing Plan shall also be submitted with the Preliminary Toll Infrastructure Plans in accordance with Section 2.23.

### 2.19.6.3 FINAL SIGNING DESIGN SUBMITTAL

The Design-Builder shall prepare and submit the Final Permanent Signing Plans as part of the Final Design Submittal specified in Section 2.28. The Final Permanent Signing Plans shall address the comments received from the Preliminary Permanent Signing Plans review and any issues raised during the design progress meetings.

The Final Permanent Signing Plans shall include the following items in addition to the items from the Preliminary Signing Plans:

- Sign Specification Sheets containing all necessary information including fabrication (sign size, letter size, color and sheeting type); structure type, size, length and clearance; installation (mounting); station offset; and relocation and removal for each sign.
- Design drawings showing the location of all new signs and existing signs to remain, to be relocated or to be removed. The drawings shall include the following:
  - Sign number referenced from the Sign Specification Sheet;
  - Small-scale layout of all signs including guide, regulatory, warning and object markers; and
  - Existing and proposed utilities within a 20-foot radius of new overhead sign structure foundations.
- Final pavement markings.
- 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 WSDOT Standard Plans (Appendix D17) 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 and sign placement in relation to travel lanes, mounting heights and vertical clearance (including all static, LCS, SDMS and VMS signs), and associated maintenance walkways.
- Structural calculations for the design of overhead sign structures, foundations, and mounting brackets, including provisions for sign lighting, where required. Refer to Section 2.13 for structural calculation requirements.
- Structural plans that incorporate the structural design calculations.

The Final Permanent Signing Plans shall be submitted to WSDOT for review and comment in accordance with the Section 2.28.

### 2.19.6.4 SHOP DRAWINGS AND SAMPLE MATERIALS

The Design-Builder shall prepare and submit shop drawings and product data including, but not limited to, the following:

- Sign Sheeting and sign panel materials and fabrication details;
- Monotube sign bridge and cantilever structures including structure posts, beams, base and connection plates;
- Steel sign posts for ground- and barrier-mounted signs;
- Wall-mounted sign brackets;
- Bridge-mounted sign brackets;
- Sign luminaires, lamps, ballasts and photoelectric controls, if any;
- Concrete for foundations;
- All mounting hardware including bolts, nuts, locknuts, washers and all other mounting hardware; and
- Paint (prime and finish).

The Design-Builder shall submit at least two samples of sign sheeting and panel materials. It shall also submit fabrication details for each type of sign furnished as part of the Project, along with the shop drawings, to WSDOT for review and comment prior to WSDOT inspection and acceptance. Refer to this section for requirements for WSDOT inspection and acceptance.

### 2.19.6.5 RELEASED FOR CONSTRUCTION DOCUMENTS

The Design-Builder shall include the following items with the Released For Construction Documents:

- All elements required for the Final Signing Design Submittal;
- All resolved comments from the Final Signing Design Submittal; and
- Additional design elements addressed.

Refer to Sections 2.2 and 2.28 for submittal and review requirements.

End of Section

# 2.20 PAVEMENT MARKING

## 2.20.1 GENERAL

The Design-Builder shall conduct all Work necessary to meet the requirements for permanent pavement markings for the Project. Refer to Section 2.22 (Maintenance of Traffic) for additional temporary pavement marking requirements.

## 2.20.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT *Standard Plans* (M21-01) (Appendix D17).
- WSDOT *Traffic Manual* (M51-02) (Appendix D19).
- *Manual on Uniform Traffic Control Devices* (MUTCD) – *Washington State Modifications* (M24-01) (Appendix D25).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D9).
- 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*, 4th Edition, 2001, with 2002, 2003, and 2006 Interims.
- 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.
- WSDOT *HOV Design Guide for the Northwest Region* (Appendix D33).
- WSDOT Northwest Region Traffic Operations Redbook (Appendix T14).
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D13).
- City of Medina Municipal Code.
- Hunts Point Town Code.
- Yarrow Point Municipal Code.
- City of Clyde Hill Municipal Code Chapter 12.04, Street Improvement and Construction Specifications.

## 2.20.3 PERFORMANCE REQUIREMENTS

### 2.20.3.1 INTENTIONALLY OMITTED

### 2.20.3.2 MEETINGS

Refer to Section 2.16 (Illumination and Roadway Electrical Systems) for information about required meetings.

### 2.20.3.3 PAVEMENT MARKING PERFORMANCE REQUIREMENTS

The Design-Builder shall ensure that all pavement markings on the Project meet the requirements of Section 8-22 of the Amendments to the WSDOT Standard Specifications (Appendix B1).

The Design-Builder shall test the retroreflective performance of newly-applied pavement markings no sooner than 12 hours after application, but within 21 Calendar Days. The Design-Builder shall take 10 evenly-spaced retroreflective readings per color line over a 2,000-foot roadway segment within every one-mile section over the length of the Project.

The Design-Builder shall prepare a written Design-Builder's Pavement Marking Test Results Report in accordance with the T 429 testing procedure in the WSDOT *Materials Manual* (Appendix D10). The Report shall summarize all of the retroreflective and chromium content test results. The Design-Builder shall submit the report to WSDOT within 7 Calendar Days of completing the testing.

Any section of pavement marking that fails to satisfy the test criteria shall be replaced at no cost to WSDOT and retested to ensure it meets retroreflectivity and chromium content criteria. The results of the retested sections shall be included in the Design-Builder's Pavement Marking Test Results Report.

The Design-Builder shall ensure that the minimum retroreflectance values for the pavement markings, as specified in the WSDOT Standard Specifications (Appendix D18) and listed in these Technical Requirements, are maintained for a 180 Calendar Day observation period beginning upon the satisfactory completion of all Work required or until Final Acceptance, whichever comes later.

## 2.20.4 DESIGN AND CONSTRUCTON REQUIREMENTS

### 2.20.4.1 PERMANENT PAVEMENT MARKING DESIGN REQUIREMENTS

The Design-Builder shall submit permanent Pavement Marking Plans to WSDOT for review and comment. The plans shall include, but are not limited to, all tapers; horizontal curve data; lane, shoulder and buffer widths; and the following marking elements:

- Center line striping;
- Edge line striping;
- Gore striping;
- Lane line striping;
- Wide lines;
- Stop lines;
- Arrows;
- Legends;
- Symbols;
- Object markers and delineators;
- Aerial surveillance markers;
- Crosswalk lines;
- Drainage markings;
- Raised Pavement Markers (RPM);
- Shoulder markings for extra-wide shoulders comprised of wide lines at 45-degree angles, spaced at 100-foot intervals; Type 1 RPMs spaced at one-foot intervals and placed in front of the striping facing oncoming traffic; and
- Any other markings consistent with the needs of the Project.

The Pavement Marking Plans shall provide a basis for the pavement marking requirements for the Project. The Design-Builder shall be responsible for removing and replacing existing pavement marking in areas where temporary pavement marking will be used during construction.

Where new striping is added for new lanes, all striping on adjacent existing lanes shall be re-striped for the same limits as the new striping.

Gore area striping for interchanges shall comply with Section M-2.40-01 in the WSDOT Standard Plans (Appendix D17).

Type 2 RPMs located in gore areas and at off-ramps shall have red reflectors on the back side to alert drivers traveling in the wrong direction.

#### 2.20.4.1.1 Permanent Pavement Marking Material Requirements

The Design-Builder shall provide permanent pavement markings that meet the requirements of Section 9-34 of the WSDOT Standard Specifications (Appendix D18) for all locations within facilities maintained by WSDOT, including lane lines and edge lines.

On arterial and local streets maintained by local agencies, the Design-Builder shall use pavement marking materials specified by the respective jurisdictions. The Design-Builder shall coordinate with the local agencies to determine the materials to use.

For WSDOT-maintained areas, all permanent pavement markings shall be Methyl Methacrylate (MMA). The use of thermoplastic or RPMs as an alternative to MMA is not acceptable for this Project.

All MMA markings except HOV wide lines shall be profiled in accordance with the WSDOT Standard Plans (Appendix D17).

#### 2.20.4.1.2 Pavement Marking Material Certification

The Design-Builder shall provide WSDOT with a Manufacturer's Certificate of Compliance that the pavement marking material meets the requirements of Section 9-34 of the WSDOT Standard Specifications (Appendix D18), Section 2.25 (Control of Materials) and Section 2.28 (Quality Management Plan). The Design-Builder shall ensure that the certification includes the manufacturer's address, telephone number and contact person name. The Design-Builder shall perform all required testing in accordance with Section 9-34 of the WSDOT Standard Specifications (Appendix D18).

### 2.20.4.2 Permanent Pavement Marking Construction Requirements

The Design-Builder shall comply with the Construction Requirements of Section 8-22 of the WSDOT Standard Specifications (Appendix D18). The Design-Builder shall be responsible for providing, and shall apply, all the required control points for preliminary spotting and pavement marking layout.

The Design-Builder shall not grind or blemish pavement after the final lift of pavement is applied.

#### 2.20.4.2.1 Materials

The Design-Builder shall use approved pavement marking materials in accordance with this section.

The Design-Builder shall provide the pavement marking materials in accordance with Section 2.25.

The Design-Builder shall provide WSDOT with a copy of the manufacturer's application instructions for review and comment. The Design-Builder shall apply the pavement markings according to the manufacturer's recommendations.

#### 2.20.4.2.2 Equipment

The Design-Builder shall use equipment designed for the preparation and application of the appropriate type of pavement marking material as required by the manufacturer.

### 2.20.4.2.3 Surface Preparation

For pavement marking removal, the Design-Builder shall remove any permanent or temporary pavement markings in accordance with the requirements in Sections 8-22 and 8-23 of the WSDOT Standard Specifications (Appendix D18).

Section 8-22.3(6) Removal of Pavement Markings of the WSDOT Standard Specifications is amended as follows:

*Pavement markings to be removed shall be obliterated until blemishes caused by the pavement marking removal conform to the coloration of the adjacent pavement. If the pavement is materially damaged by pavement marking removal, such damage shall be repaired by the Design-Builder in accordance with Section 1-07.13(1). Pavement surface damage will not apply if the pavement surface damage will be overlaid or otherwise covered within 30 Calendar Days in the same construction season.*

*Pavement surface material damage is defined as removal of greater than 0.0625 inches of pavement below the plane of the pavement surface. The depth measurement shall apply to all pavement surfaces. The pavement surface following pavement marking removal shall be smooth. Rough grinding will not be allowed. For open graded asphalt, tined concrete, BST and other surfaces with a rough texture, additional pavement marking removal shall be done by hydroblasting, sandblasting or shot blasting. The pavement marking removal shall be considered adequate when the remaining pavement marking material is not visible to a person with normal vision observing the removal area from a standing position looking 40 feet ahead.*

*In order to avoid hazardous conditions, sand or other material deposited on the pavement as a result of removing lines and markings shall be removed as the work progresses. Accumulation of sand or other material that might interfere with drainage will not be permitted.*

The Design-Builder shall prepare the pavement surface for the application of all pavement markings as recommended by the manufacturer and/or Section 8-22 of the WSDOT Standard Specifications (Appendix D18). Grinding will not be allowed after the final paving lift is complete.

### 2.20.4.2.4 Replacement of Unsatisfactory Pavement Markings

The Design-Builder shall remove and replace pavement markings that:

- Do not conform to the tolerances established under Section 8-22 of the WSDOT Standard Specifications (Appendix D18);
- Fail to meet retroreflective or chromaticity coordinates performance as described in this section;
- Have visible drag marks, gashes or gouges;
- Contain foreign material covering the markings;
- Have discolored areas;
- Fail to solidify;
- Do not adhere to the pavement;
- Have areas with a ragged appearance; areas without sharply defined edges; or areas with abrupt unintended changes in alignment; and

- Have more than 10 percent of the substrate exposed in a running 2,000-foot section of longitudinal pavement marking line.

## 2.20.5 SUBMITTALS

All submittals shall meet the requirements specified in Section 2.28.

### 2.20.5.1 PRELIMINARY PAVEMENT MARKING DESIGN SUBMITTAL

#### 2.20.5.1.1 Preliminary Pavement Marking Plans

The Preliminary Pavement Marking Plans shall be submitted to WSDOT for review and comment as part of the Preliminary Design Submittal.

The Preliminary Pavement Marking Plans shall be prepared in accordance with the WSDOT *Plans Preparation Manual* (Appendix D12), and shall include the following:

- All existing pavement marking for a minimum of 300 feet past the limits of construction, and adequate transition and tapers to maintain traffic at the design speed. Typical sections in lieu of plans will not be accepted.
- All new pavement marking by material type, color and line width. The Design-Builder shall dimension the pavement marking across the roadway completely, tying the pavement marking to a construction centerline or a monument line.
- Station and offset for all pavement arrows, legends, crosswalks and miscellaneous pavement markings.
- Station and offset for the beginning and ending of all pavement markings, and the beginning and ending of each taper. The Design-Builder shall locate the beginning and ending points of all curves and the associated radii.
- Design drawings, other than those included in the WSDOT Standard Plans (Appendix D17), which show details of pavement markings, tapers and transitions.

The Preliminary Pavement Marking Plans shall not be combined with the Paving Plans. Refer to Example 4-33 of the WSDOT *Plans Preparation Manual* (Appendix D12) for sample pavement marking plans.

### 2.20.5.2 FINAL PAVEMENT MARKING DESIGN SUBMITTAL

Prior to releasing the Final Pavement Marking Design Submittal, the Design-Builder shall respond to and incorporate all comments from WSDOT in accordance with the requirements of Section 2.28, and shall verify that the layout matches the channelization plan.

End of Section

# 2.21 LAKE WASHINGTON MARINE TRANSPORTATION

## 2.21.1 GENERAL

In addition to the requirements of Section 2.27, the Design-Builder shall conduct all Work necessary to meet the requirements associated with Lake Washington Marine Transportation for the safe and efficient movement of Project components, equipment and other marine traffic Work activities within Lake Washington internal waters while minimizing impacts to residents, businesses, tribal activities, and the boating/marine community. This Work shall also include meeting all Federal, State, and local requirements for marine transportation.

For the purposes of Lake Washington Marine Transportation, Lake Washington internal waters shall be the "Internal waters" as defined in Section 2.27.1.2, including Shilshole Bay and excluding Grays Harbor.

Project marine traffic includes, but is not limited to:

- Pontoons;
- Existing pontoons;
- Transport barges for project materials;
- Work barges, cranes, derricks and pile driving equipment; and
- Personnel boats, tugboats, and tenders.

The Design-Builder shall prepare a Lake Washington Marine Transportation Plan (LWMTP) for the management of Project work related to marine transportation within the Lake Washington internal waters. The Design-Builder shall conduct all marine transportation-related Work activities in accordance with this section and the LWMTP. Marine transportation-related work activities include, but are not limited to, the following:

- Transportation of Pontoons, barges and marine equipment;
- Anchor testing and placement;
- Marine traffic restrictions and closures of the SR 520 east and west navigation channels and existing center draw span;
- New bridge construction staging and assembly operations; and
- Existing bridge demolition and removal.

The Design-Builder shall conduct construction activities such that the number and duration of required Lake Washington Internal waters navigational restrictions and closures are minimized.

The Design-Builder shall coordinate with local jurisdictions to identify projects not listed in Section 2.1 that are scheduled for construction at the same time as the Project.

## 2.21.2 PERFORMANCE REQUIREMENTS

### 2.21.2.1 GENERAL

The Design-Builder shall submit a Lake Washington Marine Transportation Management Plan within 90 Calendar Days after NTP 2.

### 2.21.2.2 LAKE WASHINGTON MARINE TRANSPORTATION PLAN (LWMTP)

The LWMTP is a set of strategies for identifying and managing the impacts of Project-related marine transportation and traffic issues. The major components of the LWMTP include the management of the movement of Project components and equipment between Puget Sound and Lake Washington, and the management of navigational restrictions and closures within the Lake Washington Internal waters. The LWMTP shall include, but is not limited to, the following:

- Identification of all LWMTP stakeholders including, but not limited to: the Design-Builder, WSDOT, United States Coast Guard, United States Army Corps. of Engineers, University of Washington, Seattle Yacht Club, City of Seattle, City of Medina and the Muckleshoot Indian Tribe.
- The LWMTP shall be prepared in coordination with the maritime provisions of the Community Construction Management Plan (CCMP).
- Descriptions of marine navigational requirements of the Project including, but not limited to, the transport of Pontoons, superstructure components, anchors, barges, cranes and derricks.
- Description of restrictions and impacts to the existing floating bridge navigation channels.
- Identification and layout of navigational ways near and through navigation channels at the floating bridge.
- Description and schedule for impacts and closures to the existing floating bridge center draw span.
- Description and schedule for the permanent closure of the existing floating bridge center draw span.
- Description and schedule for the restoration of the new floating bridge navigation ways at the west and east ends of the floating bridge.
- Identification and layout of moorage areas for Pontoons, barges and marine equipment during staging and pre-assembly prior to final positioning.
- Identification and layout of moorage areas for barges and other marine equipment when not in use for bridge construction.
- Identification of locations and schedule for anchor testing.
- Best Management Practices (BMPs) for limiting marine traffic shoreline impacts.
- Process to provide notification to and coordination with, stakeholders of key marine transportation activities.

- Procedures for coordinating and implementing navigation channel closures and blockages.
- Procedures to identify and incorporate the needs of emergency service providers, law enforcement entities and other related corridor users.
- Description of contact methods, available personnel and amount of time required for responses to any conditions requiring attention during off hours.
- Provisions for maintaining existing waterborne access to shoreline properties affected by Project marine transportation.
- Procedures to modify the LWMTP as needed to adapt to Project changes/revisions.
- Procedures for communicating LWMTP information to the Design-Builder's public information personnel, and for notifying the public of issues in accordance with Section 2.9 (Public Information).
- Procedure for coordination of construction activities with Muckleshoot Indian Tribe.

## 2.21.3 DESIGN AND CONSTRUCTION REQUIREMENTS

### 2.21.3.1 DESIGN REQUIREMENTS

#### 2.21.3.1.1 Marine Transportation Lead

The Design-Builder shall identify a Marine Transportation Lead (MTL) for the coordination of all marine transportation and marine work activities in the Lake Washington Internal waters. The MTL shall be responsible for ensuring that elements related to marine construction phasing and transportation work are completed and applicable requirements are met. The MTL shall be the point of contact for the LWMTP Stakeholders. The MTL shall be available for the duration of the construction where Work activities impact marine navigation through Physical Completion.

#### 2.21.3.1.2 Restrictions on Marine Work Activities

This section provides for restrictions on Project-related marine transportation and Work activities. Restrictions on marine transportation Work activities are defined for the Lake Washington internal waters. All marine Work activities shall be performed in accordance with these restrictions and must comply with the accepted LWMTP.

##### 2.21.3.1.2.1 General Marine Work Restrictions

- Applicable Federal, State and local regulations
- Opening Day of boating season (first Saturday in May)
    - Pontoons and Project marine traffic and vessels longer than 50 feet shall not travel through Portage Bay, the Montlake Cut, or Union Bay during the period of one week before through one week after Opening Day.
    - For all other Project marine traffic, the Design-Builder shall coordinate with the Seattle Yacht Club for travel and construction-related activities

in Portage Bay, the Montlake Cut and Union Bay during the period of one week before through one week after Opening Day.

- University of Washington home football games
    - Project marine traffic and vessels longer than 50 feet shall not travel through the Montlake Cut or Union Bay from Friday at 9:00 a.m. through Sunday at 9:00 a.m. during the game weekend.
    - Project marine traffic shall not be moored in Union Bay from Friday at 9:00 a.m. through Sunday at 9:00 a.m. during the game day weekend.
- Requirements of Section 2.12.3.5 for SR 520 navigation channel and center draw span blockages and closures
- Closures or Blockages as defined in Section 2.12.3.5 of the navigation channels shown in Appendix M1 will not be allowed during the following events weekend periods:
    - Opening Day of boating season: Thursday 9:00 a.m. through Sunday 11:59 p.m.
    - Memorial Day weekend: Friday 9:00 a.m. through Sunday 11:59 p.m.
    - Fourth of July Weekend: Friday 9:00 a.m. through Sunday 11:59 p.m.
    - Seafair Weekend: Thursday 9:00 a.m. through Sunday 11:59 p.m.
    - Labor Day Weekend: Friday 9:00 a.m. through Sunday 11:59 p.m.
- The Design-Builder shall coordinate its Work activities with WSDOT maintenance so the Work does not interfere with the opening of the SR 520 draw span for oversize vessels and monthly maintenance bridge openings that typically occur on the second Thursday of each month. Openings are intermittent between the hours of 1:00 a.m. and 5:00 a.m. WSDOT activities will have precedence over the Design-Builder's construction activities and the Design-Builder shall maintain WSDOT access to and from the bridge during the monthly maintenance bridge openings.

#### 2.21.3.1.2.2 Tribal Fishing Coordination

During yearly fish counting operations at the Hirm M. Chittenden locks, all Project marine traffic through the Hiram M. Chittenden locks shall be restricted as follows:

- June 12th through July 31st (every Calendar Day):
    - No Project marine traffic between 6:00 a.m. and 6:10 p.m.
- August 1st through October 2nd (every Calendar Day):
    - No Project marine traffic between 8:00 a.m. and 6:10 p.m.
- Lake Washington Tribal Fishing Season Restrictions (yearly):
    - Sockeye Salmon Potential Fishing Window: July 1st through August 15th

The Sockeye Salmon season is expected to be open no more than 10 Calendar Days per year.

During Sockeye Salmon fishing windows, no Project marine traffic shall be allowed through Shilshole Bay, the Hiram M. Chittenden locks, Portage Bay, the Montlake Cut or

Union Bay into Lake Washington. Project marine traffic on Lake Washington shall be restricted to Work at the bridge site after coordination and approval by WSDOT. Impacts to Muckleshoot or other Tribal fishing operations will result in liquidated damages being assessed against the Design-Builder.

WSDOT will provide the Design-Builder with a 10 Calendar Day notification each year if a Sockeye Salmon season will be opened.

- Chinook Salmon Potential Fishing Window (yearly):
    - August 15th through September 15th

The Chinook Salmon season is expected to be open no more than 10 Calendar Days per year.

During Chinook Salmon fishing windows, no Project marine traffic shall be allowed through Shilshole Bay, the Hiram M. Chittenden locks, Portage Bay, the Montlake Cut or Union Bay into Lake Washington. Project marine traffic on Lake Washington shall be restricted to Work at the bridge site after coordination and approval by WSDOT. Impacts to Muckleshoot or other Tribal fishing operations will result in liquidated damages being assessed against the Design-Builder.

WSDOT will provide the Design-Builder with a 10 Calendar Day notification each year if a Chinook Salmon season will be opened.

- Coho Salmon Potential Fishing Window (yearly):
    - September 1st through October 31st

The Coho Salmon season is expected to be open no more than 30 Calendar Days per year.

During Coho Salmon fishing windows, Project marine traffic will be allowed through Shilshole Bay, the Hiram M. Chittenden locks, Portage Bay, the Montlake Cut and Union Bay into Lake Washington. Project marine traffic on Lake Washington will be allowed. The Design-Builder shall be responsible for coordination with WSDOT and the Muckleshoot Indian Tribe for Project marine traffic. Impacts to Muckleshoot or other Tribal fishing operations will result in liquidated damages being assessed against the Design-Builder.

WSDOT will provide the Design-Builder with a 10 Calendar Day notification each year if a Coho Salmon season will be opened.

Liquidated damages will be assessed for failure to complete Work within the specified times, in accordance with Section 1-08.9 of the General Provisions.

In accordance with Section 1-07.16(1) of the General Provisions, the Design-Builder shall be responsible for the costs associated with any damages to Muckleshoot or other Tribal fishing nets caused by their operations. WSDOT will directly reimburse the Muckleshoot or other Tribes for these damages and subtract these costs from monies due to the Design-Builder.

## 2.21.3.2 PUBLIC CONVENIENCE AND SAFETY

### 2.21.3.2.1 Construction Under Traffic

The Design-Builder shall conduct all operations with minimum obstruction and inconvenience to the public.

In order to minimize marine traffic disruption, the Design-Builder shall permit marine traffic to pass through the SR 520 navigation ways with minimum inconvenience or delay. The Design-Builder shall maintain navigation ways within the Project limits, keeping them open and in good and safe condition for vessel traffic.

To protect the rights of nearby shoreline property owners, the Design-Builder shall perform the following:

- Allow access to houseboats, marinas and other boating facilities within the Lake Washington internal waters;
- Provide sufficient pilot vessels during Pontoon Transport;
- Maintain a "No Wake" condition during Pontoon Transport and
- Comply with Federal, State, and local law.

#### 2.21.3.2.1.1 Hours of Darkness

The Design-Builder shall furnish and install both temporary and permanent channel lighting in accordance with Section 2.12 (Floating Bridge).

#### 2.21.3.2.1.2 Public Notification

The LWMTP shall address notification and communication procedures, including the notification to mariners as provided in Section 2.8, for the movement of Project components and equipment. Restrictions and closures to navigational ways in advance of the proposed Work activities shall be provided in writing to WSDOT in accordance with the LWMTP, Section 2.9 and these Technical Requirements.

### 2.21.3.2.2 Maintenance of Navigational Ways

The Design-Builder shall maintain the west and east navigation channels in a safe passable condition and provide for a safe passable condition to the existing center draw span

The Design-Builder shall pay all costs to maintain the above items, whether they are used for the Design-Builder's convenience or to facilitate construction operations.

If the Design-Builder fails to immediately provide or maintain navigational ways, WSDOT may remove the obstructions to navigational ways and deduct the costs from any payments due or coming due to the Design-Builder.

## 2.21.3.3 CONSTRUCTION REQUIREMENTS

### 2.21.3.3.1 General

The Design-Builder shall plan, manage, supervise and perform all marine traffic activities required to support the Work. The Design-Builder shall provide the required labor, equipment and materials.

### 2.21.3.3.2 Description

The Design-Builder shall perform all procedures necessary to support the Work.

The Lake Washington Marine Transportation activities described in this section shall be used to facilitate the movement of project components and for the safety of the Design-Builder's employees, WSDOT personnel and the public.

The Design-Builder shall be responsible for providing adequate labor and equipment, and for performing procedures that protect the Work and the public at all times whether or not the labor, devices or procedures have been ordered, provided or paid for by WSDOT.

The Design-Builder is advised that one or more law enforcement agencies may wish to enter Project Work zones. The Design-Builder shall cooperate and accommodate such activities.

#### 2.21.3.3.3 Existing Center Channel Drawspan Operations and Maintenance

The existing floating bridge center channel draw span will continue to be operated by WSDOT until such time as the Design-Builder permanently blocks the center channel with new floating bridge construction as allowed in Section 2.12.3.5. The Design-Builder shall allow for the normal operation and maintenance of the existing center channel draw span until it is permanently closed.

The Design-Builder is advised that the SR 520 draw span operation is regulated by both Federal and State regulations.

Federal regulation is as follows (Title 33 § 117.1049 Lake Washington):

> *The draw of the Evergreen Point Floating Bridge between Seattle and Bellevue shall operate as follows:*
>
> *(a) The draw shall open on signal if at least two hours notice is given.*
>
> *(b) Telephone requests for bridge opening may be directed as collect calls to the Highway Radio or made by direct telephone communication through the Seattle Marine Operator, Station KOH, or through other marine wire or radiotelephone service.*
>
> *(c) The draw need not be opened from 5 a.m. to 9 p.m. Monday through Friday, except for all Federal holidays other than Columbus Day.*

State operating rules under the Federal regulation above is as follows:

> ***Restrictions on marine openings:*** *Drawspan openings for marine traffic are restricted on weekdays between 5 a.m. and 9 p.m. However, with two hours notice the drawspan may be opened anytime on the weekend or on federal holidays.*
>
> ***Vessel clearance:*** *Smaller vessels may use the east or west navigational channels.*
>
> ***Request an opening:*** *Call Seattle Dispatch radio at 206-440-4490 at least two hours before the intended opening.*
>
> ***Average opening time:*** *20 minutes, traffic delays may be longer.*

The Design-Builder shall comply with the above regulations except as provided in Section 2.12 and as approved by the USCG.

The Design-Builder shall coordinate with WSDOT to provide timely written notifications regarding planned closures or restrictions to the navigation ways. The Design-Builder shall provide a minimum of 30 Calendar Days notice to WSDOT in advance of permanently closing the center channel.

For the coordination of other floating bridge operation, the NWR Bridge Maintenance Office contact information is listed below:

**NWR Bridge Maintenance**
10833 Northup Way NE
Bellevue, WA 98004
Phone: (425) 739-3700

#### 2.21.3.3.4 Marine Transportation Management

The Design-Builder's marine transportation management personnel shall be responsible for the following:

- Overseeing and approving the actions of the Project staff to ensure that proper safety and control measures are implemented, and that they are consistent with the specific requirements of the Project. An alternate form of oversight shall be in place and effective when the marine traffic management personnel are not present at the Work area.
- Providing the Design-Builder's designated MTL with the approved LWMTP.
- Coordinating all marine transportation and traffic operations, including those of Subcontractors and suppliers, with each other and with any adjacent construction or maintenance operations.
- Coordinating all marine transportation and traffic operations with Project stakeholders and other third parties, including but not limited to, the United States Coast Guard, United States Army Corps of Engineers, University of Washington, Seattle Yacht Club, City of Seattle, City of Medina and Muckleshoot Indian Tribe.
- Coordinating the Project's activities with appropriate police departments, fire control agencies and medical emergency agencies.
- Overseeing all requirements of the Project that contribute to the convenience, safety and orderly movement of marine traffic.
- Reviewing the MTL's daily diaries and retaining awareness of field operations.
- Being present onsite 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.

## 2.21.4 SUBMITTALS

### 2.21.4.1 LAKE WASHINGTON MARINE TRANSPORTATION PLAN (LWMTP)

The Design-Builder shall prepare a LWMTP for WSDOT's review and comment. The LWMTP shall be reviewed by the stakeholders and the final LWMTP shall include responses to all comments. The LWMTP shall be finalized prior to any Project marine work activity in the Lake Washington internal waters. The Design-Builder shall submit 10 hard copies and one electronic copy of the Final LWMTP to WSDOT.

### 2.21.4.2 OTHER SUBMITTAL REQUIREMENTS

One electronic copy and one paper copy of the daily diaries of Project marine transportation work shall be submitted to WSDOT on a monthly basis. Upon Completion of the Project, the diaries shall be delivered to WSDOT, at which time they will become WSDOT property.

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). This includes 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 Transportation Management Plan (TMP), 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 coordinate 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. The Design-Builder shall schedule construction activities in order to minimize the number and duration of required closures and 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.

Projects that WSDOT anticipates will be under construction at the same time as the Project are identified in Section 2.1 (General Information). The Design-Builder shall coordinate with local jurisdictions and utility companies to identify other projects not listed in Section 2.1 that are scheduled for construction at the same time as the Project.

## 2.22.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications(M41-10) (Appendix D18).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT Standard Plans (M21-01) (Appendix D17). Note: Section K is for reference only and shall not be used on the Project. Site-specific MOT Plans are required.
- WSDOT *Traffic Manual* (M51-02) (Appendix D19).
- *Manual on Uniform Traffic Control Devices* (MUTCD) – *Washington State Modifications* (M24-01) (Appendix D25).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).

- WSDOT *Maintenance Manual* (M51-01) (Appendix D9).
- WSDOT *Work Zone Traffic Control Guidelines* (M54-44) (Appendix D27).
- Instructional Letter IL 4008.00, Washington State Patrol Traffic Control Assistance in Work Zones (Appendix T7).
- WSDOT Secretary's Executive Order E 1060.00, Speed Limit Reductions in Work Zones, 2009 (Appendix T5).
- WSDOT Secretary's Executive Order E 1001.01, Work Zone Safety and Mobility, 2007 (Appendix T6).
- WSDOT *Sign Fabrication Manual* (M55-05) (Appendix D26).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- *Active Traffic Management Standard Operating Procedures I-5, SR 520, I-90* (Appendix T3).
- FHWA *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD), 2003.
- National Cooperative Highway Research Project (NCHRP) Report 350 *Recommended Procedures for the Safety Performance Evaluation of Highway Features*, 1993 (Appendix T9).
- AASHTO *A Policy on Design Standards- Interstate System,* 2005.
- 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.
- FHWA Developing and Implementing Transportation Management Plans for Work Zones, 2005 (Appendix T8).
- ITE *Traffic Engineering Handbook*, 6th Edition, 2009.
- ITE *Manual of Transportation Engineering Studies*, 2000.
- ATSSA *Quality Guidelines for Work Zone Traffic Control Devices*.
- ADA Accessibility Guideline (ADAAG), US Access Board.
- FHWA Final Rule on 23 CFR 630 Subpart J, 2004.

### 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, MUTCD – *Washington State Modifications* (Appendix D25) and FHWA Final Rule - 23 CFR Part 630 Subpart J.

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, Fredericksburg, Virginia, 22406-1022. The *Washington State Modifications* to the MUTCD (Appendix D25) may be obtained from WSDOT, Olympia, Washington, 98504.

In addition to the standards of the WSDOT and FHWA MUTCDs, WSDOT requires the implementation of crashworthiness requirements for most Work zone devices. The NCHRP Report 350 (Appendix T9) has established requirements for crash testing. Work zone devices are divided into four categories. Each of those categories and the schedule for implementation, where applicable, is described below:

- Category 1 includes devices that are small, 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. Examples 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 (Appendix T9) 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 include barricades, portable sign supports, signs, intrusion alarms and vertical panels. All Category 2 devices shall meet the requirements of the NCHRP Report 350 (Appendix T9). For definition purposes, a sign support and sign shall be considered a single unit. A new sign may be purchased for an existing sign support, and the entire unit shall be defined as “existing equipment.”

- Category 3 includes hardware expected to cause significant velocity changes or other potentially harmful reactions to impacting vehicles. Examples include barriers, fixed sign supports, crash cushions, Truck-Mounted Impact Attenuators (TMAs) and other Work zone devices that do not meet the definitions of Categories 1 or 2. All Category 3 devices shall meet the requirements of the NCHRP Report 350 (Appendix T9).

- Category 4 includes portable or trailer-mounted devices such as arrow displays, temporary traffic signals, area lighting supports and Portable Changeable Message Signs (PCMS). There is currently no implementation schedule for mandatory crashworthiness compliance of these devices.

The condition of Work zone 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 regarding the condition of a sign or traffic control device will be final. The Design-Builder shall remove any sign or traffic control device that WSDOT determines unacceptable and replace it within 12 hours of notification.

## 2.22.3 PERFORMANCE REQUIREMENTS

### 2.22.3.1 GENERAL

The Design-Builder shall establish an MOT task force and prepare a TMP and TIMP for WSDOT approval prior to any construction activity that may impact traffic. If WSDOT permits activities such as surveying, environmental work and other design-related Work before approving the TMP and the TIMP, it will only do so if the Design-Builder prepares MOT Plans in accordance with the requirements of this section. MOT Plans that will be implemented within a jurisdiction other than WSDOT's will require approval from that jurisdiction.

### 2.22.3.2 TRANSPORTATION MANAGEMENT PLAN (TMP)

A TMP is a set of strategies for managing the corridor-wide Work zone impacts of a project. The three major components of a TMP are temporary traffic control plans, transportation operation plans and public information plans. The Design-Builder shall develop a TMP in accordance with Chapter 1010 of the WSDOT *Design Manual* (Appendix D3). The TMP shall include all items from the FHWA Developing and Implementing TMP for Work Zones (Appendix T8), and 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, schools and business owners in the Project corridor.
- Procedures to obtain concurrence of stakeholders in advance of implementing road and lane closures.
- Procedures for implementing road and lane closures. The Design-Builder shall coordinate with all MOT stakeholders including the WSDOT PE office, WSDOT Construction Traffic Office (CTCO), and WSDOT Traffic Management Center (TMC).
- Processes to develop and obtain agreement among stakeholders for switching procedures.
- Procedures to identify and incorporate the needs of local jurisdictions affected by the Work.
- Processes for signing transitions from one stage to the next during construction, 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 the availability of all information required by these agencies at least 7 Calendar Days in advance of the planned event, closure or other restriction.
- Provisions for incident and emergency response.
- Processes to identify, produce and receive acceptance for designs of temporary traffic signals.

- Methods and frequency of year-round 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 Temporary Concrete Barrier (TCB) configurations.
- Descriptions of contact methods, available personnel and amount of time required for responses to any conditions requiring attention during off-hours. This item should include a communications plan submitted to WSDOT-Northwest Region Seattle Radio and WSDOT PE office.
- Identification of measurable limits for the year-round repair and replacement of traffic control devices, including pavement markings.
- Processes to determine the need for revised traffic signal timings, and if revisions are required, include procedures for the development, approval, implementation, testing and maintenance of all affected signals.
- Provisions to maintain existing access to all properties within the Project limits for the duration of the Project, except as provided by other sections in these Technical Requirements. Pertinent information about access modifications shall be made available to the affected 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 Project changes/revisions.
- Procedures to determine detour routes and obtain 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 (Public Information).
- Procedures to accommodate MOT Plans for adjacent projects, if applicable.
- Procedures to accommodate the MOT Plans when the staging schedule of the Project or any adjacent project changes.
- Procedures to identify haul routes.
- Procedures to accommodate the passage of oversized (height and width) trucks through the Work zone and detour routes when given 48 hours notice by WSDOT.

#### 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 it shall manage these incidents.

#### 2.22.3.3.1 General

The TIMP shall identify methods for incident detection, verification and response; Site management; clearance; and motorist information. The TIMP shall include procedures for interacting with the Traffic Management Center (TMC). In addition, if any local jurisdictions along the Project corridor have adopted incident management guidelines, the Design-Builder shall be responsible for adhering to 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 for reviewing, capturing and applying lessons learned from incidents.

The TIMP shall identify current, and provide for future, design elements that 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 within the Project.

#### 2.22.3.3.2 Drop Sites

The Design-Builder shall identify a minimum of two drop sites within the vicinity of the Project where WSDOT can safely tow disabled vehicles off the freeway, and motorists can be assisted. The drop sites shall feature a phone and shelter for motorists. They may be retail establishments, such as gas stations or repair shops, and shall be located within one mile of the Project limits. The Design-Builder shall be responsible for all agreements and costs associated with the use of a retail establishment's parking spaces and facilities. Temporary emergency pullouts shall not be used as a drop site.

#### 2.22.3.3.3 Staging Areas

The Design-Builder shall provide staging areas where equipment or vehicles needed for incident clearance can be stored and easily accessed from the construction zone. The staging area may 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 outlined in Section 2.8 (Environmental). The Design-Builder shall design staging areas that will achieve the following:

- Provide an area large enough to store equipment;
- Provide easy access to the mainline; and
- Maintain spare traffic control devices including, but not limited to, the following:
  - Cones and/or drums;
  - Type III barricades;
  - Adequate signs for lane closures; and
  - TCB sections.

#### 2.22.3.3.4 Emergency Vehicle Access

The Design-Builder shall coordinate with local and regional emergency service providers, law enforcement entities and other related corridor users regarding timely communication of closure plans, detour plans and other Project elements that may affect the delivery of time-sensitive services. Emergency vehicle access shall be maintained at all times, unless otherwise approved by the affected corridor users. The Design-Builder shall comply with the written notification requirements for scheduled closures as identified in the Public Notification requirements within this section.

Additional requirements are described in Section 2.9.

#### 2.22.3.3.5 Maintain CCTV Traffic Surveillance System

The Design-Builder shall comply with Section 2.18 (ITS) for maintenance requirements for the CCTV traffic surveillance system during construction.

#### 2.22.3.3.6 Active Traffic Management (ATM) System

The Design-Builder shall comply with Section 2.18 for maintenance requirements for the ATM system, including the existing Variable Message Signs (VMS).

The ATM signs within the Project limits, including Lane Control Signs (LCS), Side-mount Dynamic Message Signs (SDMS) and VMS, shall provide motorists with incident and construction-related information. Refer to the ATM Standard Operating Procedures (Appendix T3) for more information.

If WSDOT approves, existing VMS approaching the Project may be used to provide motorists with incident and construction-related information prior to entering the Work zone. The Design-Builder shall coordinate with the TMC to provide timely, accurate information regarding incidents, planned closures and updated traffic and construction information. Additional requirements are described in Section 2.9.

The Design-Builder shall also supply Portable Changeable Message Signs (PCMS) to provide information to motorists, in accordance with this section.

#### 2.22.3.3.7 Highway Advisory Radio (HAR)

Existing Highway Advisory Radio (HAR) transmitter(s) may be used to provide motorists with incident and construction-related information prior to entering the Work zone.

The Design-Builder shall coordinate with the TMC to provide timely, accurate information regarding planned closures and updated traffic and construction information.

The Design-Builder shall comply with Section 2.18 for maintenance requirements of the HAR system during construction. Additional requirements are described in Section 2.9.

#### 2.22.3.3.8 Design-Builder Response Time

The Design-Builder shall have a TCS on call or on site, equipped with a mobile phone, who can respond to and manage an emergency situation. The TCS shall arrive on site within 45 minutes of notification from the Design-Builder or WSDOT of an emergency situation, in accordance with this section. Upon arrival, the TCS shall have the resources and equipment required to set up temporary traffic control. This may include closing lanes or ramps, setting up detours and replacing or repairing TCB.

#### 2.22.3.3.9 Contingency Plan

The Design-Builder shall provide WSDOT with a Contingency Plan for reopening each closed roadway or lane to traffic in the event of an equipment breakdown, shortage of materials, lack of materials production or other production failure; or when the closure must be reopened for public traffic use. The Design-Builder shall submit the Contingency Plan at least 7 Calendar Days prior to the scheduled closure. Submission of a Contingency Plan and its acceptance by WSDOT shall not exempt the Design-Builder from the liquidated damages specified in this section and in Section 1-08 of the General Provisions.

### 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 personnel from the Design-Builder, the SR 520 Eastside Transit and HOV Project, WSDOT, King County, King County Metro, Sound Transit and other local jurisdictions, agencies and utility companies, as determined by WSDOT, 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 on a weekly basis 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 Design-Builder shall prepare the agenda, meeting minutes, exhibits and design plans required for the meetings, and shall invite representatives from adjacent projects.

The purpose of the meetings shall be as follows:

- 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;
- Identify issues relating to MOT/Traffic Control Plan requests;
- Develop, refine and review the TIMP and its implementation;
- Review the TCS diary;
- Identify the need for improvements based on previously implemented traffic control;
- Discuss comments and complaints from WSDOT and the public about traffic control and signal operations/coordination, and determine how to address them; and

- Discuss Work zone-related crashes and identify appropriate traffic control revisions for prevention of future crashes.

## 2.22.4 DESIGN AND CONSTRUCTION REQUIREMENTS

### 2.22.4.1 DESIGN REQUIREMENTS

#### 2.22.4.1.1 Work Zone Traffic Engineering Manager (WTEM)

The Work Zone Traffic Engineering Manager (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 located on site for the duration of the construction phasing and MOT Plan development. The WTEM shall also be available through Substantial Completion to approve modifications to the phasing or MOT Plans. The WTEM shall be a Professional Engineer licensed under Title 18 RCW.

Design elements for which the WTEM is responsible include, but are not limited to, the following:

- Detours;
- Phasing and MOT Plans; and
- Temporary plans for signals, Intelligent Transportation Systems (ITS), lighting, signing and striping.

#### 2.22.4.1.2 MOT Plans

The Design-Builder shall use the strategies in the TMP to develop detailed MOT Plans that provide for all construction stages and phasing, and that 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 WTEM.

Where mainline MOT Plans are developed with the intent of operating without flaggers or spotters, the Plans shall include a note stating, "NO FLAGGERS OR SPOTTERS." In such cases, flaggers or spotters will not be allowed except when no other means of traffic control is feasible, 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 shall 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 except those used in emergency situations. 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.

The MOT Plans shall include, at a minimum, the following items:

- Complete plan sheets and details–including station limits and callouts for temporary striping, signing and other traffic control devices–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, modified 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 showing the location of each sign in relation to the roadway and other traffic control devices. All temporary sign structures for each stage of construction shall be shown.
- Provisions for using temporary barriers and attenuators, including lateral displacement distance behind barrier, to satisfy clear zone requirements and protect the traveling public and the Design-Builder's personnel.
- Temporary lighting, signalization and ITS details including PCMS and Active Traffic Management (ATM) messages. The Design-Builder shall comply with additional requirements in Sections 2.16 (Illumination and Roadway Electrical Systems), 2.17 (Electrical Bridge and Services) and 2.18.
- Layouts showing the locations of ground-mounted and overhead signs, special sign details, clear zones, and structural and foundation requirements. The Design-Builder shall comply with additional requirements in Section 2.19 (Signing).
- Drawings showing how to fabricate any sign not detailed in the WSDOT *Sign Fabrication Manual* (Appendix D26). The drawings shall show dimensions of all legend elements and text alphabet; and heights for lettering, head size, length and type for traffic sign arrows, foreground and background colors, and border size and radii information.
- Methods for covering, partially covering or modifying signs when they are not applicable to the current phase of construction.
- Striping, crosswalks, intersection details and traffic delineators.
- Type and location of all pavement markings to be installed, removed or renewed for each stage of construction, and locations of the final pavement markings.
- Typical roadway 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 to which the section applies, and cross-sections that cover the entire length of the segment shall be included.
- Typical sections shall identify direction of travel, lane widths, lane type (general purpose, shoulder or HOV) and number of lanes.

- Access and control of bicyclists and pedestrians, including persons with disabilities in accordance with the Americans with Disabilities Act of 1990 (ADA), through the traffic control zones.
- Detail modifications that address wintertime conditions or periods of suspended Work.
- A switching procedure for each control stage change. 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.
- Locations and number of uniformed police officers.

The MOT Plans shall be completed with all necessary details in accordance with the requirements in Section 2.28 (Quality Management Plan). The Design-Builder shall use typical traffic control configurations such as those found in the FHWA MUTCD and the WSDOT *Work Zone Traffic Control Guidelines* (Appendix D27) to assist in developing the MOT Plans. The Design-Builder shall use only site-specific MOT Plans that have been Released For Construction. Typical plans are not acceptable unless incorporated as details into the MOT Plans.

The Design-Builder shall prepare an individual justification report for each of the following traffic closure requests:

- Full freeway closure;
- Reduction in lane storage at traffic signals and ramp meters; and
- Ramp, lane and local road closures that are outside of the allowances in this section.

Allowed full freeway closure justification reports shall include the following information:

- A thorough description of the Work to be completed during the full freeway closure;
- Traffic operations analysis (including traffic demand, traffic delay and traffic backup estimates) for the proposed detour routes and for the SR 520 corridor; and
- Impact mitigation plan that includes, but is not limited to, a Contingency Plan, Special Communication outreach and PCMS messaging as required both within the SR 520 corridor and along the full length of proposed detour routes.

Justification reports for full freeway, ramp, lane and local road closures that are outside of what this section allows, and any reduction in lane storage at traffic signals and ramp meters, shall include the following information:

- A thorough explanation of the need and reason the work cannot be done during the allowed closure times.
- Traffic operations analysis (including traffic demand, traffic delay and traffic backup estimates) for the proposed detour routes, and all affected lanes, ramps and local roads within the SR 520 corridor (and adjacent I-405 corridor when applicable).

- Impact mitigation plan that includes, but is not limited to, a Contingency Plan, Special Communication outreach and PCMS messaging as required both within the SR 520 corridor and along the full length of proposed detour routes.

The Design-Builder shall submit the report to WSDOT along with the proposed MOT plans for review, comment and approval. Full freeway closure justification reports shall be provided to WSDOT at least 42 Calendar Days before the scheduled closure date.

#### 2.22.4.1.3 Design Vehicle

The mainline design vehicle shall be a WB-67. An Articulated Bus (A-BUS) shall be used for the freeway flyer stop ramps.

The Design-Builder shall evaluate traffic patterns and vehicle classifications to determine the appropriate design vehicle for each traffic control plan. Provisions for oversized vehicles shall be coordinated with WSDOT and local jurisdictions when the MOT plans require detours or limited vertical clearance.

#### 2.22.4.1.4 Allowable Closures

This section details the allowable closure times for shoulders, lanes, ramps, freeway and local roads for the Project. No closures shall occur outside the times specified within this section unless WSDOT approves them in writing in advance. The Design-Builder shall notify the public in advance of closures, in accordance with Section 2.9.

WSDOT will only allow temporary lane closures or restrictions, including setup and removal of traffic control devices, during the hours specified in this section.

Work that restricts or interferes with traffic will not be allowed from 12 p.m. on the day preceding a holiday or holiday weekend through 12 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 are considered holidays. When any of these holidays fall on a Sunday, the following Monday is considered a holiday. When any of these holidays fall on a Saturday, the preceding Friday is considered a holiday.

Lane, ramp and freeway closures are not allowed two hours prior to, during, and two hours after the events listed below. The events are broken up into three tiers.

Tier 1 Events – No lane, ramp or full freeway closures are allowed.

Tier 2 Events – No full freeway closures are allowed. The Design-Builder shall obtain WSDOT approval for lane or ramp closures during these events.

Tier 3 Events –The Design-Builder shall obtain WSDOT approval for lane, ramp or full freeway closures during these events.

**Tier 1 Events**

- The first two weeks that SR 520 begins tolling. Tolling is currently scheduled to begin March 19, 2011, but is subject to change.
- One full weekend in March or April of 2011 for the I-405 NE 8th St to SR 520 Braided Ramps Interchange Improvements project.
- One full weekend in the summer of 2011 for the I-5 Lynnwood Braided Ramps Project.

- Scheduled closures of the I-90 floating bridge.
- Safeco Field, QWEST Field and Husky Stadium events with projected attendance over 25,000, including all Seattle Seahawks and University of Washington home football games and all Seattle Sounders FC home soccer matches.
- Graduation ceremonies at Key Arena, Safeco Field, QWEST Field, Alaska Airlines Arena at Hec Edmundson Pavilion and Husky Stadium.
- Northwest Folklife Festival (May).
- Opening day of boating season (May).
- University District Street Fair (May).
- Beat the Bridge (May).
- Seafair Rock 'n' Roll Marathon (June).
- Bite of Seattle (July).
- Bellevue Arts Museum Artsfair/Bellevue 6th Street Fair/Bellevue Festival of the Arts (July).
- Seafair Torchlight Run & Parade (July).
- Seafair Hydroplane Race Weekend from 12 p.m. Friday to 8 p.m. Sunday (August).
- Blue Angels air show and practice sessions (August).
- Bumbershoot (September).

**Tier 2 Events**

- Seattle LiveStrong Challenge (June).
- Seafair Triathlon (July).
- Seattle Danskin Women's Triathlon (August).
- Seattle Escape from the Rock Triathlon (September).
- TREK Women's Triathlon (September).
- Seattle Marathon (November).

**Tier 3 Events**

- Seattle Center events (single event or combination of events) with projected combined attendance over 8,000.
- Northwest Flower and Garden Show (February).
- Northwest Women's Show (March).
- Capitol Hill Block Party (July).

Exceptions to the allowable 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 its Work activities with other local events in the area to eliminate impact.

WSDOT reserves the right to 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, in accordance with Section 1-08.9 of the General Provisions.

When the HOV lane is the only open lane, it shall be signed for general purpose use.

The Design-Builder shall coordinate its Work activities with WSDOT maintenance so the Work does not interfere with the monthly maintenance bridge openings that typically occur on the second Thursday of each month. Openings are intermittent between the hours of 1:00 a.m. and 5:00 a.m. WSDOT activities will have precedence over the Design-Builder's construction activities and the Design-Builder shall maintain WSDOT access to and from the bridge during the monthly maintenance bridge openings.

The AET system vendor will be responsible for closures related to the AET system work as identified in Section 2.23 (All Electronic Tolling Infrastructure). The Design-Builder shall coordinate its construction activities that require closures with WSDOT and the AET system vendor so Work can be completed concurrently, when feasible, to minimize the number and duration of closures.

#### 2.22.4.1.4.1 Allowable Lane Closures

The Design-Builder shall, at a minimum, maintain the existing roadway configuration at all times outside of the allowable closures described in this section, unless otherwise permitted. The tables below list allowable lane closure times.

| **Allowable Lane Closure Times<br>Eastbound SR 520 (2-Lane Section)** | | | | |
|---|---|---|---|---|
| | **Sun Night to Mon Morning<br>Mon Night to Tue Morning<br>Tues Night to Wed Morning<br>Wed Night to Thurs Morning<br>Thurs Night to Fri Morning** | | **Sat Night to Sun Morning** | |
| **Closures** | **From** | **To** | **From** | **To** |
| 1 GP lane closed | 11:00 p.m. | 5:00 a.m. | 12:01 a.m. | 9:00 a.m. |

Note: Roadway configuration is 2 General-Purpose (GP) lanes.

| Allowable Lane Closure Times<br>Eastbound SR 520 (3-Lane Section) | | | | |
|---|---|---|---|---|
| | Sun Night to Mon Morning<br>Mon Night to Tue Morning<br>Tues Night to Wed Morning<br>Wed Night to Thurs Morning<br>Thurs Night to Fri Morning | | Sat Night to Sun Morning | |
| **Closures** | **From** | **To** | **From** | **To** |
| HOV lane closed | 9:00 p.m. | 5:00 a.m. | 9:00 p.m. | 10:00 a.m. |
| HOV & 1 adjacent GP lane closed | 10:00 p.m. | 5:00 a.m. | 11:00 p.m. | 9:00 a.m. |
| 1 GP lane closed | 9:00 p.m. | 5:00 a.m. | 10:00 p.m. | 10:00 a.m. |
| 2 GP lanes closed * | 11:00 p.m. | 5:00 a.m. | 12:01 a.m. | 9:00 a.m. |

Notes: Roadway configuration is 2 General-Purpose (GP) lanes + 1 HOV lane.
* HOV lane shall be open to all traffic during this closure.
Combining closures in this table will not be allowed.

| Allowable Lane Closure Times<br>Westbound SR 520 - (2-Lane Section) | | | | |
|---|---|---|---|---|
| | Sun Night to Mon Morning<br>Mon Night to Tue Morning<br>Tues Night to Wed Morning<br>Wed Night to Thurs Morning<br>Thurs Night to Fri Morning | | Sat Night to Sun Morning | |
| **Closures** | **From** | **To** | **From** | **To** |
| 1 GP lane closed | 11:00 p.m. | 5:00 a.m. | 12:01 a.m. | 9:00 a.m. |

Note: Roadway configuration is 2 General-Purpose (GP) lanes.

| Allowable Lane Closure Times<br>Westbound SR 520 (3-Lane Section) | | | | |
|---|---|---|---|---|
| | Sun Night to Mon Morning<br>Mon Night to Tue Morning<br>Tues Night to Wed Morning<br>Wed Night to Thurs Morning<br>Thurs Night to Fri Morning | | Sat Night to Sun Morning | |
| **Closures** | **From** | **To** | **From** | **To** |
| HOV lane closed | 9:00 p.m. | 5:00 a.m. | 8:00 p.m. | 10:00 a.m. |
| HOV & 1 adjacent GP lane closed | 11:00 p.m. | 5:00 a.m. | 12:01 a.m. | 8:00 a.m. |
| 1 GP lane closed * | 9:00 p.m. | 5:00 a.m. | 8:00 p.m. | 10:00 a.m. |
| 2 GP lanes closed * | 11:00 p.m. | 5:00 a.m. | 12:01 a.m. | 8:00 a.m. |

Notes: Roadway configuration is 2 General-Purpose (GP) lanes + 1 HOV lane.
Combining closures in this table will not be allowed.
* HOV lane shall be open to all traffic during this closure.

#### 2.22.4.1.4.2 Allowable Ramp Closures

Ramp closures will not be allowed other than the 84th Avenue NE ramps during the full SR 520 mainline closures.

#### 2.22.4.1.4.3 SR 520 Allowable Full Closures

The Design-Builder will be allowed to fully close mainline SR 520 in accordance with this section if the Design-Builder provides written notification to WSDOT, WSDOT has granted prior approval of the MOT details (including detour routing) and the Design-Builder satisfies the ramp access requirements. A full closure is defined as the closure of all lanes in one direction on mainline SR 520.

Full closures will be allowed, but not required, for only the following construction activities:

- The traffic shift to the new floating bridge, which includes the demolition of traffic barrier, pavement overlay, and pavement marking removal and installation on the WCB.
- Roadway grade adjustments between the floating bridge east abutment and the east end of the Project limits, which includes the demolition/excavation of the existing pavement, regrading, paving and pavement marking installation.

The Design-Builder shall, at a minimum, maintain the existing roadway configuration at all times outside of the allowable closures described in this section, unless otherwise permitted.

WSDOT will allow a maximum of six weekend full closures (one direction) from 11:00 p.m. Friday to 5:00 a.m. Monday for the duration of the Project. In addition to weekend full closures, WSDOT will allow the Design-Builder a maximum of four nighttime full closures for the duration of the Project.

For weekend and nighttime full closures, closing all mainline SR 520 lanes in one direction shall count as one of the Design-Builder's maximum allowable closures.

Closing all mainline SR 520 lanes in both directions concurrently shall count as two of the Design-Builder's maximum allowable closures.

The annual SR 520 floating bridge inspection/maintenance closure does not count against the maximum allowable full closures. The Design-Builder shall coordinate with Northwest Region Bridge Maintenance regarding the construction activities that will take place on the annual bridge inspection/maintenance weekends. WSDOT activities will have precedence over the Design-Builder's construction activities, and the Design-Builder shall maintain WSDOT access to and from the bridge during the annual bridge inspection/maintenance weekends.

Full closures implemented by the AET system vendor do not count against the maximum allowable full closures. The Design-Builder shall coordinate with WSDOT and the AET system vendor regarding any construction activities that will take place during the full closures.

**Allowable SR 520 Full Nighttime Closure Times**

| | Sunday to Thursday (Nights Only) | | Saturday Night to Sunday Morning | |
|---|---|---|---|---|
| **Closure** | **From** | **To** | **From** | **To** |
| Eastbound only, westbound only, or both directions | 11:00 p.m. | 5:00 a.m. | 11:00 p.m. | 6:00 a.m. |

Note: No full closures allowed on Friday nights.

The Design-Builder shall provide written notification to WSDOT at least 42 Calendar Days in advance of a full freeway closure. The notification shall include the date and time of the closure, the Work activity necessitating the closure, traffic control plans, detour plans and a Contingency Plan. WSDOT will return for correction any schedule that does not conform to the Contract Time limits, is incomplete, unintelligible, or includes inaccurate information. WSDOT will promptly notify the Design-Builder of any disapproved closures or any closure that will require coordination with other parties as a condition of approval. WSDOT will not approve requests for full freeway closures made less than 30 Calendar Days in advance.

The Design-Builder shall confirm all scheduled full freeway closures with WSDOT at least 7 Calendar Days before the scheduled closure date, and shall cancel all unconfirmed ramp closures. WSDOT will approve closures by 4:00 p.m. the following business day.

The Design-Builder shall provide detour routes for all roadway closures. WSDOT and the impacted local jurisdictions must approve detours a minimum of 21 Calendar Days before the closure. All detours, including all signing, must be in place before closing the freeway.

The Design-Builder shall coordinate full freeway closures with adjoining projects to avoid conflicting Work activities, including ramp or roadway closures that provide conflicting or overlapping detours.

The Design-Builder shall complete all Work within the specified closure times before opening the freeway to traffic.

Advance notification, public notification and signing requirements shall be performed in accordance with this section and Section 2.9.

The Design-Builder shall provide WSDOT with a Contingency Plan for reopening closed roadways to public traffic in the event of an equipment breakdown, shortage of materials, lack of materials production or other production failure; or when the closure must be reopened for public traffic use. The submission of a Contingency Plan and WSDOT's acceptance of it shall not relieve the Design-Builder from the liquidated damages as specified in this section and Section 1-08.9 of the General Provisions.

#### 2.22.4.1.4.4 Rolling Slowdown Closures

WSDOT will only allow rolling slowdowns from 11:59 p.m. to 4:00 a.m. Sunday through Thursday nights. No rolling slowdowns are allowed on Friday nights. The closure shall last 15 minutes or less.

#### 2.22.4.1.4.5 Allowable Freeway In-Line Transit Stop Closures

The Design-Builder will be allowed to close all transit operations at the Evergreen Point Road freeway in-line transit stop during the allowable weekend and nighttime full closures of the mainline SR 520 lanes. In addition, the Design-Builder may close the transit operations at the Evergreen Point Road freeway in-line transit stop for a maximum duration of 14 Calendar Days to facilitate the traffic shift from the old floating bridge to the new floating bridge. The Design-Builder shall maintain transit egress and ingress and full functionality of the Evergreen Point Road transit facility at all other times. The Design-Builder shall be responsible for obtaining approval from WSDOT, King County Metro and Sound Transit for all in-line transit stop closures. The Design-Builder shall provide to WSDOT a written in-line transit stop closure schedule at least 90 Calendar Days prior to a closure. At no time shall more than one of the two in-line transit stops (Evergreen Point Road and 92nd Avenue NE), per direction, be closed concurrently. The Design-Builder shall provide to WSDOT a written in-line transit stop closure schedule at least 90 Calendar Days prior to a closure. At no time shall more than one of the three in-line transit stops (Montlake Boulevard, Evergreen Point Road and 92nd Avenue NE) in each direction be closed concurrently.

#### 2.22.4.1.4.6 Allowable Local Road Lane Closures

Local road closures will not be allowed.

### 2.22.4.1.5 Traffic Operations Analysis

The Design-Builder shall perform traffic operational analysis, as required, to comply with the closure justification report requirements in this section. The Design-Builder shall be responsible for any additional cost and schedule impacts resulting from a proposed change.

The traffic operations analysis shall include the morning and evening peak hour periods, and/or the peak hours within impact periods. The Design-Builder shall analyze the following traffic performance parameters:

- Speed;
- Volume throughput;
- Density;
- LOS; and
- Queue distances.

The Design-Builder shall contact Bonnie Nau for freeway and ramp traffic volume data collected by the WSDOT ITS traffic data accumulation systems.

Bonnie Nau
WSDOT Construction Traffic Coordination Office (CTCO)
15700 Dayton Avenue N
Seattle, WA 98133-9710
Phone: (206) 440-4471

If needed, the Design-Builder shall be responsible for collecting current freeway and ramp traffic volumes that are not available via WSDOT ITS traffic data accumulation systems. Historic traffic counts shall not be used.

The Design-Builder shall submit the following traffic operations analysis supporting documents to WSDOT:

- Design drawings showing the Design-Builder's proposed detour, if applicable;
- Traffic counts collected by the Design-Builder, if any;
- Traffic analysis input files (electronic), if applicable;
- Traffic analysis output files for all random seed runs (electronic) , if applicable; and
- Traffic analysis summary, if applicable.

The Design-Builder must receive concurrence or direction from WSDOT prior to implementing the proposed closure or reduction in lane storage at traffic signals and ramp meters in the closure justification report.

### 2.22.4.2 TRAFFIC OPERATIONS DURING CONSTRUCTION

The Design-Builder shall contact WSDOT-Northwest Region Seattle Radio at (206) 440-4490 before implementing the traffic control plan to set up and remove lane, ramp and roadway closures.

The Design-Builder shall use protective vehicles with warning beacons and Truck-Mounted Attenuators (TMA) to protect Work zones on roadways, including shoulder closures, with a posted speed limit equal to or greater than 45 mph.

#### 2.22.4.2.1 SR 520 Mainline During Construction

The Design-Builder shall determine the adequacy of existing shoulder pavement on the SR 520 mainline for sustained traffic operations. Shoulder pavement shall meet the temporary pavement requirements in Section 2.7 (Pavement) for the temporary use of portions of the existing shoulders as travel lanes.

There may be existing facilities in the existing shoulder that are not adequate for sustained traffic operations. These may include, but are not limited to, drainage structures, junction boxes, cable vaults and pull boxes.

Before shifting traffic onto an existing shoulder, the Design-Builder shall inspect all existing facilities within the shoulder that may be subjected to sustained traffic, and remediate any facilities that would not adequately support sustained traffic. Sustained traffic is defined as any traffic that is more than occasional traffic. Any damaged existing facilities in the shoulder shall be replaced at the Design-Builder's expense.

Mainline and HOV lane widths shall measure a minimum of 11 feet wide and maximum of 13 feet wide. The minimum shy distance to barriers shall be two feet. Wider shoulders may be required to accommodate the necessary sight distance.

When shoulders are less than five feet wide, signs shall be barrier-mounted or placed behind the barrier at an elevated height to ensure visibility. Tripod-mounted signs are allowed in shoulders between five and 10 feet wide.

When shoulders are more 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 eight-foot right shoulder/distress lane when feasible.

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.

The Design-Builder shall not split or separate the mainline general purpose lanes and the HOV lane in the same direction of travel.

#### 2.22.4.2.1.1 Design Criteria

The design speed for temporary conditions shall not be less than 60 mph. All mainline shifting tapers and lane closure tapers shall use a minimum taper rate of 60:1 in accordance with Chapter 1210.07 of the WSDOT *Design Manual* (Appendix D3) and a 60 mph design speed.

#### 2.22.4.2.1.2 Temporary Lane Closures

The Design-Builder shall provide written notification to WSDOT and the local jurisdictions a minimum of 7 Calendar Days prior to any closures. Each lane closure shall feature one 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 included in the Released For Construction Documents, shall be included in the Proposal Price. The Design-Builder shall provide law enforcement for full freeway closures and rolling slowdowns.

#### 2.22.4.2.1.4 Sequential Arrow Displays

Each vehicle used to place, maintain or remove components of a traffic control system on multi-lane 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 that are not involved in placing, maintaining or removing components while operating within a stationary-type lane closure shall display only the four-corner flash caution mode. The vehicle operator 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 two G24-501 (modified) signs displaying the Project hotline phone number within the Project limits. The Design-Builder shall comply with the telephone hotline requirements in Section 2.9. The signs shall be located in both the eastbound and westbound directions of SR 520, one sign per direction. The signs shall be installed prior to any other construction activity on the Project, and within 30 Calendar Days of the Contract execution date. The signs shall remain in place until Physical Completion. The Design-Builder may need to coordinate with adjacent projects regarding placement of the signs.

The Design-Builder shall install two Project Identification Signs in accordance with this section and Section 2.9. WSDOT will supply the signs, which shall be located in both the eastbound and westbound directions of SR 520, one sign per direction. The Design-Builder shall be responsible for coordinating, transporting and installing the signs, including supplying the posts and placards displaying the Project cost and Design-Builder name. The placard for the Design-Builder's name shall be a separate sign, mounted just below the Project Identification Sign. The Design-Builder shall install the signs in accordance with the Project Construction Site Identification Signage Detail (Appendix Y5).

All of these signs shall be located a minimum of 500 feet away from any guide signs or motorist information signs.

The Design-Builder shall obtain the sign at the address below. The Design-Builder shall coordinate the receipt of the Project Identification Signs by contacting:

Greg Alseth – Highway Maintenance Specialist 3
WSDOT Traffic Maintenance
6431 Corson Avenue South
Seattle, WA 98108-3445
Phone: (206) 768-5883

The Design-Builder shall be responsible for relocating advance signing if necessary.

#### 2.22.4.2.1.6 Active Traffic Management (ATM) System

The Design-Builder shall use the existing ATM signs (LCS, SDMS and VMS) to provide motorists with advance notice of lane closures and other construction-related information. The Design-Builder shall coordinate with the TMC within 3 Calendar Days of planned closures and provide timely, accurate updates of traffic and construction information.

### 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 where they must merge or diverge from mainline lanes. Exit speeds shall be posted on all ramps. On ramps where the

design speed during construction has been 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. The Design-Builder must maintain adequate storage for queuing and throughput volumes at traffic signals and ramp meters. Ramp meters may not operate with two vehicles per green indication.

Lanes shall measure a minimum of 12 feet wide on entrance and exit ramps. The Design-Builder shall provide paved shoulders a minimum of two feet wide on both sides of each ramp. Ramp widths wider 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. All exit ramp tapers shall use a desirable taper rate of 20:1 and a minimum taper rate of 15:1.

#### 2.22.4.2.2.2 Notice of Closures

Advance notification, public notification and signing requirements shall be in accordance with this section and Section 2.9.

#### 2.22.4.2.2.3 Specific Ramp Requirements

WSDOT will only allow the ramp closures specified in these Technical Requirements.

### 2.22.4.2.3 Local Roads During Construction

All MOT Plans affecting local roads including, but not limited to, SR 520 entrance and exit ramp closures, shall follow the requirements of each local jurisdiction affected. The Design-Builder shall be responsible for submitting plans and obtaining approvals from the local jurisdictions for each planned closure. The local jurisdiction approvals shall include allowable lane closure hours on local roads. The Design-Builder shall coordinate with the local jurisdictions regarding concurrent construction work along cross streets that may be affected by traffictraffic control for the Project.

WSDOT will only allow local road closures specified in these Technical Requirements.

#### 2.22.4.2.3.1 Design Criteria

The design speed of all local roads during construction shall equal the existing posted speed limit. Any required reduction from the existing posted speed limit shall be identified in the TMP and approved by the local jurisdiction.

The Design-Builder shall maintain the existing number of through lanes at all times except as approved by WSDOT and the local jurisdictions. All lanes for local roads shall be a minimum of 11 feet wide, measured to the front of the gutter, unless the existing lane width is less than 11 feet. If this is the case, the lane shall not measure less than the existing width.

#### 2.22.4.2.3.2 Detours

All detours, including all signing, shall be in place prior to closure of any road. Detours using local roads shall follow traffic control permit requirements for each local jurisdiction impacted. The Design-Builder shall acquire all detour agreements with the affected local jurisdictions.

The Design-Builder shall identify all bus routes the detour may affect, including school bus routes, and shall coordinate with the appropriate bus agency regarding schedule impacts and bus stop locations.

#### 2.22.4.2.3.3 Limited Construction Access

The Design-Builder shall not use local roads to access Work that can be accessed within the WSDOT Right-of-Way. When Work requires the use of trucks on local roads, the Design-Builder shall follow local jurisdiction codes that regulate the kinds and classes of traffic on certain streets.

### 2.22.4.2.4 Temporary Mainline Crossovers

Temporary mainline crossovers will not be allowed. A temporary mainline crossover is defined as the equivalent to the FHWA MUTCD "Median Crossover on a Freeway," MUTCD Figure 6H-39 (Typical Application 39).

### 2.22.4.2.5 Temporary Guardrail, Barrier and 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; and
- Driving off slopes steeper than 3H:1V.

#### 2.22.4.2.5.2 Barrier

Opposing traffic lanes of mainline SR 520 shall be separated by permanent concrete barrier or Temporary Concrete Barrier (TCB) in accordance with WSDOT design requirements.

The Design-Builder shall anchor TCB placed along the edge of a bridge structure in accordance with WSDOT Standard Plans (Appendix D17).

To prevent traffic from hitting the end of TCB, the Design-Builder shall not place the end within the clear zone of approaching traffic unless an appropriate attenuator is used.

The Design-Builder shall provide a lateral displacement distance behind all barriers (including TCB) equal to or greater than the longitudinal barrier deflection shown in Exhibit 1610-2 of the WSDOT *Design Manual* (Appendix D3). The lateral displacement area shall be kept clear of fixed objects and shall not be used as a Work area.

### 2.22.4.2.6 Pedestrian Access During Construction

All existing, temporary and new pedestrian routes and access points within the Project limits; including paths, sidewalks, crosswalks and at all intersections; shall remain open and clear at all times. The Design-Builder's MOT plans shall comply with the FHWA MUTCD, ADA requirements and this section. The WSDOT Engineer shall review MOT plans detailing a required alternative accessible pedestrian route prior to implementation. Occupational safety regulations that apply to the Project limits shall also be considered the minimum standard for personal safety to pedestrians. If the Design-Builder shall perform Work over any pedestrian and bicycle routes, it shall

provide temporary lighted covered walkways to protect pedestrians and bicyclists from overhead hazards.

The Design-Builder shall maintain the width of the existing pedestrian facility if possible. When it is not possible to maintain a minimum width of 60 inches throughout the entire length of the pedestrian route, the Design-Builder shall provide a minimum width of 48 inches with 60-inch by 60-inch passing zones spaced at maximum intervals of 200 feet to allow wheelchair users to pass.

The Design-Builder shall use protective barricades, fencing, and bridges, together with warning and guidance devices and signs, to ensure the pedestrian passageway is safe, well-defined and accessible. Whenever pedestrian walkways span excavations, they shall feature 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. The Design-Builder shall provide ramps with a maximum slope of 8.3 percent at the entrance and exit of all raised footbridges. The maximum cross slope shall be 2.0 percent. When the existing facility is illuminated or Traffic Control Plans require illumination, the Design-Builder shall provide illumination during the hours of darkness. Retroreflective delineation, with or without illumination, shall also be provided during hours of darkness.

Where the Design-Builder closes accessible pedestrian routes during construction, it shall provide an alternate accessible pedestrian route that complies with the FHWA MUTCD, ADA requirements, Section 2.8 and these Technical Requirements. The alternate accessible pedestrian route shall be provided on the same side of the street as the disrupted route when possible. The Design-Builder shall provide a smooth, continuous hard surface 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 may cause tripping or inhibit wheelchair use. Vertical elevation differences between ¼ inch and ½ inch shall be beveled at a maximum 2:1 slope.

The Design-Builder shall ensure that pedestrians who have visual disabilities can detect barriers and channelizing devices. When channelization is used to delineate a pedestrian route, a continuous detectable edging shall be provided throughout the length of the facility so that pedestrians using a cane can follow it. Edging shall protrude at least six inches above the surface of the sidewalk or pathway, with the bottom of the edging a maximum of 2.5 inches above the surface.

Signs and other devices mounted lower than 84 inches above the temporary pedestrian route shall not project more than four inches into the pedestrian route.

Where it is necessary to divert pedestrians into the roadway, the Design-Builder shall provide barricading or channelizing devices to separate the pedestrian route from the adjacent vehicular traffic lane. The devices used to separate pedestrian and vehicular traffic shall be crashworthy and, when struck by vehicles, minimize the threat to pedestrians, workers and occupants of impacting vehicles. Pedestrians shall not be diverted into a portion of the street used concurrently by moving vehicular traffic.

The Design-Builder shall not park motor vehicles or construction equipment on a pedestrian sidewalk or path, or use a pedestrian sidewalk or path for loading operations or material stockpiling. The Design-Builder also shall not allow demolished or spoil materials to be deposited on the surface of a pedestrian sidewalk or path. Any surface of a pedestrian sidewalk or path affected by the Work shall be restored to its pre-construction condition, or better, prior to re-opening to pedestrian traffic. The trail

surface shall be swept or washed free of debris including, but not limited to, mud, gravel, grease and excavated, spoiled or stockpiled materials.

The Design-Builder may only close pedestrian and bicycle routes during full closures of the adjacent roadways, and it shall implement a pedestrian access plan after providing a minimum of 14 Calendar Days advance notice to pedestrians. The Design-Builder shall notify the Cascade Bicycle Club 7 Calendar Days prior to closing bicycle trails. A pedestrian access plan shall not require pedestrians to walk or bike more than ¼-mile longer than the pre-construction distance. Advance notice shall consist of signs located at the construction limits and all accesses serving the affected area, in addition to public notification in accordance with Section 2.9.

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.

The Design-Builder shall include all access closures and pedestrian access plans in the MOT Plans. All detours and Work Sites shall be signed in accordance with the FHWA MUTCD, ADA requirements, the WSDOT *Work Zone Traffic Control Guidelines* (Appendix D27) and these Technical Requirements. Refer to Toolkit 11 in thePedestrian Facilities Guidebook (Appendix D30) and Chapter 1510 of the WSDOT *Design Manual* (Appendix D3) for further pedestrian considerations in Work zones.

### 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 only enter highways through legal movements from existing roads, streets and other access points specifically permitted by the Contract or from WSDOT-approved breaks in limited access.

In order to minimize traffic disruption, 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, streets, sidewalks, walkways and all traveled ways within the Project limits, keeping them open and in good, clean and safe condition for vehicular and non-vehicular traffic at all times. Deficiencies caused by the Design-Builder's operations shall be repaired at the Design-Builder's expense.

The Design-Builder shall maintain existing permanent signing. Sign repairs will be performed at the Design-Builder's expense. White on blue Motorist Information Signing shall be maintained in size and location. Signs that must be relocated shall not be down for more than 24 hours. Refer to Section 2.29 (Maintenance During Construction) for addition maintenance requirements.

To protect the rights of abutting and nearby property owners, the Design-Builder shall perform the following:

- Conduct the construction to cause the least inconvenience possible to abutting and nearby property owners.
- Maintain ready access to driveways, houses, buildings and businesses within the Project limits.
- Provide temporary approaches to crossing or intersecting roads, and keep these approaches in operable condition and safe for use by all traffic.
- Provide an alternative access before closing an existing one 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 that is safe for use by all traffic.
- Before performing additional grading Work within the same area, place enough fill at all culverts and bridges to permit traffic to cross.
- 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 in order to minimize any drop-offs (abrupt changes in roadway elevation) left exposed to traffic during non-working hours. Grinding will not be allowed after the final paving lift is completed. 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 with a downward change in elevation of up to 0.20 feet relative to the direction of traffic may remain exposed with appropriate warning signs alerting motorists of the condition.

2) All drop-offs with an upward change in elevation relative to the direction of traffic shall require a wedge of compacted stable material as indicated in 4a below.

3) WSDOT will not allow drop-offs more than 0.20 feet that are in the traveled way or auxiliary lane unless protected with appropriate warning signs and further protected as indicated in 4b or 4c below.

4) Drop-offs more than 0.20 feet, but no more than 0.50 feet, that are not within the traveled way or auxiliary lanes 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 three 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 of, and throughout, the drop-off treatment.

(c) TCB or other approved barrier installed on the traffic side of the drop-off, with two feet between the drop-off and the back of the barrier, and a new edge of pavement stripe a minimum of two feet from the face of the barrier. An approved terminal, flare or impact attenuator shall be placed at the beginning of the section. For night use, the barrier shall feature standard delineation such as paint, reflective tape, lane markers or warning lights.

5) Drop-offs more than 0.50 feet that are not within the traveled way or auxiliary lane shall be protected with appropriate warning signs and further protected as indicated in 4a, 4b or 4c above, if all of the following conditions are met:

(a) The drop-off is less than two feet;

(b) The total length throughout the Project is less than one 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; and

(e) The drop-off is only on one side of the roadway.

6) Drop-offs more than 0.50 feet that are not within the traveled way or auxiliary lane, and are not otherwise accounted for by item 5 above, shall be protected with appropriate warning signs, and further protected as indicated in 4a or 4c above.

7) WSDOT will not allow saw cuts or open trenches across mainline or ramps under any circumstances.

### 2.22.4.3.2 Construction Over Traffic

The Design-Builder shall not work over live traffic at any time, unless the live traffic is protected from falling objects. Working over traffic includes, but is not limited to, Work performed from a bucket or boom truck. No part of a bucket or boom truck shall encroach into a travel lane open to traffic.

#### 2.22.4.3.2.1 Work Zone Clear Zone (WZCZ)

The Work Zone Clear Zone (WZCZ) applies during both working and non-working hours. During non-working hours, the Design-Builder shall not leave equipment or materials within the WZCZ unless it is protected by permanent guardrail or TCB.

During working hours, only materials absolutely necessary for construction will be allowed within the WZCZ unless it is protected as described above, and only vehicles absolutely necessary for construction will be permitted 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 will 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 pre-existing 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 will not be allowed, unless a plan for protecting the traveling public from falling debris is approved by the Engineer of Record. This protection shall remain in place during construction, and shall meet minimum vertical clearance for the highway.

#### 2.22.4.3.2.2 Controlled Access

The Design-Builder shall obtain WSDOT approval for any special access, egress (including leaving the roadway shoulder to enter the Work area) or breaks in limited access, other than normal legal movements. The Design-Builder will be allowed short-duration shoulder stops (up to a maximum of 10 minutes) in the Work area using light vehicles properly equipped with amber warning lights for activities, such as field survey or inventory Work, but not for any construction activities.

All ingress and egress to the Work area shall be shown on site-specific MOT Plans and shall be designed in accordance with this section and Section 2.11 (Roadway Design). 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. Personal employee vehicles will not be allowed to depart or enter a Work area directly from the mainline.

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 the mainline or ramp in order to enter the Work area, or to accelerate from the Work area in order 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.

Access to the Work area from outside of the Right-of-Way requires FHWA approval. The Design-Builder shall obtain FHWA approval through WSDOT for any necessary breaks in limited access.

For an approved break in limited access, the Design-Builder shall use flaggers to prohibit unauthorized use during working hours, and physical means such as barriers or locked gates during non-working hours.

The access location shall not adversely affect wetlands or other sensitive areas. The Design-Builder shall effectively control airborne particulates created as a result of using the access. The Design-Builder shall maintain the continuity of the existing drainage system throughout the access site.

Upon Completion of the Project, the Design-Builder shall restore the access site area to its original, pre-Project condition. Any damage to the traveled way, shoulders, auxiliary lanes, side slopes or other areas caused by the access shall be repaired. The Design-Builder is responsible for performing all Work required to comply with this provision. This includes building and maintaining the access site, providing erosion control, controlling airborne particulates, ensuring that drainage continues throughout the site, providing traffic control, removing the temporary access and restoring the surrounding area. The Design-Builder shall include all related costs in the Proposal Price.

#### 2.22.4.3.2.3 Work During Hours of Darkness

The Design-Builder shall comply with the local jurisdiction noise ordinances, and shall obtain any required noise variance or exemptions for Work outside the allowable times.

The Design-Builder shall, at no additional cost to WSDOT, make all arrangements for operating during hours of darkness. Flagger station illumination shall meet the requirements of the FHWA MUTCD. The Design-Builder shall provide portable lighting equipment capable of sufficiently illuminating a flagger station without creating glare for oncoming motorists. The lighting equipment shall be located on the same side of the roadway as the flagger and aimed either parallel or perpendicular to the traveled lanes to minimize glare. The lighting devices shall be located five to 10 feet from the edge of the travel lane with a mounting height of 15 to 25 feet above the ground. The flagger shall be visible and discernable as a flagger from a distance of 1,000 feet.

Additional requirements are located in Section 1-07 of the General Provisions.

#### 2.22.4.3.2.4 Signs and Traffic Control Devices

The Design-Builder shall install all signs and traffic control devices for lane, ramp and roadway closures only during the hours specified in this section. If signs are installed earlier than the specified hours of closure, they shall be turned or covered so they are not visible to motorists.

#### 2.22.4.3.2.5 Advance Notification

The Design-Builder shall submit MOT Plans for lane and sidewalk closure requests in advance of the proposed closure and in writing to WSDOT, in accordance with Section 2.9 and these Technical Requirements.

#### 2.22.4.3.2.6 Hour Adjustment

If WSDOT determines that the permitted closure hours for any lane, ramp or roadway temporary closure adversely affect traffic, including, but not limited to: developing queues that impact regional interchanges, cause significant delay at intersections, or adversely impact local arterial/residential streets or emergency services, WSDOT may adjust the closure hours and/or work with the Design-Builder to revise MOT Plans and associated communications accordingly. WSDOT will notify the Design-Builder in writing of any change in the closure hours.

#### 2.22.4.3.2.7 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 before 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. 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 before scheduled closures. The Design-Builder shall provide written copies of these notifications to WSDOT. Additional requirements are located in Section 2.9.

### 2.22.4.3.3 Construction and Maintenance of Detours

The following is a list of items the Design-Builder shall build, maintain in a safe condition, keep open to traffic and remove when no longer needed:

- Detours and detour bridges that will accommodate traffic diverted from the roadway or bridge during construction; and
- 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 the requirements in Section 2.7.

Detours, whether placed by the Design-Builder or by another project or entity, shall not extend into a detour already in place.

If the Design-Builder fails 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. The Design-Builder shall provide the required labor, equipment and materials except when WSDOT will provide them in accordance with these Technical Requirements.

The Design-Builder shall be responsible for all MOT related to the Work, starting at 12:01 a.m. on the day following NTP 1. The traffic control devices 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.

#### 2.22.4.4.2 Materials

All materials shall meet the requirements of Section 9-35 of the WSDOT Standard Specifications (Appendix D18).

#### 2.22.4.4.3 Description

The Design-Builder shall provide flaggers, spotters and all other personnel required for traffic control activities that the Contract does not specify will be 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 that the Contract does not specify will be 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 from injury or damage resulting from the Design-Builder's operations occurring on or adjacent to highways, roads or streets. No Work shall be performed on or adjacent to the roadway until all necessary signs and traffic control devices are in place.

The traffic control resources and activities described in this section shall be used to facilitate the movement of the traveling public, and for the safety of the Design-Builder's employees, WSDOT personnel and the public. The Design-Builder may use traffic control resources and activities for separating or merging public and construction traffic when such use is in accordance with the approved MOT Plans.

If the Design-Builder fails to immediately provide flaggers; or to erect, maintain, and remove signs; or to provide, erect, maintain and remove other traffic control devices upon WSDOT's request, WSDOT may, without further notice to the Design-Builder or the Surety, instruct a traffic control company to respond to 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, signs and other traffic control devices, and for performing traffic control procedures, that protect the Work and the public at all times whether or not the labor, devices or procedures have been ordered, provided 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 traffic disruption as possible. Traffic control devices shall be removed by picking them up in a reverse sequence of 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, law enforcement personnel may enter the Work area at the sole discretion of WSDOT 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 requires an agreement and, if appropriate, a cost adjustment. Nothing in the Contract is intended to create an entitlement for 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 signing (existing and temporary) daily, noting damaged signs, misplaced signs, vandalized signs and graffiti that affects legibility. 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 and the procedures shall address rectifying incorrect or misleading signing that may present a hazard to road users.

Surface flushing on local streets is not allowed when water or shot blasting is used for sign cleaning. The Design-Builder shall inspect and replace damaged temporary erosion and sediment control immediately following sign cleaning.

The Design-Builder shall ensure there are no signs that conflict or mislead due to adjacent projects. The Design-Builder shall coordinate with adjacent projects and relocate signs as required to avoid conflicting information. Temporary pavement markings shall be installed in accordance with Sections 8-23 and 9-34 of the WSDOT Standard Specifications (Appendix D18).

The Design-Builder shall use the Raised Pavement Marker (RPM) substitution patterns in Plan M-20.50-01 in the WSDOT Standard Plans (Appendix D17), temporary removable preformed tape or other AASHTO-approved items for temporary pavement marking configurations. Temporary pavement markings shall be identified in the MOT Plans and in the TMP.

If the Design-Builder uses paint or temporary removable preformed tape for temporary markings that will remain in place for 48 hours or longer, it shall supplement the markings with Type 2 RPMs installed at 40-foot spacing. The Design-Builder shall comply with Plan M-20.50-01 in the WSDOT Standard Plans (Appendix D17) for striping configurations lasting more than 30 Calendar Days.

Use of a grinder to remove painted markings will not be allowed. For removal of plastic markings, grinding will be allowed down to the pavement surface, then water blasting or shot blasting will be required to remove the remainder of the marking.

The Design-Builder shall place temporary pavement markings on the final pavement surface only in the final marking configuration.

The Design-Builder shall inspect all pavement markings daily. The Design-Builder shall provide a schedule for replacing damaged pavement markings and establish minimum replacement time frames based on the degree of degradation. If missing or damaged pavement markings present a hazardous condition, WSDOT may require the Design-Builder to close lanes or replace the pavement markings within 24 hours.

The Design-Builder shall clean or replace all pavement markings when they become damaged or lose reflectivity.

The Design-Builder shall clean or replace temporary pavement markings whenever the reflectance of the markings has deteriorated to 80 percent or less of the value specified

for the material when new. The Design-Builder shall perform the required tests monthly at one-mile intervals or at specific locations requested by WSDOT.

As each segment is completed, the Design-Builder shall install the final signing and pavement markings required to safely open the road to traffic. This Work shall be completed on or before the date of opening. Overhead signs, except for "Exit Only" guide signs and all HOV exit signing, may be temporarily ground-mounted at the Design-Builder's expense.

The Design-Builder shall possess adequate spare sections of temporary barrier and the necessary equipment on site to repair or replace it within four hours of identifying or receiving notice of damaged barrier. This requirement includes replacement of impact attenuators. The Design-Builder shall set up temporary traffic control immediately upon notice of damage to ensure vehicle safety.

#### 2.22.4.4.5 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.

Lighting design criteria for ramps is based on the merge and diverge locations; therefore, shifting gore points impact the effectiveness of existing lighting. The Design-Builder shall evaluate the lighting levels of the existing illumination in relation to the temporary configuration to determine if the existing illumination provides the required levels. If the required illumination levels are not satisfied, the Design-Builder shall provide temporary illumination satisfying the "Construction Lanes and Detours" light level and uniformity ratios in accordance with Exhibit 1040-25 in the WSDOT *Design Manual* (Appendix D3).

Where temporary illumination is required, the existing illumination system shall not be removed until the temporary system is operational. The Design-Builder shall only remove lighting equipment no longer needed for illumination of the roadway.

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 and new lighting is not in operation.

The Design-Builder shall provide temporary lighting for all intersections where traffic control devices are in place. The temporary lighting shall satisfy whichever is greater: the "Construction Lanes and Detours" ratios or the specific intersection light level and uniformity ratios.

Temporary lighting is required when an obstruction (such as a new bridge or lid) is placed over an area requiring illumination, and shall be installed prior to placing the obstruction.

The Design-Builder shall provide temporary lighting satisfying the "Construction Lanes and Detours" light level and uniformity ratio requirements of the WSDOT *Design Manual* (Appendix D3) for temporary channelization or traffic control.

Flood lights or portable light stands shall not be used for temporary roadway lighting.

The Design-Builder shall provide, at a minimum, temporary illumination satisfying the Required Illumination described in the WSDOT *Design Manual* (Appendix D3).

Temporary illumination shall be in place and operational prior to implementing the MOT Plans that require it.

Temporary lighting outside of the WSDOT limited access Right-of-Way shall be designed and constructed in accordance with local jurisdiction standards. If the local jurisdictions do not have lighting design standards, WSDOT standards and the requirements within this section shall govern.

#### 2.22.4.4.5.1 General

The Design-Builder shall perform the following, at a minimum:

- 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; and
- 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 Exhibit 1040-25 of the WSDOT *Design Manual* (Appendix D3) for "Construction Lanes and Detours."

#### 2.22.4.4.5.2 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 located outside of the clear zone or protected by barrier.

#### 2.22.4.4.5.3 Electrical Service

Electrical service shall comply with Section 2.16.

### 2.22.4.4.6 Temporary ITS

The Design-Builder shall conduct all Work necessary to meet the requirements for temporary ITS in accordance with this section and Section 2.18. The Design-Builder shall maintain electrical power and TMC communications to all ITS devices during construction of the Project. Typical construction requires ITS equipment to be temporarily relocated.

#### 2.22.4.4.6.1 General

The Design-Builder shall maintain the following, at a minimum:

- All ITS field devices/systems such as ramp meter, data collection, ATM, permanent traffic recorder (PTR) and CCTV.
- Fiber optic data and video communication systems.
- Twisted Wire Pair (TWP) data communication systems.

- Existing tolling system and toll signing.

If continuous operation of the existing ITS cannot be maintained during construction, the Design-Builder shall provide temporary ITS to maintain continuous operations. Liquidated damages will be assessed for failure to maintain continuous operation of the existing ITS and tolling system during construction, in accordance with Section 1-08.9 of the General Provisions.

#### 2.22.4.4.6.2 Communication Systems

If any existing communication system will be taken offline for longer than the allowable working hours, a temporary communication system shall be installed. The Design-Builder shall only use fiber communications for tolling and ITS, and shall use copper TWP communications for all voice circuits. Wireless communications will not be allowed.

#### 2.22.4.4.6.3 Ramp Meters

If an existing ramp meter is taken offline during normal operating hours, as defined by WSDOT, the Design-Builder shall install a fully functional temporary ramp meter system using induction loops in accordance with Section 2.18. Non-intrusive vehicle detection shall not be used for ramp meter operations.

#### 2.22.4.4.6.4 CCTV Traffic Surveillance Cameras

If an existing traffic surveillance camera is taken offline for longer than the allowable working hours, the Design-Builder shall install a temporary camera in accordance with Section 2.18. Temporary cameras shall be fully compatible with the existing system and shall have the same functionality and coverage as the camera it is replacing.

#### 2.22.4.4.6.5 Active Traffic Management (ATM) System

The existing ATM system and associated data stations and cameras shall remain operational at all times except during the allowable working hours.

At no time shall the LCS be more than one foot off-centered from the center of the travel lane to the center of the sign. The Design-Builder shall be responsible for maintaining the LCS alignment over all travel lanes. If a lane is added, the Design-Builder shall install an LCS centered over the added lane prior to the lane being opened to traffic.

During construction, the Design-Builder shall maintain at least one ATM site per direction between the floating bridge east abutment and 84th Avenue NE, and all ATM sites, installed by the Design-Builder, on the new floating bridge and transition spans when open to traffic. An ATM site during construction shall consist of LCS centered over each lane and, at a minimum, one SDMS or VMS. If the Design-Builder installs a temporary ATM system, the temporary ATM system shall be fully compatible with the existing ATM system.

The Design-Builder shall install all equipment in accordance with the requirements in Section 2.18 for fully functional ATM systems.

The Design-Builder shall provide vehicle detection between each set of two successive ATM sites. Ideally, detection locations will be situated halfway between each two successive ATM sites, but at a minimum, each detection location shall be 1000 feet away from the ATM sites. 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 all equipment in accordance with the requirements in Section 2.18 for fully functional data station systems.

The Design-Builder shall provide enough CCTV traffic surveillance systems to attain complete coverage of every ATM sign face. The cameras shall be located less than 2000 feet from the signs and located within each sign's cone of vision so that each sign's message is completely legible by the TMC operators. The Design-Builder shall install all equipment in accordance with the requirements in Section 2.18 for fully functional CCTV traffic surveillance systems.

#### 2.22.4.4.6.6 Electrical Service

Electrical service shall comply with Section 2.16.

### 2.22.4.4.7 Temporary Tolling

The Design-Builder shall comply with Section 2.23 (All Electronic Tolling Infrastructure) for tolling operations during construction.

### 2.22.4.4.8 Existing Floating Bridge Power, Communication and Fire Suppression Water Systems

The Design-Builder shall coordinate with the TMC and the NWR Bridge Maintenance Office to provide timely written notifications regarding planned closures of existing floating bridge power and communication systems. The Bridge Maintenance Office contact information is listed below:

**NWR Bridge Maintenance**
10833 Northup Way NE
Bellevue, WA 98004
Phone: (425) 739-3700

Unplanned incidents that disrupt existing floating bridge power and communication systems shall be reported immediately to the TMC listed below:

**Traffic Management Center**
15700 Dayton Avenue North
Seattle, WA 98133-9710
Phone: (206) 440-4490

## 2.22.4.5 Traffic Control Personnel

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 Project activities shall assume the responsibilities for traffic control management. The supervisors shall have at least five years of practical MOT experience with the design and/or implementation of traffic control on highway construction projects. The Design-Builder shall provide WSDOT with an electronic 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 case that person cannot 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
(800) 521-0778 or (206) 382-4090

American Traffic Safety Services Association
15 Riverside Parkway
Suite 100
Fredericksburg, Virginia 22406
(800) 272-8772 or (540) 368-1701

The TCS must possess a current flagging card. A traffic control management assignment and a TCS designation are required in order to work on the Project.

The Design-Builder shall provide all personnel required for flagging, spotting and executing all procedures related to temporary traffic control. The Design-Builder shall also provide 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 worn 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. The personnel are also responsible for having the latest adopted edition of the FHWA MUTCD, the *Washington State Modifications* to the MUTCD (Appendix D25), 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 with appropriate police departments, fire control agencies, city or county engineering departments, medical emergency agencies, school districts and transit companies.
- Overseeing all requirements of the Project that contribute to the convenience, safety and orderly movement of vehicular and pedestrian traffic.
- Reviewing the TCS' diaries daily and retaining awareness 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 unless otherwise authorized by WSDOT.

The TCS shall personally perform all of the role's required duties. During non-working hours, the TCS shall be present at the Project within 45 minutes after notification by WSDOT.

The TCS' 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 FHWA MUTCD and the *Washington State Modifications* to the MUTCD (Appendix D25); the ATSSA *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 as infrequently as 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 using DOT Forms 421-040A and 421-040B (Appendix F17) on each day that traffic control is performed, and submitting the forms 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:

- Time of day when signs and traffic control devices are installed and removed;
- Location and condition of signs and traffic control devices;
- Revisions to the MOT Plans;
- Lighting used at night;
- Observations of traffic conditions; and
- Identification of MOT and Traffic Control Plans in use, and locations on the Project where Plans are used.

- 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, to gain a complete understanding of the Project and what constitutes effective performance.
- Ensuring that all required traffic control devices and equipment are available and in good working condition before they must be installed or used.

If 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 its 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; shall supervise and verify all changes in the MOT setup; and shall 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 provide alternate traffic arrangements. The TCS shall have the resources, ability and authority to expeditiously correct any deficiencies in the traffic control system or demobilize any construction operation that is causing excessive traffic delays 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 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 includes signalized intersections, the TCS shall conduct the inspection before each morning peak traffic period and include each signal cycle. At least two of the daily inspections per week shall be performed at night so 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 inspection results shall be documented in a daily report that, at a minimum, lists the time frame of the inspection and the defects noted. The report shall also document any maintenance or corrective action ordered as a result of the inspection, and the names and positions 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 and spotters shall possess a current flagging card issued by the State of Washington, Oregon, Montana or Idaho. The flagging card shall be immediately available to show to WSDOT upon request.

Flagging stations shall be shown on the 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 from the flagging station to a safer location. During hours of darkness, flagging stations shall be illuminated so that flaggers can be easily seen but the traveling public does not experience glare. Flaggers shall be equipped with portable two-way radios that have a range suitable for the Project. The radios shall be capable of direct contact with Project management (e.g., foremen and superintendents).

The Design-Builder shall provide the standard Stop/Slow paddles for all flagging operations. All new paddles purchased for the Project shall conform to the specifications described in Section 9-35 of the WSDOT Standard Specifications (Appendix D18), which requires 24-inch paddles.

Spotting stations shall be shown on the MOT Plans at locations where a spotter can detect errant drivers or other hazards in order to 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 flaggers and spotters, the Design-Builder shall provide personnel for all other traffic control procedures required by the construction operations. It shall also provide 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 and immediately after each injury-causing accident and each shift in MOT setup. The videos shall be maintained in a remote, fireproof location, and a log of the videos including dates and

times shall be provided to WSDOT on a monthly basis. WSDOT will have the right to review the videos at any time with 24 hours notice to the Design-Builder.

## 2.22.4.7 TRAFFIC CONTROL PROCEDURES

### 2.22.4.7.1 One-Way Traffic Control

The Design-Builder shall provide one-way traffic control on a portion of the roadway if shown on the approved MOT Plans or directed by WSDOT. If this is the case, the operation shall be confined to one half of the roadway, permitting traffic on the other half, and it shall also conform to the following requirements:

- Side roads and approaches shall be closed or controlled by a flagger or appropriate approved signing. A side road flagger shall coordinate with end flaggers where there is line of sight, and with the pilot car where the end flaggers cannot be seen.
- Queues of vehicles shall be allowed to take turns passing through the Work zone in the single open lane. Design-Builder vehicles shall follow the same rules and routes required of public traffic when using the open traffic lane.

The Design-Builder shall, at the end of each Calendar Day, leave the Work area in a condition that can be traveled without damage to the Work, without danger to traffic and without one-way traffic control. If, in WSDOT's opinion, one-way traffic control cannot be eliminated after working hours, then the operation shall be continued throughout the non-working hours.

### 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 multi-lane roadway as part of an approved Traffic Control Plan. Rolling slowdowns on SR 520 will only be permitted between 11:59 p.m. and 4:00 a.m. for girder setting, and between 2:00 a.m. and 4:00 a.m. for all other items, Sunday through Thursday.

Where included in the approved MOT Plans, a rolling slowdown shall be accomplished using one traffic control vehicle with flashing amber lights for each lane to be slowed down, plus one control vehicle to serve as a chase vehicle for traffic ahead of the blockade. 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.

The Design-Builder shall provide and pay for a minimum of two Washington State Patrol officers per direction for mainline rolling slowdowns.

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 at which 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 vehicle shall follow the slowest vehicle ahead of the blockade. When the chase vehicle passes the Work area, the

Design-Builder may begin the Work operation. If 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 re-opened 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 blockade speed to accommodate the closure time needed.

If more than one rolling slowdown occurs during the same time 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 multi-lane facility. The Design-Builder shall adhere to the following lane closure 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; and
- Once the lane is closed, the TMA/arrow board combination may be replaced with an arrow board without attenuator.

If the Design-Builder closes additional lanes, it 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 their 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 the following:

- Resetting mislocated devices;
- Assuring visibility of all devices;
- Cleaning and repairing devices 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 the TCS 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 display messages to drivers. Proper use of these devices to send correct messages to drivers establishes Work zone credibility. Poor Work zone credibility has a direct, negative impact on Work zone safety by causing driver confusion, frustration and disrespect, which results in an increased potential for accidents.

#### 2.22.4.8.1 Construction Signs

The Design-Builder shall provide all construction signs required by the approved MOT Plans, as well as any other appropriate signs directed by WSDOT. The Design-Builder shall provide the posts or supports, and shall erect and maintain the signs in a clean, neat and presentable condition until they are no longer required. Post-mounted signs shall be installed in accordance with the WSDOT Standard Plans (Appendix D17). Sign attachment to posts shall conform to the applicable detail shown in the WSDOT 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.

Where no-passing zones on the existing roadway are marked with paint striping, and where the striping will likely be destroyed by construction operations, the Design-Builder shall replace the striping with “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 removal or Physical Completion.

Where the Project includes striping by the Design-Builder, the signs and posts shall be removed by the Design-Builder where the no-passing zones are re-established by striping. The signs and posts shall become the property of the Design-Builder. Where the Design-Builder is not responsible for striping, and 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.

Signs 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 when signs are not needed. These include existing signs, new permanent signs installed as part of the Work and construction signs installed as part of the Work.

Construction signs are divided into two classes: Class A and Class B. Class A construction signs are those 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 signs. Sign

and support installation for Class A signs shall be in accordance with the Contract or the WSDOT Standard Plans (Appendix D17).

Class A construction signs mounted behind traffic barrels shall be mounted a minimum of five feet above the ground (as measured from the ground to the bottom of the sign).

Class B construction signs are those that are placed and removed daily, or used for short durations which may extend for one or more days. They are mounted on portable or temporary mountings.

Where weight must be added to signs for stability, the Design-Builder shall follow the manufacturer's recommendations for sign ballasting.

The Design-Builder shall replace signs, posts or supports that are lost, stolen, damaged, destroyed or deemed unacceptable by WSDOT while used on the Project.

#### 2.22.4.8.2 Sequential Arrow Signs

Sequential arrow signs shall be shown on the MOT Plans as either standalone units without a TMA, or as units with a TMA. When required, and as shown on the MOT Plans, the Design-Builder shall provide, operate and maintain the sequential arrow signs.

#### 2.22.4.8.3 Portable Changeable Message Signs (PCMS)

Where shown on the approved MOT Plans or requested by WSDOT, the Design-Builder shall provide, operate and maintain PCMS.

The Design-Builder shall provide a minimum of four 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 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 they are no longer functioning as designed.

Where weight must be added 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 requested by WSDOT, the Design-Builder shall furnish, install and maintain traffic safety drums.

Used traffic safety drums may be utilized provided they all feature essentially the same configuration and are 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.

The Design-Builder shall regularly maintain traffic safety drums to ensure they are clean and that the drum and reflective material are in good condition. When 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 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 Plans or requested by WSDOT, the Design-Builder shall furnish, install and maintain traffic cones.

The Design-Builder shall not use traffic cones on ramps or state highways. 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, the Design-Builder shall employ an effective method of stabilizing cones, such as stacking two together at each location.

#### 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 Attenuators (TMA)

Where shown on the approved MOT Plans or requested by WSDOT, the Design-Builder shall provide, operate and maintain TMAs. These TMAs 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 remain in the full down-and-locked position. For stationary operations, the truck's parking brake shall be set.

#### 2.22.4.8.10 Impact Attenuator Systems

Where shown on the approved MOT Plans or requested by WSDOT, the Design-Builder shall furnish, install and maintain impact attenuators. Impact attenuators shall be used to protect the ends of barrier within the clear zone. The Design-Builder shall comply with Section 8-17 of the WSDOT Standard Specifications (Appendix D18) and Chapter 1620 of the WSDOT *Design Manual* (Appendix D3) for material and construction details.

The Design-Builder shall not use the Advanced Dynamic Impact Extension Module (ADIEM) impact attenuators/end treatments for the Project.

#### 2.22.4.8.11 Temporary Concrete Barrier (TCB)

Where shown on the approved MOT Plans or requested by WSDOT, the Design-Builder shall provide and maintain TCB. All TCB installation and end treatments shall conform to the WSDOT Standard Plans (Appendix D17), Section 6-10 of the WSDOT Standard Specifications (Appendix D18) and Chapter 1610 of the WSDOT *Design Manual* (Appendix D3).

## 2.22.5 SUBMITTALS

The Design-Builder shall submit the TMP and TIMP to WSDOT for review and comment before commencing any construction activity that might impact traffic. MOT Plans for individual construction phases require a Preliminary MOT Design Submittal and a Final MOT Design Submittal before each phase of construction is approved.

### 2.22.5.1 TRANSPORTATION MANAGEMENT PLAN (TMP)

The Design-Builder shall submit 10 hard copies and one electronic copy 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. The Final TMP shall include responses to all WSDOT comments and carry the WTEM's Professional Engineering stamp. The Design-Builder shall submit 10 hard copies and one 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 commencing any construction activity that might impact traffic.

### 2.22.5.2 TRAFFIC INCIDENT MANAGEMENT PLAN (TIMP)

The Design-Builder shall submit 10 hard copies and one electronic copy 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's approval. The Final TIMP shall include responses to all WSDOT comments and carry the WTEM's Professional Engineering stamp. The Design-Builder shall submit 10 hard copies and one 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 commencing any construction activity that might 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 by WSDOT 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* (Appendix D12).

The Preliminary MOT Design Submittal shall show lane configurations, including typical cross sections, signing and Work zones. General notes showing the intent of Work shall also be included; however, it is not required that stations and offsets be identified for all elements. The Design-Builder shall submit 10 hard copies and one electronic copy of the MOT Plans to WSDOT for review. WSDOT will provide comments on the Preliminary MOT Design Submittal within 14 Calendar Days of receipt.

The Final MOT 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 10 hard copies and one

electronic copy of the MOT Plans to WSDOT for review. WSDOT will provide comments on the Final MOT Design Submittal 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 that carry 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 comment 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 four 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 14 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 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. When the analysis shows that temporary illumination is required, the Design-Builder shall submit Temporary Illumination Plans as part of the MOT Plans package for the phase in which the illumination will be required.

### 2.22.5.5 TEMPORARY ITS PLANS

Temporary ITS Plans shall be submitted to WSDOT for approval prior to commencing construction of the temporary ITS. Temporary ITS Plans shall be submitted as part of the MOT Plans packages for the phase in which the temporary ITS will be required.

### 2.22.5.6 OTHER SUBMITTAL REQUIREMENTS

The Design-Builder shall deliver to WSDOT a list of all parties invited to participate in the MOT Task Force, including 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.

One electronic copy and one paper copy of the daily traffic control diaries shall be submitted to WSDOT on a monthly basis. Upon Completion of the Project, the diaries shall be delivered to WSDOT, at which time they will become WSDOT property.

End of Section

# 2.23 ALL ELECTRONIC TOLLING INFRASTRUCTURE

## 2.23.1 GENERAL

An All Electronic Tolling (AET) system is proposed for implementation in the Spring of 2011. That system shall remain fully operational until the new AET system is operational. The Design-Builder shall maintain electrical power and fiber optic communications to the existing AET system, located at the east end of the existing floating bridge, at all times until the new AET system is fully operational unless otherwise specified in these Technical Requirements.

The Design-Builder shall conduct all Work necessary to install the toll infrastructure for the new AET system including toll structures, electrical power, fiber communications, roadside toll cabinets, maintenance access, junction boxes and conduits in accordance with these Technical Requirements. All footings and foundations for the toll infrastructure will be the responsibility of the Design-Builder. The purchase and installation of the new AET system including antennas, readers, vehicle separators, cameras and dynamic message signs will be WSDOT's responsibility. WSDOT has selected an AET system vendor, which will be responsible for the installation and testing of the new AET system. The Design-Builder shall coordinate with WSDOT and the AET system vendor throughout the Project. The new AET system shall require 120 Calendar Days for installation and testing by WSDOT. During this time, the AET must continue operating on the existing system. Under no circumstances shall the tolling operations be disrupted by any Design-Builder's construction activities without pre-approval by WSDOT in accordance with this section.

Due to construction phasing and required AET installation and testing, the Design-Builder shall install temporary AET facilities prior to the transition to the permanent AET facilities. The Design-Builder shall determine the location of the temporary AET facilities and shall furnish and install all required temporary AET infrastructures. The Design-Builder shall conduct this work and coordinate with the tolling vendor such that the tolling system shall remain operational at all times during the life of the Project. The Design-Builder shall provide a smooth transition from the existing AET facility to the temporary facility, and eventually to the permanent facility without any AET system downtime. This approach shall be clearly detailed in the Design-Builder's schedule and in the Toll Transition Plan in accordance with this section.

The Design-Builder shall maintain continuous functioning of the AET electrical and network communications provided by the Design-Builder, ensure that no lane shift or other contract activities disrupt the operation of the AET equipment, and shall support continuous WSDOT operations of the AET as a whole regardless of whether the system operates at the existing, temporary or permanent facility. The Design-Builder shall be fully responsible for reimbursing the State for the loss of tolls whenever the tolls cannot be collected due to the Design-Builder's construction activities as determined by WSDOT in accordance with Section 1-08.9(3) of the General Provisions.

In addition to the design, furnishing and installation of the new tolling infrastructure, the Design-Builder shall remove the tolling infrastructure at the existing tolling facility and any temporary tolling facilities in accordance with this section.

In addition, the Design-Builder shall coordinate with WSDOT for the following work elements to be performed by WSDOT:

- AET equipment installation and testing performed by WSDOT at the permanent and any temporary tolling facilities, including lane and roadway closures; and
- Operations and Maintenance of the AET equipment at existing and permanent facilities, and at any temporary tolling facility during construction of the Project.

The Design-Builder shall provide WSDOT and its representative access to all tolling facilities during the life of the Project.

#### 2.23.1.1 COORDINATION WITH ADJOINING PROJECTS

The Design-Builder shall obtain design plans for any adjacent projects and determine the coordination requirements for continuous operations of the AET. The Design-Builder shall adjust the design and construction schedule accordingly to coordinate the installation of the required components, while continuously maintaining the AET. Projects WSDOT anticipates will be under construction at the same time as the Project are identified in Section 2.1 (General Information).

### 2.23.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Design Manual* (M22-01) (DM) (Appendix D3).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT *Traffic Manual* (M51-02) (Appendix D19).
- *Manual on Uniform Traffic Control Devices* (MUTCD) – *Washington State Modifications* (M24-01) (Appendix D25).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D9).
- WSDOT *Roadside Manual* (M25-30) (Appendix D16).
- WSDOT *Bridge Design Manual* (M23-50) (BDM) (Appendix D1).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- National Fire Protection Association (NFPA), *National Electrical Code* (NEC), 2008.

- 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 Edition with Revisions 1 and 2 Incorporated, December 2007.
- AASHTO *Roadside Design Guide*, 3rd Edition, 2002, and 2006 Chapter 6 Update.

The Design-Builder shall refer to Sections 2.16 (Illumination and Roadway Electrical Systems) and 2.18 (Intelligent Transportation Systems) for additional Mandatory Standards for electrical systems and ITS.

## 2.23.3 PERFORMANCE REQUIREMENTS

### 2.23.3.1 DESIGN-BUILDER PERSONNEL

The Design-Builder shall provide a Toll Infrastructure Design Lead Engineer with a minimum of 10 years of supervisory experience in the design and construction of highway intelligent transportation systems, fiber optic communication systems, electrical power distribution systems and other highway-related electrical and communication elements. The Toll Infrastructure Design Lead Engineer shall have at least two years of experience working in Washington State, and shall be familiar with the WSDOT Northwest Region design and construction standards. The Toll Infrastructure Design Lead Engineer shall be a Professional Engineer, licensed under Title 18 RCW, and shall be responsible for the AET infrastructure design elements of the Project.

### 2.23.3.2 WSDOT PERSONNEL

The Design-Builder shall coordinate the Work with the following WSDOT personnel:

- WSDOT Toll Engineer
- WSDOT ITS Implementation Engineer
- WSDOT Electrical Inspector

#### 2.23.3.2.1 WSDOT Toll Engineer

The WSDOT Toll Engineer will perform the following:

- Review the required AET infrastructure documentation, including specifications, shop drawings, and all measured and recorded values for the power distribution, communication systems and roadside toll cabinets.
- Coordinate with the WSDOT ITS Implementation Engineer, in accordance with Section 2.18, for reviewing and overseeing the design, installation, testing and integration of the fiber optic communication infrastructure to the roadside toll cabinets, and to the existing and new ITS communication networks for tolling-related Work.
- Coordinate with the WSDOT ITS Implementation Engineer for tolling-related Work at the communication hubs.
- Review the AET infrastructure plans, design submittals and all other required submittals.

- Review the AET infrastructure test procedures, test reports and all other test documentation; and witness all tolling infrastructure-related testing (as desired).
- Inspect the AET infrastructure components in accordance with these Technical Requirements.
- Review and approve the Design-Builder's toll disruption requests.
- Witness testing of electrical and fiber optic communication systems for the AET infrastructures.
- Review and accept the AET infrastructure components based on the submittals, test results, field inspection and other documentation packages.

#### 2.23.3.2.2 WSDOT ITS Implementation Engineer

Refer to Section 2.18 for requirements for the WSDOT ITS Implementation Engineer.

#### 2.23.3.2.3 WSDOT Electrical Inspector

Refer to Section 2.16 for requirements for the WSDOT Electrical Inspector.

### 2.23.3.3 Toll Infrastructure Design and Construction

#### 2.23.3.3.1 Progress Meetings

The Design-Builder shall work with WSDOT to establish a Toll Infrastructure Design Task Force to oversee and provide input on design and construction issues associated with the AET infrastructure. The Design-Builder shall schedule and chair biweekly Toll Infrastructure Design Task Force meetings from NTP 1 to Physical Completion, unless otherwise directed by the WSDOT Engineer. The Design-Builder shall prepare the agenda, meeting minutes, exhibits and design documents for each meeting in accordance with Section 2.1.

The Design-Builder shall foster a collaborative, cooperative design process whereby WSDOT's comments, concerns and input are acknowledged, and addressed in a timely manner as mutually agreed upon by WSDOT and the Design-Builder.

The Design-Builder shall use the biweekly Toll Infrastructure Design Task Force meetings to conduct over-the-shoulder design reviews during the course of the development of the Design Submittals, and other Project submittals as required in Section 2.28 (Quality Management Plan) and this section. The Design-Builder shall coordinate with WSDOT to schedule these over-the-shoulder review meetings, and the list of attendees shall include representatives from the following groups within WSDOT:

- SR 520 Design-Build Project Staff;
- WSDOT Toll Division;
- WSDOT Northwest Region Traffic Operations;
- WSDOT Northwest Region Traffic Design;
- WSDOT ITS Implementation Engineer;
- WSDOT Electrical Inspector(s); and

- Other representatives as requested by WSDOT.

#### 2.23.3.3.2 Timeline and Coordination for WSDOT Inspection and AET Infrastructure Turnover

Upon successful completion of the field installations and field acceptance testing of the AET infrastructures at the permanent and any temporary toll facilities, the Design-Builder shall notify WSDOT a minimum of 7 Calendar Days in advance for field inspection by the WSDOT Electrical Inspector and the WSDOT Toll Engineer. The Design-Builder shall ensure that the roadway Work is complete in the vicinity of the toll facility, and that the pavement in each toll zone is able to carry traffic prior to commencement of the WSDOT inspection. WSDOT will perform the electrical inspection of the AET infrastructure in accordance with Washington Administrative Code (WAC) Chapter 296-46B after verifying the proper operation of all components.

The Design-Builder shall allow a minimum of 14 Calendar Days for WSDOT to complete its inspection. WSDOT will notify the Design-Builder when the inspection is complete. After all issues identified during the inspection have been addressed by the Design-Builder, the toll infrastructures can be turned over to WSDOT for AET equipment installation, testing and operation.

The Design-Builder is advised that it will require 120 Calendar Days for WSDOT to complete the AET equipment installation and testing. The Design-Builder shall not perform any pavement Work, modify lane configurations, shift lanes, or shift traffic directions at any toll facility during and following the WSDOT installation and testing period. Each AET facility will become operational only after WSDOT completes all testing. The existing AET system shall remain operational while WSDOT performs installation and testing of the new AET system.

In the event that the Design-Builder shifts lanes or performs pavement work in any of the permanent or temporary AET toll zones during and following the AET equipment installation and testing period, WSDOT and the AET vendor will have to reinstall, reconfigure and retest all in-pavement and over-the-lane AET equipment to ensure that the AET system is fully functional at the affected toll zones. As a result, the AET installation and testing period shall be reset and the Design-Builder shall provide WSDOT and the AET vendor additional 120 Calendar Days for completion of the AET installation and testing at each of the affected toll zones.

During the AET equipment installation and testing, WSDOT test vehicles will need the ability to pass each toll zone in the direction of travel at speeds up to 100 mph. The Design-Builder shall provide WSDOT, the AET vendor, and WSDOT test vehicles full access to the AET infrastructure and all toll zones, and shall coordinate with WSDOT for running test vehicles in each toll zone during WSDOT lane closures.

The Design-Builder shall work closely with WSDOT to ensure continuous operations of the toll system during the life of the Project. The Design-Builder shall provide a smooth transition from the existing AET facility to the temporary facility, and eventually to the permanent facility without any AET system downtime. Loss of tolls is not allowed and the Design-Builder will be subject to liquidated damages (in accordance with Section 1-08.9 of the General Provisions) if there is any loss of tolls during the Project.

During the WSDOT installation and testing period, the Design-Builder shall work closely with the WSDOT Toll Engineer, shall provide timely support for the WSDOT work activities, and shall resolve, in a timely manner, any issues associated with the toll infrastructures provided by the Design-Builder at the permanent and any temporary

facilities. Any delays caused by the Design-Builder in response to WSDOT request may require an extension of the WSDOT installation and testing period.

The Design-Builder is notified that the temporary AET facility must be fully operational before the Design-Builder opens the new floating bridge to any traffic. The Design-Builder shall complete the temporary AET infrastructure installation such that tolls can be collected for all traffic in both directions prior to the traffic switch in accordance with the timeline required above. The Design-Builder shall not open the new floating bridge to traffic until WSDOT notifies the Design-Builder that the temporary AET facility is fully operational and collects tolls for both directions at the end of the WSDOT installation and testing period.

Upon completion of the permanent AET infrastructure installation, the Design-Builder shall notify WSDOT for WSDOT inspection no later than 90 Calendar days after Substantial Completion.

Each time after the new AET system is made operational at the new AET facility, i.e., the temporary and permanent AET facilities, the Design-Builder shall provide 21 Calendar days for WSDOT and its AET system vendor to decommission and remove the AET equipment from the old AET facility. The Design-Builder shall not remove the AET infrastructure until WSDOT notifies the Design-Builder that removal of the AET equipment is complete.

The Design-Builder shall closely coordinate with WSDOT during the above process. The Design-Builder shall incorporate the above process and timeline in the Toll Transition Plan, Baseline Contract Schedule, and Monthly Contract Schedule Updates, and shall provide them to WSDOT for review and comment.

### 2.23.3.4 AET System Working Hours and Disruptions

#### 2.23.3.4.1 Allowable Working Hours on the AET System

The Design-Builder shall coordinate with the WSDOT Toll Engineer for approval of working hours for working on the electrical and communication infrastructures that affect the AET system operations. The Design-Builder shall submit requests for toll system disruptions to WSDOT for approval a minimum of 14 Calendar Days before performing any Work on the electrical and communication infrastructures associated with the existing, temporary or permanent AET facility. WSDOT currently plans to toll all traffic across the SR 520 floating bridge in both directions from 5 a.m. to 11 p.m. every Calendar Day during the life of the Project, but this time period is subject to change. The Design-Builder shall only request disruptions to the existing, temporary or permanent AET facility outside the hours from 4 a.m. to 11 p.m.

The Design-Builder shall not work directly on any electrical or communication infrastructures that affect the AET system operations without permission from WSDOT. All Work must be performed in the presence of the WSDOT Toll Engineer and/or the WSDOT representative(s). The Design-Builder must remain on site upon completion of the Work until WSDOT confirms that the AET has resumed operations and is functioning properly.

Liquidated damages will be assessed for unplanned disruptions to the existing, temporary or permanent AET facility in accordance with Section 1-08.9 of the General Provisions.

The Design-Builder shall not perform any Work on the AET equipment. The demarcation point is the roadside toll cabinet. The communication network and power from the roadside toll cabinet to the toll devices will be the responsibility of WSDOT and the AET system vendor.

#### 2.23.3.4.2 Support for Continuous Operation of the AET System

The Design-Builder shall provide timely support for WSDOT to continuously operate the AET system as a whole during all phases of construction. During the toll collection period as designated by WSDOT, tolls for all traffic across the SR 520 floating bridge in both directions must be collected without any downtime. At any given time, the AET system must be in operation whether it is at the existing, temporary or permanent toll facility unless the disruption is planned and pre-approved by WSDOT. The existing AET facility shall not be taken out of service until the temporary AET facility is fully operational, tested and accepted by WSDOT. The temporary AET facility shall not be taken out of service until the permanent AET system is fully operational, tested and accepted by WSDOT. The transition from the existing AET system to the temporary or permanent AET system shall be clearly described in the Toll Transition Plan and updated in the Preliminary Toll Infrastructure Design Submittal in accordance with this section.

##### 2.23.3.4.2.1 Disruption and Restoration

###### *2.23.3.4.2.1.1 Planned Disruptions*

If the Work requires any disruptions including, but not limited to: the electrical or the communication network; or to the existing, temporary or permanent AET facility; the Design-Builder shall submit a Disruption Request. All planned disruptions must be approved by WSDOT prior to performing the Work.

Disruption Requests will be considered for the following:

- During an interim system cut-over from the existing AET facility to a temporary facility;
- During the final cut-over from the temporary AET facility to the permanent AET facility; and
- Any necessary toll system disruptions due to any ITS Work on the fiber optic communication network that affects the AET system operations.

The Design-Builder shall request disruptions only within the allowable working hours. The Design-Builder shall restore the disrupted system within the approved hours. The Design-Builder shall remain on site until WSDOT notifies the Design-Builder that the disrupted systems are fully operational. Any unapproved disruptions or failure to restore disrupted systems within the approved working hours will constitute an unplanned disruption as detailed below.

###### *2.23.3.4.2.1.2 Disruption Request*

The Design-Builder shall submit a written Disruption Request to WSDOT for review and comment at least 14 Calendar Days before planned disruptions of the AET.

The Design-Builder shall submit a separate, sequentially numbered Disruption Request for each planned disruption. If the Disruption Request impacts both the ITS and AET, only one request shall be submitted. Each Disruption Request shall include the system and location affected, the disruption start date and time, and the estimated duration. The planned disruption shall only be scheduled during allowable working hours. WSDOT will

approve or reject the Disruption Request in writing at least 7 Calendar Days before the proposed start of the disruption. WSDOT may recommend an alternate time or duration agreeable to both the Design-Builder and WSDOT.

#### *2.23.3.4.2.1.3 Unplanned Disruptions*

Any unplanned disruptions determined by WSDOT 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. Any failure to restore disrupted systems within the approved working hours in accordance with a WSDOT approved Disruption Request also constitutes an unplanned disruption.

In the case of an unplanned disruption and subsequent notification by the WSDOT Engineer, the Design-Builder shall immediately stop all other Work in progress and shall expend all of its efforts to restore the disrupted system or correct the problem causing the disruption. The Design-Builder will not be granted an extension of time for delays caused by repairing disrupted systems.

Unplanned disruptions that cause the loss of tolls as determined by WSDOT shall result in the assessment of liquidated damages in accordance with Section 1-08.9 of the General Provisions.

## 2.23.3.5 TESTING OF NEW AET INFRASTRUCTURE

All new AET infrastructures shall undergo all required testing in accordance with the Mandatory Standards and these Technical Requirements. The testing shall include, but is not limited to, the following:

- Factory acceptance testing by the Design-Builder;
- Shop testing of roadside toll cabinet assemblies by WSDOT; and
- Field acceptance testing by the Design-Builder.

The Design-Builder shall submit all testing procedures, pass/fail requirements, Manufacturer's Certificate of Compliance, and equipment documentation to WSDOT for review – and shall resolve all WSDOT comments on the documentation – a minimum of 14 Calendar days prior to any testing. The Design-Builder shall submit test reports upon completion of each test in accordance with this section and Section 2.28.

WSDOT may observe any tests and will audit test results.

Refer to Section 2.25 (Control of Materials) and Section 2.28 for additional testing requirements.

### 2.23.3.5.1 Factory Acceptance Testing

The Design-Builder shall perform factory acceptance testing in accordance with Section 2.18.

### 2.23.3.5.2 WSDOT Shop Testing

Upon successful completion of the factory acceptance testing, the Design-builder shall deliver roadside toll cabinets and associated equipment to WSDOT for shop testing prior to field installations, in accordance with Section 2.18.

#### 2.23.3.5.3 Field Acceptance Testing

Upon completion of field installations, the Design-Builder shall perform field acceptance testing for the AET infrastructures at the permanent and any temporary AET facilities designed and constructed as part of the Project in accordance with the Mandatory Standards and these Technical Requirements. The Design-Builder shall ensure that the AET infrastructures are fully functional upon completion of the field installation and the field acceptance testing, and that these infrastructures fully support the AET equipment installation, testing and operations to be performed by WSDOT.

##### 2.23.3.5.3.1 Field Acceptance Testing of Electrical Infrastructure

Upon installation of all cabinets, conduits, junction boxes, conductors and electrical equipment at the permanent and any temporary AET facilities, the Design-Builder shall be responsible for conducting the field acceptance testing in accordance with the requirements in Section 2.16 and the following:

- Field inspection of all conduits, fittings and appurtenances including all empty conduits, conduit plugs, and pull ropes furnished and installed by the Design-Builder;
- Preparation of dummy loads to simulate the full loading condition required by WSDOT for operating the AET system; and
- Testing of ventilation fans, heaters and lights inside the roadside toll cabinets.

##### 2.23.3.5.3.2 Field Acceptance Testing of Fiber Optic Communication Infrastructure

Upon installation of all communication conduits, cable vaults, pull boxes, distribution and preterminated fiber optic cables, preterminated patch panels, and fiber optic splice enclosures at the permanent and any temporary AET facilities, the Design-Builder shall be responsible for conducting the field acceptance testing in accordance with the requirements for communication cables and interface equipment acceptance testing in Section 2.18.

### 2.23.3.6 MAINTENANCE OF THE AET SYSTEM

The demarcation for maintenance of the AET system infrastructure is at the roadside toll cabinets. WSDOT and its AET system vendor are responsible for the maintenance of the electrical and communication system from the roadside toll cabinet to the AET equipment. The Design-Builder is responsible for the maintenance of the electrical and fiber communication network that it installs. The Design-Builder must also maintain and protect in place the electrical and communication system that supports the existing AET system.

#### 2.23.3.6.1 WSDOT Maintenance Responsibility

During the life of the Project, WSDOT or its AET system vendor will be responsible for maintenance of all AET equipment. WSDOT or its AET system vendor is responsible for the maintenance of the existing toll facility from the roadside toll cabinets to the AET equipment. After the toll infrastructure turnover from the Design-Builder, WSDOT or its AET system vendor is responsible for the maintenance of the electrical and communications from the roadside toll cabinets to the AET equipment.

#### 2.23.3.6.2 Design-Builder Maintenance Responsibility

Upon NTP 2, the Design-Builder shall have maintenance responsibility for all electrical and communication infrastructures furnished and installed by the Design-Builder at the permanent and any temporary AET facilities until Physical Completion of the Project, at no additional cost to WSDOT.

The existing power distribution and communication infrastructures to the existing AET facility will be modified by the SR 520 Eastside Transit and HOV Project. Appendix M7 includes the allowable access and control areas for the Design-Builder and the anticipated timeline for each area that will be available for the Design-Builder. Upon notification by WSDOT, the Design-Builder shall maintain and protect the existing power distribution and communication infrastructures to the existing AET facility until decommissioning of the existing AET facility by WSDOT. The Design-Builder shall not disrupt the electrical or communication infrastructure to the existing AET facility.

Maintenance of the toll infrastructure equipment shall include the Design-Builder response to faults upon notification by WSDOT. Any fault that causes a total failure or disruption of the AET system shall be responded to by the Design-Builder immediately and shall be considered an unplanned disruption. Any loss of toll revenue shall result in liquidated damages in accordance with Section 1-08.9 of the General Provisions.

The Design-Builder shall be responsible for repairing, to WSDOT's satisfaction and at no cost to WSDOT, any damage the Design-Builder causes to the toll infrastructures during the life of the Project.

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.

All replaced equipment shall be tested in accordance with the requirements included in these Technical Requirements.

The Design-Builder shall maintain a log documenting maintenance activities and all repairs performed on the toll infrastructures. The maintenance log shall be made available to WSDOT upon request.

### 2.23.3.7 REMOVAL

#### 2.23.3.7.1 Removal of Existing AET Equipment

Upon decommission of the existing AET facility, WSDOT will remove existing AET equipment including roadside toll cabinets, roadside toll equipment and structure-mounted toll equipment.

Upon notification from WSDOT, the Design-Builder shall remove the remaining tolling infrastructures including, but not limited to: conduits, junction boxes, pull boxes, cable vaults, cabinet foundations, cables and all other equipment/materials that remain in place after the WSDOT removal in accordance with the Mandatory Standards. The tolling infrastructures removed by the Design-Builder shall become the property of the Design-Builder.

#### 2.23.3.7.2 Removal of Temporary AET Equipment

It is the Design-Builder's responsibility to supply all temporary toll infrastructures and to provide personnel to load, transport and unload the materials and infrastructure equipment to the temporary AET facility.

WSDOT will be responsible for delivery, installation and testing of new roadside and structure-mounted AET equipment prior to the AET system operations at the temporary AET facility. WSDOT will uninstall and remove the AET equipment from the temporary AET facility after the temporary AET facility is decommissioned and the permanent AET facility is fully operational.

Upon notification from WSDOT, the Design-Builder shall remove all temporary toll infrastructure materials and equipment furnished and installed by the Design-Builder. All temporary toll infrastructure materials and equipment shall become the property of the Design-Builder. Temporary materials and equipment shall not be relocated and reinstalled at the permanent AET facility.

### 2.23.3.8 WARRANTY

The Design-Builder shall provide a Warranty commencing on the day of Physical Completion and ending a minimum of one year later for all AET infrastructure equipment furnished and installed as part of this Project, including both equipment and workmanship. Before the Warranty commences, a complete Materials Certification Package shall be submitted to WSDOT for review and comment in accordance with Section 2.25.

The Warranty for the AET infrastructures shall be in accordance with Section 1-05.16 of the General Provisions.

## 2.23.4 DESIGN REQUIREMENTS

### 2.23.4.1 GENERAL

In accordance with the Mandatory Standards, the Design-Builder shall design and construct a permanent and any temporary AET infrastructures including, but not limited to, the following elements:

- Support structures and foundations for the structure-mounted toll collection equipment to be furnished and installed by WSDOT;
- Roadside transformer and toll cabinets, and foundations;
- Maintenance access to the roadside toll cabinets and structure-mounted toll equipment;
- Electrical power and fiber communication infrastructures to the roadside toll cabinets; and
- Additional conduits and junction boxes for use by WSDOT to install AET equipment.

The Design-Builder shall design and construct the electrical power distribution systems to the permanent and any temporary AET facilities in accordance with additional requirements in Section 2.16.

The Design-Builder shall design and construct the fiber communication system to the permanent and any temporary AET facilities in accordance with additional requirements in Section 2.18.

The Design-Builder shall maintain traffic at all AET facilities during the life of the Project, and shall submit toll infrastructure-related design documentation in accordance with Section 2.22 (Maintenance of Traffic) and this section.

The Design-Builder shall coordinate with the WSDOT Toll Engineer for the optimal location of the permanent and any temporary AET facilities, support structures, roadside toll cabinets and maintenance access. The Design-Builder shall prepare and submit the proposed location of the permanent and any temporary AET facilities in the Toll Transition Plan to WSDOT for review and comment.

The Design-Builder shall minimize the impact to AET when determining the location of the permanent and any temporary AET facilities. The Design-Builder shall submit the draft Transportation Management Plan (TMP) (as required in Section 2.22), construction phasing/sequencing/ staging plans, and construction schedule in association with these AET facilities as part of the Preliminary Toll Infrastructure Design Submittal to WSDOT for review and comment. The final TMP, phasing/sequencing/staging plans, and construction schedule shall be submitted as part of the Final Toll Infrastructure Design Submittal in accordance with this section.

Spare conduits for the electrical and communication systems shall be provided in accordance with the Mandatory Standards and these Technical Requirements.

Appendix I21 includes a typical toll facility layout, but does not attempt to address all requirements in the Contract. The Design-Builder shall coordinate the design with WSDOT and its AET system vendor.

### 2.23.4.2 PERMANENT AET LOCATION

The Design-Builder shall design and construct a permanent AET facility between the permanent in-line transit stops at Evergreen Point Road and the on/off-ramp gore points at 84th Ave NE in accordance with the following requirements:

- The permanent AET facility shall consist of two permanent toll zones, one in each direction;
- A toll zone is defined as a toll collection area between two toll structures;
- The upstream and downstream toll structures shall be furnished and installed with a 75- to 100-foot spacing between them, and the same spacing shall be provided for both zones;
- The toll structures for the eastbound and westbound traffic may be aligned relative to the same roadway stationing, or they may be offset to maximize the use of available space;
- Each toll zone shall capture all vehicular traffic in its direction on the SR 520 mainline, including the traffic from the on-ramp or to the off-ramp at the 84th Ave NE interchange;
- No toll zones shall be placed on the on- and off-ramps at the 84th Ave NE interchange;

- Toll zones shall not coincide with any ITS induction loops, static or ATM sign structures, luminaires, ramp meters or any other ITS devices;
- There shall be a minimum separation of 50 feet from the in-line transit stop platforms to the nearest toll structure;
- The Design-Builder shall provide maintenance vehicle access to the roadside toll cabinets and toll structures in accordance with this section;
- The Design-Builder shall provide an HOV enforcement area on the roadside or in the median within the sight distance from the toll zone; and the HOV enforcement area shall be designed and constructed in accordance with the Mandatory Standards;
- Each toll zone shall be placed on a tangent roadway segment and shall avoid lane merging/diverging and vehicle acceleration/deceleration zones wherever possible;
- The toll structures in each toll zone shall span over all lanes of traffic including transit lane(s) and both shoulders in each direction;
- The upstream toll structure in each toll zone shall provide the tangent sight distance as required by the Mandatory Standards, and a minimum of 500-foot spacing from any upstream overhead signing (including ATM signs), so that WSDOT can install a toll rate sign on the upstream toll structure in each toll zone; and
- Each toll zone shall be placed such that the roadside toll cabinets are within sight distance of their associated toll zone.

### 2.23.4.3 PERMANENT TOLL STRUCTURE

The Design-Builder shall design and construct standard WSDOT monotube structures and foundations for both toll zones at the permanent AET facility in accordance with the Mandatory Standards and the requirements in these Technical Requirements. The Design-Builder shall coordinate the design with the WSDOT Toll Engineer.

Each monotube structure shall support up to 300 pounds of structure-mounted toll collection equipment per tolled lane, plus up to 500 pounds of structure-mounted signing per tolled lane. Each monotube structure shall be designed to support a sign with the surface area up to 340 square feet, centered vertically on the monotube, at any location along the horizontal tube. The vertical clearance between the bottom of the horizontal tube of the toll structure and the pavement wearing surface shall be 25 feet. The final sign mounting location shall be agreed upon during design.

Each monotube structure shall include access hand holes within one foot of the base plate and at the top of each vertical member of the monotube structures to allow access to conduits and cables in the structure. Additional hand holes with 1.5-inch diameter threaded nipples shall be provided every five feet along the horizontal beam of the structure. All hand holes shall be designed and constructed in accordance with the Mandatory Standards.

Each monotube structure shall include internal, de-burred, and clean conduits or cable raceways. Typically one two-inch conduit shall be provided for power. The Design-Builder shall coordinate with the WSDOT Toll Engineer to determine the final quantity and size of the internal conduits and their bending requirements. The design of the

monotube structures shall accommodate the largest required conduit and cable bending requirements for installing cables inside the monotube.

The Design-Builder shall provide attachment points such as strain relief grips and J-hooks inside each vertical tube of the monotube structure that WSDOT can use to install cables vertically in the monotube. The Design-builder shall coordinate with the WSDOT Toll Engineer to determine final requirements.

The Design-Builder shall provide a minimum of two three-inch diameter openings on the vertical member of each monotube structure, five feet above the finished grade. These openings will be used as conduit entrances by WSDOT for installing toll equipment on the vertical member of the monotube structures. These openings shall face away from the traffic.

All conduits, raceways and monotube structures shall be electrically bonded together in accordance with the Mandatory Standards.

Wherever applicable, the monotube structure foundations shall be placed behind a concrete barrier, or constructed integral with the concrete barrier or retaining/noise wall such that the foundations do not encroach into the adjacent roadway shoulder.

Refer to Section 2.11 (Roadway Design) for additional requirements for concrete barrier design.

Refer to Section 2.13 (Bridges and Structures) for additional requirements for monotube structures and foundations.

#### 2.23.4.4 PERMANENT ROADSIDE TOLL CABINET

The Design-Builder shall furnish and install the following roadside equipment cabinets and foundations in accordance with the Mandatory Standards:

- A total of two Model 334 double-wide roadside toll cabinets, one for each toll zone at the permanent AET facility;
- A single-phase, 480 V to 120 V transformer and cabinet (a minimum of 25 KVA for each toll zone);
- A shared concrete foundation for any co-located equipment cabinets; and
- A concrete pad on the shared foundation (a minimum of four feet in width by 10 feet in length) that WSDOT will use for installation of an emergency back-up generator.

The Design-Builder shall co-locate all roadside cabinets for both toll zones on a shared foundation wherever possible. The Design-Builder shall furnish and install a continuous eight-foot high Type 3 chain-link fence with a lockable double gate surrounding all roadside cabinets in accordance with the Mandatory Standards. The Design-Builder shall provide a minimum of five feet of level work zone around all sides of the roadside cabinets within the fence. The double gate shall be a minimum of 14 feet wide and shall be located next to the generator pad. The Design-Builder shall refer to Section 2.15 (Landscape and Aesthetics Design) for additional requirements for the chain-link fence.

Cabinet naming shall be in accordance with the WSDOT ITS Device Naming Scheme (Appendix I10).

The Design-Builder shall furnish and install the ground-mounted Model 334 double-wide roadside toll cabinets in accordance with the following requirements:

- The double-wide cabinet shall have the characteristics of the Model 334 cabinets as specified in Chapter 12 of FHWA IP-78-16.
- The external dimensions of the double-wide cabinet shall be 67 inches high by 48.5 inches wide by 30 ¼ inches deep.
- Cabinets shall be fabricated of 0.125 inches sheet aluminum, 5052 alloy, with mill finish, in accordance with Section 9-29.13 (7)D, Item number 1 of the WSDOT Standard Specifications (Appendix D18). Painted or anodized aluminum is not allowed.
- Each door shall be attached with four hinges.
- Cabinet doors shall have a three-point latch and two-position stop assembly with a spring-loaded construction core lock capable of accepting a Best Lock Company six-pin CX series core. The Design-Builder shall supply green construction cores with two master keys and one core-removal key per cabinet. The Design-Builder shall deliver the keys to the WSDOT Toll Engineer.
- The cabinet shall be equipped with an electric strip heater and four ventilation fans. The strip heater shall be rated at 100 watts and 120 VAC, and shall be shielded in a manner that prevents damage to nearby electrical cables. The ventilation fans shall be mounted in the top of the cabinet, be equipped with a screened guard, and exhaust at least 100 CFM each. The fans and strip heater shall be controlled by a separate high-low adjustable thermostat, located next to the ventilation fans, that can be set to ensure the cabinet interior temperature remains between 60°F and 125°F.
- Four shatterproof fluorescent interior cabinet lights (two on each side of the double-wide cabinet) with self-starting ballast shall be furnished and installed. On each side of the cabinet, one fixture shall be mounted on the rear rack near the top and the second mounted at the top of the front rack. Door switches shall be provided so that any door will automatically turn on all of the light fixtures.
- Two standard 19-inch EIA racks shall be provided in each cabinet, one on the left side and the other on the right side. Both racks shall be equal height with a minimum of 32 rack units (56 inches).
- The fiber communication patch panel shall be installed in the rack. Each fiber port on the patch panel shall be permanently labeled as to which distribution fiber it connects to.
- One 0.125 inches aluminum sheet metal side panel shall be provided in the cabinet. The following equipment shall be provided and mounted on the side panel:
    - One AC terminal block for terminating the incoming 120 VAC, single phase power;
    - Neutral and ground bus bars; and
    - Surge suppresser and filter unit for noise and voltage spike protection.
- One power distribution assembly (PDA) shall be installed in the bottom portion of the rack in accordance with the camera cabinet details in the WSDOT Northwest Region ITS Details (Appendix I3). The PDA shall be readily accessible, provide dead front safety, and have all voltage points covered to

prevent inadvertent contact. All receptacles and circuit breakers shall be permanently labeled.

- All terminals and conductors within the cabinet shall be permanently labeled as to where it connects "from" and "to".

The shared foundation, interconnecting conduits between cabinets, grounding and bonding details, and cabinet internal wiring shall be in accordance with the Mandatory Standards.

The Design-Builder shall coordinate the roadside toll cabinet design with the WSDOT Toll Engineer and its AET system vendor.

### 2.23.4.5 MAINTENANCE ACCESS

The Design-Builder shall design and construct maintenance access in accordance with the Mandatory Standards so that maintenance personnel and vehicles can repair the structure-mounted AET equipment, and can access the roadside toll cabinets.

The Design-Builder shall design and construct a maintenance access road or parking area to provide safe access for maintenance vehicles to the roadside equipment cabinets. The maintenance access road or parking area shall provide the same characteristics as detailed in the WSDOT Northwest Region ITS Design Guide Supplement (Appendix I8). The Design-Builder shall coordinate with the WSDOT Toll Engineer on the ingress and egress requirements to provide the access to the roadside cabinets as well as a safe vehicle turn-around area for entering SR 520. The minimum length of the maintenance access road or parking area shall be 30 feet.

The Design-Builder shall design and construct a maintenance vehicle pullout area adjacent to the upstream monotube structure at each toll zone for WSDOT maintenance access. The maintenance vehicle pullout area shall be in accordance with the maintenance access requirements in Section 2.11. The maintenance vehicle pullout areas may be provided either in the median or from the roadside for each toll zone. The Design-Builder shall coordinate with the WSDOT Toll Engineer for optimal placement of maintenance vehicle pullout areas in relation to the monotube structures.

If the monotube structure is protected by an existing barrier, any maintenance vehicle pullout area shall be constructed such that removal of the barrier does not result in clear-zone violations. Any break in the barrier shall be retrofitted to meet all roadside safety requirements.

### 2.23.4.6 PERMANENT ELECTRICAL INFRASTRUCTURE

The Design-Builder shall design, furnish and install the power distribution system for the permanent AET facility in accordance with the Mandatory Standards and the electrical design requirements in Section 2.16. The power distribution system shall include, but not be limited to: service cabinets, branch circuits, transformers, conduits, junction boxes, cable and wiring, grounding and bonding for a fully functioning electrical system.

#### 2.23.4.6.1 Electrical Service Cabinet and Branch Circuit

The Design-Builder shall coordinate with WSDOT and the SR 520 Eastside Transit and HOV Project regarding utilization of spare branch circuits in existing electrical service cabinets installed as part of the SR 520 Eastside Transit and HOV Project.

If a new electrical service is necessary as determined by the Design-Builder, the Design-Builder shall coordinate with the power company, and furnish and install a new electrical service cabinet for the permanent AET facility in accordance with the Mandatory Standards and the requirements in Section 2.16.

### 2.23.4.7 PERMANENT COMMUNICATION INFRASTRUCTURE

The Design-Builder shall design, furnish and install fiber communication infrastructure to the permanent AET facility in accordance with the Mandatory Standards and the requirements in Section 2.18. The fiber communication infrastructure shall include ITS distribution fiber optic cables, preterminated fiber optic cables with patch panels, communication conduits, cable vaults, pull boxes, and all other necessary equipment to provide a fully-functioning communication infrastructure for the permanent AET facility. The Design-Builder must design the toll fiber optic communication infrastructure together with the ITS communication network as a whole for the entire Project.

All fiber optic cables, patch panels, pull boxes, cable vaults, conduits and splice enclosures furnished and installed by the Design-Builder shall be the same as provided for the ITS fiber optic communication system in accordance with Section 2.18.

The Design-Builder shall furnish and install a new cable vault next to the roadside equipment cabinets inside the chain link fence. The cable vault shall provide access to the ITS distribution cable. The Design-Builder shall furnish and install a new 48-strand preterminated fiber cable and two three-inch communication conduits between the cable vault and each roadside equipment cabinet. The Design-Builder shall splice the 48-strand preterminated fiber cable to the ITS distribution cable in both directions using a splice enclosure in the cable vault, and shall install the preterminated patch panel inside the roadside toll cabinet. The Design-Builder shall provide redundant fiber optic communications to both Roanoke and Northup communication hubs. The Design-Builder shall coordinate the design for fiber optic communication architecture and splicing requirements with WSDOT.

### 2.23.4.8 ADDITIONAL JUNCTION BOXES AND CONDUITS

In order to support the WSDOT installations of AET equipment and cables, the Design-Builder shall design, furnish and install empty conduits and junction boxes in addition to those required for the electrical and communication infrastructures.

At a minimum, the Design-Builder shall furnish and install the following:

- Three junction boxes (Type 8 or larger) at the base of each roadside toll cabinet;
- In each toll zone, adjacent to the outside shoulder, two junction boxes (Type 2 or larger) at the base of each monotube foundation;
- In each toll zone, two junction boxes (Type 2 or larger) between two monotube structures, one on each side of the roadway; and one three-inch interconnecting conduit connecting these two junction boxes;
- Three three-inch conduits from each roadside toll cabinet to each toll zone; and
- Interconnecting conduits between the generator pad, each roadside toll cabinet, and the transformer cabinet.

Where each conduit crosses the full mainline roadway (both directions), one additional three-inch conduit shall be provided. Intermittent junction boxes shall be provided in accordance with the Mandatory Standards.

All junction boxes shall be at-grade locking junction boxes, and shall be placed outside the traveled way. When the junction box must be placed in the paved area, heavy duty junction boxes shall be used. All junction box covers shall be grounded and permanently labeled in accordance with the Mandatory Standards.

All empty conduits shall be installed with pull ropes, conduit end fittings and conduit plugs in accordance with the Mandatory Standards.

### 2.23.4.9 TEMPORARY AET FACILITY

The Design-Builder shall design and construct a temporary AET facility and associated electrical and communication infrastructures to eliminate AET system downtime during construction of the Project, and to ensure that all traffic crossing the SR 520 floating bridge in both directions is tolled. The Design-Builder shall provide all electrical and communication infrastructures and maintenance access for the temporary facility and shall ensure a smooth transition from the existing AET facility to the temporary AET facility, and then from the temporary facility to the permanent facility. No loss of tolls shall occur during the AET system transitions. No loss of tolls shall occur during operations of the temporary AET facility. The Design-Builder shall be assessed liquidated damages for the loss of any toll revenue.

The Design-Builder shall locate the temporary AET facility between the eastern paving limits and the eastern Project limits, provided that the temporary AET facility meets all requirements for the permanent AET facility except the structural requirements and other requirements noted below:

- If the temporary AET facility is placed east of the on-/off-ramps at the 84th Ave NE, the Design-Builder shall design and construct the temporary AET facilities on the on-/off-ramps in addition to the mainline AET facility. The temporary AET facilities on the ramps must be placed such that the toll zone is outside the vehicle queue during typical peak hours.
- The Design-Builder may provide Type 1 maintenance pullout as specified in the WSDOT Northwest Region ITS Design Guide Supplement (Appendix I8) for maintenance access to the roadside toll cabinets at the temporary AET facility. However, the Design-Builder shall provide maintenance pullouts at all temporary toll zones in accordance with the maintenance access requirements in Section 2.11.
- For interim operations of the temporary AET facility, some toll equipment may be installed at separate locations from the toll structures. The Design-Builder shall coordinate with the WSDOT Toll Engineer for the optimal placement of all toll equipment. The Design-Builder shall furnish and install all necessary toll infrastructures to support all AET equipment including power, communications, cabinets, mounting structures, footings, foundations, junction boxes and conduits.

The Design-Builder shall refer to Section 2.13 for temporary toll structure requirements.

### 2.23.4.10 AET EQUIPMENT FURNISHED AND INSTALLED BY WSDOT

WSDOT or its AET system vendor will furnish and install the following AET equipment:

- All structure-mounted toll equipment including additional equipment cabinets, all over the lane toll equipment, toll rate signs and toll rate verification cameras;
- In-pavement vehicle detection and lead-in cables;
- Toll equipment housed in the roadside toll cabinets (in addition to the equipment provided by the Design-Builder as specified in this section);
- Emergency back-up generator;
- Toll rate signs and toll rate verification cameras when installed separately for the temporary AET facility; and
- All conductors, cables and wiring between the AET equipment and the roadside toll cabinets.

The Design-Builder shall provide all necessary support for WSDOT to install, test, operate and maintain the above toll equipment at the permanent and any temporary AET facilities in accordance with this section.

### 2.23.4.11 AESTHETICS

The Design-Builder shall design and construct all Work in accordance with Section 2.15.

## 2.23.5 CONSTRUCTION REQUIREMENTS

The Design-Builder shall design the AET infrastructures at the permanent and any temporary AET facilities as a whole before installation of any individual field components. The Design-Builder shall notify WSDOT a minimum of 7 Calendar Days in advance of staking locations for the toll structures and roadside toll cabinets at the permanent and any temporary AET facilities.

All roadside toll cabinets, transformer cabinets, junction boxes, pull boxes, cable vaults and chain link gate shall have a lock or locking device in accordance with the Mandatory Standards. All locks and locking devices shall be master keyed. The Design-Builder shall furnish and provide three sets of keys to WSDOT at the time of WSDOT inspection.

### 2.23.5.1 MATERIALS AND FABRICATION

The Design-Builder shall furnish all materials in accordance with Section 2.25 and the Mandatory Standards.

The Design-Builder shall use stainless steel mounting hardware such as bolts, nuts, washers and external hinges on vaults, cabinets, junction boxes and other outdoor devices. The Design-Builder shall use only components designed for 10 or more years of industrial use.

All materials, 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.

If any equipment specified in these Technical Requirements 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 that meets the same performance and material specifications as the discontinued one.

The Design-Builder shall round and smooth sharp corners and edges on all components it installs.

### 2.23.5.2 ELECTRICAL EQUIPMENT AND WIRING

The Design-Builder shall perform all electrical Work including, but not limited to, electrical services, electrical equipment, transformers, cabinets, panel boards, conductors, cables, wiring, bonding and grounding in accordance with the requirements in Section 2.16. All conductors, cables and wiring shall be color-coded in accordance with the Mandatory Standards and industry practices, and shall be permanently labeled as to where and which circuit it connects "from" and "to".

If the Design-Builder places the temporary AET facilities on the new floating bridge, the Design-Builder shall refer to Section 2.17 for additional electrical requirements.

### 2.23.5.3 UTILITY LOCATES

The Design-Builder shall perform the Work in accordance with the requirements in Section 2.16.

### 2.23.5.4 CONDUIT SYSTEM

The Design-Builder shall not reuse any existing conduits, junction boxes, pull boxes or cable vaults for installing electrical conductors or fiber optic communication cables for the toll infrastructures.

Refer to Section 2.16 for additional requirements for electrical conduits and junction boxes.

Refer to Section 2.18 for additional requirements for communication conduits, pull boxes and cable vaults.

### 2.23.5.5 COMMUNICATION CABLES AND INTERFACES

The Design-Builder shall furnish and install fiber optic cables, patch panels, splice enclosures, and all other fiber optic connection components in accordance with Section 2.18.

Upon completion of the fiber optic installation and all required testing at the permanent and any temporary facilities, the Design-Builder shall field measure and record the fiber signal loss for each ITS distribution fiber strand assigned to the AET system to the communication hubs. The recorded field measurements shall be submitted to the WSDOT Toll Engineer for review and comment prior to the WSDOT inspection.

## 2.23.6 SUBMITTALS

The Design-Builder shall provide all documents and information required for the Design Documentation Package in accordance with Sections 2.2 (Project Documentation), 2.25 and 2.28.

The Design-Builder shall submit a Toll Transition Plan to WSDOT for review and comment prior to the Preliminary Toll Infrastructure Design Submittal. The Design-

Builder shall design the AET infrastructures for the permanent and any temporary AET facilities together with the ITS communication network as a whole for the entire Project. The Design-Builder shall submit the Preliminary Toll Infrastructure Design Submittal for review and comment. The Design-Builder shall prepare the Final Toll Infrastructure Design Submittal prior to issuance of the Released For Construction Documents. The Design-Builder shall submit test plans, procedures, documentation and reports to WSDOT. The Design-Builder shall submit GPS coordinates for the toll infrastructure to WSDOT.

All submittals shall follow the requirements of the Section 2.28. The Design-Builder shall comply with Sections 2.2 and 2.28 for design submittals, test plans, reports, reviews and other administrative processes unless otherwise specified.

### 2.23.6.1 TOLL TRANSITION PLAN

As part of the required submittals, a Toll Transition Plan shall be submitted 90 days after NTP 1. The Toll Transition Plan shall include:

- Location of the permanent AET site;
- Location of the temporary AET site;
- An overall plan to provide for continuous collection of tolls on SR 520;
- The transition from the existing to the temporary AET site;
- The transition from the temporary to the permanent AET site;
- Conceptual toll signing plan in accordance with Section 2.19 (Signing), and
- Schedule.

### 2.23.6.2 PRELIMINARY TOLL INFRASTRUCTURE DESIGN SUBMITTAL

The Preliminary Toll Infrastructure Plans and the following draft documents for related Work described in these Technical Requirements shall be submitted to WSDOT for review and comment as part of the Preliminary Design Submittals described in Section 2.28:

- Fiber Optic Splicing and Testing Plan;
- Transportation Management Plan (TMP);
- Construction phasing/sequencing/staging plans;
- Construction schedule; and
- Updated Toll Transition Plan.

The Preliminary Toll Infrastructure Plans shall include, but are not limited to, the following:

- Existing ITS, electrical facilities and utilities;
- Existing toll equipment location and associated electrical and communication infrastructures;
- Locations of the proposed permanent and any temporary AET facilities;
- Proposed channelization;

- Proposed fiber optic cable/conduit routing plan;
- Proposed electrical power/conduit routing plan;
- Proposed AET structures;
- Roadside toll cabinet locations;
- Proposed maintenance access road/parking area;
- Proposed maintenance vehicle pullout;
- Preliminary toll signing plans in accordance with Section 2.19;
- Junction boxes, pull vaults and toll system conduits; and
- All identified non-standard design items, if any.

### 2.23.6.3 FINAL TOLL INFRASTRUCTURE DESIGN SUBMITTAL

The Design-Builder shall provide the Final Toll Infrastructure Design Submittal as part of the Final Design Submittals described in Section 2.28. The Final Toll Infrastructure Design Submittal shall address all comments received from the Preliminary Toll Infrastructure Design Submittal review and any issues raised during the Toll Infrastructure Design and Construction Progress Meetings.

The Final Toll Infrastructure Design Submittal shall include the Final Toll Infrastructure Plans and the following finalized documents submitted as part of the Preliminary Toll Infrastructure Design Submittal:

- Fiber Optic Splicing and Testing Plan;
- Transportation Management Plan (TMP);
- Construction phasing/sequencing/staging plans;
- Construction schedule; and
- Toll Transition Plan.

The Final Toll Infrastructure Plans shall include all of the items in the Preliminary Toll Infrastructure Design Submittal, as well as the following:

- All electrical and communication details in accordance with the Mandatory Standards;
- All cabinet, equipment and cable labels;
- Pull box, cable vault, and junction box locations and details;
- Fiber communication schematics and diagrams including a one-line fiber diagram and a network diagram;
- Fiber optic splice details;
- Power service locations;
- Service cabinet details;
- Panel board details;
- Transformer/breaker schedule;

- Power distribution schematics and one-line diagrams;
- Cabinet foundation and interconnecting conduit details;
- Details for non-standard elements, if any;
- Wire notes (including identification of new and existing conductors and cable) and construction notes;
- Calculations to support transformer sizing and over current protection devices;
- Conduit fill and junction box capacity calculations;
- Service load calculations;
- Voltage drop calculations;
- Fiber optic signal budget calculations;
- Toll structures and foundation details;
- Wind load calculations for monotube structures/foundations; and
- Roadside toll and transformer cabinet layout and wiring diagrams including end-to-end connections between provided components.

### 2.23.6.4 SHOP DRAWINGS

Shop drawings and product data shall include, but are not limited to, the following:

- Monotube toll structures and foundations;
- Roadside toll cabinets;
- Wiring diagrams;
- Service cabinets;
- Transformers and cabinets;
- Electrical panels;
- Splice enclosures;
- Conduits, fittings, pull ropes and conduit plugs;
- Concrete for foundations;
- Junction boxes, pull boxes and cable vaults;
- All fiber optic cables; and
- Wiring.

Refer to Section 2.28 for submittal and review requirements for shop drawings.

### 2.23.6.5 RELEASED FOR CONSTRUCTION DOCUMENTS

The Design-Builder shall include the following items with the Released For Construction Documents:

- All elements required for the Final Toll Infrastructure Design Submittal;
- All resolved comments from the Final Toll Infrastructure Design Submittal; and

- Additional design elements addressed.

Refer to Sections 2.2 and 2.28 for submittal and review requirements.

### 2.23.6.6 OTHER SUBMITTALS

The Design-Builder shall submit test samples and testing documentation including all test plans, procedures, test equipment documentation, and test reports to the WSDOT Toll Engineer upon completion of each test in accordance with these Technical Requirements.

The Design-Builder shall submit the following items upon Physical Completion of the Project:

- All final testing documentation including all test plans, procedures, test equipment documentation and test reports; and
- Product manuals.

The Design-Builder shall provide WSDOT with the x, y, and z GPS coordinates of the newly installed components including, but not limited to, the following elements:

- Toll structures;
- Roadside toll cabinets;
- Communication conduit systems;
- Fiber optic cable and interface systems;
- All junction boxes, pull boxes, and cable vaults; and
- Stand-alone electric service pads.

End of Section

# 2.24 RIGHT-OF-WAY (ROW)

## 2.24.1 AVAILABLE RIGHT-OF-WAY AND EASEMENT AREAS

WSDOT will acquire Right-of-Way (ROW) and easements for the Work as shown in the Conceptual Plans (Appendix M1) and the approved Right-of-Way Plans (Appendix R2).

The Design-Builder shall have access to the ROW and easements upon receipt of NTP 2, except for those parcels listed in the Right-of-Way Acquisition Schedule (Appendix R4). If the ROW and easements are not available by the date shown in the Right-of-Way Acquisition Schedule, WSDOT will consider an extension of time in accordance with Section 1-08.8 of the General Provisions. Prior to commencing Work, the Design-Builder shall stake and verify the location and accuracy of the staked ROW and easement boundaries.

### 2.24.1.1 AVAILABLE RIGHT-OF-WAY

The Design-Builder shall have access to the existing SR 520 Floating Bridge and Landings Project ROW, subject to Appendix M7, upon receipt of NTP 1. The Design-Builder shall have access to planned ROW acquisitions, including Temporary Construction Easements, on the schedule shown in Appendix R4. This does not include Pontoon Casting Facilities.

If the ROW is not available as indicated in this Contract, WSDOT will consider an extension of time in accordance with Section 1-08.8 of the General Provisions.

#### 2.24.1.1.1 Lake Washington Area

WSDOT will acquire ROW for the Work across Lake Washington as shown in the Conceptual Plans (Appendix M1). Work affecting local streets in the vicinity of the Site, as shown in the Conceptual Plans (Appendix M1), will be performed within existing local agency ROW. .

## 2.24.2 ACQUISITION OF ADDITIONAL RIGHTS-OF-WAY AND EASEMENTS

If the Design-Builder's proposed design requires the acquisition of additional ROW or easements, the Design-Builder shall identify the type and location of the proposed areas of acquisition or easements and submit a request to WSDOT for review and comment, in accordance with this section and Section 1-04 of the General Provisions.

The Design-Builder's request for proposed areas of acquisition or easements shall include the following:

- A letter indicating the Design-Builder's name, the Project name, the Project location, the Contract number, the submittal date and the submittal type.
- A plan of sufficient scale and detail to show the existing and proposed roadway ROW and the proposed easements, in accordance with the WSDOT *Plans Preparation Manual* (Appendix D12).
- An outline of what will be required for WSDOT to acquire ROW and easements, including, but not limited to, additional land ownership, airspace, Utility corridors, access rights and permanent easements.

- A discussion of the impacts to the Project schedule and a proposed plan to recover the Project schedule.
- If applicable, a demolition plan of all buildings, structures and other improvements located in the proposed areas of acquisition. Refer to Section 2.8 (Environmental) for hazardous material requirements. All Utilities installed on or connected to buildings, structures or other improvements in the proposed areas of acquisition shall be de-activated or removed in accordance with the requirements of the applicable Utility Owner as part of the demolition, unless otherwise specified. All costs associated with the demolition shall be paid by the Design-Builder.

The time required to acquire ROW and easements varies. If the Design-Builder determines that additional ROW or easements will be required, the Design-Builder shall contact WSDOT to obtain an estimate of time that may be necessary for acquisition.

The Design-Builder shall reimburse WSDOT for the costs of the review associated with requests for additional ROW or easements. The costs of the review shall be paid regardless of whether or not the request is approved. All acquisition costs shall be paid by the Design-Builder, including but not limited to: WSDOT approval costs; the cost of the Right-of-Way or easement paid to the owner; environmental reviews; property surveys; title reports; appraisals; negotiation, condemnation and relocation assistance; unencumbering existing utility easements; schedule delays; and cost of schedule delays, regardless of the outcome.

WSDOT will provide an estimate of costs to the Design-Builder following receipt of the request for additional ROW or easements. The cost estimate will serve as the basis for a price adjustment as described in Section 1.04 of the General Provisions. Upon approval of the request for additional ROW or easements, WSDOT will establish a work order funded by the Design-Builder and initiate the acquisition process. Any offer that exceeds the mutually agreed-upon estimated cost must be approved by the Design-Builder prior to the settlement offer.

### 2.24.3 CONSTRUCTION PERMITS AND RIGHTS OF ENTRY

The Design-Builder, in accordance with applicable laws, shall acquire construction permits for work on city property where no permanent rights are needed. No work shall occur on city ROW or on a city-owned tax parcel without first receiving approval from the city.

If the Design-Builder determines that there is a need to enter private property for which WSDOT does not hold a valid drainage, access, or temporary construction easement, the Design-Builder shall obtain a right of entry or construction permit from the legal property owner in order to enter that property. The Design-Builder shall submit a letter to the property owner that includes the following:

- Request for permission to enter the owner's property;
- An explanation of the type of work that will take place and the type of equipment that will be used;
- A statement that any damage to the property will be repaired to the property owner's satisfaction at the Design-Builder's expense;

- Date, time and duration the Design-Builder will be on the property;
- A statement that the permission for right of entry is between the Design-Builder and the property owner, and that WSDOT is not liable in any way; and
- A signature and date block for the property owner's signature.

The Design-Builder shall submit a copy of the signed letter to WSDOT prior to entering the private property.

#### 2.24.3.1 OTHER PROPERTY RIGHTS

The Design-Builder may acquire any rights or interests in real property that, in the Design-Builder's discretion, are deemed necessary or advisable to acquire. Such real property may be required for workspace, lay-down areas, material storage areas or other convenience. WSDOT will not be obligated to exercise its power of eminent domain; will not come into title to the property; and will not take any responsibility for the acquisition, maintenance or disposition of additional properties or of any temporary rights of interest therein.

The Design-Builder shall submit to WSDOT a signed and notarized copy of any other property right described in this section that the Design-Builder has acquired for the Project.

### 2.24.4 TEMPORARY EASEMENTS

Temporary construction easements have been provided by WSDOT for the areas shown in the Conceptual Plans (Appendix M1). Any damage caused by the Design-Builder to the temporary easement areas shall be repaired by the Design-Builder at the Design-Builder's expense.

If the Design-Builder requires a time extension of any temporary easement, the Design-Builder shall submit a request to WSDOT. All costs associated with obtaining any time extension shall be paid by the Design-Builder. The duration of the Project shall not be extended if any temporary easement cannot be extended.

The Design-Builder shall notify WSDOT and the property owners as Work is completed in easement areas on the individual parcels. The Design-Builder's notification shall include, but is not limited to, the following:

- When Utilities are relocated;
- When individual sewer service lines are connected and become operational;
- When individual stormwater service lines are connected and become operational;
- The date Work in a temporary easement area commences; and
- The date Work in a temporary easement area in the Conceptual Plans (Appendix M1) is completed (except for maintenance of landscaping).

### 2.24.5 CONSTRUCTION COMMITMENTS

Upon successful acquisition of ROW or easements requested by the Design-Builder, WSDOT will provide the Design-Builder with any construction commitments. The Design-Builder shall honor all construction commitments as submitted by WSDOT.

## 2.24.6 ACQUISITION SUBJECT TO EXISTING EASEMENTS

Several areas within the ROW are encumbered with existing public Utility easements. The Design-Builder shall protect the Utilities so their function is not impaired during construction. This requirement shall remain until the Utility is relocated and becomes serviceable, if applicable. If the Utility will not be relocated, then it shall remain serviceable after construction. Utility easements are shown in Utility As-builts (Appendix U1), Subsurface Utility Engineering Investigations (Appendix U2) and the Conceptual Plans (Appendix M1).

## 2.24.7 SUBMITTALS

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

- Request for additional ROW; and
- Right of entry letter, together with all supporting documentation for right of entry.

## 2.24.8 ILLEGAL ENCAMPMENTS WITHIN STATE RIGHT-OF-WAY

The Design-Builder shall comply with the Policy on Illegal Encampments within WSDOT Right of Way (Appendix R1).

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 control of materials on the project. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- WSDOT Structures Minimum Standards (Appendix B2).
- WSDOT Amendments to the Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT Qualified Products List (M46-02) (QPL) (Appendix D13).
- AASHTO *Guide Specifications for LRFD Seismic Bridge Design*, 1st Edition, 2009.
- AASHTO *LRFD Bridge Design Specifications*, Customary U.S. Units, 4th Edition, with 2008 and 2009 interim Revisions.
- AASHTO *LRFD Bridge Construction Specifications*, 2nd Edition with 2006, 2007, 2008, and 2009 Interims.

## 2.25.3 BUY AMERICA

The major quantities of steel and iron construction material that is permanently incorporated into the project shall consist of American-made materials only. Buy America does not apply to temporary steel items, e.g., temporary sheet piling, temporary bridges, steel scaffolding and falsework.

Minor amounts of foreign steel and iron may be utilized in this project provided the cost of the foreign material used does not exceed one-tenth of one percent of the total contract cost or $2,500.00, whichever is greater.

American-made material is defined as material for which all manufacturing processes occur domestically. To further define the coverage, a domestic product is a manufactured steel material that was produced in one of the 50 States, the District of Columbia, Puerto Rico, or in the territories and possessions of the United States.

If domestically produced steel billets or iron ingots are exported outside of the area of coverage, as defined above, for any manufacturing process then the resulting product does not conform to the Buy America requirements. Additionally, products manufactured domestically from foreign source steel billets or iron ingots do not conform to the Buy America requirements because the initial melting and mixing of alloys to create the material occurred in a foreign country.

Manufacturing begins with the initial melting and mixing, and continues through the coating stage. Any process which modifies the chemical content, the physical size or shape, or the final finish is considered a manufacturing process. The processes include rolling, extruding, machining, bending, grinding, drilling, welding and coating. The action of applying a coating to steel or iron is deemed a manufacturing process. Coating includes epoxy coating, galvanizing, aluminizing, painting and any other coating that protects or enhances the value of steel or iron. Any process from the original reduction from ore to the finished product constitutes a manufacturing process for iron.

Due to a nationwide waiver, Buy America does not apply to raw materials (iron ore and alloys), scrap (recycled steel or iron), and pig iron or processed, pelletized and reduced iron ore.

The following are considered to be steel manufacturing processes:

- Production of steel by any of the following processes:
  - Open hearth furnace.
  - Basic oxygen.
  - Electric furnace.
  - Direct reduction.
  - Rolling, heat treating, and any other similar processing.
  - Fabrication of the products.
  - Spinning wire into cable or strand.
  - Corrugating and rolling into culverts.
  - Shop fabrication.

A certification of materials origin will be required for any items comprised of, or containing, steel or iron construction materials before they are incorporated into the permanent Work. The certification shall be on WSDOT Form 350-109 (Certification of Materials Origin) provided in Appendix F11, or such other form the Design-Builder chooses, provided it contains the same information as WSDOT Form 350-109.

## 2.25.4 MATERIALS APPROVAL

The Design-Builder shall use either the WSDOT Qualified Projects List (QPL) or the Request for Approval of Materials form, which can be accessed online at the following Web site:

http://www.wsdot.wa.gov/biz/mats

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 WSDOT Standard Specifications (Appendix D18), 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 shall be approved by the Materials Approval Engineer;
- Shall be inspected or tested in accordance with these Technical Requirements, WSDOT standards, and WSDOT manuals; and
- Shall not be used in the Work if they become unfit after previous approval.

Prior to use by the Design-Builder, all materials shall be reviewed and approved by the Materials Approval Engineer in accordance with Section 9-1.3 of the WSDOT *Construction Manual* (Appendix D2). Materials submittals may be in the form of a Qualified Products List, QPL, Request for Approval of Materials (RAM), or they may list the materials in the plans and specifications that have been stamped by the Engineer of Record. The Construction QA Manager shall establish the materials acceptance requirements of the material approved by the Materials Approval Engineer on the Record of Materials (ROM).

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 QA Manager, shall be submitted to WSDOT prior to Completion 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. It is possible for a manufacturer to be listed in the QPL, but not for the product the Design-Builder may be intending to use. The QPL is defined in Section 9-1.3A of the WSDOT *Construction Manual* (Appendix D2). The Design-Builder shall follow the acceptance requirements listed in the QPL for the product/material used. The current QPL can be accessed online at the following website:

www.wsdot.wa.gov/biz/mats/QPL

**Request for Approval of Materials (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. The current RAM form can be accessed online at the following website:

www.wsdot.wa.gov/biz/mats/RAM

**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. Proprietary items shall follow the acceptance requirements in this section.

**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

**Optional Approval** – The Design-Builder's Construction QA Manager may elect to request to accept materials listed in Table 9-1 of the WSDOT *Construction Manual* (Appendix D2) by invoking Section 9-1.1D – Optional Approval/Acceptance for Materials. The request must be approved by the Materials Approval Engineer with concurrence of the WSDOT Project Engineer and submitted to the Quality Assurance Team for final approval.

**WSDOT Oversight** – The Design-Builder shall distribute copies of all documents that list materials for review within 3 Calendar Days of receipt of approval. WSDOT will use these documents to verify the materials being used.

**Use of Materials Found on the Project –** With the WSDOT Engineer's written approval, the Design-Builder may use any of the following on the Project: stone, gravel, sand, other materials from on-site excavation, or timbers removed in the course of the Work. Approval will not be granted if:

- The excavated materials or timber fail to meet Contract requirements;
- The excavated materials or timber are required for other use under the Contract; or
- Such use is not in the best interest of WSDOT as determined by the WSDOT Engineer, whose decision shall be final as provided in Section 1-05.1 of the General Provisions.

Any material disturbed by, but not used in, the Work shall be disposed of in accordance with the Contract Requirements or as directed by WSDOT.

The Design-Builder shall not create borrow pits on the WSDOT Right-of-Way unless specifically provided for in the Contract.

## 2.25.5 ACCEPTANCE OF MATERIALS

### 2.25.5.1 GENERAL

All materials that the Design-Builder intends to use shall be approved prior to use by the Materials Approval Engineer, shall be listed on the Record of Materials with the established materials acceptance requirements, 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* (Appendix D2), the WSDOT *Materials Manual* (Appenidx D10), the WSDOT Standard Specifications (Appendix D18), or other provisions of the Contract.

For most materials, the method of acceptance can be found in Chapter 9 of the WSDOT *Construction Manual* (Appendix D2).

**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 all acceptance documents and the status for each (i.e. approved or rejected). The ROM shall be updated daily, kept at the Project Office, and available for WSDOT review.

Upon award of the Contract, WSDOT will provide the Design-Builder's Construction QA Manager with a CD ROM containing the most recent listing of the method of acceptance for materials, to assist the Design-Builder in developing the ROM.

**Visual Acceptance –** If a visual acceptance is required as part of the acceptance method for materials, or if it is the acceptance criteria, the materials shall be inspected by the Construction QA Inspector to ensure they meet the specifications. The QA Inspector shall document the results of the inspection.

**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 all materials permanently incorporated into the Project. The field verification or visual inspection shall occur prior to or during placement of materials. The QA inspector shall inspect the product, material and construction processes for conformity to the Contract requirements. The QA inspector shall also inspect the product or material for shipping and handling damage. When the Design-Builder gives authorization for payment of the materials placed, they are affirming that items requiring field verification have been checked and have been found to be acceptable. 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 that have been approved on the plan sheets shall require acceptance by testing, inspection or other forms of acceptance as required by the Contract, and shall also require field verification.

**Tested Materials** – The Design-Builder's QA staff shall test materials that require testing for acceptance. All materials with three or more sublots as listed in Table 6 in this section, or any other materials where three 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 one or two QA tests for acceptance, or that have less than three 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* (Appendix D10) and the Contract.

**Optional Acceptance** – The Design-Builder's Construction QA Manager may elect to request to accept materials listed in Table 9-1 of the WSDOT *Construction Manual* (Appenidx D2) by invoking Section 9-1.1D – Optional Approval/Acceptance for Materials of the WSDOT Construction Manual. These materials would be accepted by Visual Acceptance. The request must be approved by the Materials Approval Engineer with concurrence of the WSDOT Project Engineer, and submitted to the Quality Assurance Team for final approval.

### 2.25.5.2 VALIDATION BY F AND † TEST ANALYSIS

The Construction QA Manager shall be responsible for statistically evaluating all the QA test results against 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 (Quality Management Plan).

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.

### 2.25.5.3 STATISTICAL ACCEPTANCE OF MATERIALS

Where specified, QA sampling and testing will be performed by the Design-Builder's Quality Assurance Organization. For materials with quantities greater than two QA sublots as defined in Table 6 of this section, statistical evaluation shall be the method of evaluation for acceptance decisions.

The Construction QA Manager shall be responsible for statistically evaluating the validated QA test results using the Statistical Analysis of Materials (SAM) software to determine the acceptability of the test data, the total percent of the lot that is within specification limits, and to determine an appropriate pay factor as described in Section 2.28. Refer to this section for the statistical acceptance requirements.

### 2.25.5.4 NON-STATISTICAL ACCEPTANCE OF MATERIALS

When materials are not statistically evaluated, the material shall meet the minimum and maximum specifications. The Construction QA Manager shall be responsible for comparing the difference between the Design-Builder's QA test results and 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 of this section, 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.

### 2.25.5.5 SAMPLE AND TESTING FREQUENCY

Table 6 of this section shall be used in conjunction with the testing frequencies defined in the WSDOT Standard Specifications (Appendix D18) and the WSDOT *Construction Manual* (Appendix D2). This table replaces Section 9-3.7 of the WSDOT *Construction Manual*. Additional testing requirements can be found in the WSDOT Standard Specifications (Appendix D18) and these Technical Requirements.

If the tables do not define a material test or material sample rate, the Quality Assurance team will establish the testing attributes and frequency. The QV sampling and testing will occur at a frequency of one test or sample per five QA tests or samples.

During operational startup or unprecedented Project testing, the QV sampling and testing shall be required at the same frequency as the Design-Builder's QA frequency for the first five samples in order to establish a statistical base for verification and acceptance, and on a more frequent basis as needed until the process is under good control. Additional testing may be performed for validation of statistical modeling if the Construction QA Manager and WSDOT deem it necessary. If the Design-Builder elects to

take extra QA samples and tests to insure quality, the QV sampling frequency will continue to be based on the quantity stated in Table 6.

### 2.25.5.6 MANUFACTURER'S CERTIFICATE OF COMPLIANCE

When authorized by these Technical Requirements, 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 it must 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 using WSDOT Form 350-572 (Manufacturer's Certificate of Compliance Checklist), or the Design-Builder's own checklist containing 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.

### 2.25.5.7 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 request must be approved by the Materials Approval Engineer with concurrence of the WSDOT Project Engineer and submitted to the Quality Assurance Team for final approval.

A material can be accepted as a small quantity if the proposed total quantity for the specific material is less than one testing frequency for the entire project.

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 who is 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; and
- Paved ditches and slopes.

### 2.25.5.8 FABRICATION INSPECTION

The WSDOT Fabrication Inspection Office will be responsible for in-plant inspection and approval of items fabricated specifically for the Project as detailed in the WSDOT *Construction Manual* (Appendix D2) 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 current 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 shall provide two 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:

- Precast concrete wall panels;
- Prestresssed concrete products;
- Precast three-sided structures;
- Steel pedestrian and highway bridges;
- Wood bridges;
- Bridge bearings;
- Modular expansion joints; and
- 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:

- Collecting and reviewing all material certification documents for acceptance;
- Collecting and reviewing all of the fabricator's inspection reports for acceptance;
- Visually inspecting the fabricated items for acceptance; and
- Maintaining the Inspection Daily Report.

Items requiring fabrication inspection will be stamped or tagged for approval as specified in Section 9-2 of the WSDOT *Construction Manual* (Appendix D2) before the item is 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 before incorporation 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 shall be responsible for sampling and testing moisture-cured polyurethane, prestressing 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.

## 2.25.6 HANDLING AND STORING MATERIALS

In storage and handling, the Design-Builder shall protect materials against damage from 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.

## 2.25.7 PORTLAND CEMENT CONCRETE MIX DESIGN AND BATCH PLANT

The Design-Builder, or its designee, shall develop the concrete mix design in accordance with the WSDOT Standard Specifications (Appendix D18). The Construction QA Manager shall certify that the concrete mix design conforms to the Contract provisions and to the WSDOT Standard Specifications (Appendix D18).

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 Project.

## 2.25.8 HOT MIX ASPHALT (HMA) MIX DESIGN AND ASPHALT CONCRETE PLANT

**HMA Mix Design** – The Design-Builder or mix supplier shall submit a mix design to the WSDOT Project Engineer on WSDOT Form 350-042 EF (HMA Mix Design Submittal) prior to the initial production of HMA and prior to the production of HMA each calendar year thereafter. For a mix design that was originally developed for another WSDOT contract, the Design-Builder or mix supplier shall also submit WSDOT Form 350-041 (Request for Reference HMA Mix Design) and shall include all changes to the job mix formula that have been approved on other contracts. The mix design aggregate structure and asphalt binder content shall be determined in accordance with WSDOT Standard Operating Procedure 732 and meet the requirements of Sections 9-03.8(2) and 9-03.8(6) of the WSDOT Standard Specifications (Appendix D18).

Mix designs that were developed during the calendar year prior to current year's production of HMA, and have been issued a WSDOT mix design report, will be accepted provided the Design-Builder or mix supplier submits a certification letter stating that the aggregate and asphalt binder have not changed. Changes to the aggregate that may require a new mix design include the source of material or a change in the percentage of material from a stockpile greater than five percent. Changes to asphalt binder that may require a new mix design include the source of the crude petroleum supplied to the refinery, the refining process, and additives or modifiers in the asphalt binder.

The Design-Builder or mix supplier shall submit representative samples of the mineral materials that are to be used in the HMA production. WSDOT will use these samples to conduct verification testing of the mix design in accordance with WSDOT Standard Operating Procedure 732 in the WSDOT *Materials Manual* (Appendix D10) and to determine anti-strip requirements, if any, in accordance with WSDOT test method T718 in the WSDOT *Materials Manual*. 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 report will be provided within 25 Calendar Days after a mix design submittal has been received in the State Materials Laboratory in Tumwater, Washington. No paving shall begin prior to issuance of the mix design report or reference mix design report for that year.

The mix design shall be the initial job mix formula (JMF) for the class of mix. The Design-Builder or mix supplier may request a change in the JMF. Any adjustment to the JMF will require the approval of the WSDOT Project Engineer in accordance with Section 9-03.8(7) of the WSDOT Standard Specifications.

**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 WSDOT Standard Specifications (Appendix D18). The Construction QA Manager shall inspect the asphalt concrete plants and document that they meet all requirements.

## 2.25.9 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.

**Traffic Signal Controllers** –Traffic signal controllers supplied by the Design-Builder shall be tested by WSDOT in accordance with WSDOT Standard Operating Procedure 429 in the WSDOT *Materials Manual* (Appendix D10) at the State Materials Laboratory in Tumwater, Washington. The Design-Builder is advised that the time necessary to test a traffic signal controller is dependent upon the quality of the product submitted, and the response time of the vendor in correcting deficiencies in the programming or circuitry. Typically it takes approximately 20 Calendar Days for testing if everything is correct. Only traffic signal controllers tested by WSDOT shall be installed. The Design-Builder shall be responsible for delivery and pick-up of traffic signal controllers.

**Intelligent Transportation Systems** –Refer to Section 2.18 (Intelligent Transportation Systems) for the division of responsibility between WSDOT and the Design-Builder for testing of the Intelligent Transportation System (ITS) equipment and system.

**Electrical Bridge and Services** – All electrical equipment supplied under this item will be tested by WSDOT in accordance with Section 2.17 (Electrical Bridge and Services).

**Hot Mix Asphalt (HMA) and Asphalt Treated Base (ATB) –** Unless otherwise explicitly stated elsewhere in these Technical Requirements, 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 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 in this section, 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 in accordance with Chapter 9 of the WSDOT *Construction Manual* (Appendix D2); and delivering the samples to the State Materials Laboratory in Tumwater, Washington. The Design-Builder shall provide notice to WSDOT 14 Calendar Days prior to sampling, and shall coordinate these activities with the WSDOT Engineer. The sampling requirements and the testing procedures for the following materials shall be in accordance with the WSDOT *Construction Manual* (Appendix D2).

- Premolded joint filler;
- Joint sealant and longitudinal joint seal;
- Hot-poured joint sealant;
- Elastomeric expansion joint seals;
- Two-component poured rubber joint sealer;
- Hot melt traffic button adhesive;
- Plastic raised pavement marker (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;
- Rigid galvanized steel RGS conduit;
- Electrical conductors;
- Chain link fabric;
- Wire mesh;
- Fencing tension and barbed wire;
- Grade 1 fence posts;
- Wire fence line posts; and
- Mechanical rebar splices.

## 2.25.10 SUBMITTALS

### 2.25.10.1 OWNER'S MANUALS, OPERATING INSTRUCTIONS AND PRODUCT DATA

For equipment and materials that are permanently incorporated into the Work, the Design-Builder shall provide WSDOT with all owner's manuals and operating instructions furnished by the equipment or material manufacturer. The Design-Builder shall also submit two 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. WSDOT will advise the Design-Builder of the status of this product data within 14 Calendar Days of receipt. Refer to additional warranty requirements in other sections of these Technical Requirements.

The Design-Builder shall submit two hard copies of all inspection reports to WSDOT daily, and copies of testing reports within 24 hours of test completion. The Design-Builder shall ensure that the product data cited in this section is organized and indexed in a manner that allows easy retrieval of information.

### 2.25.10.2 MATERIALS CERTIFICATION PACKAGE

The Design-Builder shall submit a final Materials Certification Package to WSDOT. The Design-Builder may use WSDOT Form 350-115 EF (Contract Materials Checklist), or develop its own checklist containing 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 WSDOT Standard Specifications (Appendix D18).

## 2.25.11 STATISTICAL EVALUATION OF MATERIALS FOR ACCEPTANCE

### 2.25.11.1 GENERAL

Acceptance of materials shall be based on statistical evaluation for the applicable elements as defined in Table 6 of this section. The applicable "Adjustment Factor" for various materials is shown in Table 4 of this section. The Design-Builder shall use WSDOT's Statistical Analysis of Materials Software. The material shall be sampled at the point of acceptance in accordance with the applicable test procedure and specifications.

Since these specifications designate the payment of the material by means other than a unit bid price basis, the unit price for calculating a "Price Adjustment" as stated in Table 5 of this section will be used. The credit payment for the Price Adjustment shall be made under the item "Non-specification Material Price Adjustment" and "Non-specification Material Compaction Price Adjustment."

Sections 5-04.5(1) and 6-02.3(5)L of the WSDOT Standard Specifications (Appendix D18) have been deleted and replaced by these Technical Requirements.

For the purpose of statistical acceptance sampling and testing, a lot is defined as a minimum of three sublots and a maximum of 15 sublots, except that the final lot may be increased to a maximum of 25 sublots. All of the test results obtained for a material type, such as gravel backfill for walls, CSBC or gravel borrow shall be evaluated collectively, except for the following:

- Concrete – Each concrete mix design shall be evaluated collectively.
- Hot Mix Asphalt – Each job mix formula, and all changes to that job mix formula, shall be evaluated collectively. A compaction lot for HMA shall be according to Section 5-04.3(10)B of the WSDOT Standard Specifications (Appendix D18).
- Portland Cement Concrete Pavement – Each concrete mix design shall be evaluated collectively. The total volume of concrete for each lot shall be based on the calculated volume as defined in Section 5-05.4 of the WSDOT Standard Specifications (Appendix D18).All tests performed for QA purposes shall be recorded and incorporated into the lot.

The quantity represented by each sample will constitute a sublot. Sampling and testing for statistical acceptance shall be performed on a random basis at the frequency of one sample per sublot. A Lot shall be not less than three uniform sized sublots with a maximum sublot size as stated in Table 6 of this section for the material being sampled and tested.

After the first three sublots have been tested, the Design-Builder Construction QA Manager shall compute and maintain the Composite Pay Factor (CPF) of the completed sublots. The Design-Builder Construction QA Manager shall furnish WSDOT with a copy

of the results of all Quality Assurance testing and the composite pay factor calculations within 24 hours of completing the testing, or the next business day.

### 2.25.11.2 FINANCIAL INCENTIVE

As an incentive to produce superior quality material, an item pay factor greater than 1.00 may be obtained with the maximum item pay factor being 1.05, with the maximum composite incentive pay factor being 1.00. The maximum composite incentive pay factor for Portland Cement Concrete Pavements (PCCP) (compressive strength and air content) and Hot Mix Asphalt (HMA) (gradation, binder content, volumetrics and in-place density) will be 1.05. A lot containing non-specification material will be accepted provided the Composite Pay Factor reaches the minimum value specified elsewhere. A lot containing non-specification material which fails to obtain at least the specified minimum Composite Pay Factor shall be rejected by the Construction QA Manager. The Construction QA Manager shall take one or more of the following actions when rejected material has been incorporated into the Work:

- Require complete removal and replacement with specification material at no additional cost to WSDOT.
- At the Design-Builder's written request, and with WSDOT concurrence, allow corrective work at no additional cost to WSDOT and then an appropriate price reduction that may range from no reduction to no payment based on the unit prices in Table 5 of this section.
- Any lot for which at least three samples have been obtained, and all of the test results meet one of the appropriate criteria listed below, will receive at least a 1.00 Composite Pay Factor:
  - All test results are within the allowable limits specified for the item, or
  - All test results that only have a lower specification limit are greater than or equal to that limit, or
  - All test results that only have an upper specification limit are less than or equal to that limit.
- Lots represented by less than 3 samples or unsampled lots will be exempt from statistical-based acceptance.

### 2.25.11.3 REJECTED MATERIAL

The following actions shall be taken regarding defective materials and compaction:

**Rejected by the Design-Builder** - The Design-Builder may, prior to sampling, elect to remove any defective material and replace it with new material at no expense to WSDOT. Any such new material will be sampled, tested and evaluated for acceptance as a part of the sublot in accordance with this statistical sampling and testing procedure.

The Construction QA Manager may also reject a sublot which tests show to be defective. Such rejected material shall not be used in the Work, and the results of tests run on the rejected material will not be included in the original lot acceptance tests.

**Partial Sublot** - In addition to the preceding random acceptance sampling and testing, WSDOT or the QA tester may also isolate from a normal sublot any material that is suspected of being defective. Such isolated material will not include any original sample locations. A minimum of three random samples of the suspect material will be obtained

and tested. The material will then be statistically evaluated as an independent lot in accordance with the statistical acceptance section.

**An Entire Sublot** - An entire sublot that is suspected of being defective may be rejected. When a sublot is rejected, a minimum of two additional random samples from this sublot will be obtained. These additional samples and the original sublot will be evaluated as an independent lot.

**A Lot In Progress** - The Design-Builder shall shut down operations and shall not resume placement until such time as the Construction QA manager is satisfied that specification material can be produced:

- When the Composite Pay Factor (CPF) of a lot in progress drops below 1.00 and the Design-Builder is taking no appropriate corrective action; or
- When the Pay Factor (PF) for any constituent of a lot in progress drops below 0.95 and the Design-Builder is taking no appropriate corrective action; or
- When either the Individual Pay Factor ($PF_i$) for any constituent or the CPF of a lot in progress is less than 0.75

**An Entire Lot** - An entire lot with a CPF of less than 0.75 will be rejected.

## 2.25.11.4 QUALITY LEVEL ANALYSIS

### 2.25.11.4.1 General

Quality level analysis is a statistical procedure for determining the percent compliance of the material with the Contract. Quality level is the computed percent of material meeting these specifications and is determined from the arithmetic mean ($X_m$, and the sample standard deviation (S) for each constituent of the lot.

The quality level calculations for HMA and other materials are completed using the formulas in this section. For HMA, the definition of the "x" value used in the calculations and the definition of the upper and lower specification limit are in this section. For other materials the definition of the "x" value used in the calculations and the definition of the upper and lower specification limit are in this section. All other terms and variables are the same for all calculations.

Any necessary rounding off of test results or calculations will be accomplished according to the individual testing procedure, or, if not defined in the procedure then according to the following rule:

1. The final significant digit will not be changed when the succeeding digit is less than 5.
2. The final significant digit will be increased by one when the succeeding digit is 5 or greater.

### 2.25.11.4.2 Hot Mix Asphalt

For gradation and percent binder, x = difference between an individual test value and the job mix formula (JMF).

For voids and VMA, x = individual test value.

USL = maximum allowable limit in Section 9-03.8(7) of the WSDOT Standard Specifications (Appendix D18).

LSL = minimum allowable limit in Section 9-03.8(7) of the WSDOT Standard Specifications (Appendix D18).

### 2.25.11.4.3 Other Materials

x = individual test value.

USL = upper specification limit.

LSL = lower specification limit.

### 2.25.11.4.4 Quality Level Calculation

Procedures for determining the quality level and pay factors for a material are as follows:

1. Determine the arithmetic mean, (Xm), for each specified material constituent:

$$X_m = \frac{\sum x}{n}$$

where: $\sum$ = summation of
$n$ = total number test values

2. Compute the sample standard deviation, "S," for each constituent:

$$S = \left[ \frac{n\sum x^2 - (\sum x)^2}{n(n-1)} \right]^{1/2}$$

where: $\sum x^2$ = summation of the squares of individual test values
$(\sum x)^2$ = summation of the individual test values squared

3. Compute the upper quality index, ($Q_U$), for each constituent:

$$Q_U = \frac{USL - X_m}{S}$$

4. Compute the lower quality index, ($Q_L$), for each constituent:

$$Q_L = \frac{X_m - LSL}{S}$$

5. For each constituent determine $P_U$ (the percent within the upper specification limit which corresponds to a given $Q_U$) from Table 1 in this section. If the USL is 100.00 percent or is not specified, $P_U$ will be 100.

   For negative values of $Q_U$, $P_U$ is equal to 100 minus the table $P_U$ (e.g. N = 15 and $Q_U$ = - 0.5 will result in $P_U$ = 30. If the value of $Q_U$ does not correspond exactly to a figure in the table, use the next higher value.

6. For each constituent determine $P_L$ (the percent within the lower specification limit which corresponds to a given $Q_L$) from Table 1 of this section. If a LSL is zero or not specified, $P_L$ will be 100.For negative values of $Q_L$, $P_L$ is equal to 100

minus the table $P_L$. If the value of $Q_L$ does not correspond exactly to a figure in the table, use the next higher value.

7. For each constituent determine the quality level (the total percent within specification limits):

   Quality Level = $(P_U + P_L) - 100$

8. Using the quality level from step 7, determine the Individual Pay Factor ($PF_i$) from Table 2 of this section for each constituent tested.

   where: $PF_i$ = Individual Pay Factor (Pay Factor for each constituent being tested)

9. Determine the Composite Pay Factor (CPF) for each lot:

$$CPF \quad \frac{f_1(PF_1) + f_2(PF_2) + \cdots + f_i(PF_i)}{\sum f_i} =$$

i=1 to j

where:

**CPF = Composite Pay Factor (composite of all individual Pay Factors for each lot)**

Fi = Price adjustment factor listed in this RFP for the applicable material

J = Number of constituents being evaluated

10. Determine an item adjustment factor:

    (item) adjustment factor = CPF – 1.

11. Determine the Materials Compliance Price Adjustment:

    Compliance Price Adjustment = Total Quantity of Material * Unit Price * Item Adjustment Factor.

# 2.25.12 MATERIALS TABLES

## 2.25.12.1 TABLE 1 - QUALITY LEVELS / QUALITY LEVEL ANALYSIS BY STANDARD DEVIATION METHOD

### Estimated Percent of Work Within Specification Limits

| Estimated Percent Within Specification Limits ($P_U$ or $P_L$) | Upper Quality Index $Q_U$ or Lower Quality Index $Q_L$ | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | n=3 | n=4 | n=5 | n=6 | n=7 | n=8 | n=9 | n=10 to n=11 | n=12 to n=14 |
| 100 | 1.16 | 1.49 | 1.72 | 1.88 | 1.99 | 2.07 | 2.13 | 2.20 | 2.28 |
| 99 | - | 1.46 | 1.64 | 1.75 | 1.82 | 1.88 | 1.91 | 1.96 | 2.01 |
| 98 | - | 1.43 | 1.58 | 1.66 | 1.72 | 1.75 | 1.78 | 1.81 | 1.84 |
| 97 | 1.15 | 1.40 | 1.52 | 1.59 | 1.63 | 1.66 | 1.68 | 1.71 | 1.73 |
| 96 | - | 1.37 | 1.47 | 1.52 | 1.56 | 1.58 | 1.60 | 1.62 | 1.64 |
| 95 | 1.14 | 1.34 | 1.42 | 1.47 | 1.49 | 1.51 | 1.52 | 1.54 | 1.55 |
| 94 | - | 1.31 | 1.38 | 1.41 | 1.43 | 1.45 | 1.46 | 1.47 | 1.48 |
| 93 | 1.13 | 1.28 | 1.33 | 1.36 | 1.38 | 1.39 | 1.40 | 1.41 | 1.41 |
| 92 | 1.12 | 1.25 | 1.29 | 1.31 | 1.33 | 1.33 | 1.34 | 1.35 | 1.35 |
| 91 | 1.11 | 1.22 | 1.25 | 1.27 | 1.28 | 1.28 | 1.29 | 1.29 | 1.30 |
| 90 | 1.10 | 1.19 | 1.21 | 1.23 | 1.23 | 1.24 | 1.24 | 1.24 | 1.25 |
| 89 | 1.09 | 1.16 | 1.18 | 1.18 | 1.19 | 1.19 | 1.19 | 1.19 | 1.20 |
| 88 | 1.07 | 1.13 | 1.14 | 1.14 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 |
| 87 | 1.06 | 1.10 | 1.10 | 1.10 | 1.10 | 1.10 | 1.10 | 1.10 | 1.11 |
| 86 | 1.04 | 1.07 | 1.07 | 1.07 | 1.07 | 1.06 | 1.06 | 1.06 | 1.06 |
| 85 | 1.03 | 1.04 | 1.03 | 1.03 | 1.03 | 1.03 | 1.02 | 1.02 | 1.02 |
| 84 | 1.01 | 1.01 | 1.00 | 0.99 | 0.99 | 0.99 | 0.99 | 0.98 | 0.98 |
| 83 | 0.99 | 0.98 | 0.97 | 0.96 | 0.95 | 0.95 | 0.95 | 0.95 | 0.94 |
| 82 | 0.97 | 0.95 | 0.93 | 0.92 | 0.92 | 0.92 | 0.91 | 0.91 | 0.91 |
| 81 | 0.95 | 0.92 | 0.90 | 0.89 | 0.88 | 0.88 | 0.88 | 0.87 | 0.87 |
| 80 | 0.93 | 0.89 | 0.87 | 0.86 | 0.85 | 0.85 | 0.84 | 0.84 | 0.84 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 79 | 0.91 | 0.86 | 0.84 | 0.82 | 0.82 | 0.81 | 0.81 | 0.81 | 0.80 |
| 78 | 0.88 | 0.83 | 0.81 | 0.79 | 0.79 | 0.78 | 0.78 | 0.77 | 0.77 |
| 77 | 0.86 | 0.80 | 0.77 | 0.76 | 0.75 | 0.75 | 0.74 | 0.74 | 0.74 |
| 76 | 0.83 | 0.77 | 0.74 | 0.73 | 0.72 | 0.72 | 0.71 | 0.71 | 0.70 |
| 75 | 0.81 | 0.74 | 0.71 | 0.70 | 0.69 | 0.69 | 0.68 | 0.68 | 0.67 |
| 74 | 0.78 | 0.71 | 0.68 | 0.67 | 0.67 | 0.65 | 0.65 | 0.65 | 0.64 |
| 73 | 0.75 | 0.68 | 0.65 | 0.64 | 0.63 | 0.62 | 0.62 | 0.62 | 0.61 |
| 72 | 0.73 | 0.65 | 0.62 | 0.61 | 0.60 | 0.59 | 0.59 | 0.59 | 0.58 |
| 71 | 0.70 | 0.62 | 0.59 | 0.58 | 0.57 | 0.57 | 0.56 | 0.56 | 0.55 |
| 70 | 0.67 | 0.59 | 0.56 | 0.55 | 0.54 | 0.54 | 0.53 | 0.53 | 0.52 |
| 69 | 0.64 | 0.56 | 0.53 | 0.52 | 0.51 | 0.51 | 0.50 | 0.50 | 0.50 |
| 68 | 0.61 | 0.53 | 0.50 | 0.49 | 0.48 | 0.48 | 0.48 | 0.47 | 0.47 |
| 67 | 0.58 | 0.50 | 0.47 | 0.46 | 0.45 | 0.45 | 0.45 | 0.44 | 0.44 |
| 66 | 0.55 | 0.47 | 0.45 | 0.43 | 0.43 | 0.42 | 0.42 | 0.42 | 0.41 |
| 65 | 0.51 | 0.44 | 0.42 | 0.40 | 0.40 | 0.39 | 0.39 | 0.39 | 0.38 |
| 64 | 0.48 | 0.41 | 0.39 | 0.38 | 0.37 | 0.37 | 0.36 | 0.36 | 0.36 |
| 63 | 0.45 | 0.38 | 0.36 | 0.35 | 0.34 | 0.34 | 0.34 | 0.33 | 0.33 |
| 62 | 0.41 | 0.35 | 0.33 | 0.32 | 0.32 | 0.31 | 0.31 | 0.31 | 0.30 |
| 61 | 0.38 | 0.30 | 0.30 | 0.30 | 0.29 | 0.28 | 0.28 | 0.28 | 0.28 |
| 60 | 0.34 | 0.28 | 0.28 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| 59 | 0.31 | 0.27 | 0.25 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |
| 58 | 0.30 | 0.25 | 0.23 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| 57 | 0.25 | 0.20 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 |
| 56 | 0.20 | 0.18 | 0.16 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 55 | 0.18 | 0.15 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |
| 54 | 0.15 | 0.13 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 53 | 0.10 | 0.10 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| 52 | 0.08 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 51 | 0.05 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| 50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

**Table 1** (continued)

**Estimated Percent of Work Within Specification Limits**

| Estimated Percent Within Specification Limits ($P_U$ or $P_L$) | Upper Quality Index $Q_U$ or Lower Quality Index $Q_L$ | | | | | |
|---|---|---|---|---|---|---|
| | n=15 to n=17 | n=18 to n=22 | n=23 to n=29 | n=30 to n=42 | n=43 to n=66 | n=67 to ∞ |
| 100 | 2.34 | 2.39 | 2.44 | 2.48 | 2.51 | 2.56 |
| 99 | 2.04 | 2.07 | 2.09 | 2.12 | 2.14 | 2.16 |
| 98 | 1.87 | 1.89 | 1.91 | 1.93 | 1.94 | 1.95 |
| 97 | 1.75 | 1.76 | 1.78 | 1.79 | 1.80 | 1.81 |
| 96 | 1.65 | 1.66 | 1.67 | 1.68 | 1.69 | 1.70 |
| 95 | 1.56 | 1.57 | 1.58 | 1.59 | 1.59 | 1.60 |
| 94 | 1.49 | 1.50 | 1.50 | 1.51 | 1.51 | 1.52 |
| 93 | 1.42 | 1.43 | 1.43 | 1.44 | 1.44 | 1.44 |
| 92 | 1.36 | 1.36 | 1.37 | 1.37 | 1.37 | 1.38 |
| 91 | 1.30 | 1.30 | 1.31 | 1.31 | 1.31 | 1.31 |
| 90 | 1.25 | 1.25 | 1.25 | 1.25 | 1.26 | 1.26 |
| 89 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 | 1.20 |
| 88 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 | 1.15 |
| 87 | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 | 1.11 |
| 86 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 | 1.06 |
| 85 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 | 1.02 |
| 84 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 | 0.98 |
| 83 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 | 0.94 |
| 82 | 0.91 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| 81 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 | 0.87 |
| 80 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 | 0.83 |
| 79 | 0.80 | 0.80 | 0.80 | 0.80 | 0.80 | 0.79 |
| 78 | 0.77 | 0.76 | 0.76 | 0.76 | 0.76 | 0.76 |
| 77 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 | 0.73 |
| 76 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 | 0.70 |
| 75 | 0.67 | 0.67 | 0.67 | 0.67 | 0.67 | 0.66 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 74 | 0.64 | 0.64 | 0.64 | 0.64 | 0.64 | 0.63 |
| 73 | 0.61 | 0.61 | 0.61 | 0.61 | 0.61 | 0.60 |
| 72 | 0.58 | 0.58 | 0.58 | 0.58 | 0.58 | 0.57 |
| 71 | 0.55 | 0.55 | 0.55 | 0.55 | 0.55 | 0.54 |
| 70 | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 | 0.52 |
| 69 | 0.49 | 0.49 | 0.49 | 0.49 | 0.49 | 0.49 |
| 68 | 0.47 | 0.46 | 0.46 | 0.46 | 0.46 | 0.46 |
| 67 | 0.44 | 0.44 | 0.43 | 0.43 | 0.43 | 0.43 |
| 66 | 0.41 | 0.41 | 0.41 | 0.41 | 0.41 | 0.40 |
| 65 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 | 0.38 |
| 64 | 0.36 | 0.35 | 0.35 | 0.35 | 0.35 | 0.35 |
| 63 | 0.33 | 0.33 | 0.33 | 0.33 | 0.33 | 0.32 |
| 62 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| 61 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 | 0.28 |
| 60 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |
| 59 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |
| 58 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 | 0.20 |
| 57 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 | 0.18 |
| 56 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| 55 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 | 0.13 |
| 54 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| 53 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 | 0.08 |
| 52 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 | 0.05 |
| 51 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| 50 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |

1

## 2.25.12.2 TABLE 2 – PAY FACTORS

| PAY FACTOR | Minimum Required Percent of Work Within Specification Limits for a Given Factor ($P_U + P_L$) – 100 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | n=3 | n=4 | n=5 | n=6 | n=7 | n=8 | n=9 | n=10 to n=11 | n=12 to n=14 | n=15 to n=17 | n=18 to n=22 | n=23 to n=29 | n=30 to n=42 | n=43 to n=66 | n=67 to ∞ |
| 1.05 | | | | | | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 1.04 | | | | | 100 | 99 | 97 | 95 | 96 | 96 | 96 | 97 | 97 | 97 | 97 |
| 1.03 | | | | 100 | 98 | 96 | 94 | 92 | 93 | 93 | 94 | 95 | 95 | 96 | 96 |
| 1.02 | | | | 99 | 97 | 94 | 91 | 89 | 90 | 91 | 92 | 93 | 93 | 94 | 94 |
| 1.01 | 100 | 100 | 100 | 98 | 95 | 92 | 89 | 87 | 88 | 89 | 90 | 91 | 92 | 92 | 93 |
| 1.00 | 69 | 75 | 78 | 80 | 82 | 83 | 84 | 85 | 86 | 87 | 88 | 89 | 90 | 91 | 92 |
| 0.99 | 66 | 72 | 76 | 78 | 80 | 81 | 82 | 83 | 84 | 85 | 86 | 87 | 89 | 90 | 91 |
| 0.98 | 64 | 70 | 74 | 76 | 78 | 79 | 80 | 81 | 82 | 84 | 85 | 86 | 87 | 88 | 90 |
| 0.97 | 63 | 68 | 72 | 74 | 76 | 77 | 78 | 79 | 81 | 82 | 83 | 84 | 86 | 87 | 88 |
| 0.96 | 61 | 67 | 70 | 72 | 74 | 75 | 76 | 78 | 79 | 81 | 82 | 83 | 84 | 86 | 87 |
| 0.95 | 59 | 65 | 68 | 71 | 72 | 74 | 75 | 76 | 78 | 79 | 80 | 82 | 83 | 84 | 86 |
| 0.94 | 58 | 63 | 67 | 69 | 71 | 72 | 73 | 75 | 76 | 78 | 79 | 80 | 82 | 83 | 85 |
| 0.93 | 57 | 62 | 65 | 67 | 69 | 71 | 72 | 73 | 75 | 76 | 78 | 79 | 80 | 82 | 84 |
| 0.92 | 55 | 60 | 63 | 66 | 68 | 69 | 70 | 72 | 73 | 75 | 76 | 78 | 79 | 81 | 82 |
| 0.91 | 54 | 59 | 62 | 64 | 66 | 68 | 69 | 70 | 72 | 74 | 75 | 76 | 78 | 79 | 81 |
| 0.90 | 53 | 57 | 61 | 63 | 65 | 66 | 67 | 69 | 71 | 72 | 74 | 75 | 77 | 78 | 80 |
| 0.89 | 51 | 56 | 59 | 62 | 63 | 65 | 66 | 68 | 69 | 71 | 72 | 74 | 75 | 77 | 79 |
| 0.88 | 50 | 55 | 58 | 60 | 62 | 64 | 65 | 66 | 68 | 70 | 71 | 73 | 74 | 76 | 78 |
| 0.87 | 49 | 53 | 57 | 59 | 61 | 62 | 63 | 65 | 67 | 68 | 70 | 71 | 73 | 75 | 77 |
| 0.86 | 48 | 52 | 55 | 58 | 59 | 61 | 62 | 64 | 66 | 67 | 69 | 70 | 72 | 74 | 76 |

**Note:** If the value of ($P_U + P_L$) - 100 does not correspond to a ($P_U + P_L$) - 100 value in this table, use the next smaller ($P_U + P_L$) - 100 value.

## **Table 2 - Pay Factors** (continued)

| PAY FACTOR | Minimum Required Percent of Work Within Specification Limits for a Given Pay Factor ($P_U + P_L$) - 100 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Category | n=3 | n=4 | n=5 | n=6 | n=7 | n=8 | n=9 | n=10 to n=11 | n=12 to n=14 | n=15 to n=17 | n=18 to n=22 | n=23 to n=29 | n=30 to n=42 | n=43 to n=66 | n=67 to ∞ |
| 0.85 | 46 | 51 | 54 | 56 | 58 | 60 | 61 | 62 | 64 | 66 | 67 | 69 | 71 | 72 | 75 |
| 0.84 | 45 | 49 | 53 | 55 | 57 | 58 | 60 | 61 | 63 | 65 | 66 | 68 | 70 | 71 | 73 |
| 0.83 | 44 | 48 | 51 | 54 | 56 | 57 | 58 | 60 | 62 | 64 | 65 | 67 | 69 | 70 | 72 |
| 0.82 | 43 | 47 | 50 | 53 | 54 | 56 | 57 | 59 | 61 | 62 | 64 | 66 | 67 | 69 | 71 |
| 0.81 | 41 | 46 | 49 | 51 | 53 | 55 | 56 | 58 | 59 | 61 | 63 | 64 | 66 | 68 | 70 |
| 0.80 | 40 | 44 | 48 | 50 | 52 | 54 | 55 | 56 | 58 | 60 | 62 | 63 | 65 | 67 | 69 |
| 0.79 | 39 | 43 | 46 | 49 | 51 | 52 | 54 | 55 | 57 | 59 | 61 | 62 | 64 | 66 | 68 |
| 0.78 | 38 | 42 | 45 | 48 | 50 | 51 | 52 | 54 | 56 | 58 | 59 | 61 | 63 | 65 | 67 |
| 0.77 | 36 | 41 | 44 | 46 | 48 | 50 | 51 | 53 | 55 | 57 | 58 | 60 | 62 | 64 | 66 |
| 0.76 | 35 | 39 | 43 | 45 | 47 | 49 | 50 | 52 | 54 | 56 | 57 | 59 | 61 | 63 | 65 |
| 0.75 | 33 | 38 | 42 | 44 | 46 | 48 | 49 | 51 | 53 | 54 | 56 | 58 | 60 | 62 | 64 |
| **REJ E C T** | Values Less Than Those Shown Above | | | | | | | | | | | | | | |

Reject Quality Levels Less Than Those Specified for a 0.75 Pay Factor

**Note**: If the value of ($P_U + P_L$) - 100 does not correspond to a ($P_U + P_L$) - 100 value in this table, use the next smaller ($P_U + P_L$) - 100 value.

### 2.25.12.3 TABLE 3 – ALLOWABLE TOLERANCE FOR NON-STATISTICAL MATERIALS

**Quality Verification Test vs. Quality Assurance Test**

| **SOILS** | |
|---|---|
| **TEST** | **QUALITY VERIFICATION TEST vs. QUALITY ASSURANCE TEST, +/-** |
| Plasticity Index (AASHTO T90) | 3 |
| No. 200 Sieve, % (AASHTO T11/T27) | 1.5 |
| Optimum Moisture, % (AASHTO T265) | 1.0 |
| Proctor Density, lb/ft$^3$ (AASHTO T99) | 2 |
| Compaction, % (AASHTO T310) | 2.0 |
| **Aggregate (Base, Subbase, Backfill, and Mineral Aggregates)** | |
| **TEST** | **QUALITY VERIFICATION TEST vs. QUALITY ASSURANCE TEST, +/-** |
| Sieve Analysis (Non-statistical Item)AASHTO T11/T27 | |
| No. 4 sieve & larger | 5.0 |
| No. 6 sieve to No. 10 sieve | 4.0 |
| No. 10 sieve to No. 80 sieve | 3.0 |
| No. 80 sieve and No. 200 sieve | 2.0 |
| Fractured Faces (AASHTO T 335) | 5 |
| Sand Equivalent (AASHTO T 176) | 5 |
| **HOT MIX ASPHALT** | |
| **TEST** | **QUALITY VERIFICATION TEST vs. QUALITY ASSURANCE TEST, +/-** |
| Sieve Analysis (Non-statistical Item)AASHTO T11/T27 | |
| No. 4 sieve & larger | 5.0 |
| No. 6 sieve to No. 10 sieve | 4.0 |
| No. 10 sieve to No. 80 sieve | 3.0 |
| No. 80 sieve and No. 200 sieve | 2.0 |
| HMA Binder (AASHTO T308) | 0.3 |
| Compaction, % (WAQTC TM8) | 2.0 |

| PORTLAND CEMENT CONCRETE | |
|---|---|
| **TEST** | **QUALITY VERIFICATION TEST vs. QUALITY ASSURANCE TEST, +/-** |
| Slump of Concrete, mm (AASHTO T119) | |
| 3/4 inch Max. Aggregate and Specified Slump 3 inch or less | 1/2 |
| 1 1/2 inch Max. Aggregate and Specified Slump greater than 3 inch | 1 |
| Air Content, % (AASHTO T152) | 1.0 |
| Temperature, °F (AASHTO T 309) | 1 |

## 2.25.12.4 TABLE 4 – PRICE ADJUSTMENT FACTORS

| Item | Maximum Size Sieve: 100 % pass (Note 1) | Nominal Maximum Size Sieve (Note 2) | Other Specification Sieves #4 and Larger | Specification sieves #8 to #100 | #200 Sieve | Sand Equivalent | Fracture (Note 3) | Dust Ratio | Other | Compaction |
|---|---|---|---|---|---|---|---|---|---|---|
| Crushed Cover Stone & Screening | 2 | 2 | 5 | 5 | 10 | 15 | 15 | - | | |
| Ballast | 2 | 2 | 5 | 5 | 10 | 15 | - | 15 | | (Note 4) |
| Permeable Ballast | 2 | 2 | 5 | 5 | - | - | 15 | - | | (Note 4) |
| Crushed Surfacing | 2 | 2 | 5 | 5 | 10 | 15 | 15 | - | | (Note 4) |
| Maintenance Rock | 2 | 2 | 5 | 5 | 10 | 15 | 15 | - | | |
| Streambed Sediment | 2 | 2 | 5 | 5 | 10 | - | - | - | | |
| Gravel Base | - | 2 | 5 | - | 6 | 10 | - | 10 | | (Note 4) |
| Gravel Backfill for Foundations Class A | 2 | 2 | 5 | 5 | 6 | 10 | 15 | 10 | | (Note 4) |
| Gravel Backfill for Foundations Class B | - | 2 | 5 | - | 6 | 10 | - | 10 | | (Note 4) |
| Gravel Backfill for Walls | 2 | 2 | 5 | - | 6 | 10 | - | 10 | | (Note 4) |
| Gravel Backfill for Pipe Zone Bedding | 2 | 2 | 5 | 5 | 6 | 10 | - | - | | (Note 4) |
| Gravel Backfill for Drains | 2 | 2 | 5 | - | 6 | - | - | - | | |
| Gravel Backfill for Drywells | 2 | 2 | 5 | - | 6 | - | - | - | | |
| Backfill for Sand Drains | - | 2 | 5 | 3 | 10 | - | - | - | | |
| Sand Drainage Blankets | - | 2 | 5 | 3 | 10 | - | - | - | | |
| Gravel Borrow | 2 | 2 | 5 | 5 | 6 | 10 | - | - | | |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Select & Common Borrow | 2 | 2 | 5 | 5 | 6 | 10 | - | - | | |
| Gravel Borrow for Geosynthetic Walls | 2 | 2 | 5 | - | 6 | 10 | - | 10 | | |
| Foundation Material, Class A & B | - | 2 | 3 | - | - | - | - | - | | |
| Foundation Material Class C | 2 | - | 3 | - | - | - | - | - | | |
| Bank Run Gravel for Trench Backfill | 2 | 2 | 5 | - | 6 | 10 | - | 10 | | (Note 4) |
| Hot Mix Asphalt and ATB | 2 | 2 | 2 | 15 | 20 | - | - | - | Asphalt Binder Content 40 / Voids 20 | (Note 4) |
| HMA Mineral Aggregate, Fracture and SE | - | - | - | - | - | 15 | 5 | | | |
| Concrete | - | - | - | - | - | - | - | - | Cylinder Strength 6 | |
| Paving Concrete | - | - | - | - | - | - | - | - | Cylinder Strength 6 / Air Content 4 | |
| Concrete Aggregate | 2 | 2 | 2 | 10 | 20 | - | - | - | | |
| Embankment | | | | | | | | | Compaction 10 | |

**Note 1**: 100% passing size shall be analyzed with a LSL of 99%

**Note 2:** Nominal maximum size sieve is the largest sieve in the applicable specifications upon which any material is permitted to be retained

**Note 3:** Price adjustment factor applies where criteria is contained in the material specification.

**Note 4:** The CPF for Material is calculated at 60 % of the Unit Bid Price and a separate CPF for Compaction is calculated at 40% of Unit Bid Price.

## 2.25.12.5 TABLE 5 – MATERIALS UNIT PRICES

| Material | Unit Price/Ton | Unit Price/CY |
|---|---|---|
| Common Borrow | $20.00 | $40.00 |
| Select Borrow | $15.00 | $30.00 |
| Gravel Borrow | $15.00 | $30.00 |
| Foundation Material Class A & B | $25.00 | $50.00 |
| Foundation Material Class C | $25.00 | $50.00 |
| Bank Run Gravel for Trench Backfill | $30.00 | $60.00 |
| Ballast | $20.00 | $40.00 |
| Permeable Ballast | $25.00 | $50.00 |
| Streambed Sediment | $30.00 | $60.00 |
| Crushed Surfacing | $20.00 | $40.00 |
| Maintenance Rock | $20.00 | $40.00 |
| Gravel Base | $15.00 | $30.00 |
| Crushed Cover Stone & Crushed Screenings | $20.00 | $40.00 |
| Gravel Backfill for Walls | $30.00 | $60.00 |
| HMA - Mineral Aggregate, Fracture and SE | $20.00 | $40.00 |
| Hot Mix Asphalt - All Mixes | $85.00 | |
| Asphalt Treated Base | $50.00 | |
| Gravel Backfill for Foundation Cl. A | $30.00 | $60.00 |
| Gravel Backfill for Foundation Cl. B | $30.00 | $60.00 |
| Gravel Backfill for Pipe Zone Bedding | $30.00 | $60.00 |
| Gravel Backfill for Drains | $30.00 | $60.00 |
| Gravel Backfill for Drywalls | $30.00 | $60.00 |
| Backfill for Sand Drains | $30.00 | $60.00 |
| Sand Drainage Blanket | $30.00 | $60.00 |
| Concrete Aggregate | $15.00 | $30.00 |
| Portland Cement Concrete | | $300.00 |
| Portland Cement Concrete Pavement | | $150.00 |
| Gravel Backfill for Geosynthetic Retaining Walls | $30.00 | $60.00 |
| Roadway Excavation (compaction) | | $8.00 |
| Embankment | $6.00 | $12.00 |

## 2.25.12.6 TABLE 6 – SAMPLING AND TESTING FREQUENCY

| Materials or Item | Test Description | Test Method | Quality Assurance Sample | Quality Verification Sample | F and t Statistical Evaluation | Statistical Acceptance |
|---|---|---|---|---|---|---|
| Aggregates | | | | | | |
| Gravel Borrow | Grading | WAQTC FOP for AASHTO T27/11 | 1-4,000 Ton | 1-20,000 Ton | Yes | Yes |
| | Sand Equivalent | WSDOT FOP for AASHTO T176 | 1-4,000 Ton | 1-20,000 Ton | Yes | Yes |
| Select Borrow | Grading | WAQTC FOP for AASHTO T27/11 | 1-4,000 Ton | 1-20,000 Ton | Yes | Yes |
| | Sand Equivalent | WSDOT FOP for AASHTO T176 | 1-4,000 Ton | 1-20,000 Ton | Yes | Yes |
| Sand Drainage Blanket | Grading | WAQTC FOP for AASHTO T27/11 | 1-4,000 Ton | 1-20,000 Ton | Yes | Yes |
| Gravel Base | Grading | WAQTC FOP for AASHTO T27/11 | 1-4000 Ton | 1-20,000 Ton | Yes | Yes |
| | Sand Equivalent | WSDOT FOP for AASHTO T176 | 1-4,000 Ton | 1-20,000 Ton | Yes | Yes |
| | Dust Ratio | Calculate | 1-4,000 Ton | 1-20,000 Ton | Yes | Yes |
| Crushed Surfacing Top Course (CSTC) | Grading | WAQTC FOP for AASHTO T27/11 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| | Sand Equivalent | WSDOT FOP for AASHTO T176 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| | Fracture | WSDOT FOP for AASHTO T335 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| Crushed Surfacing Base Course (CSBC) | Grading | WAQTC FOP for AASHTO T27/11 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| | Sand Equivalent | WSDOT FOP for AASHTO T176 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| | Fracture | WSDOT FOP for AASHTO T335 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |

## Table 6 – Sampling and Testing Frequency (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| Aggregates | | | | | | |
| Maintenance Rock | Grading | WAQTC FOP for AASHTO T27/11 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| | Sand Equivalent | WSDOT FOP for AASHTO T176 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| | Fracture | WSDOT FOP for AASHTO T335 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| Streambed Sediment | Grading | WAQTC FOP for AASHTO T27/11 | 1-500 Ton | 1-2,500 Ton | Yes | Yes |
| Ballast | Grading | WAQTC FOP for AASHTO T27/11 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| | Sand Equivalent | WSDOT FOP for AASHTO T176 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| | Dust Ratio | Calculate | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| Permeable Ballast | Grading | WAQTC FOP for AASHTO T27/11 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| | Fracture | WSDOT FOP for AASHTO T335 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| Backfill for Sand Drain | Grading | WAQTC FOP for AASHTO T27/11 | 1-2,000 Ton | 1-10,000 Ton | Yes | Yes |
| Crushed Coverstone | Grading | WAQTC FOP for AASHTO T27/11 | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |
| | Sand Equivalent | WSDOT FOP for AASHTO T176 | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |
| | Fracture | WSDOT FOP for AASHTO T 335 | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |

## Table 6 – Sampling and Testing Frequency (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| Aggregates | | | | | | |
| Crushed Screenings | Grading | WAQTC FOP for AASHTO T27/11 | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |
| | Fracture | WSDOT FOP for AASHTO T 335 | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |
| Gravel Backfill for Foundations | Grading | WAQTC FOP for AASHTO T27/11 | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |
| | Fracture | WSDOT FOP for AASHTO T335 | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |
| Gravel Backfill for Walls | Grading | WAQTC FOP for AASHTO T27/11 | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |
| | Fracture | WSDOT FOP for AASHTO T335 | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |
| | Dust Ratio | Calculate | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |
| Gravel Backfill for Pipe Zone Bedding | Grading | WAQTC FOP for AASHTO T27/11 | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |
| | Sand Equivalent | WSDOT FOP for AASHTO T176 | 1-1,000 Ton | 1-5,000 Ton | Yes | Yes |
| Gravel Backfill for Drains, and Drywells | Grading | WAQTC FOP for AASHTO T27/11 | 1-500 Ton | 1-2,500 Ton | Yes | Yes |

## Table 6 – Sampling and Testing Frequency (continued)

| PCC Paving | | | | | | |
|---|---|---|---|---|---|---|
| Coarse Aggregate | Grading | WAQTC FOP for AASHTO T27/11 | 1-2,000 CY of concrete | 1-10,000 CY of concrete | Yes | Yes |
| Fine Aggregate | Grading | WAQTC FOP for AASHTO T27/11 | 1-2,000 CY of concrete | 1-10,000 CY of concrete | Yes | Yes |
| Combined Aggregate | Grading | WAQTC FOP for AASHTO T27/11 | 1-2,000 CY of concrete | 1-10,000 CY of concrete | Yes | Yes |
| PCC Paving (Completed Mix) | Compressive Strength (28 day) | WSDOT FOP for AASHTO T23 | 1 set – 500 CY | 1 set –2,500 CY | Yes | Yes |
| | Air Content | WAQTC FOP for AASHTO T152 | 1-500 CY | 1-2,500 CY | Yes | Yes |
| PCC Paving Cores | Density | WSDOT T810 | 1-500 CY | 1– 2,500 CY | No | Yes |
| | Thickness | WSDOT T812 | 1-500 CY | 1– 2,500 CY | No | No |
| PCC Paving Cement | Chemical and Physical | | Certification | | | |

## Table 6 – Sampling and Testing Frequency (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| PCC Structures | | | | | | |
| Coarse Aggregate | Grading | WAQTC FOP for AASHTO T27/11 | 1-1,000 CY of concrete | 1-5,000 CY of concrete | Yes | Yes |
| Fine Aggregate | Grading | WAQTC FOP for AASHTO T27/11 | 1-1,000 CY of concrete | 1-5,000 CY of concrete | Yes | Yes |
| Combined Aggregate | Grading | WAQTC FOP for AASHTO T27/11 | 1-1,000 CY of concrete | 1-5,000 CY of concrete | Yes | Yes |
| PCC Structures (Completed Mix) | | | | | | |
| | Slump – Consistency | WSDOT FOP for AASHTO T119 | For placements with 50 cubic yards or less, test until 1 load meets specification. Quantities greater than 50 cubic yards, test the first load, the second load, and continue until 2 successive loads are in specification, then 1 per every 5 loads (50 CY) thereafter until 300 cubic yards. When the quantity reaches 301 cubic yards, then 1 test for every 10 loads (100 CY). See Note 1 | 1-250 CY | No | No |
| | Slump greater than 9 inches – Slump Flow | WSDOT FOP for ASTM C 1611 | Each Load | 1-50 CY | No | No |
| | Slump greater than 9 inches – Visual Stability Index | Appendix XI of ASTM C 1611 | Each Load | 1-50 CY | No | No |
| | Air Content | WAQTC FOP for AASHTO T152 | The Testing frequency shall be the same as Slump-Consistency shown above. | 1-250 CY | Yes | No |
| | Compressive Strength (28 day) | WSDOT FOP for AASHTO T23 | The Testing frequency shall be the same as Slump-Consistency shown above. | 1-250 CY | Yes | Yes |
| PCC Structures Cement | Chemical and Physical | | Certification | | | |
| Grouts | Grout Cube Strength | WSDOT FOP for AASHTO T106 | 1 set per day | 1 set for every 5 days | Yes | Yes |

## Table 6 – Sampling and Testing Frequency (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| Asphalt Concrete Pavement | | | | | | |
| Asphalt Concrete Pavement (Completed Mix) See Note 2 | Grading | WSDOT FOP for AASHTO T308 and WAQTC FOP for T27/11 | | 1-800 Ton | No | Yes |
| | Asphalt Content | WSDOT FOP for AASHTO T308 | | 1-800 Ton | No | Yes |
| | Voids | WSDOT FOP for AASHTO T312 and WSDOT SOP 731 | | 1-800 Ton | No | Yes |
| | Maximum Density (Rice Density) | WSDOT FOP for AASHTO T209 | | 1-800 Ton | No | Yes |
| | Compaction | WAQTC FOP for TM8 | | 1-80 Ton | No | Yes |
| | Cyclic Density | WSDOT SOP 733 | | As needed | No | No |
| | Longitudinal Joint Density | WSDOT SOP 735 | | 1-400 Ton | No | No |
| Combined Aggregate | Sand Equivalent (Sampled at cold feed) | WSDOT FOP for AASHTO T176 | | 1-1,600 Ton | No | Yes |
| | Fracture (Sampled at cold feed) | WSDOT FOP for AASHTO T 335 | | 1-1,600 Ton | No | Yes |
| Blend Sand | Sand Equivalent | WSDOT FOP for AASHTO T176 | | 1-1,600 Ton | No | Yes |
| Mineral Filler | Sp. G and PI | | | Certification | | |

## Table 6 – Sampling and Testing Frequency (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| Asphalt Treated Base | | | | | | |
| Aggregate | Grading | WSDOT FOP for AASHTO T308 and WAQTC FOP for AASHTO T27/11 | | 1-1,000 Ton | No | Yes |
| | Sand Equivalent | WSDOT FOP for AASHTO T176 | | 1-1,000 Ton | No | Yes |
| Completed Mix | Grading | WAQTC FOP for AASHTO T27/11 | | 1-1,000 Ton | No | Yes |
| | Asphalt Content | WSDOT FOP for AASHTO T308 | | 1-1,000 Ton | No | Yes |
| | Asphalt Compaction | WAQTC FOP for TM8 | | 5 per day. For daily quantity of less than 200 tons, a minimum of 2 gauge readings will be taken. | No | Yes |
| Asphalt Materials | | | | | | |
| Paving Asphalt (AR, PG, Etc.) | Sampling for DOT Verification Testing | WAQTC FOP for AASHTO T40 | | 2 - 1 Qt. cans Every other mix acceptance sample of HMA | No | N/A |
| Liquid Asphalt (Cutback, Emulsion) | Sampling for DOT Verification Testing | WAQTC FOP for AASHTO T40 | | 2 - 1 Qt. cans Every other mix acceptance sample of HMA | No | N/A |
| Emulsion for HMA Tack Coat | | | | | No | N/A |
| Rubberized Asphalt | Sampling for DOT Verification Testing | WAQTC FOP for AASHTO T40 | | 2 - 1 Qt. cans Every other mix acceptance sample of HMA | No | N/A |

## Table 6 – Sampling and Testing Frequency (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| Compaction | | | | | | |
| Embankment | Compaction | WSDOT FOP for AASHTO T310 and WSDOT SOP 615 | 1-2,500 CY | 1 per 12,500 CY | Yes | Yes |
| Cut Section | Compaction | WSDOT FOP for AASHTO T310 and WSDOT SOP 615 | 1-500 LF | 1 per 2,500 LF | Yes | Yes |
| Surfacing | Compaction | WSDOT FOP for AASHTO T310 and WSDOT SOP 615 | 1-1,000 LF per layer | 1 per 5,000 LF | Yes | Yes |
| Backfill | Compaction | WSDOT FOP for AASHTO T310 and WSDOT SOP 615 | 1-500 CY (for Qty less than 2000 CY)<br>1-1000 CY (for Qty greater than 2001 CY) | 1 per 1,000 CY | Yes | Yes |

## Table 6 – Sampling and Testing Frequency (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| Compaction Standards | | | | | | |
| Subgrade Embankment | Granular Compaction Standards | WSDOT T606 or WSDOT FOP for AASHTO T180 Method D | Develop density curve for each material type used on Project. | Split sample provided to QV for testing | N/A | N/A |
| | Moisture Density Curve | WSDOT FOP for AASHTO T99, T272 | Develop density curve for each material type used on Project. | Split sample provided to QV for testing | N/A | N/A |
| Granular Embankment | Granular Compaction Standards | WSDOT T606 or WSDOT FOP for AASHTO T180 Method D | Develop density curve for each material type used on Project. | Split sample provided to QV for testing | N/A | N/A |
| | Moisture Density Curve | WSDOT FOP for AASHTO T99, T272 | Develop density curve for each material type used on Project. | Split sample provided to QV for testing | N/A | N/A |
| Backfill | Granular Compaction Standards | WSDOT T606 or WSDOT FOP for AASHTO T180 Method D | Develop density curve for each material type used on Project. | Split sample provided to QV for testing | N/A | N/A |
| | Moisture Density Curve | WSDOT FOP for AASHTO T99, T272 | Develop density curve for each material type used on Project. | Split sample provided to QV for testing | N/A | N/A |
| Surfacing | Granular Compaction Standards | WSDOT T606 or WSDOT FOP for AASHTO T180 Method D | Develop density curve for each material type used on Project. | Split sample provided to QV for testing | N/A | N/A |
| | Moisture Density Curve | WSDOT FOP for AASHTO T99, T272 | Develop density curve for each material type used on Project. | Split sample provided to QV for testing | N/A | N/A |

**Note 1**: If at any time one load of concrete fails to meet specifications for slump, air content, or temperature, continue testing every load until two successive loads meet specifications, and then continue with the established sampling frequency.

**Note 2**: Mix design conformation samples shall be submitted to the State Materials Laboratory Bituminous Concrete Section. For all projects, submit one sample per day from the first five days of production for each plant and one sample every fifth day of production thereafter. The conformation samples should be taken in conjunction with and be a representative quarter of the acceptance samples taken for the project as described in WSDOT Test Method 712.

If no acceptance sample is required for any day of production no conformation sample will be required either.

End of Section

# 2.26 REMOVAL OF EXISTING FLOATING BRIDGE

## 2.26.1 GENERAL

The Design-Builder shall remove and dispose of all elements of the existing floating bridge, including but not limited to all elevated superstructure, pontoons, lift spans, control towers, anchor cables, hazardous materials on the existing floating bridge, and all structural, mechanical and electrical attachments. The existing floating bridge anchors shall be abandoned in place. Elements on or attached to the existing floating bridge that are to be salvaged shall be removed prior to the removal of the existing floating bridge from Lake Washington.

## 2.26.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Structures Minimum Standards (Appendix B2)
- Amendments to WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M 41-10) (Appendix D18).
- WSDOT Bridge & Structures Office Design Memoranda (Appendix B4), as modified for Design-Build.
- WSDOT *Bridge Design Manual LRFD* (M 23-50) (BDM) (Appendix D1).
- AASHTO *LRFD Bridge Design Specifications*.
- WSDOT *Plans Preparation Manual* (M 22-31) (PPM) (Appendix D12).
- WSDOT *Construction Manual* (M 41-01) (Appendix D2).
- AASHTO *LRFD Bridge Construction Specifications*.
- Bridge Welding Code: AASHTO/AWS D1.5M/D1.5.
- Structural Welding Code: AWS D1.1/D1.1M.
- Unified Facilities Criteria, Design: Moorings (UFC 4-159).
- Unified Facilities Criteria, Design: Piers and Wharves (UFC 4-152).
- Rules for Planning and Execution of Marine Operations, Det Norske Veritas, Part 2 Operations Specific Requirements.
- PIANC Guidelines for the Design of Fender Systems.

### 2.26.2.1 MODIFICATIONS TO WSDOT BRIDGE DESIGN MANUAL

Modifications to the WSDOT *Bridge Design Manual* (Appendix D1) shall be in accordance with Section 2.12.

## 2.26.3 PERFORMANCE REQUIREMENTS

The Design-Builder shall remove and dispose of the existing floating bridge No. 520/8, including but not limited to the following:

- Two cross pontoons A and AA, including the elevated superstructure and support piers;
- East and West Transition Spans;
- Six longitudinal pontoons B, C, D, X, Y and Z, including the elevated superstructure and support piers;
- Thirteen longitudinal pontoons E through J and Q through W;
- Two draw pontoons M and N;
- Two lift span cross pontoons LL and OO;
- Six lift span support pontoons K, Ln, Ls, On, Os and P;
- East and West lift span structures;
- Control tower and maintenance buildings;
- Anchor cables, including anchor attachments, eyebars to mudline; and
- Pile anchors removed to two feet below the mudline;
- All structural, mechanical and electrical attachments to the floating bridge pontoons and associated elevated bridge deck superstructure and support piers.

As-built plans showing the existing floating bridge are located in Appendix A-B. The plans are not guaranteed to be dimensionally accurate or complete. The Design-Builder shall field measure existing dimensions as required.

### 2.26.3.1 DESIGN PERSONNEL REQUIREMENTS

The Design-Builder shall provide a Structural Lead Engineer in accordance with the requirements of Section 2.12 (Floating Bridge). The Structural Lead Engineer shall be in responsible charge of all structures design elements and be the Engineer of Record for all structural engineering Design Documents for this Project.

The Design-Builder shall provide a Marine Lead Engineer in accordance with the requirements of Section 2.12. The Marine Lead Engineer shall be in responsible charge of all naval architecture and marine engineering design elements and be the Engineer of Record for all naval architecture and marine engineering Design Documents for this Project.

## 2.26.4 CONSTRUCTION CRITERIA

### 2.26.4.1 GENERAL FLOATING BRIDGE REMOVAL REQUIREMENTS

All elements of the existing floating bridge specified for removal shall become the property of the Design-Builder, and all debris generated by the Design-Builder's demolition operations shall be contained, collected, and disposed of off-site. No elements of the existing floating bridgespecified for removal shall be disposed of into Lake Washington. The Design-Builder's demolition operations, and the removal, towing, and disposal of the existing floating bridge shall conform to all environmental conditions and restrictions in the Environmental Commitments List (Appendix C1) and Section 2.8 (Environmental).

Existing floating bridge pontoons shall be maintained as watertight and seaworthy until they arrive at their disposal site.

The Design-Builder shall protect the new floating bridge during removal of the existing floating bridge. Protective measures shall include, but not be limited to, marine fenders and bumpers to prevent pontoon or barge impacts, anchor cable guards and buoys.

The Design-Builder's removal operations shall conform to applicable regulations of the United States Coast Guard, including all permits for towing operations.

The Design-Builder's pontoon transporting and handling operations shall be conducted with prudence and good seamanship practices.

No existing power, sanitary, or telephone facilities will be available on the existing floating bridge for the Design-Builder's use.

### 2.26.4.2 HAZARDOUS MATERIALS

Hazardous Materials are present on the existing floating bridge and associated structures. The Design-Builder shall be responsible for the costs associated with the Hazardous Materials testing, removal, and disposal of these materials in accordance with all applicable local, State, and Federal regulatory requirements and laws.

The following list is the baseline condition for the Hazardous Materials that the Design-Builder shall include in their bid proposal for disposal:

- Lead Paint – all steel trusses, steel beams, control tower, anchor cableways, and bolted joints inside the pontoons
- Zinc – all galvanized metal, including drain pipes, catwalks, ladders, and hatch assemblies
- Hydraulic Fluid – 2500 gallons
- Gear Oil – 100 gallons
- Diesel Fuel – 500 gallons
- Sewage – 100 gallons
- Creosote Treated Piling – the timber fenders at the draw span and the east and west high rises
- Asbestos – existing embedded conduits inside the pontoons, pipes within the control tower, and draw span machinery

If Hazardous Materials are encountered which are not listed above or in quantities exceeding the limits shown above, they will be considered a DSC and compensated as defined in Section 1-04.7 of the General Provisions.

### 2.26.4.3 SALVAGE REQUIREMENTS

WSDOT has identified equipment and systems on the existing floating bridge to remain the property of WSDOT and to be salvaged. See the following Sections for salvage requirements:

- Section 2.16 for existing illumination and roadway electrical equipment,
- Section 2.17 for existing bridge electrical system equipment and existing ITS equipment,
- Section 2.23 for existing tolling equipment.

### 2.26.4.4 LOAD RESTRICTIONS ON EXISTING FLOATING BRIDGE PONTOONS

After the existing bridge has been closed and the new floating bridge has been opened to the public, the Design-Builder may store construction materials and operate construction equipment on the existing floating bridge subject to the approval of the Structural Lead Engineer. The Structural Lead Engineer shall verify that the capacity of the existing floating bridge is adequate to resist the loads from construction materials and equipment in conjunction with environmental and other applicable loads. Construction materials and equipment on the existing floating bridge shall be tied down when not in use to prevent damage to the existing and new floating bridges.

### 2.26.4.5 MOORING AND TYING TO EXISTING FLOATING BRIDGE PONTOONS

The Design-Builder shall not moor or tie to existing floating bridge pontoons in Lake Washington except as otherwise noted in this Section. After the existing floating bridge has been closed and the new floating bridge has been opened to the public, the Design-Builder may moor or tie to pontoons A through J and Q through AA of the existing floating bridge subject to the following conditions:

- Prior to mooring or tying to any of the specified pontoons, the Design-Builder shall submit a plan with supporting calculations to WSDOT for review and comment providing complete details of the proposed mooring or tying.
- The Design-Builder shall not moor or tie vessels to any of the specified pontoons if the wind velocity at the site, defined as the five-minute average wind velocity as measured by WSDOT personnel at the floating bridge weather station, exceeds the velocity specified below. The Design-Builder shall remove such vessels to the nearest dock or safe harbor outside of the wind fetch immediately when the wind velocity at the site exceeds the following:
  - 25 miles per hour from any direction at the bridge site.
  - 20 miles per hour at a bearing of South 45-degrees East to South 30-degrees West at the bridge site.
- The Design-Builder shall not drill holes in or through existing pontoon walls or pontoon top deck for the purposes of mooring or tying.

## 2.26.5 SUBMITTALS

### 2.26.5.1 EXISTING FLOATING BRIDGE DEMOLITION PLAN

The Design-Builder shall submit an Existing Floating Bridge Demolition Plan, with working drawings and supporting calculations, to WSDOT for review and comment. The Existing Floating Bridge Demolition Plan shall be prepared by the Structural Lead Engineer.

The Existing Floating Bridge Demolition Plan shall include the following as a minimum:

- Details of the containment, collection and disposal of all debris generated by demolition operations.
- Details of where and how the existing pontoons will be disposed.
- The sequence of demolition and removal through all stages of the demolition operations.
- The methods and equipment used to de-tension the external (exposed) post-tensioned tendons, and associated structural frames.
- The methods and equipment used to protect the pontoon top deck and overall pontoon structure from damage during removal of the elevated bridge deck superstructure and associated support piers, transition span pontoon support piers, and control tower and maintenance buildings.
- Methods and equipment used to maintain pontoon stability during removal operations. Details of the actions to be taken to prevent pontoon instability shall show that such operations do not take place adjacent to the new floating bridge above its anchors or anchor cables. Examples of pontoons that may become unstable include, but are not limited to, the following:
  - Pontoons with elevated superstructure that are separated before the superstructure is removed.
  - The draw span pontoons (which includes pontoons M,N, K, Ln, On, Os, P, LL, and OO) during disassembly of the draw span structure.

The Design-Builder shall not begin existing floating bridge removal operations until WSDOT has reviewed and commented on the Existing Floating Bridge Demolition Plan, and the Design-Builder has addressed all WSDOT comments and implemented the revised plan.

### 2.26.5.2 EXISTING FLOATING BRIDGE PONTOON SEPARATION PLAN

The Design-Builder shall submit an Existing Floating Bridge Pontoon Separation Plan, with working drawings and supporting calculations, to WSDOT for review and comment. Structural aspects of the Existing Floating Bridge Pontoon Separation Plan shall be prepared by the Structural Lead Engineer. Marine aspects (stability analysis of the existing separated pontoons or sets of pontoons) of the Existing Floating Bridge Pontoon Separation Plan shall be prepared by the Marine Lead Engineer.

The Existing Floating Bridge Pontoon Separation Plan shall include the following as a minimum:

- Method and equipment used to separate the pontoons at the pontoon bolted joint, and all measures and precautions to prevent damage to the existing pontoons and the new floating bridge by these operations.
- Method and equipment used to control and contain water leakage, and to remove water from the pontoon cells.
- Method and equipment used to de-tension and remove existing bolts and external (exposed) post-tensioned tendons, and associated structural frames, at all pontoon joints to be separated, and the sequence of the operation.
- Identification of the existing pontoons, or sets of pontoons, to be transported as units, and identification of the pontoon joints where pontoon separation is intended.

The Design-Builder shall not begin existing floating bridge removal operations until WSDOT has reviewed and commented on the Existing Floating Bridge Pontoon Separation Plan, and the Design-Builder has addressed all WSDOT comments and implemented the revised plan.

### 2.26.5.3 Monitoring, Damage Control, and Emergency Response Plan

Due to the potentially critical nature of any damage to the pontoons, the Design-Builder shall submit a Monitoring, Damage Control, and Emergency Response Plan to WSDOT for review and comment. The plan shall describe the monitoring of the pontoons for damage and flooding and describe potential emergency scenarios and corresponding emergency response procedure for rapid corrective action to prevent pontoon flooding, stem flooding which may occur from any source, prevent progressive flooding, and restore the watertight integrity of the pontoons.

The Monitoring, Damage Control, and Emergency Response Plan shall be prepared by the Marine Lead Engineer, with shipboard damage control experience. Calculations and plans prepared by the Marine Lead Engineer shall carry the Professional Engineer's signature and seal.

The Monitoring, Damage Control, and Emergency Response Plan shall include the following as a minimum:

- The method and equipment used to provide continuous automatic or manual (once minimum per each twelve hours) monitoring and documenting of water levels inside the pontoons, including interior cells, and pontoon freeboard.
- Full identification of all flooding risks, and contingency plans to mitigate each risk.
- The preplacement of pumps and other damage control equipment and materials at or near the pontoons, including the type and quantity of equipment, pumping capacities, and power sources, including backup generators for emergency power.
- Develop and identify potential emergency scenarios that may arise during the construction and assembly of the new floating bridge and the demolition of the existing floating bridge.
- Prepare corresponding emergency response plan to emergency scenarios identified.

- Emergency response staffing by the Design-Builder and any subcontracted emergency services, including names and phone numbers of all contact personnel.
- The emergency response to be taken by the Design-Builder's emergency response staff that will result in timely and effective damage control, including the calling and response times of additional Design-Builder personnel, WSDOT maintenance personnel, and subcontracted emergency services.

The Design-Builder shall not begin existing floating bridge removal operations until WSDOT has reviewed and commented on the Monitoring and Damage Control Plan, and the Design-Builder has addressed all WSDOT comments and implemented the revised plan.

### 2.26.5.4 MARINE OPERATIONS PLAN

The Design-Builder shall submit a Marine Operations Plan for towing operations within Lake Washington to WSDOT for review and comment. The Marine Operations Plan shall comply with the requirements described in Rules for Planning and Execution of Marine Operations, Det Norske Veritas, Part 2 Operations Specific Requirements, Chapter 2 Towing, and shall present details of the towing operations to demonstrate that the pontoons will remain intact, floating and secure within the Design-Builder's control while being transported. The Marine Operations Plan shall also include emergency response scenarios and procedures.

The Marine Operations Plan shall be prepared by the Marine Lead Engineer, with shipboard damage control experience. Calculations and plans prepared by the Marine Lead Engineer shall carry the Professional Engineer's signature and seal.

The Design-Builder shall not begin existing floating bridge removal operations until WSDOT has reviewed and commented on the Marine Operations Plan, and the Design-Builder has addressed all WSDOT comments and implemented the revised plan.

End of Section

# 2.27 MOORAGE AND TOWING

## 2.27.1 GENERAL

The Design-Builder shall perform all Work necessary to meet the requirements for moorage and towing of Pontoons for the Evergreen Point floating bridge replacement. Refer to Sections 2.12, 2.13 and 2.26 for requirements relating to the floating bridge, bridges and structures, and removal of the existing floating bridge. For environmental restrictions and requirements for moorage and towing and Pontoon cleaning requirements, refer to the Environmental Commitments List (Appendix C1).

### 2.27.1.1 DESIGN-BUILDER MOORAGE AND TOWING RESPONSIBILITIES

#### 2.27.1.1.1 WSDOT Moorage Facility for PFS in Grays Harbor

WSDOT has environmentally cleared an 85-acre aquatic site in Grays Harbor (hereinafter "Moorage Facility") and has applied for permits to use the site for moorage of PFS based upon WSDOT's conceptual design. Conceptual plans of the WSDOT Moorage Facility, along with mooring equipment (anchors, buoys, chains, floats, or lines), are referenced in Appendix M14. WSDOT will construct the Moorage Facility under separate contract referred to as the Moorage Contract.

The Moorage Facility contains two mooring sites designated as Moorage Site A and Moorage Site B and is designed to moor the PFS from cycle 1 and cycle 2 as identified in Section 2.27.4.1. The Moorage Contractor is responsible to take delivery of the cycle 1 and cycle 2 PFS from the PCP Contractor at the PCP Contractor's dockside berths owned by the Port of Grays Harbor shown in Appendix M9. The Moorage Contractor will assemble the PFS from each cycle into two rafts and place the rafts into moorage as shown in Appendix M14 (hereinafter referred to as "PFS Rafts"). The two PFS Rafts from cycle 1 will be moored at Moorage Site A and the two PFS Rafts from cycle 2 will be moored at Moorage Site B. Although WSDOT is only constructing two moorage sites within the Moorage Facility, there is additional space within the 85-acre aquatic site that may be suitable for additional Pontoon storage depending on the design. This additional space is being made available to the Design-Builder for additional moorage space at the Design-Builder's sole risk and cost. The Design-Builder shall have no right under the Contract to a change in Contract Price or Contract Time for any reason in regards to expanding moorage capacity beyond Moorage Site A and Moorage Site B in the Moorage Facility.

The Moorage Contractor is responsible to protect and maintain the Moorage Facility along with any physical equipment and components and any PFS moored therein until such time as either responsibility for an individual site and the corresponding PFS Rafts are transferred to the Design-Builder at the Instance of Transfer as described in Section 2.27.4.1.1, or until 9:00 AM on January 7, 2013, whichever occurs first. At 9:00 AM on January 7, 2013, responsibility for the entire Moorage Facility, including both Moorage Site A and Moorage Site B, along with any PFS moored therein, shall transfer to the Design-Builder irrespective of whether the Instance of Transfer as addressed in Section 2.27.4.1.1 has been implemented by the Design-Builder.

Immediately upon transfer to the Design-Builder of: i) an individual moorage site; or ii) the Moorage Facility in its entirety, the Design-Builder shall assume full responsibility and liability for said site or facility as well as all physical equipment or components, and

all PFS moored therein, at which point the Design-Builder may use the site or facility to moor PFS at the Design-Builder's discretion. The Design-Builder shall be responsible for decommissioning the entire Moorage Facility, including all moorage sites of any nature, and removing all moorage equipment and components at the Moorage Facility to two feet below the bottom of the bay prior to Substantial Completion. All removed moorage equipment and components shall become the property of the Design-Builder.

#### 2.27.1.1.2 General Requirements for All Pontoons

The Design-Builder shall be responsible for towing and moorage of all PFS from Grays Harbor and all PPDB from the PPDB construction site(s) to the final floating bridge alignment in Lake Washington including site(s) chosen by the Design-Builder for temporary moorage, outfitting, cleaning, maintenance, assembly, or damage repair.

The Design-Builder's towing operations shall conform to applicable regulations of the Unites States Coast Guard, including all permits for tow operations. The Design-Builder's Pontoon transporting and handling operations shall be conducted with prudence and good seamanship practices. The Design-Builder shall be responsible for performing the analysis and design, and for constructing any modifications necessary, so that each PFS is equipped with required towing hardware for safe open ocean towing as applicable.

The Design-Builder shall be responsible for moorage, including all associated costs, for leases of privately-owned moorage facilities and State-owned aquatic lands used for moorage, if other than the WSDOT Moorage Facility. If the Design-Builder selects existing facilities for moorage that have not been permitted, the Design-Builder shall be responsible for securing and conforming to all necessary permits.

The Design-Builder shall be responsible for all costs associated with moorage systems for Pontoons that are in the Design-Builder's care, including any improvements to the moorage locations.

The Design-Builder shall be responsible for all costs associated with emergency response as described in the Mooring Plan and the Towing Plan.

#### 2.27.1.1.3 Intentionally Omitted

#### 2.27.1.1.4 Intentionally Omitted

### 2.27.1.2 MOORING AND TOWING ENVIRONMENT

The Design-Builder's mooring or towing operations shall comply with the applicable regulations in the following environments:

- **Internal waters** defined by 33 CFR 2.24; e.g., lakes, bays, harbors, including waters within Grays Harbor, Shilshole Bay, the Lake Washington Ship Canal from the Chittenden Locks to Lake Washington, and Lake Washington.
- **Inland waters** defined by 33 CFR 2.26; e.g., waters east of the boundary line of the Strait of Juan de Fuca defined by 46 CFR 7.145.
- **Coastal waters**, also called the U.S. Territorial Sea defined by 33 CFR 2.22; e.g. the transit from Grays Harbor Entrance to the western boundary line of the Strait of Juan de Fuca defined by 46 CFR 7.145.

- **National Marine Sanctuary** defined by 15 CFR 922.150 Subpart O; e.g. the Olympic Coast National Marine Sanctuary.
- **High seas** defined in 33 CFR 2.32; e.g. any transit to Washington from outside the U.S. Territorial Sea.

#### 2.27.1.3 CONTACTS

U.S. Army Corps of Engineers
Seattle District
Hiram M. Chittenden Locks

Lake Washington Ship Canal
3015 NW 54th Street
Seattle, WA 98107-4299

Marian Valentine, P.E.
Operations Project Manager
Phone: (206) 789-2622, ext. 201
Cell: (206) 799-4583
Email: marian.l.valentine@usace.army.mil

David Carpenter
Navigation Facilities Supervisor
Phone: (206) 789-2622, ext. 202
Cell: (206) 399-0159
Email: david.a.carpenter@usace.army.mil

The contacts listed are current as of the RFP issue date.

### 2.27.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Amendments to WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M 41-10) (Appendix D18).
- WSDOT *Bridge Design Manual* (M 23-50) (BDM) (Appendix D1), including the WSDOT Design Memoranda (Appendix B4), as modified for Design-Build.
- WSDOT *Geotechnical Design Manual* (M 46-03) (GDM) (Appendix D5).
- AASHTO *LRFD Bridge Design Specifications*.
- WSDOT *Plans Preparation Manual* (M 22-31) (PPM) (Appendix D12).

- WSDOT *Construction Manual* (M 41-01) (Appendix D2).
- WSDOT *Materials Manual* (M 46-01) (Appendix D10).
- WSDOT Standard Plans (M 21-01) (Appendix D17).
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D13).
- Bridge Welding Code: AASHTO/AWS D1.5M/D1.5.
- Structural Welding Code: AWS D1.1/D1.1M.
- American Petroleum Institute Recommended Practice 2SK (API RP 2SK).
- Unified Facilities Criteria, Design: Moorings (UFC 4-159).
- Unified Facilities Criteria, Design: Piers and Wharves (UFC 4-152).
- Rules for Planning and Execution of Marine Operations, Det Norske Veritas, Part 2 Operations Specific Requirements.
- Technical Policy Board, Guidelines for Marine Transportation, Revision 4, GL Noble Denton.
- US Navy Towing Manual, SL-740-AA-MAN-010, Revision 3.

#### 2.27.2.1 MODIFICATIONS TO WSDOT DESIGN MANUALS

Modifications to the WSDOT *Geotechnical Design Manual* shall be in accordance with Section 2.6.

Modifications to the WSDOT *Bridge Design Manual* shall be in accordance with Section 2.12.

## 2.27.3 PERFORMANCE REQUIREMENTS

### 2.27.3.1 GENERAL

The Design-Builder's moorage and towing operations shall be designed, developed, and conducted in a manner that satisfies seamanship practices, engineering requirements, and jurisdictional requirements as applicable. For Environmental restrictions and requirements for moorage and towing and Pontoon cleaning requirements, refer to Section 2.8 (Environmental) and the Environmental Commitments List (Appendix C1).

### 2.27.3.2 PONTOON MOORAGE FACILITIES

The Design-Builder shall be responsible for all moorage of floating Pontoons that are in the care of the Design-Builder. No later than 120 Calendar Days after receiving NTP 1, the Design-Builder shall submit to WSDOT the location(s) to be used for moorage, as well as the schedule for use of the location(s).

### 2.27.3.3 BOLLARDS

The Design-Builder shall design, construct, and install bollards for all Pontoons to meet the needs of towing and mooring operations.

### 2.27.3.4 PONTOON CLEAR ZONE

At least 14 Calendar Days prior to mooring Pontoons at a mooring location, the Design-Builder shall confirm that the mooring location meets water depth requirements and that the Pontoon clear zone is free of obstructions. Clear zone is defined as the footprint of the Pontoon plus the maximum drift dimensions as determined by the Design-Builder and provided in the Mooring Plan.

### 2.27.3.5 PONTOON MONITORING

Once a PPDB is launched, or a PFS is received from the State, the Pontoon shall be monitored by the Design-Builder. The Design-Builder shall provide Pontoon monitor personnel to monitor the current condition in, on, and around the Pontoon.

Pontoon monitor personnel shall inspect all Pontoons and Pontoon monitoring systems in accordance with the Pontoon Monitoring Plan.

During each inspection the Pontoon monitor personnel shall ensure that all Pontoon deck hatches and interior watertight doors to cells not in use are closed, dogged shut and watertight. A written log including all cells inspected, work being performed in the cells, and water levels, if any, shall be kept. Inspection of all hatches shall be made at the end of each working day to ensure that the hatches are bolted down and sealed, watertight. A written log of all hatches inspected shall be kept.

All written logs for inspection of the Pontoons and cells shall be submitted to WSDOT by the end of each working day.

### 2.27.3.6 PONTOON ACCESS DURING MOORAGE

The Design-Builder shall provide WSDOT, or third parties in conjunction with WSDOT, access to moorage locations, including piers/terminals, and Pontoons. If the moorage location is not accessible by land, the Design-Builder shall provide access by boat as requested.

### 2.27.3.7 MAINTENANCE OF PONTOONS DURING MOORING

The Design-Builder shall be responsible for all Pontoon and moorage location maintenance within its control, including but not limited to:

- All monitoring of Pontoons as defined in this section;
- Maintenance and repair of all mooring lines, anchors, connections, and fenders; and
- Repair of any damage to Pontoons sustained while in the care of the Design-Builder as described in General Provision 1-07.13(1).

## 2.27.4 PONTOON TRANSFER

### 2.27.4.1 PONTOONS FURNISHED BY THE STATE (PFS)

PFS will be available for transfer to the Design-Builder at the moorage location(s) described herein not later than the PFS availability dates shown in the table below:

| Cycle | PFS Quantities and Types | PFS Availability |
|---|---|---|

| | | Date |
|---|---|---|
| 1 | 2 -Type 1 longitudinal Pontoons<br>1 -Type 3 cross Pontoon<br>1- Type 3a cross Pontoon<br>1- Type 4a supplemental stability Pontoon<br>1 - Type 4 supplemental stability Pontoon | 6/4/2012 |
| 2 | 4 - Type 1 longitudinal Pontoons<br>1 - Type 4a supplemental stability Pontoon<br>1 - Type 4 supplemental stability Pontoon | 9/17/2012 |
| 3 | 4 - Type 1 longitudinal Pontoons<br>2 - Type 5 supplemental stability Pontoons | 3/15/2013 |
| 4 | 2 - Type 1A longitudinal Pontoons<br>2 - Type 1 longitudinal Pontoons<br>1- Type 4 supplemental stability Pontoon<br>1 - Type 4A supplemental stability Pontoon | 8/9/2013 |
| 5 | 4 - Type 1 longitudinal Pontoons<br>1 - Type 4a supplemental stability Pontoon<br>1 - Type 4 supplemental stability Pontoon | 1/6/2014 |
| 6 | 3 - Type 1 longitudinal Pontoons | 5/8/2014 |

#### 2.27.4.1.1 Obtaining Cycles 1 and 2 PFS from Moorage Contractor

The Design-Builder shall obtain the PFS in cycles 1 and 2 from the Moorage Contractor at the WSDOT Moorage Facility in Grays Harbor. The transfer of PFS in cycle 1 and cycle 2 to the Design-Builder shall take place on a cycle by cycle basis with all PFS in each cycle being transferred to the Design-Builder as two rafts moored at the Moorage Facility. Responsibility for the respective moorage site where the rafts are located (Moorage Site A or Moorage Site B) shall also transfer to the Design-Builder at the same time as the respective PFS Rafts. The point in time that the responsibility for a PFS cycle of pontoons and corresponding moorage site transfers to the Design-Builder is referred to as the Instant of Transfer.

The actual day on which the Instant of Transfer occurs for the PFS in cycle 1 and 2 will be selected by the Design-Builder, subject to the following. WSDOT will advise the Design-Builder, approximately 14 Calendar Days in advance, of when the PFS in cycle 1, and in like manner cycle 2, will be available for transfer to the Design-Builder. This date is subject to the actual production and progress in constructing each PFS by the PCP Contractor. Said date will be uncertain until it becomes imminent, and could occur well in advance of the dates shown in the table above, but will not be later than the dates in the table above. The Design-Builder shall not assume in developing its Proposal, Proposal Price, or Baseline Schedule, that said date will occur earlier than shown in the table above.

The Design-Builder may choose at its discretion to initiate transfer of a PFS cycle of pontoons from the Moorage Contractor to the Design-Builder at any time after the date WSDOT notifies the Design-Builder that the PFS cycle is available for transfer up until 9:00 AM on January 7, 2013. At 9:00 AM on January 7, 2013, responsibility for the

entire Moorage Facility, including both Moorage Site A and Moorage Site B along with any PFS moored therein, shall be deemed transferred to the control of the Design-Builder irrespective of whether the Design-Builder has taken steps to initiate transfer pursuant to this Section. To initiate transfer of a PFS cycle of pontoons, the Design-Builder shall notify WSDOT in writing that the Design-Builder desires to accept transfer of possession of the designated PFS cycle from the Moorage Contractor to the Design-Builder. The notice shall identify the date that the transfer is to take place. The Instant of Transfer shall be deemed to occur at 9:00 AM on the day identified in the written notice requesting transfer. Although the Design-Builder shall be able to inspect the PFS Rafts prior to transfer, the Design-Builder shall not be able to perform any physical construction or preparation for towing on the PFS until after the Instant of Transfer.

The Design-Builder shall participate in coordination meetings with WSDOT and the Moorage Contractor to review transfer plans and coordinate transfer operations. Upon 7 Calendar Days advance notice by the Design-Builder to WSDOT, WSDOT will make arrangements with the Moorage Contractor to provide access to the Design-Builder for the purpose of conducting inspections of the PFS at moorage in advance of the Instant of Transfer. The Design-Builder will be afforded the opportunity to participate in the final inspection by WSDOT at which WSDOT determines whether or not the PCP Contractor has fulfilled the PCP Contract obligations regarding the construction of each PFS.

Immediately upon the Instant of Transfer as described in this Section, the Design-Builder shall assume full responsibility and liability for the PFS in that cycle that are being transferred along with the respective moorage site. This responsibility and liability includes, but is not limited to, the following: providing all applicable insurance, damage from any cause, loss due to any cause, security, monitoring, inspection, maintenance, repair, and responding to planned or emergency situations.

After the Instant of Transfer pursuant to this Section, WSDOT will provide the Design-Builder with the following:

- Ballasting logs documenting the condition and depth of ballast water in each PFS cell at the time of the Instant of Transfer.
- Monitoring and damage control documentation by the Moorage Contractor up to the Instant of Transfer.

#### 2.27.4.1.2 Obtaining Cycles 3, 4, 5, and 6 from PFS Contractor

The Design-Builder shall obtain each moored PFS in cycles 3, 4, 5, and 6 from the PCP Contractor at one of the identified docks owned by the Port of Grays Harbor in the PCP Contract shown in Appendix M9.

WSDOT will advise the Design-Builder of the anticipated date for physical completion of a given PFS approximately 14 Calendar Days in advance, and verification of the exact anticipated date 5 Calendar Days in advance.

WSDOT will, upon 24 hour advance notice from the Design-Builder, make arrangements with the PCP Contractor to provide access to the Design-Builder for the purpose of allowing it to conduct inspections and measurements of a given PFS, during the 5 Calendar Days prior to the date anticipated for pontoon physical completion. During this or any other time prior to the Instant of Transfer, the Design-Builder shall perform no physical construction or preparation for towing on the PFS eligible for transfer.

The Design-Builder shall conduct coordination meetings with WSDOT and the PCP Contractor to review transfer plans and coordinate transfer operations. The Design-

Builder will be afforded the opportunity to participate in the final inspection by WSDOT at which WSDOT determines whether or not the PCP Contractor has fulfilled the PCP Contract obligations regarding the construction of each PFS.

The Instant of Transfer of each PFS in cycles 3, 4, 5, and 6 shall be deemed to occur at precisely 9:00:00 AM on the day after WSDOT issues written notice of Segment Physical Completion under the PCP Contract.

Immediately upon the Instant of Transfer of a PFS, the Design-Builder shall assume full responsibility and liability for that PFS. This responsibility and liability includes, but is not limited to, the following: providing all applicable insurance, damage from any cause, loss due to any cause, security, monitoring, inspection, maintenance, repair, and responding to planned or emergency situations.

After the Instant of Transfer of the PFS pursuant to this Section, WSDOT will provide the Design-Builder with the following:

- Ballasting logs documenting the condition and depth of ballast water in each PFS cell at the time of the Instant of Transfer.
- Monitoring and damage control documentation by the PCP Contractor up to the Instant of Transfer.

#### 2.27.4.1.3 Additional Dock Time for Cycle 3, 4, 5, and 6

The cycle 3, 4, 5 and 6 PFS eligible for transfer to the Design-Builder will be berthed at one of the identified docks owned by the Port of Grays Harbor in the PCP Contract shown in Appendix M9. The PCP Contractor will provide an additional 48 hours of dock berthing time immediately following the Instant of Transfer at no cost to the Design-Builder. Use of the dock space for berthing PFS beyond the 48 hours after the Instant of Transfer shall be the responsibility of the Design-Builder and the Design-Builder shall coordinate with the Port of Grays Harbor for availability and cost. The 48 hours of dock time provided after the Instant of Transfer is to allow the Design-Builder access to the PFS for any preparation deemed necessary by the Design-Builder such as the installation of hardware at dockside for towing or mooring operations.

### 2.27.4.2 MOORING AND TOWING HARDWARE ON CYCLE 1 AND 2 PFS

The PFS will be equipped with bollards, padeyes, inserts, and blockouts suitable for towing and moorage of PFS within Grays Harbor Internal Waters.See Appendices M11, M22 and M23. The PFS will also be equipped with fenderings, navigation lights, spring lines, and breast lines suitable for moorage of PFS within Grays Harbor Internal Waters. WSDOT makes no guarantee this hardware is suitable for towing or mooring beyond Grays Harbor Internal Waters. The Design-Builder shall be responsible for the design and installation of all necessary hardware for towing and moorage in accordance with the requirements of this section. The Design-Builder shall remove all hardware used for mooring and towing prior to Substantial Completion. All of the removed hardware shall become the property of the Design-Builder.

### 2.27.4.3 MOORING AND TOWING HARDWARE ON CYCLE 3, 4, 5, AND 6 PFS

The PFS will be equipped with bollards, padeyes, inserts, and blockouts suitable for towing and moorage of PFS within Grays Harbor Internal Waters. See Appendices M11, M22 and M23. WSDOT makes no guarantee this hardware is suitable for towing or mooring beyond Grays Harbor Internal Waters. The Design-Builder shall be responsible

for the design and installation of all necessary hardware for towing and moorage in accordance with the requirements of this section. The Design-Builder shall remove all hardware used for mooring and towing prior to Substantial Completion. All of the removed hardware shall become the property of the Design-Builder.

## 2.27.5 DESIGN CRITERIA

The Design-Builder shall meet the requirements in Section 2.12 regarding the allowable stresses in Pontoons during mooring and towing.

### 2.27.5.1 MOORAGE AND TOWING DESIGN PERSONNEL REQUIREMENTS

The Design-Builder shall provide a Marine Lead Engineer with a minimum of 15 years of experience in marine design and applicable experience in developing wind and wave loads for large floating structures. The Marine Lead Engineer shall be a Professional Engineer in Naval Architecture and Marine Engineering, licensed under Title 18 RCW, and shall be in responsible charge of the marine design elements of the Project. The Marine Lead Engineer shall assume the leadership role for the development of design for the work described in this section to ensure that a safe and seaworthy design is produced.

### 2.27.5.2 MOORING DESIGN

The mooring system for Pontoons shall be designed such that the Pontoons will not be damaged by Pontoon to Pontoon clashing, Pontoon grounding, fender loads or overloading of mooring bitts. The mooring design shall, at a minimum, include the analysis of the following elements:

- Design of all mooring system components, including; wires, chains, soft lines, fenders, buoys, anchors, piles, dolphins, floats, clump weights and all connectors, that are planned for use during the mooring of the Pontoons;
- Identification of safety factors for mooring system components;
- Calculation of steady loads response to determine forces in fenders, bitts, fairleads, mooring lines, buoys, dolphins, piles and anchors, if used, and a comparison with required safety factors;
- Calculations shall be done for both the intact condition and a loss of mooring line condition; and
- The analysis shall be performed as described in American Petroleum Institute Recommended Practice 2SK (API RP 2SK).

### 2.27.5.3 TOWING DESIGN

The towing procedure for the Pontoons shall be designed such that the Pontoons will not be damaged during the tow. The towing design calculations shall show that the design loads do not overstress the Pontoons, as defined in Section 2.12, or cause damage such as spalling, punching shear or cracking at any time during towing operations. The towing design shall meet the following requirements as a minimum:

- Pontoon intact stability shall be positive and shall be determined using the procedures in 46 CFR 174.015 and 46 CFR 170.170.

- Global vertical bending moments, lateral bending moments and torsion moments in the Pontoon shall be determined for each tow in the wind and wave climatology of that tow.
- Global vertical bending moments, lateral bending moments and torsion moments in the Pontoon for each tow shall be determined in the wave climatology of that tow, assuming the Pontoon is damaged, with one or more flooded compartments.
- Inertial loads (due to accelerations from wave action) into the Pontoon decks from any allowed items being transported and from any completed substructure and superstructure shall be determined.
- Loads on interior bulkheads for any compartments used for interior ballast shall be determined.
- Loads on exterior (end) bulkheads from wave impacts during towing shall be determined.
- The analysis shall be performed as described in Rules for Planning and Execution of Marine Operations, Det Norske Veritas, Part 2 Operations Specific Requirements, Chapter 2 Towing.

If a dry tow option is chosen the towing design shall meet the following additional minimum requirements:

- Transport vessel flooding condition for damaged stability analysis and for shear and bending moment calculation shall be one compartment flooding. The transport vessel damaged stability shall be positive and shall be determined using the procedures in 46 CFR 174.015 and 46 CFR 170.170.
- Global loads in the Pontoon due to transport vessel static hogging or sagging shall be determined.
- Global loads in the Pontoons shall be determined from transport vessel motions for each tow in the wind and wave climatology of that tow.
- Inertial loads (due to accelerations from wave action) shall be used to calculate transport vessel structural requirements, cribbing and seafastening design. Dynamic loads from any completed substructure and superstructure shall be determined.

If a dry load option is chosen for loading the Pontoons onto the transport vessel the design shall meet the following additional minimum requirements:

- Global loads in the Pontoons during dry load shall be determined.
- Point loads in the Pontoons during dry load shall be determined.

If a float on and/or float off option is chosen for either loading or unloading the Pontoons from the transport vessel the design shall meet the following additional minimum requirements:

- Vessel/Pontoon stability shall be positive in all stages of the loading and/or unloading procedure.
- Pontoon pivot reaction at first point of contact during loading and the last point of contact during off loading shall be determined.

# 2.27.6 CONSTRUCTION CRITERIA

## 2.27.6.1 BASELINE INSPECTION REQUIREMENTS

Prior to beginning any Pontoon tow operation, the Design-Builder shall perform a joint (coordinated) inspection of the Pontoon(s) included in the tow operation with WSDOT. This inspection shall include an underwater hull inspection recorded on DVD or other recording media acceptable to WSDOT. The joint inspection shall be documented by the Design-Builder and include the condition of each Pontoon in general and each Pontoon cell in particular, in comparison to the initial inspection report.

At the destination end of a Pontoon tow operation, the Design-Builder shall perform a joint inspection of the Pontoon(s) included in the tow operation with WSDOT. The joint inspection shall be documented by the Design-Builder and include the condition of each Pontoon in general and each Pontoon cell in particular, in comparison to the initial inspection report. The inspection at the end of a tow shall include the measurement and recording of the ballast level in each cell and the freeboard at the edges of the Pontoon.

All Pontoon inspections for this Project are part of the commissioning process described in Section 2.34 and shall be coordinated by the Commissioning Authority.

The Design-Builder shall be responsible for repair of any damage to Pontoons sustained while in the care of the Design-Builder as described in Section 1-07.13(1) of the General Provisions.

## 2.27.6.2 INITIAL INSPECTION AND ACCEPTANCE

Prior to PFS acceptance and transfer, the Design-Builder shall perform a joint (coordinated) inspection with WSDOT of the PFS to be transferred to the Design-Builder, as described in Section 2.27.4.1. The joint inspection shall be documented by the Design-Builder and include the condition of each PFS in general and each PFS cell in particular. A measurement of the ballast level in each PFS cell and the freeboard measured at the edges of the PFS shall also be completed during the initial inspection. The ballast level readings shall be the initial entries in the Ballast Log, prepared in accordance with Section 2.12.

## 2.27.6.3 CLEANING PONTOONS FOR REMOVAL OF INVASIVE SPECIES

Since Pontoons will be exposed to the different moorage and towing environments defined in Section 2.27.1.2, there is a risk that invasive species could attach to Pontoons and be transported from one environment to another. The Design-Builder shall take the steps necessary to reduce this risk, including cleaning Pontoons.

### 2.27.6.3.1 Cleaning of PFS

#### 2.27.6.3.1.1 Inland Waters

For the purposes of Pontoon cleaning requirements Inland waters means Puget Sound as defined in Section 2.27.1.2.

#### 2.27.6.3.1.2 Cleaning of PFS Not Required

If the Design-Builder relocates PFS to Inland waters within 150 Calendar Days of the PFS availability date as indicated in Section 2.27.4.1, cleaning for removal of invasive species will not be required.

#### 2.27.6.3.1.3 Cleaning of PFS Required

If the Design-Builder does not relocate PFS to Inland waters in less than 150 Calendar Days of the PFS availability date as indicated in Section 2.27.4.1, cleaning of PFS for removal of invasive species, per Section 2.27.6.3.3, shall be performed by the Design-Builder prior to moving the PFS to Inland waters.

### 2.27.6.3.2 Cleaning of PPDB

#### 2.27.6.3.2.1 Cleaning of PPDB Not Required

If the sum total of Calendar Days that PPDB are in waters other than Inland waters is less than 180 Calendar Days prior to permanently entering Inland waters, cleaning for removal of invasive species shall not be required.

#### 2.27.6.3.2.2 Cleaning of PPDB Required

If the sum total of Calendar Days that PPDB are in waters other than Inland waters is greater than or equal to 180 Calendar Days prior to permanently entering Inland waters, the PPDB shall be cleaned for removal of invasive species in accordance with Section 2.27.6.3.3.

### 2.27.6.3.3 Cleaning Requirements

Pontoons shall have all invasive species that are attached to the Pontoon completely removed. Pontoon cleaning shall occur in the same water environment where the invasive species became attached to the Pontoon and shall comply with State water quality standards. Pontoons shall be cleaned using underwater hull cleaning machines or pressurized water jets. The Design-Builder shall follow the manufacturer's recommendations regarding cleaning rate such that Pontoon surfaces are not damaged.

## 2.27.7 SUBMITTALS

The PPDB shall not be launched and Pontoons shall not be towed until WSDOT has reviewed and commented on the Transfer Plan, the Mooring Plan, the Towing Plan, and the Pontoon Monitoring Plan, and the Design-Builder has addressed all WSDOT comments and implemented each revised Plan.

### 2.27.7.1 TRANSFER PLAN

The Design-Builder shall submit a Transfer Plan to WSDOT for review and comment. A Transfer Plan shall be prepared for each cycle of PFS transfer.

The Transfer Plan shall include the following elements as a minimum:

- Transfer date and time;
- Location of transfer;
- Details of the operations to be performed by the Design-Builder, the Moorage Contractor, and the PCP Contractor to complete the transfer; and
- A list of the single points of contact for the Design-Builder,, the Moorage Contractor, the PCP Contractor, and WSDOT.

### 2.27.7.2 MOORING PLAN

The Design-Builder shall submit a Mooring Plan prepared by the Marine Lead Engineer to WSDOT for review and comment. A Mooring Plan shall be prepared for all mooring sites used for Pontoons.

The Mooring Plan shall include the following elements as a minimum:

- Definition of responsibilities of WSDOT, Design-Builder, mooring master, tug captain, mooring crews and tug crews during hookup and disconnect.
- Drawings of mooring layout, locations of all mooring elements, including anchors, floats, clump weights, mooring lines, dolphins, pilings, bits, Pontoon connections, buoys, fenders.
- Drawings of intermediate and final configuration of the Pontoons in the mooring.
- Required ballast levels in each Pontoon and calculated freeboard. Any changes in ballast shall be recorded in the Ballast Log.
- Plan for access to the moored Pontoons by authorized personnel.
- Plan for use of the moored Pontoons for storage of construction equipment and / or construction supplies.
- Plan for construction of superstructure and any other outfitting activities on moored Pontoons.
- Sequence of Pontoon arrivals to all mooring sites.
- Sequence of Pontoon departures from all mooring sites.
- Description of precautions planned to ensure that the general public or other unauthorized personnel are restricted from boarding the Pontoons when moored or dockside at all ports-of-call.
- Criteria for weather limitations for hookup and disconnect from the mooring.
- Expected frequency of weather limitations for hookup and disconnect from the mooring.
- Water depths (both minimum and maximum) at the mooring site, water level and tide elevations at the mooring site.
- A methodology for verification of Pontoon clear zone shall be described. The verification method shall have the ability to identify submerged objects of a size that may damage the Pontoon bottom slab.
- Water level and tide elevation restrictions, if any, for hookup and disconnect of the Pontoons at the mooring site.
- Sequence of hookup of mooring lines to the Pontoons upon arrival.
- Sequence of disconnect of mooring lines from the Pontoons upon departure.
- Plan for control of the Pontoons during hookup.
- Plan for control of the Pontoons during disconnect.
- Plan for monitoring and inspection of the Pontoons while in the moor.

- Plan for monitoring weather conditions at the mooring site.
- Plan for monitoring the wildlife usage of the Pontoons and moorage structures in conformance with Section 2.8 and the Environmental Commitment List (Appendix C1).
- Signage, radar reflectors and lighting plan.
- Method of protecting the seal and neoprene sheet at the ends of the Pontoons.
- Emergency response plans including:
  - A discussion of possible emergency situations, including but not limited to: breakage of mooring line or lines, anchor failure, mooring bitt failure, mooring fender failure, vessel collisions, flooding, boarding by unauthorized personnel, etc;
  - Description of response asset availability and response times for salvage equipment including vessels, pumps, air supply, hoses, patching materials, special rigging; and
  - Location of a complete set of information describing the moored Pontoons, including arrangement and structural drawings, hydrostatic and tank capacity data and bitt foundation drawings.
- An emergency notification plan, including:
  - Contact information for regulatory authorities;
  - Contact information for emergency response personnel; and
  - Contact information for WSDOT.
- A site-specific design and an analysis of all components of the mooring.

### 2.27.7.3 TOWING PLAN

The Design-Builder shall submit a Towing Plan prepared by the Marine Lead Engineer to WSDOT for review and comment. A Towing Plan shall be prepared for all Pontoon towing segments including coastal, inland, internal waters, and high seas as appropriate. If the tow transects the National Marine Sanctuary then compliance with all National Marine Sanctuary requirements shall be identified. The Towing Plan shall include PFS and PPDB.

The Design-Builder shall submit a Towing Plan that identifies and plans for all jurisdictional, environmental and engineering issues for each towing segment.

The Towing Plan shall include the following elements as a minimum for each type of Pontoon:

- Definition of responsibilities of WSDOT, Design-Builder, towing contractor, tug captain, and tug crews during the tow.
- Description of security measures to be implemented to protect the safety of the general public and crews working on the tow.
- Details of the notification plan to be used in the event of an incident involving the Pontoons or unauthorized access to the Pontoons, including notifying law enforcement, U.S. Coast Guard and WSDOT.

- Results of towing analysis and design, including results of structural analysis and calculated stresses in the Pontoon.
- Description of permissible drafts, trim, and heel and corresponding ballasting plan.
- Required ballast levels in each Pontoon and calculated freeboard. Any changes in ballast shall be recorded in the Ballast Log.
- The towing schedule, including; time for disconnecting from the mooring, delays for bar crossing, and tow durations.
- Description of recording and reporting routines.
- Plan and criteria for crossing the Grays Harbor bar.
- Plan and criteria for crossing any other harbor bar along the proposed transport route.
- Plan for monitoring the wildlife usage of the Pontoons in conformance with Section 2.8 and the Environmental Commitment List (Appendix C1).
- List of points of particular hazard along the tow route.
- List of all navigational restrictions along the tow route, including but not limited to length, width and draft restrictions at the Chittenden Locks and along the Lake Washington Ship Canal, showing adequate clearance for the tow.
- List of all overhead clearances along the tow route, showing adequate clearance for Pontoons and Pontoon superstructure.
- Weather statistics to match towing dates, including wind speeds and significant wave heights.
- Weather event duration statistics for wave heights and wind speeds shall be calculated and included in the plan.
- Plan for weather forecasting prior to tow departure.
- Technical specifications for the towing vessel(s), including but not limited to: propulsion redundancy, winch specifications, minimum horsepower, bollard pull, seakeeping performance, and manning.
- Method of protecting the seal and neoprene sheet at the ends of the Pontoons.
- Technical specifications for towing outfit, including but not limited to; navigation lights and towing shapes, main tow wire, towing bridle and surge chain, boarding ladder(s), emergency towing wire, and emergency position indicators (EPIRBs).
- An emergency response plan, including but not limited to the following:
    - A discussion of possible emergency situations, including but not limited to: breaking the towline, propulsion failure on the towing vessel, towing bitt failure, severe-weather grounding, collisions, flooding, and sinking.
    - Description of response asset availability and response times for salvage equipment, including salvage vessels, pumps, air supply, hoses, patching materials, special rigging.

- Location of a complete set of information describing the towed Pontoon, including arrangement and structural drawings, hydrostatic and tank capacity data and bitt foundation drawings.
- A list of salvage equipment to be carried aboard the tug including pumps, air supply, hoses.
- A list of provisions on the Pontoons for emergency response, such as pumps, hoses, air fittings, additional salvage equipment and any special rigging.
- A list of resources along the route for rescue towing and salvage services including calling procedures.
- The plan shall identify ports of refuge and facilities within those ports where the Pontoon may be moored with adequate safety and security measures.

- An emergency notification plan including:
  - Incident reporting procedures.
  - Contact information for regulatory authorities.
  - Contact information for emergency response personnel.
  - Contact information for WSDOT.
- If dry towing is chosen the plan shall include, in addition to the above, but not limited to the following;
  - Pontoon loading procedure including schedule requirements and tidal effects.
  - Pontoon off-loading procedure including schedule requirements and tidal effects.
  - Results of structural analysis of loading, unloading and towing the Pontoon, including stresses in the Pontoon.
  - Hydrostatic and stability calculations for transport vessel and Pontoon for both loading and unloading procedure.
  - Transport vessel data including dimensions, strength, subdivision, ballast capacities and ballast handling machinery.
  - Tug requirements during loading and unloading and towing.
  - Plan for submerged vessel control if float-on or float-off procedure is chosen.
  - Emergency plan for bulkhead failure for submerged vessel if float-on or float-off procedure is chosen.
  - List and qualifications of all key personnel required for all operations.
  - Proposed locations for load and off-load.
  - Water depths at planned locations for load and off-load.
  - Tide data at planned locations for load and off-load.
  - Technical specifications for transport vessel structure, cribbing and seafastenings.
  - Technical specifications for transporter, if dry loading is chosen.

- Technical specifications for drydock, if drydock loading or unloading is chosen.
- Design for tandem towing, if chosen.

### 2.27.7.4 PONTOON MONITORING PLAN

The Design-Builder shall submit a Pontoon Monitoring Plan prepared by the Marine Lead Engineer to WSDOT for review and comment. The Pontoon Monitoring Plan shall include monitoring of PFS and PPDB.

The Pontoon Monitoring Plan shall include the following elements as a minimum for each type of Pontoon:

- The frequency of inspection by the Design-Builder's Pontoon monitor personnel of all cells in Pontoons for the following cases, at a minimum:
  - Pontoons that have not had work performed on them (inside or outside) in the past 24 hours.
  - Pontoons that have had work performed on them (inside or outside) in the past 24 hours.
  - Pontoons in which the Pontoon monitoring system has been temporarily turned off.
- The maximum duration after a storm event, as defined and identified by the Design-Builder, that the Design-Builder's Pontoon monitor personnel will inspect the Pontoons.
- The frequency of inspection of the Pontoon monitoring systems in all Pontoons.
- Sample inspection logs indicating the elements to be inspected on each Pontoon.

End of Section

# 2.28 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 design QMP shall be submitted to WSDOT within 30 Calendar Days of NTP 1. A draft construction QMP shall be submitted to WSDOT within 30 Calendar Days of NTP 2. 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 remain in effect until all requirements of the Contract have been fulfilled and the Project is accepted.

WSDOT has developed a non-project-specific Quality Management Plan Outline (QMP Outline) that is available at the following Web site:

http://www.wsdot.wa.gov/Projects/delivery/designbuild/

In developing its own QMP, the Design-Builder is encouraged to follow the organization and format of the QMP Outline. The Design-Builder may elect to use all or part of the QMP Outline. When using the QMP Outline, the Design-Builder shall make changes to section headings and text as needed to meet project-specific requirements and the Design-Builder's own quality approach. The QMP Outline is provided for informational purposes only. WSDOT accepts no responsibility for the content of the QMP Outline, nor does WSDOT warrant that use of the QMP Outline will result in Contract compliance.

The QA organization is responsible for obtaining all documentation necessary for approval and acceptance of materials; obtaining materials certifications as required; ensuring that all required materials testing is completed; and ensuring that all tests results meet the Contract requirements before the materials are incorporated into the Project. The QA organization shall inspect all Work and ensure that sufficient QA staff is present to determine whether the Work complies with Contract requirements, in accordance with the process required in the Contract Documents and the Approved QMP.

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 comply with the applicable environmental requirements and the WSDOT and AASHTO publications listed in these Technical Requirements preparing the QMP. The Design-Builder shall revise the 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 personnel performing QA functions shall be exclusively assigned 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 for resolution 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 regarding 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 WSDOT Standard Specifications (Appendix D18), 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 type of Work shall 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 in the meeting.

Pre-Activity Meetings shall be scheduled a minimum of seven 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;
- Status of materials approval and acceptance requirements
- Frequency of materials testing;
- Examination of the Work area;
- Examination of stored material; and
- 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 following personnel to the Quality Assurance Team: those 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 Project 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 Nonconformance 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; and
- 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 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 if 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.

### 2.28.1.5 QUALITY SYSTEM

#### 2.28.1.5.1 General

The Design-Builder shall prepare a QMP that includes a Quality System which meets the Contract requirements.

The hierarchy 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; and
- 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.

#### 2.28.1.5.2 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 these Technical Requirements.

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 process to verify compliance by suppliers and Subcontractors with requirements.
- Identify who within the Construction QA organization has stop work authority.

#### 2.28.1.5.3 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;
- Environmental permit application materials;
- Utility Management Plan;
- Project progress schedule;
- Submittal schedules;
- Design schedule, acknowledging documents, and/or packages that will be submitted for review;
- Roadside Work Plan;
- Traffic Management Plan;
- Traffic Incident Management Plan;
- Document Control Work Plan; and
- Construction documentation including, but not limited to:
  - Inspector's Daily Reports;
  - Non-Conformance Reports;
  - QA and QC Inspection Checklists;
  - Materials Testing Reports; and
  - Traffic Control Supervisor's Daily Report.

### 2.28.1.6 PRE-APPROVED 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 pre-approved re-work or repair procedures.

The following is a sample list of items for which pre-approved re-testing and/or re-work 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;
- Subgrade too soft;
- Materials out of specification; and
- Soil too wet.

**Hot Mix Asphalt (HMA)**

- Materials out of specification; and
- Low density.

**Rebar**

- Poor or incorrect locations;
- Insufficient clearance or lack of support;
- Damaged epoxy coating on reinforcing steel, including damage due to field cutting or bending;
- Broken ties or displaced bars
- Out-of specification post-tension tendon elongations; and
- Post tensioning ducts that fail air pressure testing.

**Concrete**

- Slump out of specification;
- Improper cold weather curing;
- Rock pockets, small and large;
- Repair of cracked concrete;
- Temperature out of specification;
- Air content out of specification (too low or too high);
- Inadequate counter reporting;
- Improper certification of compliance;
- Exceeding maximum allowed time between concrete lifts
- Over time limit; and
- Incorrect mix design.

The Design-Builder shall add re-testing 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 PROJECT QUALITY MANAGER

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. The Project Quality Manager shall report directly to the person or group with overall Project management responsibilities, e.g. the Project Manager, an offsite principle or project sponsor, or an executive oversight committee established for the Project.

**Minimum Qualifications**

The Project Quality Manager must have at least 10 years of recent experience in the management of a quality management program for heavy civil engineering projects including at least two years experience with concrete structures.

### 2.28.2.2 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 person or group with overall Project management responsibilities.

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 be a Licensed Structural Engineer in the State of Washington, and have at least 10 years of recent experience in the design or quality management of heavy civil engineering projects including at least five years experience with large bridge structures.

### 2.28.2.3 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 Section 9-1.4 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 two 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 six years of recent experience overseeing the inspection and materials testing on major highway construction projects. Of the six years minimum, the Construction QA Manager shall have a minimum of three years experience in construction materials acceptance administration and a minimum of three 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 three years of either construction inspection or construction materials administration.

### 2.28.2.4 MATERIALS APPROVAL ENGINEER

The Materials Approval Engineer shall have authority for the approval of all materials for the project. The Materials Approval Engineer shall review and approve all materials submitted via RAM, QPL, proprietary items and/or in accordance with Section 9-1.3 of the WSDOT *Construction Manual* (Appendix D2).

**Minimum Qualifications**

The Materials Approval Engineer must have 5 years of design experience in major highway design or equivalent, and must be a registered Professional Engineer in the State of Washington, and shall be an employee of the firm that leads the design for the Design-Builder.

### 2.28.2.5 ENVIRONMENTAL COMPLIANCE MANAGER (ECM)

Refer to Section 2.8 for requirements for the Environmental Compliance Manager.

### 2.28.2.6 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 four years of highway materials testing experience; or
- 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 four years of experience in the appropriate subfield in which sampling and testing is being performed; or

- Eight years of highway materials testing and construction experience.

### 2.28.2.7 ELECTRICAL/INTELLIGENT TRANSPORTATION SYSTEMS (ITS) INSPECTOR

The Design-Builder's Electrical and ITS Inspector shall have the following minimum qualifications:

- Administrator and Master Electrician certificate (AD-01) issued by the Washington State Department of Labor and Industries, and four years of experience supervising the installation of highway electrical and/or ITS systems; or
- Eight years of experience in engineering highway electrical systems including illumination, traffic signals, and/or ITS systems, and four years of full-time experience as an electrical inspector on highway construction projects.

The Design-Builder's Electrical and ITS Inspector shall notify WSDOT when electrical and ITS components are ready to be inspected for code compliance, functionality, and acceptance as required by WAC 296-46B.

### 2.28.2.8 MECHANICAL AND FIRE PROTECTION INSPECTOR

The Design-Builder's Mechanical and Fire Protection Inspector shall have a five years minimum experience in each trade or include multiple inspectors with the required skills. The experience shall be as journeyman or licensed installer of commercial equipment for buildings in excess of 20,000 square feet. The Design-Builder shall provide a skilled craftsman in HVAC, plumbing and fire protection.

The Design-Builder's Mechanical and Fire Protection Inspector shall notify WSDOT when the Bridge MaintenanceProtection Facility is ready to be inspected for code compliance, functionality and acceptance as required by WAC 51.

### 2.28.2.9 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*. 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 re-evaluated 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 or the Construction QA Manager. 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 report to the Construction QA Manager. The QA Inspection Technicians shall not be affiliated with or employed by any materials suppliers or subsidiaries. The QA Inspection Technicians shall not perform QC inspection. The QA Inspection Technicians shall have a minimum of four years of qualifying experience in roadway construction inspection.

### 2.28.2.9.1 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 |
| Drainage 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 |

### 2.28.2.9.2 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 one QA Inspector on the Project site at all times when permanent Work is being incorporated into the Project. QA Inspectors shall

not inspect concurrent work items, for example an inspector may not inspect MSE wall construction and paving operations simultaneously.

#### 2.28.2.9.3 Restrictions on Quality Assurance (QA) Staff

The restrictions for QA staff are included in the Restrictions on QA Staff (Appendix V1).

#### 2.28.2.9.4 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.

### 2.28.2.10 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, checking, back checking, correcting and verifying 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 Design-Builder originator, checker, back checker, corrector and verifier 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, re-established city, county and subdivision monuments, and Record of Survey Map.
- A defined process for tracking the design drawings through the Final Design Documents 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 prior to being sent to WSDOT for design review.

### 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 Day review period for WSDOT Review and Comment on all design submittals. WSDOT reserves the right to extend the review time by up to seven Calendar Days for submittals that are received between November 15th and January 1st, and for submittals with overlapping review periods which are being reviewed by the same discipline team.

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. Any deviation from the Mandatory Standards and Technical Requirements shall be approved by WSDOT prior to a submittal being Released For Construction.

#### 2.28.3.4.1 Technical Specifications

The WSDOT Standard Specifications (Appendix D18) 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 WSDOT 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 percent complete. The Final Design Submittal shall include plan sheets, specifications, technical memos, reports, calculations, and other pertinent data, as applicable. As a result of the on-going 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 WSDOT Standard Specifications (Appendix D18), 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, any

affected municipalities, 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 signature, 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 six 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 percent, and the average conformance level for all drawing files shall be 95 percent or greater. MOT Plans are not required to meet the conformance level criteria. The Design-Builder shall provide WSDOT with a Microsoft Excel (version 2007) 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 and Falsework Drawings

The QMP shall describe the personnel assigned to shop drawing review and approval, including falsework drawings, forms, temporary structures, construction processes, and other 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 for review and comment.

The Design-Builder shall submit all shop drawings to WSDOT, prior to implementation. The submittal shall include one hard copy and one electronic copy of shop drawings. The Design-Builder shall submit shop drawings for all steel elements, pre-cast concrete elements and post-tensioning reinforcement to WSDOT prior to implementation. The submittal shall include one hard copy and one electronic copy. If the WSDOT Engineer offers any comments, they will be submitted to the Design-Builder in accordance with this section. The Design-Builder shall provide a 14 Calendar Day review period for WSDOT review and comment on all shop and falsework 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); and
- 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).

Shop drawings which are received without the Design-Builder's documentation and comments attached, will be returned without WSDOT review and comment.

### 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 Project, and shall be organized, indexed, and delivered to WSDOT upon Final Acceptance unless required to be delivered earlier pursuant to the Contract; or within seven Calendar Days of receipt of request from WSDOT, even if the documents are incomplete. The documents shall include all test documentation including those prepared by WSDOT.

#### 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 or 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 construction in accordance with the planned Work and minimum frequencies for sampling and testing as described in Table 6, Section 2.25 of the Technical Requirements.

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 prior to work. 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 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 re-testing conducted for these purposes.

**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 2.25, the WSDOT *Construction Manual* (Appendix D2), the WSDOT *Materials Manual* (Appendix D10), and the Contract.

**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* (Appendix D2), the WSDOT *Materials Manual* (Appendix D10), 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.

### 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 the following:

- Staff qualifications, position descriptions, and the 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 procedures;
- Diagnostic and Corrective Action Reports; and
- Quality Systems review.

WSDOT will perform an on-site evaluation of the facility, in accordance with WSDOT QC 3, Quality Systems Laboratory Review in the WSDOT *Materials Manual*, 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 its staff has been inspected and has 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 WSDOT Standard Specifications (Appendix D18) and the WSDOT *Materials Manual* (Appendix D10)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 2.25 of the Technical Requirements. 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 one verification test to every five 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 five 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 one in 20. If at any time the QA and QV testing results have wide variances or cannot be validated, the QV testing frequency shall be increased to one in five 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 2.25.

For HMA, WSDOT will conduct the acceptance testing for Asphalt Treated Base and HMA aggregate, mixture, in-place density, cyclic density, and longitudinal joint density at the frequency described in Table 6, Section 2.25.

Materials that require less than five tests for acceptance, or that have less than five sublots, will require WSDOT and the QA personnel to test at the same frequency. Refer to Chapter 9 of the WSDOT *Construction Manual* (Appendix D2) 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, SAM 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. This evaluation will be performed on all test results for the total quantity of material placed for a single material type such as gravel backfill for walls, CSBC or gravel borrow. There needs to be at least 3 QA and 3 QV test results to perform the F and t analysis.

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; and
- 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 as follows:

- Pontoon Construction: At 15, 50, and 75 percent construction completion.
- SR 520 Evergreen Point Floating Bridge and Landings Project: At 15, 50, and 75 percent construction completion.

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 Project requirements:

- Project progress schedule;
- Submittal schedule;

- Design schedule, acknowledging documents, and/or packages that will be submitted for review;
- Structural elements and embed items have been integrated during the design process and as a result approved Working Drawings reflect all changes/modifications;
- Inspection requirements;
- Bridge maintenance facility;
- Pontoon cure and thermal control;
- Pontoon crack and defect inspection;
- Post-tensioning stressing and grouting operations;
- Pontoon pre-launch inspection;
- Pontoon leak inspection;
- Pontoon post-launch inspection underwater video;
- Pontoon moorage inspection;
- Pontoon towing;
- Pontoon outfitting and assembly;
- Pontoon anchor cable inspection and post-installation underwater video;
- Bridge demolition;
- Instrumentation and survey monitoring for verification of the performance of the Project geotechnical features;
- Survey monitoring for verification of Pontoon geometry for all specified dimensions and tolerances;
- Specific documentation for QA and QC activities, including control charts; and
- 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 before the close of business on Thursday of each week of planned construction activities, including fabrication, and shall describe the anticipated construction activities for the following week (Sunday through Saturday) to allow WSDOT to schedule its resources. For activities occurring further then 60 miles from 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 one 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 three Calendar Days notice of each Hold Point 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.The Engineer of Record and the Designer of Record shall submit specific Hold Points with the RFC Documents.

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 Work.

**Utility Relocations**

- Prior to any relocation of existing utilities.
- Prior to backfill of utility relocations and as required by Utility Owner's permit.

**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.
- Prior to any TESC Dewatering Operations.

**Embankments (includes backfill behind walls and abutments)**

- After completion of drainage embankment and utility installations, and before backfill.
- At intervals of embankment construction every 5 vertical feet.

**Structures (bridge, abutment walls, noise walls, curtain walls, and end walls)**

- At completion of bridge embankment or excavation, and before the start of structure foundation.
- Before saw-cutting of concrete occurs.
- Before pile driving or drilled shaft operations.
- After completion of the first piling driven at each structure support, and at the completion of each pile group, for each structure support.
- After completion of each drilled shaft along with Cross Hole 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.
- After field assembly and erection of structural steel.
- After field erection of prestressed girders.
- Grout pad or anchor bolts prior to setting bearing or girder.
- After girder and diaphragm placement.
- Before concrete placement of bridge deck, approach slabs, diaphragms, moment slabs, traffic barrier, and parapet walls (with formwork, inserts, and reinforcement in place).
- After completion of excavation and prior to box culvert construction.
- Before concrete placement for cast-in-place box culverts with formwork, inserts, and reinforcement in place.
- Prior to installation of post tensioning strands or bars.
- Prior to jacking operations for post tensioning with a hydraulic jack on the job site.
- After completion of bridge deck grinding and deck repair.

**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.
- Panel tolerances after completion of placement of panels for each Structural Earth wall prior to beginning of coping placement.
- Before concrete placement for cast-in-place retaining walls with formwork, inserts, and reinforcement in place.
- Before installation of any soldier pile, tieback or ground anchor wall and before/after verification tests.

**Noise Wall**

- After completion of soil foundation and before the placement of footing formwork.
- For pre-cast panels, after the placement of 10 panels.

**Pontoons**

- Layout
  - After the Pontoon walls and work lines have been laid out on the bond breaker and before the wall form installation begins.
  - After the exterior wall forms have been laid out for block outs, conduit wall and ceiling penetrations, inserts and post tensioning and before the rebar installation begins on the wall.
  - After the exterior walls have been installed and before rebar installation begins.

- Rebar/forms/concrete
  - A comprehensive pre-pour checklist must be completed, approved and signed by the QC and QA Inspection Technicians prior to starting the placement of concrete for each concrete pour.
  - Prior to pouring or placing concrete, review the pour sequence: pump trucks, tremies, vibrators (internal and external), access ports, pumping ports, emergency bulkheads
  - After the pre-tied wall rebar mats, columns, cages and all other pre-tied rebar elements are tied, and before they are place in the forms.
  - After the bottom mat of rebar for the base slab is installed and before the fillet or top mat installation of rebar for the base slab begins.
  - After the top mat of rebar for the base slab is installed and before starting the interior fillet form installation.
  - After the interior forms and all other items located in the base slab concrete pour area are installed and before starting the concrete placement in the base slab.
  - After the exterior wall rebar, post tensioning ducts, inserts, and all cast-in items are installed and before the interior form panel is installed.
  - After the precast interior walls are placed and the interior intersection rebar installed and before the intersection wall forms are placed.
  - After top slab bottom mat of rebar and fillet rebar instillation and before the top mat of top slab rebar placement begins.
  - After the top slab soffit forms are placed and before rebar and hatch installation begins.
  - After all concrete (including concrete for concrete repairs) has obtained the required compressive strength and crack repair has been completed, and before the post-tensioning prestressing steel tendons are installed.
  - After all top slab rebar, post-tensioning ducts, inserts, column rebar, and cast-in items are installed and before concrete placement begins.
- Precast walls
  - After rebar, hatch frames and hardware are installed and before the concrete placement begins. A comprehensive pre-pour checklist must be completed, approved, and signed by the QA and QC inspectors prior to starting the placement of concrete for each concrete pour.
  - After form panels are placed and before rebar installation begins.
  - After concrete cure is complete and before the precast wall is installed in the Pontoon.

- Structural repairs and structural crack repair - Epoxy injection
  - After concrete has been cured but before post-tensioning and concrete finishing operations begin.
  - Rock pockets
  - Cold joints
  - Deficient strength concrete prior to repair.
- Non-structural crack repair
  - After concrete has been cured but before post-tensioning and concrete finishing operations begin.
  - After prepping of construction joints and prior to subsequent pours.
- Post-tensioning
  - After post-tensioning prestressing steel tendons have been installed and before tensioning of the tendons.
  - After post-tensioning prestressing steel tendons have been tensioned and before grouting operations begin.
  - After grouting of the prestressing steel tendons, cutting of the tendons, installing the blockout rebar, and applying the epoxy bonding agent and before pouring the concrete in the blockouts.
- Pontoon prelaunch
  - After Pontoon completion and before flooding the casting facility.
  - Prior to any launch channel dredging at Grays Harbor.
- Pontoon post launch
  - After Pontoons are moored
  - Hull inspection
  - Mooring/monitoring/damage control plan.
  - Towing to Puget Sound and Lake Washington
- Pontoon assembly and outfitting
  - Prior to assembly of Pontoons – survey of alignment (horizontal and vertical) and existing condition of joints.
  - Prior to installation and tensioning of anchor bolts.
  - Prior to installation of expansion joints.
  - Prior to Pontoon ballasting and after ballasting is completed.
  - Grout pad or anchor bolts prior to setting bearing or girder.
  - After girder and diaphragm placement.
  - Prior to any coring through the Pontoon walls for conduit placement or the addition of any needed wall penetrations.

- After installation of electrical and ITS systems and prior to the energizing of systems.
- Before concrete placement of bridge deck, approach slabs, diaphragms, moment slabs, traffic barrier, and parapet walls (with formwork, inserts, and reinforcement in place).
- Prior to installation of post tensioning strands or bars.
- Prior to jacking operations for post tensioning with a hydraulic jack on the job site.
- After completion of bridge deck grinding and deck repair.

- Pontoon anchor cable installation
  - Prior to and after anchorages have been surveyed and located.
  - Prior to lowering anchor cables into the Lake.
  - Prior to tensioning and final adjustment of anchor cables.
- Existing Bridge Removal
  - Prior to removal of any anchor cables.
  - Prior to cutting the internal post tensioning ducts.
  - Prior to moving the floating bridge.
- Bridge Maintenance Facility
  - Prior to and after the layout of the Bridge Maintenance Facility and dock.
  - At completion of excavation, and before the start of the building foundation.
  - Before concrete placement of foundation, walls, and floor slabs.
  - Prior to and after layout of internal building components – walls, offices, windows, HVAC systems, mechanical systems, etc.
  - Prior to layout of electrical and ITS systems.
  - After installation of electrical and ITS systems and prior to the energizing of systems.

**Drainage**

- After placement of pipe or box culvert and prior to backfilling.
- After installation and placement of bands or gaskets and prior to backfilling.
- After placement of catch basins and manholes and prior to backfilling.
- After completion of drainage systems behind walls and before backfill of walls.

Stormwater Facility (including bioswales)

- After layout of stormwater facility.
- After excavation and prior to installation of drainage structures.
- Prior to operation of facility.

Sanitary Sewer Service

- After excavation and prior to connection with existing City main.
- After placement of pip and prior to backfilling.
- After placement of manholes and prior to backfilling.

**In-Water Work**

- Before conducting any in-water construction activities and prior to operating any equipment below the ordinary high water mark. This includes Work in wetlands, streams, or mitigation sites.
- Culvert replacement, removal, and extensions.
- Prior to capturing and removing fish from the job site at any area that includes water bypass, in-water coffer dam, and any water area likely to be disturbed.
- Prior to installing riprap or other bank stabilization.

**Subgrade, Surfacing, and Pavement**

- After completion of subgrade and prior to surfacing placement.
- After completion of surfacing placement and prior to Asphalt Treated Base, HMA, and reinforcement for approach slab placement.

Local Jurisdiction Roadways

- Prior to any roadway work within local jurisdiction ROW.

**Electrical, ITS, and Illumination**

- Prior to removal of existing ITS equipment, and after new or temporary ITS equipment is in place and operational, in accordance with Section 2.18.
- Prior to and after the fiber optic system cut-over to the new or temporary ITS during each construction stage that affects the ITS.
- Prior to removal of existing CCTV cameras, and after new CCTV cameras is in place and operational.
- Prior to removal of existing ATM signs, and after new ATM signs are in place and operational.
- As required by WAC 296-46B, inspection of electrical and traffic management systems that will be performed by WSDOT.
- Prior to removal of existing illumination, and after new or temporary illumination are in place or operational, in accordance with Section 2.16.

**All Electronic Tolling Infrastructure**

- Prior to WSDOT shop testing;
- Prior to WSDOT inspection of the permanent and any temporary AET infrastructure;
- Prior to AET infrastructure turnover to WSDOT for AET equipment installation and testing; and

- After the AET system becomes operational at the permanent and any temporary AET facilities.

**Landscaping and Aesthetics**

- After planting area preparation and prior to planting any plant material;
- After the delivery of imported soil, soil amendment or mulch, and prior to commencing placement of soils, soil amendment or mulch.
- Prior to backfilling of irrigation mainline trenches and irrigation valves; and
- Prior to removal of any existing tree larger than 8 inches in diameter at breast height.

### 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. Refer to Section 2.18.

### 2.28.5.6 MECHANICAL AND FIRE PROTECTION INSPECTION

The Design-Builder shall inspect all Mechanical and Fire Protection systems and the overall Bridge Maintenance Facility and the Bridge Fire Protection equipment to ensure that it meets all building codes and design requirements. Refer to Sections 2.30, 2.32, and 2.35 for more information.

### 2.28.5.7 COMMISSIONING INSPECTION

The Design-Builder shall complete a formal commissioning inspection program for this project. Refer to Section 2.34 for more information.

### 2.28.5.8 PERFORMANCE VERIFICATION OF PROJECT GEOTECHNICAL ELEMENTS/FEATURES

The QMP shall include inspection and tests to verify the integrity of foundation structures and elements, and to verify that their performance is as anticipated from the design. For drilled shaft foundations, refer to the Special Provision shown in Appendix B5.

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.

The Design-Builder shall use geotechnical instrumentation in accordance with Section 2.6, to verify the performance of areas with significant cuts or fills to determine deformation and stability, in particular where soft or otherwise unstable ground is present, or to control filling or cutting rates to maintain stability.

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. Additional discussion on the design requirements for ground improvements are contained in Section 2.6.

### 2.28.5.9 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, an NCI report will be generated in the CATS program.

### 2.28.5.10 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 WSDOT Standard Specifications (Appendix D18).

### 2.28.5.11 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 WSDOT Standard Specifications (Appendix D18), the WSDOT *Construction Manual* (Appendix D2), and the WSDOT *Materials Manual* (Appendix D10). 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.

### 2.28.5.12 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 in accordance with approved MOT plans, 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; and
- The Inspector's signature.

### 2.28.5.13 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 foremen 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 WSDOT Standard Specifications (Appendix D18) or the Contract for that Work activity. At a minimum, each checklist shall address the following:

| | |
|---|---|
| Date | |
| Time | |
| Location | > Pier or structure component<br>> Drainage code #<br>> Compaction Report (referenced to centerline station and subgrade elevation, etc.) |
| Type of Inspection | Completion of drainage 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 2.25 of Technical Requirements for material test requirements) |
| Items Inspected | List elements or items inspected (e.g., rebar, chair placement or pipe size and type, grate box, pipe bedding, etc.) |
| Conformation 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 |

### 2.28.5.14 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.

### 2.28.5.15 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 in the State of Washington. 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.

#### 2.28.5.16 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.

#### 2.28.5.17 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 shall 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.

#### 2.28.5.18 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 Construction Audit Tracking System, CATS program, and will require the same review and ultimate closure as NCRs generated by the Construction QA Manager.

#### 2.28.5.19 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; and
- Correct unacceptable construction practices.

### 2.28.6 SUBMITTALS

#### 2.28.6.1 QUALITY MANAGEMENT PLAN (QMP)

The Design-Builder shall submit six hard copies and one electronic copy on CD-ROM 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 six hard copies and six electronic copies on CD-ROM 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 six hard copies of the Final QMP, and submit six electronic copies of the revised QMP on CD-ROM. Each hard copy or CD-ROM shall be clearly marked with the revision that 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 six hard copies and a complete set of electronic files on CD-ROM of each design submittal to be reviewed, unless specified otherwise in these Technical Requirements.

### 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. Acceptable documentation for design submittals will include a marked set and a corrected clean set of plans and specifications, including originator, checker, back-checker, corrector and verifier annotations as described in this section and in accordance with industry standards. The Design-Builder has the option of producing deliverables in accordance with the approved SR 520 Quality Control/Quality Assurance (QC/QA) process.

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 operation, maintenance and repair of the existing facilities, in addition to facilities constructed for the Project beginning at the start of construction on the floating bridge and landings site and ending on the day of Physical Completion, at which time the product warranty shall govern the Work.

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 centerline of SR 520 (including the existing floating bridge) from the Right-of-Way limit to the north of the highway to the Right-of-Way limit to the south of the highway, from MP 1.97 to MP 4.96.
- The CTC Site as defined by the Site lease (Appendix R3).
- The Grays Harbor site as defined by the site map (Appendix R9).
- The portions of municipal streets included in the limits listed above; including but not limited to Evergreen Point Road.

WSDOT will remove disabled vehicles as well as snowplowing and the application of de-icing agents and/or abrasives on roadways open to use by the general public on SR 520. WSDOT will perform these functions during WSDOT-assigned work shifts only. WSDOT will retain responsibility for operation and maintenance of the floating bridge drawspan as well as inspection and maintenance inside the existing floating bridge pontoons (including responding to leak detection alarms and seasonal adjustments to the anchor cables) until the new floating bridge is open to traffic. Once the new floating bridge is open to traffic, the contractor shall assume full responsibility for maintenance of the existing floating bridge including but not limited to operation of the drawspan, response to leak detection alarms, and seasonal adjustment to the anchor cables.

Following the start of construction at the SR 520 Right-of-Way and the Grays Harbor facility, the Design-Builder shall provide maintenance, inspections and repairs required to that facility on an “as needed” basis throughout the duration of the Contract in a manner acceptable to WSDOT. If WSDOT determines 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 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 a case, WSDOT will

deduct the cost of correcting deficiencies from payments 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 related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- Amendments to the WSDOT Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D9).
- WSDOT *Roadside Manual* (M25-30) (Appendix D16).
- WSDOT Northwest Region, Area 5, Integrated Roadside Vegetation Management Plan (Appendix L3).
- WSDOT *Right-of-Way Manual* (M 26-01) (Appendix D14).

## 2.29.3 MAINTENANCE OF THE PROJECT SITES

### 2.29.3.1 CTC SITE

#### 2.29.3.1.1 Noxious Weed Control

The Design-Builder shall develop a Weed Control Plan in accordance with Section 8-02.3(2) of the WSDOT Standard Specifications (Appendix D18), and consistent with the terms of the CTC Site lease agreement (Appendix R3). The Weed Control Plan shall be submitted to WSDOT for review and comment prior to starting any Work at the CTC Site.

### 2.29.3.2 GRAYS HARBOR SITE

#### 2.29.3.2.1 Noxious Weed Control

The Design-Builder shall develop a Weed Control Plan in accordance with Section 8-02.3(2) of the WSDOT Standard Specifications (Appendix D18) for the Grays Harbor Site (Appendix R9). The Weed Control Plan shall be submitted to WSDOT for review and comment prior to starting any Work at the Grays Harbor Site.

## 2.29.3.3 FLOATING BRIDGE AND LANDINGS SITE

### 2.29.3.3.1 General

The Design-Builder shall maintain the roadway vegetation outside the limits of vegetation disturbed by the Design-Builder's operations and outside the sensitive area boundaries. The Work includes unwanted vegetation control, noxious weed control, tree and brush control, and turf and grass care. Refer to Section 2.15 (Landscape and Aesthetics Design) for roadside restoration requirements.

### 2.29.3.3.2 Noxious Vegetation Control

The Design-Builder shall maintain areas within the Project free of noxious or unwanted weeds in accordance with Section 1-05.16(9).2 of the General Provisions and Appendix D16.

### 2.29.3.3.3 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, plant type and required compliance date. The Design-Builder shall conduct weed control.

The Design-Builder shall apply the herbicides between Monday and Friday between the hours of 9:00 a.m. and 3:00 p.m., and before the required compliance date.

Notices to comply typically allow up to 10 Calendar Days to complete the activity. The performance measure for control is 100 percent. Herbicides used within the Project limits will be applied at recommended label rates to the target vegetation, and only during weather conditions that will allow use of the control agent.

The Design-Builder shall provide WSDOT with access to the area where the herbicide will be applied, and shall ensure that all materials, equipment and personnel are outside of the area when the herbicide is applied.

If the Design-Builder decides to apply the herbicide or to remove noxious weeds by hand, it shall remove the root of the plant and dispose of it in a container. The Design-Builder shall dispose the plant and the container in a refuse disposal, and shall complete the activity within the time limit specified on the notice to comply. The Design-Builder shall use an herbicide at legal rates and as recommended by the herbicide manufacturer for the target vegetation, and it shall ensure that a person who is licensed to apply herbicide performs the Work. A copy of the application record shall be submitted to WSDOT.

If the Design-Builder fails to respond to the King County Weed Board's notice to comply, the Design-Builder shall pay all fines assessed by the King County Weed Board, including subcontractor, administrative overhead, personnel, material, equipment and/or excess penalties. The King County Weed Board reserves the right to control weeds in an area identified as out of compliance by any means it chooses, and at any time of day it deems appropriate.

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.

### 2.29.3.3.4 Tree and Brush Control

The Design-Builder shall remove or trim any trees or brush that obscure any roadway bicycle and pedestrian path signs or cause a reduction in sight distance. The Design-Builder shall remove any trees that are identified as hazards or dangers within the Project limits, roadway or structures adjacent to or within the Right-of-Way. WSDOT will identify and notify the Design-Builder of any trees and brush that fall within this criteria. The Design-Builder shall remove any fallen or standing danger/hazard trees within 24 hours of verbal and/or written notification from WSDOT. The Design-Builder shall remove any downed trees that have fallen and are within 30 feet of the edge of paved shoulder of an active travel lane or path, or trees that may be a safety concern for public travel.

### 2.29.3.3.5 Turf and Grass Care

The Design-Builder shall mow existing turf or grasses from the edge of pavement to a point 16 feet from the edge. The grass or turf shall be mowed to a height of no less than 6 inches but no higher than 12 inches when the average grass height reaches 30 inches. The Design-Builder shall not scalp the ground within sensitive areas. Mowing will not be required on slopes steeper than 2:1.

### 2.29.3.3.6 Health Hazards

The Project area including the CTC, the Grays Harbor, and floating bridge and landings sites are 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 the 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 initially contacting the agencies.

The Design-Builder shall ensure that the public, including persons who may be non-English speaking or 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 WSDOT's Guidelines to Address Illegal Encampments within State Right-of-Way, (Appendix R1). 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 these Technical Requirements. 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 three 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; 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 of the Work 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 seven 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 the personnel of WSDOT and the Design-Builder. 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 AND FACILITIES

### 2.29.4.1 CTC SITE

The Design-Builder shall coordinate maintenance of the CTC Site in accordance with the requirements of Section 2.24 (Right-of-Way) and Section 2.33 (Pontoon Casting Facilities) and the corresponding Lease Agreements (Appendix R3).

If the Design-Builder should lease additional properties to support operations at the CTC Site, the Design-Builder shall perform all Work to maintain said properties in accordance with requirements of the respective lease agreements.

### 2.29.4.2 GRAYS HARBOR SITE

#### 2.29.4.2.1 General

The Design-Builder shall perform all Work required to maintain the functionality and configuration of the Grays Harbor Pontoon Casting Facility (Appendix R9). The Grays Harbor Pontoon Casting Facility includes, but is not limited to, the following:

- Casting basin, including fish collection and removal system;
- Casting basin gate system and hydraulic control structure;
- Launch channel;
- Dolphins;
- Shoreline protection;
- Pavement;
- Stormwater management;
- Fire suppression system;
- Perimeter security fencing and gates;
- Potable water distribution;
- Crane support structure;
- Support buildings;
- Railroad spur; and
- Electrical systems and controls;

#### 2.29.4.2.2 Maintenance Prior to Facility Turnover to WSDOT

The Design-Builder shall perform the necessary maintenance and repairs to bring the Pontoon casting facility to a complete and functional condition, consistent with the Facility Acceptance requirements of Section 2.33 (Pontoon Casting Facilities). The casting facility includes all aspects, features, portions, and systems required for operation to support the construction and launching of Pontoons. These systems specifically include, but are not limited to, the list provided in Section 2.29.4.3.1. This Work includes the repair and replacement of any failed part of component of any aspect, feature, portion or system of the Pontoon casting facility.

Staging, laydown, parking, and storage areas located on the Grays Harbor Site shall be thoroughly cleaned and shall be free of any debris, oil, or chemicals.

Outer fish barrier pumping screens shall be removed from the saltwater and stored in an upright position within the casting facility. The screens shall be cleaned or all debris and flushed with fresh water.

All basin flooding and stormwater pumps and the associated sumps shall be flushed with fresh water until all saltwater residue is removed.

All fire cabinets shall be returned to their proper locations within the casting facility. The Design-Builder shall secure the casting facility gates.

All utilities, including power and water, shall be maintained in a ready state.

Refer to 2.8 (Environmental).

#### 2.29.4.2.3 Site Access to Local Streets

During construction operations, the Design-Builder shall perform all Work to prevent tracking of dirt and gravel onto local streets from the Project in accordance with the TESC requirements of Section 2.8 (Environmental). Any maintenance of local streets accessing the Site shall be per the terms of local agency haul route agreements obtained by the Design-Builder.

#### 2.29.4.2.4 Building for Dry Storage of Materials

The Design-Builder shall perform all Work to maintain buildings for dry storage of materials in accordance with the requirements of Sections 2.10 (Utilities and Relocation Agreements) and 2.13 (Bridges and Structures). Maintenance shall satisfy the requirements of applicable law. Should the Design-Builder choose to lease properties for dry storage of materials, maintenance shall be in accordance with terms of the lease agreement.

### 2.29.4.3 Floating Bridge and Landings Site

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 (Maintenance of Traffic).

#### 2.29.4.3.1 Roadway Sweeping

The Design-Builder shall maintain all paved areas within the Project limits, including the existing floating bridge, to prevent the accumulation of dirt and gravel. The Design-Builder shall periodically, and when directed by WSDOT, perform street sweeping or other best management practices to remove debris from the roadway and shoulders.

The Design-Builder shall take measures to prevent spillage on haul routes. If spillage occurs, the Design-Builder shall remove it and clean the area within one hour of observation 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 (Environmental).

### 2.29.4.3.2 Existing Pavement

The Design-Builder shall maintain all existing pavement, including pothole repair. Any pothole larger than a total of 36 cubic inches in volume and/or three inches in depth shall be repaired within 24 hours of being observed by the Design-Builder or notified by WSDOT. If the pothole is causing traffic to slow and/or deviate from normal traffic patterns, the Design-Builder shall perform pothole repair within one hour of being observed by the Design-Builder or notified by WSDOT. Temporary pothole repairs will be allowed if the material is pre-approved by WSDOT, if weather conditions will not allow for permanent repairs, and if traffic conditions dictate that permanent repairs are scheduled for another time to reduce impacts. All temporary pavement repairs shall be inspected by the Design-Builder at least once every business day or more often if the temporary repair shows any signs of failure. If the temporary repair shows signs of imminent failure, the repair shall be reinforced within one hour of being observed by the Design-Builder or receiving verbal notification from WSDOT.

Permanent pothole repair shall be performed in accordance with Section 2.7 (Pavement). Materials used for permanent pothole repair shall be of the same type and depth as the adjacent pavement.

### 2.29.4.3.3 Roadway Debris

The Design-Builder shall maintain the Project free of roadway debris such as sheets of plastic, tarps, garbage cans and tires, which may cause traffic to slow below the posted speed limit, present a traffic hazard to the public or cause traffic to deviate from normal traffic patterns. In the event these conditions occur, the Design-Builder shall remove them within one hour of observation by the Design-Builder or verbal notification from WSDOT, so that traffic flows freely and there is no hazard to the public. The debris shall be removed from the Project limits and disposed of by proper means at an approved location. Failure to maintain the Project free of roadway debris, to comply with site and clean-up procedures required by the Contract, or to remedy the situation within one hour after receipt of verbal notification from WSDOT will result in WSDOT correcting such deficiencies. In such cases, WSDOT shall deduct the cost of correcting such deficiencies from payments then or thereafter due. 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.

### 2.29.4.3.4 Pavement Markings

The Design-Builder shall maintain existing and new pavement with painted, plastic or raised pavement markings. WSDOT will indicate where existing markings require refreshing. Paint for temporary pavement markings shall be in accordance with Section 9-34 of the WSDOT Standard Specifications (Appendix D18). The Design-Builder shall anticipate that existing markings will need to be refreshed at a minimum of once per calendar year.

All costs to maintain, install, move or remove permanent or temporary pavement markings, lines or raised pavement markings within or outside of the Project limits that are considered part of the Work are the responsibility of the Design-Builder.

WSDOT will maintain the existing striping until the Design-Builder begins Work for the Project.

### 2.29.4.3.5 Animal Carcasses

The Design-Builder shall maintain the Project free of animal carcasses that present a traffic hazard such as damaging vehicles, causing traffic to deviate from normal traffic patterns or causing traffic to slow below the posted speed limit. The Design-Builder shall remove them from the travel lanes within one hour of observation by the Design-Builder or notification from WSDOT. The carcass shall be removed from the Project limits and disposed of by proper means at an approved location. Failure to maintain the Project free of animal carcasses, to comply with site and clean-up procedures required by the Contract, or to remedy the situation within one hour after receipt of verbal notification from WSDOT will result in WSDOT correcting such deficiencies. In such cases, WSDOT will deduct the cost of correcting such deficiencies from payments then or thereafter due. 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.

### 2.29.4.3.6 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 five feet or greater. When the shoulder width is less than five feet, the devices shall be placed off the paved shoulder and a minimum of eight feet from the traveled lanes. The Design-Builder shall develop and submit for approval a written procedure for securing traffic control devices that are not in use so as to prevent them from becoming an obstacle to traffic. If the Design-builder cannot demonstrate that the traffic control devices being stored are properly secured, they shall be removed from the roadway at the end of each shift. The Design-Builder shall locate traffic control devices so as not to block any existing sidewalks or bicycle trails, and to leave adequate space for wheelchairs. Traffic control devices shall not be stored on the sidewalks of the existing floating bridge.

### 2.29.4.3.7 Guardrail, Concrete Barrier and Attenuators

The Design-Builder shall replace or repair any guardrail, concrete barrier or attenuators that become damaged by the public or 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.

### 2.29.4.3.8 Traffic System Signs

The Design-Builder shall be responsible for maintenance of existing permanent signs. Maintenance of existing permanent signs includes cleaning, repairing and replacing damaged signs and posts. Cleaning will only be required when directed by WSDOT. Payment for maintenance of existing permanent signs shall be in accordance with Section 1-09 of the General Provisions.

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.

All Motorist Information Signs shall be maintained in size and location. Any signs that must be relocated shall not be down for longer than 24 hours. WSDOT approval is required prior to relocation.

#### 2.29.4.3.9 Stormwater Management

The Design-Builder shall maintain and provide adequate stormwater management on the Project until Physical Completion. Maintenance shall include cleaning and repair of riprap, cribbing, ditches, channels, culverts, cross drains, drainage structures and gutters.

#### 2.29.4.3.10 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.

#### 2.29.4.3.11 Protection of Drainage Structures and Electrical Boxes

The Design-Builder shall verify that all existing and new drainage structures and electrical boxes located within two feet of temporary or permanent travel lanes have sufficient strength to safely carry highway traffic loads without failing. If any of these structures or boxes do not have sufficient strength, they shall be reinforced and/or protected prior to opening the travel lanes to traffic.

#### 2.29.4.3.12 Video Documentation of Pre-Existing Conditions

The Design-Builder shall make a video record of the pre-existing conditions of any section of road, street or public facility within 14 Calendar Days of starting Work or using that section of road, street or public facility. This video record shall be made available to WSDOT upon request.

## 2.29.5 SNOW AND ICE OPERATIONS

### 2.29.5.1 PUBLIC TRAVEL WAY

WSDOT will perform snowplowing and application of de-icer 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 AND MECHANICAL

### 2.29.6.1 INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

All ITS equipment within the Project limits shall be maintained by the Design-Builder. Refer to Section 2.18 (Intelligent Transportation Systems) for ITS requirements and Section 2.22 for MOT requirements.

### 2.29.6.2 ACTIVE TRAFFIC MANAGEMENT (ATM) SYSTEM

All ATM systems equipment within the Project limits shall be maintained and kept operational by the Design-Builder. Refer to Sections 2.18 (Intelligent Transportation Systems) for ITS requirements and Section 2.22 for MOT requirements.

### 2.29.6.3 TOLLING INFRASTRUCTURE

Refer to Section 2.23 (All Electronic Tolling Infrastructure) for requirements for maintaining the AET infrastructure during construction and Section 2.22 for MOT requirements.

### 2.29.6.4 LUMINAIRES

The Design-Builder shall maintain and operate all lighting systems in accordance with Sections 2.16 (Illumination and Roadway Electrical Systems), 2.17 (Electrical Bridge and Services) and 2.22. Maintenance and operation shall include, but is not limited to, the following:

- Replacement of lamps, as required;
- Replacement or repair of any damaged equipment or underground cable;
- Maintenance concerning a public safety issue (including exposed wires and knockdowns), within one hour of notice from WSDOT; and
- Routine maintenance and other maintenance that does not affect the public safety, within 24 hours of notice from WSDOT.

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 (Environmental).

### 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. The Design-Builder shall be required to clean-out drains on the existing floating bridge on an as needed basis but not less than once per month. Free draining of water through any drainage structure shall be maintained at all times. Refer to section 2.14 (Stormwater Management).

The Design-Builder shall perform yearly inspections of the existing anchor cables on both the North and South sides of the existing floating bridge starting in 2011. These inspections shall be completed before the start of the storm season (October). These cable inspections shall conform to the requirements of the anchor cable inspections as provided in Section 2.12.5.16.10. WSDOT will require the Design-Builder to repair damage to the anchor cables if such damage directly or indirectly results from the Design-Builder's failure to exercise adequate maintenance measures. WSDOT will direct repairs to the anchor cables as required.

#### 2.29.8.2 PONTOONS FURNISHED BY THE STATE (PFS)

The Design-Builder shall perform all Work to maintain the PFS in accordance the requirements in Sections 2.12 (Floating Bridge) and 2.27 (Moorage and Towing).

### 2.29.9 FLOATING BRIDGE

All Electrical, Communications, and other utility services for the SR 520 Evergreen Point Floating Bridge that are within the vicinity of the project limits need to be maintained at all times. Refer to sections 2.12 (Floating Bridge), 2.16 (Illumination and Roadway Electrical Services), 2.17 (Electrical Bridge and Services), and 2.18 (ITS) for specific information.

### 2.29.10 EMERGENCY RESPONSE

#### 2.29.10.1 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 (Public Information) for additional public information requirements regarding emergency response.

#### 2.29.10.2 EMERGENCY ACCESS

The Design-Builder shall work with emergency service providers to address their concerns about emergency access to and through the Project corridor. This may include installing gates to allow emergency personnel to access the Project area. Refer to Section 2.22 (Maintenance of Traffic) for additional maintenance of traffic requirements.

#### 2.29.10.3 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 and 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.

#### 2.29.10.4 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.

### 2.29.11 MAINTENANCE OF PROPERTY

#### 2.29.11.1 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 (Surveys and Mapping) for additional requirements regarding monumentation and surveying.

#### 2.29.11.2 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 before the damage occurred by repairing, replacing in kind, rebuilding, replanting or compensating the property owner.

#### 2.29.11.3 TEMPORARY FENCING

The Design-Builder shall be required to furnish and install temporary chain link security fencing in order to contain animals and people before removing any existing sound barrier or Right-of-Way fencing within the Project limits.

# 2.29.12 MAINTENANCE OF AESTHETIC TREATMENT

## 2.29.12.1 GENERAL

The Design-Builder shall monitor the appearance of the aesthetic treatments on walls or bridges for any defects, flaws or vandalism until Physical Completion. The Design-Builder shall note and bring to WSDOT's attention defects, flaws and vandalism.

Defects and flaws shall be corrected in accordance with Section 1-05 of the General Provisions.

The Design-Builder shall be responsible for cleaning up and restoring property impacted by vandalism until Physical Completion.

The use of paint and/or permanent marking of any type on permanent barrier, railing and walls will not be allowed except as required by the Contract.

# 2.29.13 SUBMITTALS

## 2.29.13.1 WEED CONTROL PLAN

The Design-Builder shall submit a weed control plan in accordance with Sections 2.29.3.1.1, 2.29.3.2.1, and 2.29.3.3.1.

## 2.29.13.2 HERBICIDE APPLICATION

A copy of the application record of herbicide for noxious weed removal shall be submitted to WSDOT within two Calendar Days of the application of the herbicide.

## 2.29.13.3 TRAFFIC CONTROL DEVICES

The Design-Builder shall submit a plan for securing stored traffic control devices in accordance with Section 2.29.

## 2.29.13.4 EXISTING ANCHOR CABLE INSPECTION

The Design-Builder shall submit the existing anchor cable inspection report in accordance with Section 2.12.

End of Section

# 2.30 BRIDGE MAINTENANCE FACILITY AND DOCK

## 2.30.1 GENERAL

The Design-Builder shall conduct all Work necessary to design and construct the Bridge Maintenance Facility (BMF) and Bridge Maintenance Dock (BMD) as described in this section.

The Conceptual Plans (Appendix M1) show the layout and configuration of the Bridge Maintenance Facility and Dock. The Basic Configuration (refer to Section 1-01.3 of the General Provisions) is represented in the Conceptual Plans.

The Bridge Maintenance Facility and Dock include, but are not limited to, the following:

- Bridge Maintenance Facility including:
  - Parking.
  - Shoring walls.
  - Access road.
  - Site work including landscape screening.
  - Building Architecture and Systems.
  - Building Frame and Envelope Requirements.
  - Interior Space Requirements.
  - Freight and passenger elevators and hoistways.
  - Stairways (interior and exterior).
  - Life Safety Requirements.
  - Acoustical Requirements.
- Bridge Maintenance Dock:
  - Service Platform.
  - Approach Pier.
- Permanent walls.
- Bridge Maintenance Facility and Dock utilities, services, systems and equipment:
  - Coordination between the Electrical Bridge and Services, including the Bridge Control System, CCTV System, Electrical Service, Diesel Generator, Automatic Transfer Switch, power distribution system, and navigation with technical requirements located in Section 2.17 with portions of the systems located at the Bridge Maintenance Facility and Dock.
  - A complete interior and exterior lighting, receptacles, telephone service, computer communication, security system, intercom system, and WSDOT Card Readers for access control for the Bridge Maintenance Facility and Dock.

- A complete power distribution system consisting of cable, wire, conduit, junction boxes, power distribution panels, and step down transformers for the Bridge Maintenance Facility and Dock.
- A Fiber HUB connection, to allow communication between the Bridge Control System (in accordance with Section 2.17) and ITS.
- A jib hoist selected to match the jib hoists on the Bridge to be located on the Bridge Maintenance Dock. A similar jib hoist shall be provided in the parking lot adjacent to the Freight Elevator to load equipment into the elevator.
- A bridge crane hoist to be located in the shop area.
- All electrical controls required for the mechanical HVAC systems, air compressor, water pumping equipment, etc.
- Other mechanical systems including HVAC, a fire protection system, a passenger elevator and a freight elevator.
- Utilities including a diesel fuel system, a potable water system, a sanitary sewer system and a compressed air system.

- Removal of existing structures as required to complete the Work.

#### 2.30.1.1 SITING

The Bridge Maintenance Facility and Dock shall be located on the east shore of Lake Washington, in the City of Medina. They shall be located beneath the replacement East Approach Bridge, within the SR520 right-of-way and adjacent to the replacement floating bridge designated navigation channel.

#### 2.30.1.2 PERMITS

The Design-Builder shall be responsible for the permitting of the structures in accordance with Section 2.8 Environmental and for the coordination of function, design and aesthetics with WSDOT, State and local agencies, and abutting owners.

The Design-Builder shall obtain all necessary permits and approvals not obtained by WSDOT for the structures and systems from the Authorities Having Jurisdiction, including but not limited to building and construction permits from the City of Medina, Washington State Department of Labor and Industries and the U.S. Coast Guard for the Bridge Maintenance Facility and Dock.

### 2.30.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. This is not a comprehensive list; other applicable publications may be required to complete the design and construction. If conflicts between standards occur, the more stringent requirement shall be used. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication, including the supplemental interim revisions, as of the RFP publication date shall be used.

The Bridge Maintenance Facility shall be designed using standards as identified in Section 2.30.2.1. The Bridge Maintenance Dock and any retaining walls or structures

supporting components of SR520 roadway, including permanent shoring walls for the Bridge Maintenance Facility, shall be designed using standards as identified in Section 2.30.2.2.

### 2.30.2.1 BRIDGE MAINTENANCE FACILITY

- WAC Title 51 (Commerce, Department of [Building Code Council] - State of Washington, Washington State Building Code.
- International Building Code (IBC), International Code Council.
- Medina Municipal Code.
- Medina Shoreline Management Master Program.
- WSDOT *Bridge Shaft Mandatory Standard* (Appendix B5).
- WSDOT Amendments to the Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- Bridge Maintenance Facility Mandatory Specifications (Appendix B12).
- Bridge Maintenance Facility Architectural Concept (Appendix L10).
- Bridge Maintenance Facility Building Code, Zoning and Land Use Analysis (Appendix S13).
- Bridge Maintenance Facility Sustainability Checklist (Appendix S14).
- U.S. Green Building Council, Leadership in Energy and Environmental Design (LEED) for New Construction (NC)
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D13).
- *ACI 117, Specifications for Tolerances for Concrete Construction and Materials and Commentary*.
- Washington Administrative Code (WAC) Chapter 296 46B, Electrical Safety Standards, Administration and Installation.
- WAC 296-96 (Safety regulations and fees for all elevators, dumbwaiters, escalators and other conveyances).
- National Fire Protection Association (NFPA), National Electric Code (NEC), latest edition.
- National Fire Protection Association (NFPA), Life Safety Code (NFPA-101), latest edition.
- Underwriters Laboratory (UL).
- American National Standards Institute (ANSI).
- National Electrical Manufacturer's Association (NEMA).
- Institute of Electrical and Electronic Engineers (IEEE).
- International Cable Engineers Association (ICEA).
- The Occupational Safety and Health Act (OSHA).

- International Electrical Testing Association (NETA).
- American Association of State Highway and Transportation Officials (AASHTO), Movable Highway Bridge Design Specifications, 2nd Edition with 2008 Interim Revisions.
- United States Access Board ADA Accessibility Guidelines (ADAAG).

### 2.30.2.2 BRIDGE MAINTENANCE DOCK & ROADWAY SUPPORTING STRUCTURES

Although the following Mandatory Standards do not necessarily specifically address the Bridge Maintenance Dock, the intent of this section is that the Bridge Maintenance Dock conform to these standards as closely as possible. For the purposes of applying and interpreting the requirements of the Mandatory Standards, the components and elements of the Bridge Maintenance Dock shall meet the requirements for similar components and elements of bridges and other structures specifically addressed in the Mandatory Standards.

- Structures Minimum Standards (Appendix B2).
- WSDOT *Bridge Shaft Mandatory Standard* (Appendix B5).
- WSDOT Amendments to the Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M41-10) (Appendix D18).
- Bridge Maintenance Facility Mandatory Specifications (Appendix B12).
- Bridge Maintenance Facility Architectural Concept (Appendix L10).
- Bridge Maintenance Facility Building Code, Zoning and Land Use Analysis (Appendix S13).
- Bridge Maintenance Facility Sustainability Checklist (Appendix S14).
- U.S. Green Building Council, Leadership in Energy and Environmental Design (LEED) for New Construction (NC)
- Workboat Performance Specification (Appendix B13).
- WSDOT *Bridge Design Manual* (M23-50) (BDM). (Appendix D1).
- WSDOT *Design Manual* (M22-01) (Appendix D3).
- WSDOT *Geotechnical Design Manual* (M46-03) (GDM)(Appendix D5).
- WSDOT *Highway Runoff Manual* (M31-16) (HRM) (Appendix D6).
- WSDOT *Hydraulics Manual* (M23-03) (Appendix D7).
- WSDOT *Utilities Manual* (M22-87) (Appendix D21).
- WSDOT *Utilities Accommodation Policy* (M22-86) (Appendix D20).
- WSDOT *Local Agency Guidelines* (M36-63) (LAG) (Appendix D8).
- WSDOT *Maintenance Manual* (M51-01) (Appendix D9).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).

- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D13).
- Medina Municipal Code.
- Medina Shoreline Management Master Program.
- AASHTO Guide Specifications for LRFD Seismic Bridge Design.
- AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms.
- AASHTO LRFD Guide Specifications for Design of Pedestrian Bridges, 2nd Edition.
- AASHTO LRFD Bridge Design Specifications.
- AASHTO LRFD Bridge Construction Specifications.
- Washington Administrative Code (WAC) Chapter 296 46B, Electrical Safety Standards, Administration and Installation.
- National Fire Protection Association (NFPA), National Electric Code (NEC), 2008.
- National Fire Protection Association (NFPA), Life Safety Code (NFPA-101), 2009.
- Underwriters Laboratory (UL).
- American National Standards Institute (ANSI).
- National Electrical Manufacturer's Association (NEMA).
- Institute of Electrical and Electronic Engineers (IEEE).
- International Cable Engineers Association (ICEA).
- The Occupational Safety and Health Act (OSHA).
- International Electrical Testing Association (NETA).
- American Association of State Highway and Transportation Officials (AASHTO), Movable Highway Bridge Design Specifications, 2nd Edition with 2008 Interim Revisions.
- American Petroleum Institute, LRFD RP2A, 2002.

#### 2.30.2.2.1 Modifications to the WSDOT Bridge Design Manual (BDM)

WSDOT *Design Memoranda* shall apply to the Project, except that the references to the Project advertisement dates shall not apply.

The BDM (Appendix D1), as modified by 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 (Appendix D1) are applicable to the Design-Builder:

- The Design-Builder shall complete all analyses, evaluations, load ratings, plans and specifications discussed in the BDM (Appendix D1).
- 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 (Appendix D1).

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 (Appendix D1).

## 2.30.3 PERFORMANCE REQUIREMENTS

### 2.30.3.1 GENERAL

Design and construction of the Bridge Maintenance Facility and Dock shall conform to the configuration, form and character as described in the Conceptual Plans (Appendix M1). Design and construction of the Bridge Maintenance Facility and Dock shall preserve conceptual design as far as practicable.

### 2.30.3.2 EXCLUSIVE FACILITY AND DUTY STATION

The Bridge Maintenance Facility and Dock shall be exclusively dedicated to support the inspection, maintenance, operations and emergency response of the floating bridge.

The Bridge Maintenance Facility and Dock shall function as a duty station for the WSDOT floating bridge maintenance crew consisting of 10 members, including one electrician, one lead tech, and one supervisor.

### 2.30.3.3 RESPONSE TIME

The design and construction of the Bridge Maintenance Facility and Dock shall minimize response time for the crew between the Bridge Maintenance Facility and the floating bridge.

### 2.30.3.4 SCREENING FROM ADJACENT RESIDENCES

The operation of the Bridge Maintenance Facility and dock access area shall be screened from adjacent residences to the extent possible as shown in Appendix L10. Visual and noise impacts to adjacent residences shall be minimized as required in this Section and by the City of Medina.

The Bridge Maintenance Facility and Dock, including parking, shall be located underneath the superstructure for the East Approach Bridges. Parking shall be screened on all sides by concrete panels. Landscaped fill shall be placed on top of the Bridge Maintenance Facility building to recreate existing hillside contours.

### 2.30.3.5 LEED CERTIFICATION

In support of current legislation the building shall incorporate the US Green Building Council's, Leadership in Energy and Environmental Design Green Building Rating

System (LEED-NC). The Design-Builder shall perform all Work necessary to achieve at a minimum LEED Silver Certification for the Bridge Maintenance Facility. For the purposes of LEED Certification, the Bridge Maintenance Facility shall include the Access Drive, Parking Structure, the maintenance building, the Bridge Maintenance Dock, existing dock demolition, and residential demolition already completed. LEED project boundaries are shown in the Bridge Maintenance Facility Sustainability Checklist (Appendix S14). Key green building strategies necessary to achieve a sustainable design solution include but are not limited to, the following:

- Stormwater
- Sustainable site features
- Low energy buildings
- High performance equipment
- Renewable energy
- Potable water use reduction
- Natural ventilation
- Day lighting

WSDOT has completed an Eco-charrette for the Bridge Maintenance Facility (refer to the Bridge Maintenance Facility Sustainability Checklist in Appendix S14). The Eco-charrette identifies a conceptual way to achieve the required number of points for LEED Silver Certification.

The technical requirements contained here-in do not attempt to identify all LEED coordination options and possible requirements. The Design-Builder shall provide a proposal for all LEED conformance items and clearly identify any conflicts between the technical requirements and any proposed LEED options. All LEED options shall be submitted to WSDOT for review and comment.

The Design-Builder shall meet the following specific criteria:

- Sustainable Site Credit 4.3 Alternative Transportation: The Design-Builder shall provide electric vehicle charging stations as required to obtain LEED credit.
- Water Efficiency Credit 3 Water Use Reduction: The Design-Builder shall not obtain this credit through the use of waterless urinals.
- Energy & Atmosphere Credit 6 Green Power: The Design-Builder shall not obtain this credit.
- Materials & Resources Credit 2 Construction Waste Management: WSDOT has removed and recycled existing structures from the site. Demolition work already completed including permits and recycling tickets are available upon request.

### 2.30.3.6 COORDINATION OF DESIGN

WSDOT has coordinated the Conceptual Design of the Bridge Maintenance Facility and Dock with stakeholders including the City of Medina, Department of Fish and Wildlife, Department of Ecology, US Coast Guard, Corps of Engineers, NOAA, MIT Fisheries Division and the Central Puget Sound Regional Transit Authority (Sound Transit).

Design intent resulting from that coordination is further developed in the following documents:

- Bridge Maintenance Facility Architectural Concept (Appendix L10); and
- Conceptual Plans (Appendix M1); and
- Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

In completing the design of the Bridge Maintenance Facility and Dock, the Design-Builder shall adhere to aesthetic parameters described in Section 2.15 Landscape and Aesthetics Design and to the Bridge Maintenance Facility Architectural Concept (Appendix L10) as demonstrated with the Conceptual Plans (Appendix M1). The exterior architectural palette has been selected with sensitivity to the adjoining residential sites, while maintaining a unique and functional design identity. The information shown in Appendices L10 and M1 has been presented to stakeholders as an acceptable frame work for the Design-Builder to proceed. Design of the Bridge Maintenance Facility and Dock shall provide an appropriate architecture that contributes to its context.

The Design-Builder shall advance the design and construct the Building Architecture elements in such a way as to achieve a uniformity of appearance throughout the Project limits, and to control the quality of materials, texture, surface treatment, and color in accordance with Section 2.30.3.6.2 Design Review.

### 2.30.3.6.1 Design Meetings

The Design-Builder shall work with WSDOT to establish a Maintenance Facility Task Force to oversee and provide input on the design and construction of elements including, but not limited to, architectural systems, landscaping, screening, structural, drainage, waterproofing, HVAC, plumbing, fire protection, power, emergency power, lighting, communications systems, security systems, covered parking, vertical circulation, permanent shoring walls, and interfacing with the SR520 roadway above and it's supporting structure. The Design-Builder shall 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 (refer to Section 2.1). Meetings shall include representatives from WSDOT, the City of Medina, and other representatives as requested by WSDOT.

### 2.30.3.6.2 Design Review

The Conceptual Plans (Appendix M1) for the Bridge Maintenance Facility and Dock contained in the referenced drawings and the Bridge Maintenance Facility Architectural Concept (Appendix L10) have been reviewed with the City of Medina and reflects their expectations for the final design of the above-grade structures. The Conceptual Plans (Appendix M1) and the Bridge Maintenance Facility Architectural Concept (Appendix L10) comply with major zoning provisions but include a number of design departures. The Design-Builder is required to provide updates and be responsive to the City of Medina as the design is advanced to completion and to obtain approval of any design departures required for the design of the Bridge Maintenance Facility and Dock. A minimum of four progress reviews are required.

Focus of the review is on the exterior expression of the structures and landscaping and their impact on the public realm. Unless required for the safe operation of the building, dock, parking structure, or SR 520 roadway, significant departures in the exterior massing and external appearance in the Conceptual Plans (Appendix M1) and Bridge

Maintenance Facility Architectural Concept (Appendix L10) are strongly discouraged since such changes shall re-start the Design Review Process and may result in design delay.

### 2.30.3.7 SAFETY AND SECURITY

Design and construction of the Bridge Maintenance Facility and Dock shall meet Occupational Safety and Health Act (OSH Act) safety standards, WAC Title 51 and Title 49.17 RCW WISHA.

Design and construction of the Bridge Maintenance Facility and Dock shall conform to safety requirements of the local municipal code where applicable.

Design and construction of the Bridge Maintenance Facility and Dock shall provide for efficient access and rescue operations by emergency responders as well as routine monitoring and surveillance by WSDOT personnel.

The Bridge Maintenance Facility Site shall be fenced and gated to restrict public access to the Bridge Maintenance Facility building and Dock. Type and design of fencing and gating shall be coordinated with WSDOT and the City of Medina. Access through gates and Facility entrances shall be by standard WSDOT proximity card readers.

The Bridge Maintenance Dock Approach Pier shall include a continuous railing except at the Service Platform where it would interfere with workboat access.

A CCTV security system shall be provided as described in Section 2.17.

Maintenance and inspection personnel shall be protected from falling debris from the East Approach Bridges roadways above. Portions of the Bridge Maintenance Facility and Dock exposed to falling debris from the roadways above, such as the Observation Deck, shall be covered. The exterior staircase and sidewalk need not be covered.

Flooring in wet areas, entrances, ramps, the Dock, stairways, and areas around equipment shall have slip resistant characteristics.

#### 2.30.3.7.1 Screens, Fencing, Barriers & Railings

The Design-Builder shall provide design and construction of Bridge Maintenance Facility screens, fencing, barriers and railings as located in the Conceptual Plans (Appendix M1), and in accordance with the WSDOT Standard Specifications (Appendix D18), WSDOT *Design Manual* (Appendix D3), and Section 2.13. Railings and barriers shall conform to Urban Design intent and requirements of Section 2.15 and the Bridge Maintenance Facility Architectural Concept (Appendix L10).

### 2.30.3.8 MAINTAINABILITY

The Bridge Maintenance Facility and Dock Conceptual Design indicated in the Conceptual Plans (Appendix M1), the Bridge Maintenance Facility Architectural Concept (Appendix L10) and the Bridge Maintenance Facility Mandatory Specifications (Appendix B12) represent a family of elements and parts that the Design Builder shall design and construct to be functional and maintainable.

The Design-Builder shall coordinate with WSDOT during the design and construction of the Bridge Maintenance Facility and Dock to develop a preventive maintenance schedule for the facility and equipment therein. The Design-Builder shall provide the preventive maintenance schedule after coordination with WSDOT.

Preventive maintenance is defined as any time-based or meter-based, repetitive, preplanned, or regularly scheduled maintenance work or routine inspection activity. This type of work is scheduled at intervals necessary to prevent equipment breakdown and maintain proper facility and equipment operations. Inspection, calibration, adjustment, cleaning, sealing, painting, lubrication, and parts replacement are examples of preventive maintenance work.

WSDOT uses a computerized maintenance management system to track and plan all facility maintenance. The Design Builder shall provide all product and equipment information required to develop, in conjunction with WSDOT, a preventive maintenance methodology that provides a strategic and proactive approach for regularly evaluating facility assets, detecting potential problems, and scheduling maintenance work to prevent problems and minimize the frequency of corrective maintenance work.

#### 2.30.3.9 SECONDARY BRIDGE ACCESS

A secured staircase between the Bridge Maintenance Facility Parking and the SR 520 mainline bike/pedestrian path shall be provided. The access shall be provided adjacent to the Bridge Maintenance Facility to minimize response time. Public access to the staircase from the bike/pedestrian path shall be restricted with a keyed gate and card reader.

#### 2.30.3.10 DURABILITY

The Design-Builder shall design and construct the Bridge Maintenance Facility and Dock structural systems so as to achieve a required Design Life of 75-years. See Section 1-01.3 of the General Provisions for Definitions. The Design-Builder shall prepare a Durability Report as described in 2.30.7.

#### 2.30.3.11 COMMISSIONING

The Design-Builder shall commission and test all building systems as a part of the building turn over. All testing and commissioning of the systems necessary for the operation of the Bridge Maintenance Facility and Dock shall be in accordance with Sections 2.30.6 and 2.34 (Commissioning).

#### 2.30.3.12 BARRIER FREE DESIGN

The Bridge Maintenance Facility shall comply with the provisions of ADAAG and the Washington State Accessibility Code. In the event of inconsistencies between these regulations, compliance with regulations requiring the greatest accessibility shall take precedence. All persons must have access to each workspace within the Bridge Maintenance Facility building. The Approach Pier and Service Platform, Secondary Bridge Access, as well as spaces within the Bridge Maintenance Facility and Parking Structure which are accessed only for equipment repairs and are not considered workspaces under ADAAG and the Washington State Accessibility Code are not required to comply.

### 2.30.4 DESIGN REQUIREMENTS

#### 2.30.4.1 GENERAL

The Design-Builder shall design and construct the Bridge Maintenance Facility building in conformance with WAC Title 51 (State of Washington, Washington State Building

Code) as amended by the Medina Municipal Code. The Bridge Maintenance Facility shall be considered a "significant structure" per RCW 18.

The Design-Builder shall design and construct the Bridge Maintenance Dock and the Bridge Maintenance Facility shoring walls in conformance with the WSDOT BDM (Appendix D1), Medina Municipal Code, Medina Shoreline Management Master Program, AASHTO Guide Specifications for LRFD Seismic Bridge Design, AASHTO LRFD Bridge Design Specifications, AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms and AASHTO LRFD Guide Specifications for Design of Pedestrian Bridges, 2nd Edition.

The Design-Builder shall design and construct the Bridge Maintenance Facility & Dock to have non bird-friendly surfaces.

**Location and Configuration:** Locations, basic geometry, layout, size, orientation and relationships to bridges and other structures for design and construction of the Bridge Maintenance Facility and Dock shall be as shown in the Conceptual Plans (Appendix M1).

**Clearances**: Design of the Bridge Maintenance Facility Parking shall provide a minimum vertical clearance of 14.0 feet for vehicles. The top elevation of the Bridge Maintenance Facility Parking shall also consider clearances required for elements such as elevators, incoming service, ATS, and the generator.

**Grades**: The maximum grade between the Bridge Maintenance Facility and the Dock Service Platform shall not exceed 5%.

**Coordination**: Coordinate design and construction of the Bridge Maintenance Facility and Dock with requirements of the Work with particular attention to Section 2.6 (Geotechnical Design), Section 2.10 (Utilities and Relocation Agreements), Section 2.13 (Bridges and Structures), Section 2.14 (Stormwater Management), Section 2.15 Landscape and Aesthetics Design), Section 2.17 (Electrical Bridge and Services), Section 2.18 (Intelligent Transportation Systems) and Section 2.32 (Mechanical Systems).

#### 2.30.4.1.1 Design Professional Qualifications

The Design-Builder shall provide design professionals including a Bridge Maintenance Facility and Dock Architect, Structural Engineer, Mechanical Engineer, Electrical Engineer, Civil Engineer, Coastal Engineer and Landscape Architect meeting the requirements of Section 1-02.3 and with 10 years experience in the design and construction of similar facilities. The design professionals shall be in responsible charge of their corresponding designs for the Bridge Maintenance Facility and Dock. The design professionals shall assume responsibility for the accuracy and completeness of the Bridge Maintenance Facility and Dock Final Design Documents and the Bridge Maintenance Facility and Dock Released For Construction Documents including Bridge Maintenance Facility and Dock Technical Specifications sections.

The Structural Engineer for the Bridge Maintenance Facility and Dock shall be a registered Structural Engineer, licensed under Title 18 RCW, State of Washington.

For the Bridge Maintenance Dock and any retaining walls or structures supporting components of SR520 roadway, including permanent shoring walls for the Bridge Maintenance Facility, the Structural Engineer shall have a minimum of 10-years of experience in the design and construction of bridges, retaining walls and other highway-related structures.

The Design-Builder shall provide a Bridge Maintenance Facility and Dock Technical Specifications Writer with at least five years experience as an architectural specifications writer and experience in writing specifications for transportation facilities. The Bridge Maintenance Facility and Dock Technical Specifications writer shall have working knowledge of the organization and content of WSDOT Standard Specifications.

#### 2.30.4.1.2 Payload Transfer

The Design-Builder shall provide pathway, structure and elements to transport 2 ton payloads on standard 4 foot by 4 foot pallets with forklifts and pallet jacks from the Bridge Maintenance Facility parking to the Bridge Maintenance Facility Shop and to workboats moored at the Bridge Maintenance Dock.

For the purposes of laying out corridors and door openings with adequate widths to accommodate forklift operations the Design-Builder shall use the following forklift minimum dimensions for planning purposes:

- Overall Width: 50 inches
- Overall Height: 96 inches
- Length: 120 inches (chassis length plus payload)
- Outside Turning Radius: 90 inches

The payload transfer elements shall include the following:

**Jib Hoist:** Provide a 2 ton capacity jib hoist in a loading zone adjacent to the freight elevator in the Bridge Maintenance Facility parking for transfer of payloads into and out of vehicles.

**Freight Elevator:** Provide a freight elevator.

**Bridge Crane Hoist:** Provide a 2 ton capacity bridge crane hoist in the Bridge Maintenance Facility Shop capable of reaching all portions of the Shop and Shop Mezzanine.

**Pedestal-Mounted Jib Hoist:** Provide a 2 ton capacity pedestal-mounted jib hoist on the Bridge Maintenance Dock Service Platform. The jib hoist shall have rotational abilities, height and boom length such that it can service the Workboat.

#### 2.30.4.1.3 Foundations

Refer to Section 2.6 (Geotechnical Design) for geotechnical data and recommendations.

Shafts shall meet the requirements of the WSDOT Bridge Shaft Mandatory Standard (Appendix B5).

#### 2.30.4.1.4 Utility Service

The Design-Builder shall provide independently metered utility services, service infrastructure and support spaces as required by the Bridge Maintenance Facility and Dock. These shall include but not be limited to electrical, potable water, sanitary sewer and natural gas.

The Design-Builder shall coordinate design and construction of the Bridge Maintenance Facility and Dock utility services with the requirements of WAC Title 51 (Washington State Building Code), local utility requirements, Section 2.10 (Utilities and Relocation Agreements), and Section 2.32 (Mechanical Bridge Services).

Design and construction of the Bridge Maintenance Facility and Dock services shall be based on the Conceptual Plans (Appendix M1).

#### 2.30.4.1.5 Drainage Systems

The design and construction of the Bridge Maintenance Facility and Dock drainage systems shall conform to WSDOT Highway Runoff Manual criteria (Appendix D6) and Section 2.14 (Stormwater Management). The Design-Builder shall ensure that the access roadway be designed to preclude surface water runoff from flowing into the parking level. The Design-Builder shall slope the parking level in such a way that any runoff from the parking surface flows away from the Bridge Maintenance Facility building.

The Bridge Maintenance Facility and Dock drainage design and construction shall also conform to the Conceptual Plans (Appendix M1).

#### 2.30.4.1.6 Materials

All materials shall be in accordance with the requirements of this Section, the WSDOT Standard Specifications (Appendix D18) and the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

The Design-Builder is responsible for approval and acceptance of all materials by means of testing, inspection and documentation in accordance with Sections 2.28 Design-Build Quality Management Plan (QMP) Requirements and Section 2.25 Control of Materials.

#### 2.30.4.1.7 Concrete

Minimum design compressive strength of concrete, f'c, shall be 4,000 psi at 28 days. Concrete for drilled shafts and cast-in-place piling shall be Class 4000P.

#### 2.30.4.1.8 Structural Steel

High strength bolts for structural steel connections shall be galvanized. Use of weathering steel shall not be permitted.

### 2.30.4.2 BRIDGE MAINTENANCE FACILITY BUILDING PROGRAM

#### 2.30.4.2.1 General

The Bridge Maintenance Facility building shall be assigned an "Occupancy Category" of IV in accordance with IBC Chapter 16.

The exterior walls of the Bridge Maintenance Facility building shall be separated from the Bridge Maintenance Facility excavation permanent shoring walls by a minimum of three feet. Exterior to the BMF parking, the separation shall be covered by an open grated, galvanized expansion joint capable of supporting a 100 psf live load. Interior to the BMF parking, the separation shall be covered by a solid surfaced expansion joint capable of supporting an H-10 axle loading. Two open grilled, lockable gates shall be provided at the ground level to control access into the separation.

The Bridge Maintenance Facility building shall be of Type I construction in accordance with IBC Chapter 6. Roof construction and secondary members shall have a minimum 2-hour fire-resistance rating. Exterior walls adjacent to shoring walls shall have a minimum 2-hour fire-resistance rating. Interior nonbearing walls and partitions and the observation deck shall be of noncombustible construction.

The Bridge Maintenance Facility generator and diesel fuel storage areas shall be located in the parking level as shown on the Conceptual Plans (Appendix M1). They shall be separated from the Bridge Maintenance Facility parking and East Approach Bridges by Type 1 construction noncombustible enclosures with 4 hour fire rated construction.

### 2.30.4.2.2 Functional Requirements and Adjacencies

The program for the Bridge Maintenance Facility shall include, as a minimum, the following spaces and requirements. The program includes spaces within the Bridge Maintenance Facility building and the parking structure and connections to the exterior improvements identified throughout this document (exterior stairs, dock, etc.).

#### 2.30.4.2.2.1 Shop Level

**S-100 MAINTENANCE SHOP**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Shop as shown in the Conceptual Plans (Appendix M1).

Minimum vertical clearance in the shop (except directly under mezzanine) is 14.0'.

The Shop shall address space requirements for servicing and repairing bridge and Pontoon components. An open shop floor shall be provided with moveable metal and carpentry work stations allowing for a large lay-down assembly area for any fabrication work required.

The Bridge Maintenance Facility Shop shall include two eye washes. It shall also include general and task lighting.

The Design-Builder shall provide all safety equipment (ventilation, eye wash, shower, etc.) as necessary per OSHA 29 CFR 1910.151.

Silent, vertical doors shall be provided in the Shop for access between the Shop and the Bridge Maintenance Dock. The vertical doors shall be at least 16' wide and 14' high.

Ventilation shall be provided for anticipated shop activities including painting, welding, bead blasting, etc.

A metal workstation including space for the following elements shall be provided in the Shop:

- Portable welder
- Welding vent with pivoting articulated crane support
- Bench grinder with stand
- Drill press
- Metal band saw
- Steel table with vise
- Bead blaster cabinet
- Oxy-acetylene torch
- Cutting tables
- Work benches

A carpentry workstation including space for the following elements shall be provided in the Shop:

- Table saw
- Radial arm saw
- Cut off saw
- Band saw
- Assembly space for equipment

Workstation layouts including all elements shall be coordinated with the WSDOT Bridge Maintenance Group and shall be submitted for review and comment.

A bridge crane hoist shall be provided in the Shop capable of moving 2 ton payloads between any two points within the Shop and Mezzanine.

Climate control shall be provided in the Shop.

The floor slab in the Shop shall be concrete. A 6" thick sacrificial concrete overlay shall be provided to facilitate post-installed anchors for placement of future equipment and fabrication.

**Adjacencies:** The Bridge Maintenance Facility Shop shall be adjacent to and at the same elevation as the Bridge Maintenance Dock access. The Shop shall be adjacent to eye washes, Equipment Storage, Mechanical Closet, dock access, and freight elevator, and in close proximity to the Toilet and unisex shower.

The Mezzanine Storage shall be adjacent via the freight elevator and bridge crane hoist.

**S-101 MECHANICAL CLOSET**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Mechanical Closet as shown in the Conceptual Plans (Appendix M1). The Bridge Maintenance Facility Mechanical Closet shall house standard building elements including a water heater, service sink, plumbing risers, manifolds, adjustable shelving, etc. and provisions for a clothing washer and dryer.

**Adjacencies:** The Mechanical Closet shall be in close proximity to the Shop and the Unisex Restroom & Shower.

**S-102 FREIGHT ELEVATOR**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Freight Elevator as indicated in Section 2.30.4.5 and as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** The freight elevator shall connect the Bridge Maintenance Facility Shop to the Mezzanine and all levels of the Bridge Maintenance Facility and Parking Level by means of front and rear doors.

**S-103 VENT SHAFT**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Vent Shaft as shown in the Conceptual Plans (Appendix M1).

The Vent Shaft shall allow for natural and/or mechanically assisted air flow from the Shop through the Vent Shaft to the point of discharge at the exterior of the Parking Level.

**Adjacencies:** Provide adjacent to the Shop and the Parking structure.

**S-104 PASSENGER ELEVATOR**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Passenger Elevator as indicated in Section 2.30.4.5 and as shown in the Conceptual Plans (Appendix M1).

The passenger elevator shall connect the Bridge Maintenance Facility Crew Level to all levels of the Bridge Maintenance Facility by means of front and rear doors.

**Adjacencies:** Provide for direct access from the Shop Level to the Crew Level, Mechanical Level, and the Parking Level.

**S-105 STAIR 1**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Stair 1 which shall connect the Bridge Maintenance Facility Shop Level to all levels of the Bridge Maintenance Facility as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Provide for direct access to all levels from the Shop Level.

**S-106 JANITOR'S CLOSET**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Janitor's Closet on the Crew Level as shown in the Conceptual Plans (Appendix M1). The Janitor's Closet shall include, at a minimum, a mop sink, 20LF of adjustable shelving, adequate floor area for storage of mop bucket, vacuum, trash cart, etc.

**Adjacencies:** A Janitor's Closet shall be adjacent to the Toilet/Showers on each occupied floor.

**S-107 UNISEX SHOWER**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Unisex Shower on the Shop Level as shown in the Conceptual Plans (Appendix M1). The Unisex Shower shall include, at a minimum a shower and toilet facilities. Restrooms shall be sized as required to meet code requirements and to allow for the placement of the required fixtures. Mandatory fixture requirements shown for restrooms are the minimum which shall be provided per restroom. More shall be provided if required by code.

**Adjacencies:** The Unisex Shower shall be in close proximity to the Shop.

**S-108 VESTIBULE**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Vestibule on the Shop Level as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** The Vestibule shall be adjacent to the Passenger Elevator and Stair 1 and in close proximity to the Shop of the Bridge Maintenance Facility.

**S-109 EQUIPMENT STORAGE**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Equipment Storage on the Shop Level as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** The Equipment Storage shall be adjacent to the Shop and in close proximity to the Freight Elevator.

**S-110 STAIR 2**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Stair 2 which shall connect the Bridge Maintenance Facility Shop to the Bridge Maintenance Facility Crew Room as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Provide for direct means of egress through the exit corridor between Stair 2 and the Shop.

**S-111 COMMUNICATION ROOM**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Communications Room as shown in the Conceptual Plans (Appendix M1). The Bridge Maintenance Facility Communication Room shall provide space for the following equipment:

- ITS Data Fiber Optic Data hub
- Security system panels
- Fire alarm system panel
- PBX Phone System hub
- Electrical Bridge and Services Main Control Panel
- 480VAC Power Distribution Panel
- 240VAC Power Distribution Panel
- 208/120VAC Power Distribution Panel
- Step Down Transformers

Space shall be provided to access racks on both sides. All raceways and wiring shall be surface mounted and accessible.

**Adjacencies:** The Communication Room shall be adjacent to the Electrician's Workroom and in close proximity to the Crew Room to facilitate data feed to the bridge telemetry monitoring panel. The Communication Room shall have access to vertical circulation, including the freight elevator.

**S-112 HYDRAULICS WORKROOM**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Hydraulics Workroom as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Hydraulics Workroom shall be adjacent to the Shop and in close proximity to the Freight Elevator.

**S-113 EXIT CORRIDOR**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Exit Corridor as shown in the Conceptual Plans (Appendix M1). Exit corridors shall be provided as required by code.

**Adjacencies:** The Exit Corridor, as shown in the Conceptual Plan (Appendix M1) provides for a protected means of egress from the Crew Level, Electrician's Workroom, Hydraulics Workroom, and the Shop. The Design Builder will provide protected means of egress as required by code and to minimize exterior openings and Bridge Maintenance Facility security concerns.

**S-114 ELECTRICIAN'S WORKROOM**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Electrician's Workroom as shown in the Conceptual Plans (Appendix M1).

The room shall be provided a separate service circuit breaker to power work desk mounted receptacles. The receptacles shall be rated to match all service voltage and phases provided for the electrical systems on the Bridge, Bridge Maintenance Facility and Dock.

**Adjacencies:** The Electrician's Workroom shall be adjacent to the Communication Room and in close proximity to the Shop and the Crew Room. The Electrician's Workroom shall have access to the Toilet/Shower and vertical circulation, including the freight elevator.

#### 2.30.4.2.2.2 Crew Level

**C-200 MEZZANINE**

**Functional Requirements:** The Bridge Maintenance Facility storage Mezzanine shall be the maximum size permitted by code and large enough to store and maneuver palletized material.

**Adjacencies:** The Mezzanine shall be directly above the Shop and serviceable by the bridge crane hoist and the Freight Elevator.

**C-201 STORAGE CLOSET**

**Functional Requirements:** The Bridge Maintenance Facility Storage Closet shall allow for controlled storage on the Mezzanine.

**Adjacencies:** The Storage Closet shall be in close proximity to the Shop directly adjacent to the Mezzanine and the Freight Elevator.

**C-202 FREIGHT ELEVATOR**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Freight Elevator as indicated in Section 2.30.4.5 and as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** The freight elevator shall connect the Bridge Maintenance Facility Mezzanine to all levels of the Bridge Maintenance Facility and Parking Level by means of front and rear doors.

**C-203 VENT SHAFT**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Vent Shaft as shown in the Conceptual Plans (Appendix M1).

The Vent Shaft shall allow for natural and/or mechanically assisted air flow from the Mezzanine through the Vent Shaft to the point of discharge at the exterior of the Parking Level.

**Adjacencies:** Provide adjacent to the Mezzanine and the Parking structure.

**C-204 PASSENGER ELEVATOR**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Passenger Elevator as indicated in Section 2.30.4.5 and as shown in the Conceptual Plans (Appendix M1).

The passenger elevator shall connect the Bridge Maintenance Facility Crew Level to all levels of the Bridge Maintenance Facility by means of front and rear doors.

**Adjacencies:** Provide for direct access from the Crew Level to the Shop Level, Mechanical Level, and the Parking Level.

**C-205 STAIR 1**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Stair 1 which shall connect the Bridge Maintenance Facility Crew Level to all levels of the Bridge Maintenance Facility as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Provide for direct access to all levels from the Crew Level.

**C-206 JANITOR'S CLOSET**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Janitor's Closet on the Crew Level as shown in the Conceptual Plans (Appendix M1). The Janitor's Closet shall include, at a minimum, a mop sink, 20LF of adjustable shelving, adequate floor area for storage of mop bucket, vacuum, trash cart, etc.

**Adjacencies:** A Janitor's Closet shall be adjacent to the Toilet/Showers on each occupied floor.

**C-207 MEN'S RESTROOM**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Men's Restroom on the Crew Level as shown in the Conceptual Plans (Appendix M1). Restroom shall be sized as required to meet minimum code requirements and to allow for the placement of all required fixtures.

**Adjacencies:** The Men's Restroom shall be in close proximity to the Crew Room and Offices on the Crew Level of the Bridge Maintenance Facility.

**C-208 WOMEN'S RESTROOM**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Women's Restroom on the Crew Level as shown in the Conceptual Plans (Appendix M1). Restroom shall be sized as required to meet minimum code requirements and to allow for the placement of all required fixtures.

**Adjacencies:** The Women's Restroom shall be in close proximity to the Crew Room and Offices on the Crew Level of the Bridge Maintenance Facility.

**C-209 VESTIBULE**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Vestibule on the Crew Level as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** The Vestibule shall be adjacent to the Passenger Elevator and Stair 1 and in close proximity to the Crew Room and Offices on the Crew Level of the Bridge Maintenance Facility.

**C-210 RECORDS**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Records Room on the Crew Level as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Records room shall be in close proximity to the Crew Room, Lead Tech, Supervisor, Freight Elevator, and Passenger Elevator.

**C-211 EMERGENCY STORAGE**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Emergency Storage on the Crew Level as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Emergency Storage shall be in close proximity to the Crew Room, Lead Tech, Supervisor, Freight Elevator, vertical circulation and Unisex Shower.

**C-212 MECHANICAL CHASE**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Mechanical Chase as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Mechanical Chase shall be located to facilitate mechanical system distribution throughout the Bridge Maintenance Facility.

**C-213 STAIR 2**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Stair 2 which shall connect the Bridge Maintenance Facility Crew Room to the Bridge Maintenance Facility Shop as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Provide for direct means of egress through the exit corridor between Stair 2 and the Shop.

**C-214 LEAD TECH OFFICE**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Lead Tech Office as shown in the Conceptual Plans (Appendix M1).The Lead Tech Office shall have windows or relites with views of the Crew Room, the Bridge Maintenance Dock, Lake Washington, the floating bridge, and the underside of the East Approach Bridges.

**Adjacencies:** The Lead Tech Office shall be adjacent to the Supervisor Office and the Crew Room. The Lead Tech Office shall be in close proximity to Stair 2, Records, and the Shop below.

**C-215 SUPERVISOR'S OFFICE**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Supervisor's Office as shown in the

Conceptual Plans (Appendix M1).The Supervisor's Office shall have windows or relites with views of the Crew Room, the Bridge Maintenance Dock, Lake Washington, the floating bridge, and the underside of the East Approach Bridges.

**Adjacencies:** The Supervisor's Office shall be adjacent to the Lead Tech Office and the Crew Room. The Supervisor's Office shall be in close proximity to Stair 2, Records, and the Shop below.

## C-216 CREW ROOM

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Crew Room as shown in the Conceptual Plans (Appendix M1). Direct visual observation of the Shop, Lake Washington, the Bridge Maintenance Dock, the floating bridge, and the underside of the East Approach Bridges shall be provided from the Crew Room. Exterior glazing shall be bullet resistant.

The Crew Room shall include the following minimum elements:

- Sink
- Countertop and Cabinets
- 10 lockers with dimensions at least 2'wide x 2'deep x 8'high and with lockable doors, hooks and full depth shelves
- Intercom system
- Marine band radio base station
- Weather station
- CCTV Console with Monitors and Controllers
- Control System HMI PanelView

The Crew Room shall include space and provisions for:

- Oven
- Refrigerator/freezer
- Microwave
- Printer, Fax Machine, Copier
- Radio antennae
- Four personal computer workstations
- Table capable of seating 10

The proposed Crew Room layout including locations of all elements shall be coordinated with the WSDOT Bridge Maintenance Group and shall be submitted for review and comment.

**Adjacencies:** The Crew Room shall be adjacent to the Supervisor's Office, Lead Tech Office, lockers and Stair 2. The Crew Room shall be located in close proximity to the toilets, shower, Freight and Passenger Elevators, and Record Storage.

## C-217 OBSERVATION DECK

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Observation Deck as shown in the

Conceptual Plans (Appendix M1).The Observation Deck shall have an unobstructed view of the Bridge Maintenance Dock, Lake Washington, the floating bridge, and the underside of the East Approach Bridges.

**Adjacencies:** The Observation Deck shall be adjacent to the Crew Room and the exterior stair from the Access Drive above and to the ground level of the Bridge Maintenance Dock below.

#### 2.30.4.2.2.3 Mechanical Level

**M-300 MECHANICAL ROOM**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Mechanical Room as shown in the Conceptual Plans (Appendix M1).The Bridge Maintenance Facility Mechanical Room shall house building HVAC distribution equipment including packaged systems, chillers, fans, etc.

**Adjacencies:** The Mechanical Room shall be directly adjacent to the Freight Elevator and the Ventilation Shaft. The Mechanical Room shall be in close proximity to the Shop Level and the Crew Level.

**M-301 COMPRESSOR ROOM**

**Functional Requirements:** The Bridge Maintenance Facility Compressor Room shall house the air compressor and distribution system.

**Adjacencies:** The Compressor Room shall be on the Mechanical Level.

**M-302 FREIGHT ELEVATOR**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Freight Elevator as indicated in Section 2.30.4.5 and as shown in the Conceptual Plans (Appendix M1).

The freight elevator shall connect the Bridge Maintenance Facility Mechanical Level to all levels of the Bridge Maintenance Facility by means of front and rear doors.

**Adjacencies:** Provide for direct access to the Mechanical Level from all levels of the Bridge Maintenance Facility. The freight elevator shall open directly into the Mechanical Room such that there is no need to maneuver Mechanical Level equipment around corners.

**M-303 VENT SHAFT**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Vent Shaft as shown in the Conceptual Plans (Appendix M1).

The Vent Shaft shall allow for natural and/or mechanically assisted air flow from the Mechanical Level through the Vent Shaft to the point of discharge at the exterior of the Parking Level.

**Adjacencies:** Provide adjacent to the Mechanical Room and the Parking structure.

**M-304 PASSENGER ELEVATOR**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Passenger Elevator as indicated in Section 2.30.4.5 and as shown in the Conceptual Plans (Appendix M1).

The passenger elevator shall connect the Bridge Maintenance Facility Mechanical Level to all levels of the Bridge Maintenance Facility by means of front and rear doors.

**Adjacencies:** Provide for direct access to the Mechanical Level from the Shop Level, Crew Level, and the Parking Level.

**M-305 STAIR 1**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Stair 1 which shall connect the Bridge Maintenance Facility Mechanical Level to all levels of the Bridge Maintenance Facility as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Provide for direct access to the Mechanical Level from the Parking Level.

**M-306 ELECTRICAL CHASE**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Electrical Service & Distribution which shall connect the Bridge Maintenance Facility to the Utility Service through the Parking Level of the Bridge Maintenance Facility as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Locate directly below the Electrical Service & ATS Enclosure in the Parking structure and adjacent to the Electrical Room on the Mechanical Level.

**M-307 ELECTRICAL ROOM**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Electrical Room in accordance with Sections 2.17 and 2.30.4.4 and as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Locate adjacent to the Electrical Chase on the Mechanical Level.

#### 2.30.4.2.2.4 Parking Level

**P-400 PARKING**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility vehicle parking as shown in the Conceptual Plans (Appendix M1).

Vehicle parking includes but is not limited to pavement, screening, curbs, drainage, rails & barriers, painted lines, markings & signage.

Design and construction of site parking shall comply with the WSDOT Design Manual (Appendix D3). The site parking shall be concealed from adjacent residences using concrete noise wall panels. A minimum 26 foot clearance behind parking stalls shall be provided for vehicular access, backup and turning. Parking stalls shall be perpendicular to the vehicular access corridor unless shown otherwise. Parking stalls shall be a minimum of 9'-9" wide and 20' deep unless shown otherwise.

Design and construction of site parking shall provide a minimum 17 total parking stalls for:

- 15 Vehicles
- 1 Visitor
- 1 ADA

Design and construction of site parking shall provide a Loading Zone adjacent to the vertical circulation to the Bridge Maintenance Facility (elevators and stairs). The generator and fuel storage shall be located in the site parking and shall be accessible by maintenance and service personnel.

Silent, vertical vehicular doors shall be provided for vehicular access. Vehicular doors shall be provided on the north side of the site parking to access the maintenance access road and on the south side of the site parking to access the swale. A personnel door shall be provided on the north side of the site parking to access the maintenance access road.

Stormwater shall be prevented from flowing from the access road into the parking level. The parking level shall be sloped such that water flows away from the BMF building expansion joint.

**Adjacencies:** Primary site access is from the east, off of Evergreen Point Road and shall be on the north side of the new SR 520 alignment through a locking gate. Parking and access for WSDOT equipment, staff, and visitors (including accessible parking) shall be provided within the enclosed parking garage, under the SR 520 roadway, adjacent to the East Approach Bridges abutment. The westernmost edge of the parking structure shall be skewed to the roadway, generally aligning with the existing site contours. The access drive shall be graded, textured and sized to accommodate delivery vehicles and fire trucks as described in Section 2.11 and the Conceptual Plans (Appendix M1).

## P-401 VALVE ROOM

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Valve Room as shown in the Conceptual Plans (Appendix M1).

Valve Room functional requirements include risers, check valves, domestic water service, timers, controllers, and appurtenances as required to provide domestic water service, irrigation, and fire flow to the Bridge Maintenance Facility.

**Adjacencies:** Provide directly adjacent to the primary site access drive and fire department dry stand pipes as shown in the Conceptual Plans (Appendix M1).

## P-402 ELEVATOR EQUIPMENT ROOM

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Elevator Equipment Room as shown in the Conceptual Plans (Appendix M1).

Elevator Equipment Room requirements include elevator hydraulic pumps, controllers, and appurtenances as required to operate hydraulic freight and passenger elevators to all floors of the Bridge Maintenance Facility.

**Adjacencies:** Provide on the parking level and in the proximity of the Freight Elevator and the Passenger Elevator.

## P-403 FREIGHT ELEVATOR

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Freight Elevator as indicated in Section 2.30.4.5 and as shown in the Conceptual Plans (Appendix M1).

The freight elevator shall connect the Bridge Maintenance Facility parking to all levels of the Bridge Maintenance Facility by means of front and rear doors.

**Adjacencies:** Provide adjacent to the loading zone on the Parking level. The freight elevator shall open directly into the Shop such that there is no need to maneuver freight loads around corners. The freight elevator shall include a stop on the Mezzanine Level and Mechanical Level.

**P-404 VENT SHAFT**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Vent Shaft as shown in the Conceptual Plans (Appendix M1).

The Vent Shaft shall allow for natural and/or mechanically assisted air flow from the shop, through the Vent Shaft to the point of discharge at the exterior of the Parking Level.

**Adjacencies:** Provide adjacent to the Shop, Mezzanine, Mechanical Level, and the Parking structure.

**P-405 PASSENGER ELEVATOR**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Passenger Elevator as indicated in Section 2.30.4.5 and as shown in the Conceptual Plans (Appendix M1).

The passenger elevator shall connect the Bridge Maintenance Facility parking to all levels of the Bridge Maintenance Facility by means of front and rear doors.

**Adjacencies:** Provide adjacent to the Shop Level, Crew Level, Mechanical Level, and the Parking Level.

**P-406 STAIR 1**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Stair 1 which shall connect the Bridge Maintenance Facility parking to all levels of the Bridge Maintenance Facility as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Provide adjacent to the Shop Level, Crew Level, Mechanical Level, and the Parking Level.

**P-407 ELECTRICAL SERVICE AND ATS ENCLOSURE**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Electrical Service and ATS Enclosure as described in 2.30.4.4 and as shown in the Conceptual Plans (Appendix M1).

**Adjacencies:** Provide on the Parking Level adjacent to the Bridge Maintenance Facility Medium Voltage backup generator.

**P-408 GENERATOR ROOM**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Generator Room as shown in the Conceptual Plans (Appendix M1).The Bridge Maintenance Facility Generator Room shall house the medium voltage generator as described in Section 2.17 which provides emergency power for the entire bridge, Pontoon deck, and Maintenance Facility.

**Adjacencies:** The Generator Room shall be located on the Parking Level directly adjacent to the Fuel Room, Electrical Service Entry, and ATS.

**P-409 FUEL ROOM**

**Functional Requirements:** The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility Fuel Room as shown in the Conceptual Plans (Appendix M1).The Bridge Maintenance Facility Fuel Room shall house the fuel storage system as described in Section 2.30.4.5.

**Adjacencies:** The Fuel Room shall be located on the Parking Level adjacent to the Generator Room.

### 2.30.4.2.3 Size Requirements

The Bridge Maintenance Facility shall include the following programmed spaces with approximate dimensions and areas shown below and on the Conceptual Plans (Appendix M1). Actual sizes of building systems and common space shall be determined by the actual systems and code requirements. Floor congruency is established to illustrate rooms that need to be located on the same level. For example all of the rooms with the designation (S) need to be on the level with the shop, designation (C) on the level with the Crew Room, designation (M) on the level with the mechanical equipment, designation (P) on the parking level. Dimensions listed, unless noted otherwise, are recommended lengths, widths and heights.

| Bridge Maintenance Facility | | | | | | |
|---|---|---|---|---|---|---|
| Room Number | Room Name | Floor Congruency | Length (feet) | Width (feet) | Area (square feet) | Height (feet) |
| S-100 | Shop | S | 76 | 40 | 3040 | 23 |
| S-101 | Mechanical Closet | S | 17 | 12 | 204 | 10 |
| S-102 | Freight Elevator | ALL | 12 | 10 | 120 | |
| S-103 | Ventilation Shaft | ALL | 12 | 10 | 120 | |
| S-104 | Passenger Elevator | ALL | 12 | 8 | 96 | |
| S-105 | Stair 1 | ALL | 22 | 12 | 264 | |
| S-106 | Janitorial Closet | S | 12 | 6 | 72 | 10 |
| S-107 | Unisex Shower Room | S | 15 | 10 | 150 | 10 |
| S-108 | Vestibule | S | 24 | 10 | 240 | 10 |
| S-109 | Equipment Storage | S | 40 | 25 | 1000 | 10 |
| S-110 | Stair 2 | C & S | 22 | 10 | 220 | |
| S-111 | Communications Room | S | 40 | 10 | 400 | 10 |
| S-112 | Hydraulics Workroom | S | 18 | 12 | 216 | 10 |
| S-113 | Exit Corridor | S | 40 | 6 | 240 | 10 |
| S-114 | Electrician's Workroom | S | 25 | 22 | 550 | 10 |
| C-200 | Storage Mezzanine | C | | 10 | 1/3 Shop Area | 10 |
| C-201 | Storage Closet | C | 17 | 12 | 204 | |
| C-202 | Freight Elevator | ALL | 12 | 10 | 120 | |
| C-203 | Ventilation Shaft | ALL | 12 | 10 | 120 | |
| C-204 | Passenger Elevator | ALL | 12 | 8 | 96 | |
| C-205 | Stair 1 | ALL | 22 | 12 | 264 | |

| Bridge Maintenance Facility | | | | | | |
|---|---|---|---|---|---|---|
| Room Number | Room Name | Floor Congruency | Length (feet) | Width (feet) | Area (square feet) | Height (feet) |
| C-206 | Janitorial Closet | C | 12 | 6 | 72 | 10 |
| C-207 | Men's Restroom | C | 15 | 10 | 150 | 10 |
| C-208 | Women's Restroom | C | 15 | 10 | 150 | 10 |
| C-209 | Vestibule | C | 20 | 16 | 320 | 10 |
| C-210 | Records | C | 22 | 10 | 220 | 10 |
| C-211 | Emergency Storage | C | 15 | 10 | 150 | 10 |
| C-212 | Mechanical Chase | C | 10 | 5 | 50 | |
| C-213 | Stair 2 | C & S | 22 | 10 | 220 | |
| C-214 | Lead Tech's Office | C | 14 | 12 | 168 | 9 |
| C-215 | Supervisor's Office | C | 14 | 12 | 168 | 9 |
| C-216 | Crew Room | C | 40 | 22 | 1200 | 9 |
| C-217 | Observation Deck | C | Length of Crew Room | 9 | | |
| M-300 | Mechanical Room | M | 58 | 30 | 1740 | 10 |
| M-301 | Compressor Room | M | 17 | 12 | 204 | 10 |
| M-302 | Freight Elevator | ALL | 12 | 10 | 120 | |
| M-303 | Ventilation Shaft | ALL | 12 | 10 | 120 | |
| M-304 | Passenger Elevator | ALL | 12 | 8 | 96 | |
| M-305 | Stair 1 | ALL | 22 | 12 | 264 | |
| M-306 | Electrical Service Entrance | M | 12 | 6 | 72 | |
| M-307 | Electrical Room | M | 30 | 22 | 660 | 12 |
| P-400 | Parking | P | 156 | | | 14 |
| P-401 | Valve Room | P | 10 | 10 | 100 | 14 |
| P-402 | Elevator Equipment Room | P | 12 | 12 | 144 | 14 |
| P-403 | Freight Elevator | ALL | 12 | 10 | 120 | |
| P-404 | Ventilation Shaft | ALL | 12 | 10 | 120 | |
| P-405 | Passenger Elevator | ALL | 12 | 8 | 96 | |
| P-406 | Stair 1 | ALL | 22 | 12 | 264 | |
| P-407 | Electrical Service Chase | P | 12 | 6 | 72 | 14 |
| P-408 | Generator Room | P | 29 | 12 | 348 | 14 |
| P-409 | Fuel Room | P | 12 | 12 | 144 | 14 |

### 2.30.4.2.4 Building Exterior Envelope Requirements

Exterior envelopes for all above grade structures shall be designed to ensure weather tightness, minimize maintenance, maximize building longevity, and be architecturally compatible with the surrounding environment. Structures shall be designed to withstand all loads, including but not limited to gravity loads, lateral loads (i.e., wind and seismic forces) and thermal induced loads, in accordance with the WAC 51 (Washington State Building Code). The envelope construction shall comply with the provisions of the City of Medina Municipal Code and the Washington State Energy Code. The material characteristics of the exterior envelope are described in the Bridge Maintenance Facility Architectural Concept (Appendix L10). Life cycle cost analysis shall be used in the selection of wall systems. In addition, the walls shall provide for air barrier construction. See also Divisions 07 and 08 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

**Water Tightness**

The Design-Builder shall design and construct the Bridge Maintenance Facility building foundation slabs, slabs on grade, exterior walls, elevator pits and roof to achieve a functional waterproofed structure for the design life of the building. Potential leaks shall be easily accessible and repairable by maintenance personnel.

No drips shall be permitted over any occupied space or where they have the potential to cause damage to equipment, malfunctioning or any electrical power, signaling, lighting, control, communication equipment, or compromise electrical clearances.

No material used in preventing or stemming water ingress shall compromise the fire safety of the works or the durability of the structures in which they are used.

Embedded electrical boards, electrical conduits and other similar elements must be completely waterproofed and watertight.

#### 2.30.4.2.4.1 Windows/Glazing and Wall Openings

The Design-Builder shall provide design and construction of Bridge Maintenance Facility glazing. The design of the Bridge Maintenance Facility glazing shall conform to the Conceptual Plans (Appendix M1) and the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

The criteria below applies to the design and installation of glazed storefronts, windows, curtain walls, metal panels, louvers and their coordination with other exterior cladding systems. See also Division 08 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

**Design Criteria**

Metal panels, window framing and louvers shall be part of a manufactured aluminum framing system and factory coated with a fluoropolymer finish. Window framing shall include a thermal break. In non-curtain wall or storefront applications, provide a weather shield over window heads exposed directly to the weather. All exterior glazing except at the Crew Room shall be a minimum Double Glazed Clear Low-E Vision Glass. Exterior Crew Room glazing shall be bullet resistant. Windows shall meet the requirements of the Washington State Energy Code.

### 2.30.4.2.4.2 Exterior Walls

The Design-Builder shall provide design and construction of Bridge Maintenance Facility walls such that they conform to requirements of WAC Title 51 (Washington State Building Code); WSDOT Standard Specifications (Appendix D18); the Conceptual Plans (Appendix M1); the Bridge Maintenance Facility Mandatory Specifications (Appendix B12); and Bridge Maintenance Facility Architectural Concept (Appendix L10).

Exterior wall construction includes facing materials, exterior applied finishes, back-up construction, framing, wallboard, parapets, insulation & vapor retarders, sheathing, load-bearing construction, louvers & screens, and soffits.

Exterior walls shall be of non-combustible construction and shall provide physical separation between exterior and interior conditioned space, keep out weather, unauthorized people, animals and insects.

**Finishes**

The Design-Builder shall provide the design, specification and construction, installation or application of Bridge Maintenance Facility finishes and such shall conform to WAC Title 51 (Washington State Building Code); WSDOT Standard Specifications (Appendix D18); the Conceptual Plans (Appendix M1); the Bridge Maintenance Facility Mandatory Specifications (Appendix B12); and Bridge Maintenance Facility Architectural Concept (Appendix L10). See Section 2.15 for random flare finish for concrete retaining walls, exposed shoring walls or concrete screen walls.

Finishes include concrete wall finishes, masonry, plastering, painting, and other coatings & finishes.

**Design Criteria**

1. Exterior walls consist of:
    a. The exterior skin, including the surface material, vapor retarders and air barriers.
    b. Thermal and acoustical insulation.
    c. The interior skin if an integral part of the wall assembly.
    d. The supporting secondary structure.
    e. Firestopping and draftstopping within walls and between walls and floors, and other exterior wall elements.
2. Thermal Break: All exterior closure wall components containing heated spaces, except doors and door frames, should provide for a "thermal break" from the inside surface to the outside surface. No continuous thermal conductor from the interior surface to the exterior surface.
3. Air Infiltration
    a. All exterior personnel doors should be designed to limit air leakage into or from the building when in a closed position.
4. Thermal Expansion and Contraction
    a. Provide for noiseless expansion and/or contraction caused by surface temperature range 0 degrees F to 120 degrees F.

b. Stressed skin (sandwich) panels should be limited to 1/175 for thermal warp. If stressed skin panels are utilized, provide movable connections at closure between exterior wall and columns or interior surfaces.

5. Joints and Fasteners: All exposed work should be carefully matched to produce continuity of line, design and finish. Joints in exposed work, unless required for thermal movement, should be accurately fitted, rigidly secured and sealed watertight. All fasteners and attachment devices should be concealed.

6. Deflection: The deflection of any framing member in the plane of the wall should not exceed 1/175 of its clear span or 3/4 inch, whichever is less, except that when a plastered surface is affected, then deflection should not exceed 1/360 of the span.

7. Acoustics: The sound attenuation of the exterior walls shall be such that sound levels from interior noise sources including but not limited to mechanical and electrical equipment are maintained in accordance with Medina Municipal Code at all adjacent properties. Sound level limits at the adjacent properties are given elsewhere in this Section.

#### 2.30.4.2.4.3 Concrete

Concrete walls may be either cast-in-place or precast.

#### 2.30.4.2.4.4 Masonry

Provide reinforced with cast-in-place concrete or Concrete Masonry Unit (CMU) backing.

See also Division 04 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

#### 2.30.4.2.4.5 Exterior Personnel Doors

The Design-Builder shall provide the design, Technical Specifications and installation of Bridge Maintenance Facility exterior personnel doors. Design of Bridge Maintenance Facility exterior personnel doors shall conform to the parameters indicated in the Conceptual Plans (Appendix M1) and the Bridge Maintenance Facility Mandatory Specifications (Appendix B12). Bridge Maintenance Facility and Dock exterior personnel doors shall conform to WAC Title 51.

Exterior personnel doors include door panels, door frames, door hardware, door opening elements, door painting, gates, hatches and access doors, and shop doors. This standard applies to the design and installation of building entrances and to exterior personnel doors.

**Design Criteria**

1. Exterior personnel doors shall be galvanized 18 gage hollow metal doors with galvanized 16 gage hollow metal frames, field painted, rated where required. Doors shall not contain asbestos.

2. Doors shall be standard 84 inches height. Doors shall have minimum widths of 3 feet-0 inches.

3. Within an accessible route, at exterior personnel doors where environmental conditions required a closing pressure greater than 8.5 pounds, power operated doors shall be used within the accessible route of travel; interior doors that require an opening pressure of greater than 5 lbs shall have power operated doors.

4. Door frames are to be welded assembly, not knock-down type.
5. Provide weather shield over door frame heads that are exposed to weather.
6. Coordinate any view windows with ADAAG and hardware templates to prevent overlaps and possibly other conflicts; in particular doors with panic exit devices.
7. Metal doors shall conform to Steel Door Institute standards and to the following:
    a. Door faces – minimum 19 gauge.
    b. Core – urethane foam to meet thermal requirements.
    c. Vision panels – shall be low enough to see a person in a wheel chair as required by ADAAG, area per code.
    d. Reinforcement for hardware – all doors to have provision for surface mounted closure whether called for or not.
    e. All interior and exterior surfaces to be rust proofed and prime painted.
    f. Door shall be full flush construction, mechanically stiffened.
8. Wood doors shall not be used.

### 2.30.4.2.4.6 Door Hardware

This standard applies to the selection and installation of finish hardware for exterior and interior doors. See also Division 08 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

**Design Criteria**

1. General Requirements
    a. All hardware is to comply with ADAAG requirements.
    b. Hardware schedule submittals are to be provided.
    c. A final hardware schedule is to be provided with the Operation and Maintenance manuals.
    d. Each kind of hardware is to be provided by only one manufacturer.
    e. Specify hex nut and bolt type fasteners for closers and panic exit devices where doors have hollow interiors.
    f. Require the manufacturer to visit the site and check doors for final proper operation. Require that a warranty period adjustment occur, typically six months after final completion.
2. Lock Sets and Latch Sets
    a. All doors and handles shall be heavy-duty mortise type with non-handed lever handles and trim except as required by code.
    b. Selection of lock sets and key function shall be coordinated with WSDOT during the design phase. Perimeter doors shall be wired for electronic control and be ADAAG compliant.
3. Panic Hardware

Provide panic exit hardware as required by code, or if more restrictive, as required by Authority Having Jurisdiction. Do not use pairs of doors with vertical rod exit devices. Provide single doors with fixed or removable mullions and heavy duty rim type devices.

4. Keys, Key Cards and Keying

    a. Design-Builder shall schedule a meeting between WSDOT staff and the hardware supplier for developing a keying schedule.

    b. Provide figure eight removable cores in all locks, or as required by WSDOT. Temporary construction cores shall be provided by the Design-Builder. Permanent cores shall be received and installed by WSDOT.

    c. Mechanical and electrical rooms shall be keyed alike to the current maintenance key. Keying shall be performed by WSDOT.

    d. All key cards shall be proximity cards for Bridge Maintenance Facility Security Systems.

    e. All Card Openers must be coordinated with Power Door Operating Mechanism and must be located on the strike side of the door.

5. Door Closures

    a. Provide all required fire rated doors with self-closing devices and latching hardware. Provide WSDOT the manufacturer, type, and model number to be used.

    b. Janitor rooms generally require doors with 20 minute rating. To facilitate their closure, but discourage the propping open of doors, all should have 180 degree hold open and be connected to the fire alarm system.

    c. Overhead closures are preferred. All closures shall have adjustments for latch and closing speeds, and back-check control.

    d. Unless required by code, door closures are not required on access doors and panels, which are only opened under maintenance supervision. This includes doors in shafts or pipe chases, and electrical/telephone closets (3 feet deep or less).

6. Power Operated Doors

    a. Coordinate any security access card readers and ADAAG access pads so that pushing the ADAAG pad does not activate door operator when door is in secure mode.

    b. Entry doors and high use doors that exceed the capacity of a normal closer may require a heavy duty closer.

    c. Units shall be installed on doors where opening pressure is greater than 8.5 lbf for exterior personnel doors and greater than 5 lbf for interior doors.

    d. Units shall be installed on same side and in close proximity to card key readers.

7. Pushes and Pulls

Pushes and pulls shall be operable with a closed fist. Push and pull plates shall be cut for cylinders or fitted with thumb knobs as required to fit deadlocks or night latches.

8. Kick Plates, Mop Plates and Armor Plates

    a. Exterior and interior plates shall be stainless steel, 0.05 inch minimum thickness.

    b. Kick plates shall be a minimum of 8 inches high and 2 inches less than door width; mop plates 6 inches high.

    c. Kick Plates shall be applied to the Push Side of the Door, Mop Plate applied to the Pull Side.

    d. All plates shall have beveled four edges (B4E) and countersunk for screws. To be effective, plates should cover the door width, less approximately 2 inches up to a height of 16 in from its bottom edge and be centered across the width of the door.

9. Thresholds

    a. Furnish all Thresholds with ¼ inch-20 by 2 inches Zinc Plated Flat Head Sleeve Anchors.

    b. The maximum height of thresholds at doorways shall be 5/8 inch. Such thresholds shall have beveled edges on each side and comply with ADAAG requirements.

10. Butts

All butts are to be ball bearing.

#### 2.30.4.2.4.7 Garage & Shop Vertical Doors

This standard applies to the selection and installation of vertical four-fold doors for the garage vehicle entry, garage stormwater treatment pond maintenance access from the garage, and for the Shop door connecting the Bridge Maintenance Facility with the Bridge Maintance Dock. See also Division 08 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

#### 2.30.4.2.4.8 Louvers

All exterior louvers are to be aluminum coated with a fluoropolymer finish.

#### 2.30.4.2.4.9 Roof Coverings

Provide a complete roofing system that is fully weatherproof. Slope all roof surfaces at a minimum grade of ¼ inch per horizontal foot. Provide roof parapets with roof drains and supplementary overflow drains or scuppers. Provide walking surfaces as needed for access to roof-top equipment, planters, and rooftop landscape management.

See also Division 07 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

#### 2.30.4.2.4.10 Fluid-Applied Waterproofing

This standard applies to the design and installation of fluid-applied waterproofing systems.

These standards and procedures apply to roofs located over occupied and service spaces, which are below grade and covered with earth or walking surfaces, and above grade roofs which are developed for landscaping, planters, and maintenance access and circulation.

## Design Criteria

1. General Requirements

a. Provide minimum 20 year waterproof warranty period.

b. Soils reports and the drawings shall graphically identify water tables.

c. Joints in concrete slabs-on-grade and foundation joints shall have water stops.

d. A sub-grade perimeter drainage system and under slab drainage system is required.

e. All seismic joints, expansion joints, perimeter joints, joints at shaft walls, that cannot be successfully provided with water stops, shall have vertical curbs that extend one foot minimum above the waterproof membrane; and appropriate flashings.

f. The structure shall slope one-quarter of an inch per foot minimum (valley) away from all joints and carry water to drains at the sloped structural deck or over the edge of the foundation wall. The design of the structure shall enhance the slope as building creep relaxes.

g. No upset beams or appendages shall impede the flow of water.

h. Conduits, piping, etc., shall be surface mounted above or below the structural slab. Cast-in conduits or piping are not allowed.

i. Conduit and piping shall not penetrate the horizontal waterproof membrane.

j. Area drains shall be designed to accept the complete rate of flow from a 100- year storm as contributed from the deck, adjacent walls, and other run-off without requiring water storage on the deck surface.

k. Roofing projects shall call for testing the roof drainage system for proper flow prior to and after the roofing installation and provide a flood test of the installed roofing to ensure no leaks. Landscaped roof areas shall be tested prior to installation of geofoam, soil or landscape material to ensure no leaks.

l. Horizontal joints shall be designed with armor plate guard, gasket, and interior gutter drain system. The joint shall be the high point with positive slope away from the joint. Stainless steel flashing at side walls and over up-set curbs shall be tent-like and adequately cover the vertical surfaces.

m. Grates and joints shall have spaces no greater than 1/2 in wide in one direction. If gratings have elongated openings, then they shall be placed so that the long dimension is perpendicular to the dominant direction of travel.

n. Include manufacturer's Standards Drawings (SD drawings) for specific installation details.

## Products, Materials and Equipment

1. Waterproofing Membrane – Hot, Fluid Applied

The waterproof membrane shall be manufactured for submerged installation.

2. Waterproofing Membrane – Cold, Fluid Applied

The waterproof membrane shall be manufactured for submerged installation.

#### 2.30.4.2.4.11 Other Waterproof Membranes

This standard applies to the design of waterproof membranes at all below-grade foundation walls and slabs.

**Below Grade:** Provide external waterproofing membrane system for the Bridge Maintenance Facility. The below grade membrane must be contiguous in installation and manufacturer, fully bonded without breaks in coverage. The below-grade structure must satisfy the water tightness requirements as specified herein.

The manufacturer and installer of the waterproofing system shall submit a list of a minimum of 10 successful projects of similar design and complexity completed within the past 5 years with contact information for each project.

The Design-Builder shall design appropriate protection measures for the waterproofing membrane including the chamfering of corners of the structure, external protection, etc. All components of the waterproofing system shall comply with applicable Volatile Organic Compound (VOC) regulations.

Bentonite waterproofing is prohibited for use on the Bridge Maintenance Facility structure.

#### 2.30.4.2.4.12 Flashing and Exterior Sheet Metal

The Design-Builder shall design and construct Bridge Maintenance Facility flashing and trim to prevent moisture penetration into building walls or roofs. Design and construction of flashing and trim provided by the Design-Builder shall conform to parameters indicated in the Conceptual Plans (Appendix M1); and the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

Flashing and exterior sheet metal shall be galvanized steel sheet, 24 gage minimum, factory coated with a fluoropolymer finish to match adjacent metal building components. Provide self-adhesive bituminous membrane under all copings.

#### 2.30.4.2.4.13 Gutters & Downspouts

The Design-Builder shall provide design and construction of Bridge Maintenance Facility drainage elements, gutters and downspouts in accordance with the Conceptual Plans (Appendix M1); and the Bridge Maintenance Facility Mandatory Specifications (Appendix B12). Bridge Maintenance Facility drainage elements shall include gutters and downspouts adequate for controlled conveyance of run-off from Bridge Maintenance Facility roofs and canopies to drainage systems outfall prior to the point of discharge as described in Section 2.14 (Stormwater Management).

#### 2.30.4.2.4.14 Roof Accessories

This standard applies to the design and installation of roof accessories.

**Design Criteria**

1. WSDOT's Safety Officer shall be contacted to assist in determining the type of system to be installed.
2. Access to roof areas shall be provided through a doorway, elevator, or stairway.

3. A freeze-proof hose bib shall be installed near the exterior roof to mechanical room door for roof cleaning. The valve and shut-off shall be located inside the structure to prevent freezing.

**Mechanical Equipment Screening**

Provide acoustical screening for rooftop mechanical equipment as required to maintain sound levels in accordance with Medina Municipal Code at the vertical plane of the adjacent property lines.

#### 2.30.4.2.4.15 *Insulation*

This standard applies to the design of the Bridge Maintenance Facility thermal insulation that shall be provided at the following locations and as applicable and required for Washington State Energy Code compliance:

- Exterior walls
- Exterior Soffits
- Foundation walls
- Slabs on grade
- Floors over un-conditioned space

See also Division 07 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

### 2.30.4.2.5 Building Interior Construction

This standard applies to the design of all levels of the Bridge Maintenance Facility including the parking garage. See also Division 08 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

#### 2.30.4.2.5.1 Interior Partitions

Interior fixed partitions shall be one of the following as indicated in the referenced design documents:

1. Painted 5/8 inch gypsum wall board on metal studs, 16 inches O.C. Gage of metal studs shall be as required for span and percentage opening needed for horizontal penetration by building systems (conduit, vent ducts, etc.). Interior framed metal stud walls shall have acoustic insulation.
2. Painted or sealed cast-in-place concrete or CMU, thickness and expansion/control joints as required for span.
3. Shaftwalls at elevators and mechanical shafts shall be a UL rated gypsum shaftwall system on prescribed metal framing, CMU or concrete.

Provide UL listed partitions with mandated fire rating where required by code.

See also Division 09 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

#### 2.30.4.2.5.2 Interior Doors

The Design-Builder shall provide the design, Technical Specifications and installation of Bridge Maintenance Facility interior doors.

Interior doors include door panels, door frames, door hardware, door opening elements, door painting, hatches and access doors.

Bridge Maintenance Facility interior doors shall conform to WAC Title 51.

Design of Bridge Maintenance Facility interior doors shall conform to the parameters indicated in the Conceptual Plans (Appendix M1) and the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

This standard applies to the design and installation of interior doors. Interior doors include doors of all sizes, uses, and elements that form or complete the partition openings. See also Division 08 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

**Design Criteria**

1. Interior doors shall be 18 gage hollow metal doors with galvanized 16 gage hollow metal frames, field painted, rated where required. Doors shall not contain asbestos.
2. Doors shall be standard 84 inches height. Minimum widths are to comply with ADAAG.
3. Door frames are to be steel with a welded assembly, not knock-down type.
4. Acoustical Performance: See elsewhere within this Section.
5. Closers: Provide sufficient force to close and latch door despite drafts and wind, but not more than that required by code.
6. Fire and Life Safety:
    a. Protect door openings in fire-rated walls and partitions in accordance with the code.
    b. Emergency Egress: Comply with the code, including where doors must be latched or locked in one direction.
7. Locks: Provide key card or keyed locksets for each room that allow simple, one handed exit from inside. Exceptions:
    a. The following should have no locksets: Doors accessing corridors or exit stairwells required for emergency egress. Also, doors to restrooms, shower rooms, and locker rooms.
    b. Doors to bathrooms, water closet compartments, shower compartments, or single person restrooms may have privacy lock function (without key).
    c. Doors to closets within a secured room do not require a keyed lockset, unless otherwise indicated in the Conceptual Plans (Appendix M1).
8. Forced Entry: Doors shall be capable of resisting forced entry.
9. Glazing in Doors: Comply with requirements for safety glazing, security, and forced entry.
10. Wear Resistance
    a. Door Surfaces: Provide scuff-resistant surfaces in areas where foot impact is likely and highly scratch-resistant in areas where hand contact is likely.

b. Door Handles and Knobs: Provide highly scratch-resistant products with finish that shall minimize appearance changes due to wear. No plated or coated finishes allowed.

11. Swinging Doors: Control door swing to prevent damage due to impact to either door or element impacted.
12. Ease of Use and Repair: Provide doors that shall be easy to use by occupants, easy to repair or service, and with operating components easy to replace.
13. Span of Operating Components: Provide components with a life span greater than 10 years under normal use.
14. Fire Separation Doors, Non-egress: Use same type as other interior doors and that comply with code.
15. Door louvers, if required, shall be painted steel.

#### 2.30.4.2.5.3 Other Interior Openings

The Design-Builder shall provide interior openings; access doors, panels, and hatches where required for maintenance access to mechanical services and other concealed systems.

1. Design to be unobtrusive.
2. Provide floor hatches that are flush with finished floor surface or lapped not more than 1/4 inch above finished surface with tapered edges to present minimal tripping hazard.
3. Provide access panels and hatches that are sized appropriately for access to services, and utilities concealed by other construction.
4. Provide access panels and hatches with concealed hinges, recessed latch, keyed cylinder, and hold-open device.
5. Provide access panels, hatches, and louvers that are compatible in appearance with the finished surfaces in which they are installed; use similar colors and textures.

#### 2.30.4.2.5.4 Interior Fittings

Handrails and guardrails shall be of welded steel construction, painted. Provide interior louvers and vents where required for systems operations.

#### 2.30.4.2.5.5 Stairs

The Design-Builder shall provide interior stairs, ramps, and fire escapes as necessary to occupied spaces when required by code. In addition, provide interior stairs connecting related functions identified in the Conceptual Plans (Appendix M1). Provide stairs to unoccupied roofs, mechanical spaces, and equipment or storage mezzanines. Stairs include stair treads, risers, landings, handrails, balustrades, finishes to treads & risers, finishes to landings & soffits and finishes to handrails & balustrades.

A staircase exterior to the Bridge Maintenance Facility shall be provided between the Bridge Maintenance Facility Parking and the ground near the shoreline and Bridge Maintenance Dock access.

1. Design risers and treads, maximum rise, landings, guards and railings in accordance with code.

2. Provide pedestrian ramps, landings, guards and railings in accordance with code.
3. Construct enclosed or interior stairs with a highly finished appearance.
4. Sound Isolation: Refer to elsewhere in this Section.
5. Provide safety tread and nosing on all stairs.
6. Provide exterior stairs treads that have a minimum static coefficient of friction of 0.80.
7. Provide treads that have a maximum bevel or radius on leading edge of 1/2 inch.
8. Fire Resistance: Construct stairs and handrails of noncombustible materials.

### 2.30.4.2.5.6 Interior Finishes

The Design-Builder shall provide the design, specification and construction, installation or application of Bridge Maintenance Facility finishes in conformance with WAC Title 51 (Washington State Building Code); WSDOT Standard Specifications (Appendix D18); the Conceptual Plans (Appendix M1); the Bridge Maintenance Facility Mandatory Specifications (Appendix B12); and Bridge Maintenance Facility Architectural Concept (Appendix L10).

Finishes include concrete wall finishes, wall plastering, gypsum wallboard, tile, painting, acoustic wall treatment, floor toppings, hardeners & sealers, masonry & stone flooring, exposed concrete ceiling finishes and other coatings & finishes. Interior finishes are to be selected for durability and ease of maintenance. See also Division 09 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

The Design-Builder shall provide the interior finishes for programmed spaces as indicated in the following Bridge Maintenance Facility Finish Schedule:

| Bridge Maintenance Facility Finish Schedule | | | | | | |
|---|---|---|---|---|---|---|
| Room Number | Space | Floor | Base | Walls | Ceiling | Notes |
| S-100 | Shop | Hardened Concrete | Hardened Concrete | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| S-101 | Mechanical Closet | Hardened Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| S-102 | Freight Elevator | Diamond Plate | Mfr Std | Mfr Std | Mfr Std | |
| S-103 | Ventilation Shaft | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| S-104 | Passenger Elevator | Mfr Std | Mfr Std | Mfr Std | Mfr Std | |

| Bridge Maintenance Facility Finish Schedule | | | | | | |
|---|---|---|---|---|---|---|
| Room Number | Space | Floor | Base | Walls | Ceiling | Notes |
| S-105 | Stair 1 | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| S-106 | Janitor | Ceramic Tile or Epoxy Coating | 6” Ceramic Tile or Epoxy Coating | Painted GWB, CMU or Concrete | Paint exposed concrete slab | Ceramic tile or epoxy coating full height wet walls |
| S-107 | Unisex Toilet & Shower | Ceramic Tile or Epoxy Coating | 6” Ceramic Tile or Epoxy Coating | Ceramic Tile or Epoxy Coating | Paint GWB | Ceramic tile or epoxy coating full height wet walls |
| S-108 | Vestibule | Epoxy Coating | 6” Epoxy Coated Concrete or CMU | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| S-109 | Equipment Storage | Hardened Concrete | Hardened Concrete | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| S-110 | Stair 2 | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| S-111 | Comm Room | Antistatic Vinyl | 4” Vinyl | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| S-112 | Hydraulics Workroom | Epoxy Coating | 6” Epoxy Coated Concrete or CMU | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| S-113 | Exit Corridor | Hardened Concrete | Hardened Concrete | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| S-114 | Electrician’s Workroom | Antistatic Vinyl | 4” Vinyl | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| C-200 | Mezzanine | Hardened Concrete | Hardened Concrete | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |

| Bridge Maintenance Facility Finish Schedule | | | | | | |
|---|---|---|---|---|---|---|
| Room Number | Space | Floor | Base | Walls | Ceiling | Notes |
| C-201 | Storage | Hardened Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| C-202 | Freight Elevator | Diamond Plate | Mfr Std | Mfr Std | Mfr Std | |
| C-203 | Ventilation Shaft | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| C-204 | Passenger Elevator | Mfr Std | Mfr Std | Mfr Std | Mfr Std | |
| C-205 | Stair 1 | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| C-206 | Janitor | Ceramic Tile or Epoxy Coating | 6” Ceramic Tile or Epoxy Coating | Painted GWB, CMU or Concrete | Paint exposed concrete slab | Ceramic tile or epoxy coating full height wet walls |
| C-207 | Men’s Restroom | Ceramic Tile or Epoxy Coating | 6” Ceramic Tile or Epoxy Coating | Ceramic Tile or Epoxy Coating | Paint GWB | Ceramic tile or epoxy coating full height wet walls |
| C-208 | Women’s Restroom | Ceramic Tile or Epoxy Coating | 6” Ceramic Tile or Epoxy Coating | Ceramic Tile or Epoxy Coating | Paint GWB | Ceramic tile or epoxy coating full height wet walls |
| C-209 | Vestibule | Epoxy Coating | 6” Epoxy Coated Concrete or CMU | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| C-210 | Records | Epoxy Coating | 4” Vinyl | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| C-211 | Emergency Storage | Epoxy Coating | 4” Vinyl | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| C-212 | Mechanical Chase | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |

| Bridge Maintenance Facility Finish Schedule | | | | | | |
|---|---|---|---|---|---|---|
| Room Number | Space | Floor | Base | Walls | Ceiling | Notes |
| C-213 | Stair 2 | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| C-214 | Lead Tech | Epoxy Coating | 4" Vinyl | Painted GWB, CMU or Concrete | ACT | |
| C-215 | Supervisor | Epoxy Coating | 4" Vinyl | Painted GWB, CMU or Concrete | ACT | |
| C-216 | Crew Room | Epoxy Coating | 4" Vinyl | Painted GWB, CMU or Concrete | ACT | |
| C-217 | Observation Deck | Sealed Concrete | None | None | Paint exposed concrete slab | Exterior wall finish where applicable |
| M-300 | Mechanical Room | Sealed Concrete | None | Painted GWB, CMU or Conc | Paint exposed concrete slab | |
| M-301 | Compressor Room | Sealed Concrete | None | Painted GWB, CMU or Conc | Paint exposed concrete slab | |
| M-302 | Freight Elevator | Diamond Plate | Mfr Std | Mfr Std | Mfr Std | |
| M-303 | Ventilation Shaft | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| M-304 | Passenger Elevator | Mfr Std | Mfr Std | Mfr Std | Mfr Std | |
| M-305 | Stair 1 | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| M-306 | Electrical Service Entrance | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| M-307 | Electrical Room | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| P-400 | Parking Garage | Concrete | None | Concrete | Concrete | |

| Bridge Maintenance Facility Finish Schedule | | | | | | |
|---|---|---|---|---|---|---|
| Room Number | Space | Floor | Base | Walls | Ceiling | Notes |
| P-401 | Valve Room | Concrete | None | Concrete | Concrete | |
| P-402 | Elevator Equipment Room | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| P-403 | Freight Elevator | Diamond Plate | Mfr Std | Mfr Std | Mfr Std | |
| P-404 | Ventilation Shaft | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| P-405 | Passenger Elevator | Mfr Std | Mfr Std | Mfr Std | Mfr Std | |
| P-406 | Stair 1 | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| P-407 | Electrical Service Entrance | Sealed Concrete | None | Painted GWB, CMU or Concrete | Paint exposed concrete slab | |
| P-408 | Generator Room | Concrete | None | Concrete | Concrete | |
| P-409 | Fuel Room | Concrete | None | Concrete | Concrete | |

### 2.30.4.2.5.7 Interior Fixtures

1. Provide fixtures attached to interior construction necessary for the complete and proper functioning of spaces identified by the Conceptual Plans (Appendix M1).
2. Interior fixtures include the following elements:
    a. Storage Fixtures: Non-furniture items intended primarily for storing or securing objects, materials and supplies: includes cabinets, casework, closet fixtures, lockers, and shelving.
    b. Window Treatment: Non-furnishing accessories for control of light, solar heat gain, privacy, and view at interior and exterior windows: includes blinds, shades, shutters, and curtain tracks.
    c. Accessory Fixtures: Specialty items intended to provide service or amenity to building interiors: includes toilet and bath accessories, visual display surfaces and telecommunications fixtures.
    d. Other Interior Fixtures: Other items fixed to interior construction that enhance comfort or amenity in building spaces: includes service wall systems, planters, guardrails, and fixed ladders.

## Design Criteria

1. Light and Glare: Provide interior fixtures that are not a source of direct or reflected glare.
    a. Written and Graphic Information on Interior Fixtures: Should be clearly legible from typical viewing distances by occupants with normal eyesight.
    b. Surfaces Containing Written or Graphic Information: Should be matte finished to reduce the incidence of veiling reflections.
    c. Trans-Illuminated Surfaces: Should have luminance that is not more than 10 times brighter than surrounding surfaces under normal ambient lighting.
2. Provide interior fixtures with fittings and controls that are manageable without special instruction or the need for excessive force.
3. Provide interior fixtures that are coordinated in design with other elements of interior construction, using compatible materials, colors, textures, and design features.
4. Provide durable, low maintenance exposed surfaces for interior fixtures that fall within normal reach of occupants.
    a. Flat, Exposed Metal Surfaces: Provide finishes that are nonreflective rather than smooth polished surfaces. Applied coatings are not permitted.
    b. Hardware and Other Rounded Metal Surfaces: Provide with satin finishes. Applied coatings are not permitted.
    c. Plastic Surfaces: Provide matte, rather than glossy or polished finishes.
5. Provide suspended interior fixtures or portions of fixtures designed for storage or support of persons or objects that have been structurally engineered and installed to withstand:
    a. Live Loads: 1.5 times the anticipated live loads without excessive deflection or permanent distortion.
    b. Seismic Loads: seismic forces that are 20 percent greater than those required by code. For design purposes, apply the component seismic force at the center of gravity of the component nonconcurrently in any horizontal direction.
6. Visibility
    a. Illumination Levels: Provide ambient lighting or equivalent backlighting adequate to provide clear visibility for normally sighted persons at typical viewing distances.
        - Wall-Mounted Corridor Signs or Signs Intended for Viewing at Less Than 5 feet: Provide minimum of 10 foot candles (fc).
        - Signs Mounted above Head Height or Intended for Viewing at More Than 10 feet: Provide minimum of 30 fc.
    b. Character Size: Provide signs with characters of adequate size to be seen comfortably by normally sighted persons at typical viewing distances.

- Wall-Mounted Corridor Signs or Signs Intended for Viewing at Less Than 5 feet: Provide minimum character height of 5/8 inch and maximum of 2 inch.
- Signs Mounted above Head Height or Intended for Viewing at More Than 10 feet: Provide minimum character height of 3 inches.
- Building Directories: Provide minimum name strip height of 3/8 inch.

c. Reflectivity: Provide signs with matte surface measuring 11-19 degree gloss on 60 degree glossimeter; except that backlighted signs may have glossy surfaces.

d. Contrast: Provide signs with contrast between characters and background of not less than 70 percent.

7. Appearance: Provide signage for entire Project that is consistent in design with other interior features and coordinated with overall color scheme.

#### *2.30.4.2.5.7.1 Window Treatment*

Provide window treatments attached to interior construction that are necessary for adequate control of light, glare, privacy, and views for spaces with interior and exterior windows.

1. Provide commercial grade aluminum window blinds at all exterior windows.
2. Comply with ADA Accessibility Guidelines and provide accessible controls for all window treatments, regardless of location.
3. Provide window treatment throughout that enhances and controls interior thermal comfort.
4. Provide window treatment that shall allow control of light transmitted through window assembly.
    a. Fully Open Position: Maximum reduction of light level of 10 percent.
    b. Fully Closed Position: Minimum reduction of light level of 50 percent.
5. Provide window treatment that is water resistant and made of non-corrosive materials that shall not be damaged by contact with condensation on window surface.
6. Provide window treatments throughout the Project that are made of totally incombustible or fire-retardant treated materials.
7. Provide controls that are conveniently located and easily operated.
    a. Vertical Movement by Manual Controls: Maximum weight of window treatment of 20 lb.
    b. Horizontal Movement by Manual Controls: Maximum weight of window treatment of 60 lb.
8. Provide window treatment that is coordinated with window modules and does not conflict with expression of architectural elements of interior construction.
9. Provide window treatment materials that are resistant to degradation from exposure to ultraviolet light.

#### 2.30.4.2.5.8 Concrete Wall Finish

All exposed concrete and CMU walls are to be sealed or painted. See also Division 09 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12), and the Finish Schedule in this Section.

#### 2.30.4.2.5.9 Gypsum Wallboard (GWB)

This standard applies to interior and exterior gypsum board assemblies. See also Division 09 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

**Design Criteria**

1. Gypsum board panels for this Project shall be manufactured in the USA. Each panel shall contain the wording "Made in the USA" or "USA Gypsum" or similar wording certifying manufacture in the USA.
2. It is preferred that 'gypsum board' panels contain recycled content material, either in its paper facings and/or its gypsum core; such recycled content shall be certified by the manufacturer.
3. Provide maximum lengths of GWB available to minimize end-to-end butt joints in each area receiving finished gypsum board.
4. Typical GWB finish shall be Level 4 smooth finish.

#### 2.30.4.2.5.10 Tile Wall Finish

Provide glazed ceramic or porcelain tile with cushion edge. Install using latex thin set on backer board recommended by tile manufacturer; latex grout. See also Division 09 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

#### 2.30.4.2.5.11 Paint

The State requires that paints used on State properties be of paints with VOC levels of 0–100 gm/l. WSDOT must approve any products not within the EPA and Washington State regulations for VOC's.

This standard applies to Interior and Exterior painting. "Paint", as herein defined, means all coating systems materials. Work includes preparation and finishing of all interior and exterior surfaces that are a part of this Project. Work shall include adjacent existing surfaces that are disturbed as a result of this Work. Work excluded shall be that which is normally excluded such as operating parts and code-required labels.

Epoxy wall coating used in lieu of ceramic tile shall be of the same manufacturer as epoxy floor finish manufacturer. See also Division 09 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

**Design Criteria**

1. Provide solvent-free, non-VOC paint products: Kelly-Moore, Glidden, Sherwin Williams or approved. Design-Builder shall provide a proposed color pallet for review by WSDOT. This shall include all room surface finishes, common trim and accent colors.
2. Interior walls and ceilings surfaces shall be painted in accordance with the following criteria over an appropriate prime/base coat, unless otherwise stated.

a. Areas not otherwise listed below to be washable acrylic latex with eggshell finish.

b. Corridors, stairwells, entry vestibules, lobbies, laundry facilities / rooms, public wash / shower / bathrooms shall be washable acrylic latex with semi gloss finish.

c. Bathrooms, shower rooms, locker area and crew room shall be washable waterborne epoxy with a semi-gloss finish.

3. Inspect substrates prior to starting Work; provide notification of any unsatisfactory conditions. Beginning Work shall imply acceptance of substrate.

**Mechanical and Electrical Equipment**

1. Color-code and provide identifying labels for all equipment, ductwork, piping and conduit. Provide WSDOT with a comprehensive schedule for the color 17 coding system and review for methodology and specifics prior to painting.
2. Paint all shop primed equipment, materials and products.
3. Remove louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
4. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports except where items are pre-finished.
5. Do not paint identification markings.
6. Paint interior surfaces of air ducts that are visible through grilles and louvers with one coat of flat black paint to limit of sight line.
7. Paint exposed conduit and electrical equipment occurring on the Crew Level except the mezzanine.
8. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
9. Color code equipment, piping, conduit, and exposed ductwork in accordance with color schedule.

**Products, Materials and Equipment**

All materials shall comply with EPA and State of Washington regulations regarding Volatile Organic Compounds (VOC).

1. Use water-based, low VOC - no more than 150 gm/l, typical.
2. Where use of oil-based paints is indicated, they are not to exceed 250 gm/l VOC.

**Mixing and Tinting**

1. Unless otherwise specified, all paint shall be ready-mixed and pre-tinted. Re-mix all paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformity.
2. Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

### 2.30.4.2.5.12 Flooring

Provide design and construction of Bridge Maintenance Facility floors in accordance with WAC Title 51 (Washington State Building Code); WSDOT Standard Specifications (Appendix D18); the Conceptual Plans (Appendix M1); division 09 of the Bridge Maintenance Facility Mandatory Specifications (Appendix B12); and Bridge Maintenance Facility Architectural Concept (Appendix L10).

Floors include floor structural frame, floor slabs and decks, inclined and stepped floors, expansion & contraction joints, balcony construction and suspended ramps.

Bridge Maintenance Facility floors shall be of non-combustible construction.

**Entry Mats**

All entryways and lobbies shall have recessed matting installed in areas where applicable.

1. Matting shall generally be a dark color. Samples should be submitted to WSDOT for review and comment and review of colors.
2. Total length of interior walk-off matting should be no less than 12 ft. from outside entry doors to the end of matting area.
3. Recessed (Inlaid) matting in exterior areas shall allow water to flow through the backing.
4. Inlaid matting areas may require a floor drain under mats.
5. Inlaid matting frames shall be of aluminum, bronze or other material complementary to the building design.
6. Inlaid panels must be such that they can be easily removed for cleaning.
7. Metal foot grille type mats shall not be allowed.

**Concrete Floor Finish**

Concrete floors shall be sealed at all exposed locations, including stairs, mechanical and electrical rooms, service spaces, service corridors, etc. with a zero VOC penetrating sealer.

**Tile Floor Finish**

For tile floors, the Design-Builder shall provide unglazed ceramic tile with a cushion edge and with a slip resistant surface. Install using epoxy thin set; epoxy grout.

Provide one (1) unopened carton of each type, shape and color of ceramic tile used on the Project.

**Epoxy Floor Finish**

This standard applies to the epoxy floor finish. See also Division 09 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

### 2.30.4.2.5.13 Ceiling Finish

This standard applies to interior ceiling finishes not indicated in other Sections. Ceilings shall be of three types:

1. Painted or sealed concrete where the underside of slab is exposed, typical in stairs, mechanical and electrical rooms, service spaces, services corridors, etc.; zero VOC penetrating sealer or water-based, low VOC paint - no more than 150 gm/l, typical.
2. Painted gypsum wallboard
    a. For all painted ceiling surfaces, use water-based, low VOC paint- no more than 150 gm/l, typical.
3. Suspended acoustical ceiling
    a. Suspended ceilings shall be heavy duty grid with standard 2'x2' or 2'x4' ceiling panels. Concealed spline ceiling systems shall not be used.
    b. Provide two (2) unopened cartons of each type ceiling panels used on the Project.
    c. Approved Manufacturers of Acoustical Ceiling Panels are:
        - Armstrong World Ind.
        - U.S. Gypsum.
        - BPB USA / Celotex.
    d. Approved Manufacturers of Suspension Grid System are:
        - Donn Products Inc.
        - Chicaco Metallic Corp.
        - Armstrong World Ind.
        - U.S. Gypsum

### 2.30.4.2.5.14 Toilet and Bath Accessories

This standard applies to the design and installation of toilet and bath accessories. Installation and mounting heights shall comply with WAC 51 and ADAAG. See also Division 10 in the Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

**Design Criteria**

1. Paper towel dispensers shall be multi-fold type.
2. Mirrors:
    a. Provide one over each lavatory.
    b. Provide only fully tempered float glass for mirrors.
    c. Provide for broken glazing replacement without disassembly of frame.
3. Grab Bars: Provide wherever required by code for safety and assistance in use of toilet and bath fixtures.
    a. Design strength: Design to provide strength, anchorage, and support as required to withstand 250 pounds-force applied vertically at the center between supports and 250 pounds-force tension applied at any support; design supports of sufficient rigidity to prevent rotation of bars under load.

b. Slip Resistance: Fixtures Expected to Support or Assist in the Support of Persons: Touchable surfaces having slip resistance of 0.50, using wet conditions.

4. Waste receptacles
    a. Provide one for each paper towel dispenser.
    b. Provide one for every toilet in women's restrooms, for sanitary napkin disposal.
5. Hooks: Provide one in each toilet compartment.
6. Provide the following holders and dispensers:
    a. Toilet Paper: one holder per toilet.
    b. Paper Towels: one holder per 3 lavatories.
    c. Toilet Seat Covers: one holder per toilet.
    d. Hand Soap: one liquid dispenser for each lavatory.

**Products, Materials and Equipment**

1. Finishes, General: unless noted otherwise, finishes to be satin finish stainless steel.
2. Accessories can be recessed or surface mounted.
3. Jumbo Tissue Dispensers shall be provided.
4. Multi-Fold Paper Towel Dispenser: 500 towel capacity.
5. Electric Hand dryer: Energy efficient hand dryer. Operation: automatic (touch-less), 120V with dedicated circuit.
6. Toilet Seat Cover Dispenser: 250 seat cover capacity.
7. Grab Bar (straight): stainless steel, 0.05 inch thick, exposed mounting, smooth, satin finish and an outside diameter of 1.5 inches for heavy-duty applications.
8. Grab Bar (corner): stainless steel, 0.05 inch thick exposed, mounting, smooth, satin finish with an outside diameter of 1.5 inches for heavy-duty applications.
9. Paper Towel Waste Receptacle: 8 gallon minimum capacity.
10. Feminine Napkin/Tampon Waste Receptacle: 1 gallon minimum capacity.
11. Liquid-Soap Dispenser: wall mounted “storage container” type soap dispenser. 32 fluid ounce minimum.
12. Mirror Unit: 16 inches by 20 inches Minimum with stainless-steel angle frame.
13. Hooks: Provide 3 inch hooks.
14. Underlavatory Guard: Provide white, antimicrobial, molded-vinyl covering for supply and drain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. Provide components as required for applications indicated with flip tops at valves that allow service access without removing coverings.

### 2.30.4.2.5.15 Janitor Accessories

1. Janitorial Mop and Broom Holder

a. Material: Stainless steel
b. Length: 48 inches
c. Hooks: 5
d. Mop/Broom Holders: 6, spring-loaded, rubber hat, cam type.
e. Shelf for supplies: 20 lineal feet minimum 1 ft deep

#### 2.30.4.2.5.16 Furnishings

Not included in Contract.

### 2.30.4.2.6 Environmental Graphics

Provide environmental graphics for the following areas.

#### 2.30.4.2.6.1 Identification Signage

1. Exterior
   a. Building entries
   b. Building pedestrian entry
   c. Street address
   d. Parking
   e. Elevator Equipment Room
   f. Freight Elevator
   g. Passenger Elevator
   h. Stairs
   i. Loading Zone
2. Interior
   a. Building systems spaces
3. Roof
   a. Enclosed MEP spaces
   b. Stairs
   c. Elevators

#### 2.30.4.2.6.2 Regulatory/Code Signage

1. Building
   a. Accessibility identification and directional signage
   b. Restrooms
   c. Occupancy
   d. Stairwells and exit passages
   e. Conveyance lobbies

f. Security, specialty, and policy signage

g. Support functions and system spaces as required (e.g. electrical rooms, mechanical rooms, etc.)

h. All Fire Department required signs

**Design Criteria**

1. Provide graphics that are not a source of direct or reflected glare.
   a. Written and graphic information should be clearly legible from typical viewing distances by occupants with normal eyesight.
   b. Surfaces containing written or graphic information should typically have a matte finish to reduce the incidence of veiling reflections.
2. Provide graphics that are coordinated in design with other elements of interior construction, using compatible materials, colors, textures, and design features.
3. Visibility
   a. Provide ambient lighting or equivalent backlighting adequate to provide clear visibility for normally sighted persons at typical viewing distances.
   b. Provide signs with characters of adequate size to be seen comfortably by normally sighted persons at typical viewing distances.
   c. Provide signs with contrast between characters and background of not less than 70 percent.

## 2.30.4.2.7 Architectural Acoustics

### 2.30.4.2.7.1 Acoustical Criteria

**General**

The Design-Builder shall perform all Work necessary to meet the requirements and criteria specified in this Section for noise control throughout the Bridge Maintenance Facility building and ancillary facilities. Maintain ambient sound levels in enclosed, occupied spaces within noise criteria (NC) ranges and sound pressure levels specified in the table below. In multi-use spaces the more stringent criteria shall apply.

| Space | NC Criterion | Sound Pressure Level (dBA) |
|---|---|---|
| Offices | 35 | 40 |
| Specialty Work Rooms | 35 | 40 |
| Communications Room | 40 | 45 |
| Crew Room | 40 | 45 |
| Vestibules/Corridors/Stairways | 45 | 50 |
| Storage | 50 | 55 |
| Shop | 50 | 55 |

## Sound Isolation

Audibility of an intruding sound is dependent on the amount of acoustic isolation provided by the construction separating the two adjacent spaces and by the level of ambient sound in the receiving space.

## Adjacencies

Use the most cost effective approach to achieving good sound isolation in the planning stage. During the design process, identify areas with noisier activities, such as: fan rooms, mechanical rooms, generator room, transformer room, shop spaces, and compressor rooms. Optimize the location and/or construction of acoustically sensitive spaces (noise criteria NC 35-40) to be proximally and/or audibly isolated from noisy spaces and activities. Corridors, storage and other less noisy spaces can help buffer the sound intrusion. Preventive design can eliminate the need for added construction to ensure adequate acoustical separation. Use the table below as a guide for suggested adjacencies throughout the Bridge Maintenance Facility building and parking structure.

| Receiving Space | Adjacent Space (Horizontal or Vertical) | | | | |
|---|---|---|---|---|---|
| | Parking, Generator, Elevator Machine Room | Mechanical, Electrical, Compressor | Shop, Work Rooms | Offices | Vestibule |
| Shop, Work Rooms | Do not locate adjacent | 55 | 50 | 60 | 60 |
| Offices | Do not locate adjacent | Do not locate adjacent | 60 | 50 | 40 |
| Vestibules, Corridor | Do not locate adjacent | 60 | 60 | 40 | 40 |
| Crew Room, Lockers | Do not locate adjacent | Do not locate adjacent | 55 | 50 | 40 |

## Structural Systems

The structural components selected shall meet the STC ratings listed in the table above to meet Specific Criteria. However, the STC rating does not sufficiently address low frequency sound transmission. If the source of the sound contains a significant low frequency component (large fans, compressors, generator, pumps, shop equipment, etc.), use concrete or filled masonry structures.

Substantiation: Acoustical analysis of predicted ambient noise levels shall be prepared by an acoustical consultant.

Do not use resilient channels in wall construction. Resilient clips shall be used in place of resilient channels where needed.

Partitions with ratings STC 45 or above must not terminate at the ceiling plane. Extend these partitions to the structure. Caution must also be used to prevent further breach of the barrier through conduit and ductwork penetrations, recesses in the wall (speakers, clock, etc.).

The following guide shall be used for sound retardant wall construction (these notes shall be included in construction documents drawings):

- Stagger joints on all multiple layers of gypsum board.
- Caulk along both sides of the perimeter with a non-hardening silicone mastic.
- Where a double row of studs is used, make no connections between rows.
- Where a sound retardant partition abuts perpendicularly to a continuous gypsum board partition, interrupt the gypsum board at the point of intersection and caulk the joint liberally. Do not continue the gypsum board behind the intersecting stud.
- All openings around duct/pipe penetrations shall be sealed with non-hardening silicone mastic.

#### 2.30.4.2.7.2 Environmental Sound

**Exterior Noise Level**

Maintain 60 dBA maximum average daytime and nighttime noise level from all exterior sound sources operating under normal conditions including but not limited to rooftop mechanical equipment in accordance with local noise regulations (Medina Municipal Code), measured at the closest adjacent property line.

**Modifications to maximum permissible sound levels**

For any source of sound that is of short duration, the sound levels are increased by:

1. 5 dB(A) for a total of fifteen minutes in any one-hour period;
2. 10 dB(A) for a total of five minutes in any one-hour period; and
3. 15 dB(A) for a total of one and one-half minutes in any one-hour period.

**Rooftop Mechanical Equipment**

The analysis of the expected sound level at the closest adjacent property lines shall be performed to meet the design criteria. The analysis shall include the predictions of sound levels at the closest adjacent property lines, mitigation measures including but not limited to sound barriers, construction and acoustical performance of the sound barriers.

#### 2.30.4.2.7.3 Room Finishes

Especially noisy areas, such as the mechanical areas, generator room, transformer room, compressor room and shop may need acoustical absorption to control noise. The extent and suitability of selected materials shall be verified in the design phase.

**Vestibule**

- T60 (Reverberation Time) – This room shall be designed to have an average mid-frequency reverberation time not greater than 0.95 seconds.
- The ceiling shall be absorptive, minimum NRC 0.65.

**Offices**

- Typical moderate acoustical privacy office space.
- The ceiling shall be absorptive, minimum NRC 0.65.

**Crew Room**

- T60 (Reverberation Time) – This room shall be designed to have an average mid-frequency reverberation time not greater than 0.75 seconds.
- The ceiling shall be absorptive, minimum NRC 0.65.

**Toilet Rooms**

- Where possible, toilet rooms shall stack vertically and shall not have common walls with normally occupied spaces.

**Mechanical Level**

- STC – Walls and floor ceiling construction shall be highly dependent on the equipment selected for the Project. Construction shall be sufficient to meet interior noise criteria of adjacent spaces and to the external environment.

**Compressor Room**

- Concrete walls and floor/ceiling structure are recommended for this room.
- Doors to these rooms shall be an acoustical assembly rated no less than STC 55.

**Generator, Compressor, Transformers**

- Concrete walls and floor/ceiling structure are recommended for these rooms.
- Doors to these rooms shall be an acoustical assembly rated no less than STC 55.

**Elevator Equipment Room**

- Concrete walls and floor/ceiling structure are recommended for this room.
- Doors to this room shall be an acoustical assembly rated no less than STC 55.

#### 2.30.4.2.8 Inspection & Maintenance Access For East Approach Bridges

A minimum 3' vertical clearance to the East Approach soffit shall be provided at the East Approach Bridges bearings. East Approach Bridges bearings shall be exposed and inspectable.

#### 2.30.4.2.9 Structural System

##### 2.30.4.2.9.1 General

The structural system for the Bridge Maintenance Facility building shall be at the discretion of the Design-Builder. All structural items and finishes shall be capable of resisting the loads applied to them, including loads by self weight; imposed dead and live loads; wind, earthquake, snow, rain, temperature, and flood loads; and soil and water pressures; along with relative & differential movements; without exceeding the limits of deformation, distortion, deflection, stress, fatigue, vibration, fire resistance, and serviceability.

The following minimum loads shall be used:

- Minimum floor live load shall be 100 psf.
- Minimum shop live load shall be 250 psf, or actual equipment weight plus housekeeping pads plus 50 psf around equipment, whichever is greater.

Buoyancy force shall be computed at 62.4 lb/sqft per foot depth below design water table or lake elevation. For baseline groundwater elevations, see the Geotechnical Baseline Report (Appendix G1). Adequate resistance to flotation shall be provided at all sections for full uplift pressure on the structure foundation, including factors of safety. A permanent dewatering system may be assumed in buoyancy calculations upon approval by WSDOT.

#### 2.30.4.2.9.2 Basement & Elevator Pit Walls

Basement and elevator pit walls shall be designed as reinforced concrete walls subject to the applied loads including earth and full hydrostatic pressure, including dynamic inertial lateral soil pressures and liquefaction effects due to earthquake motions. The design of these walls shall consider the size, foundation type and proximity of adjacent structures, as well as the settlements of those structures. These walls shall be designed to comply with the water-tightness requirements of this Section. A minimum 1' x 1' x 1' low point sump shall be provided in each elevator pit.

#### 2.30.4.2.9.3 Foundations

The foundations are required to be designed to carry loads imparted on them by the building elements above and to be capable of transferring these loads to the bearing strata. Structure design shall accommodate anticipated settlements.

#### 2.30.4.2.9.4 Concrete Slabs On Ground

Concrete slabs on ground subjected to water pressures shall be designed for all applied loads including full hydrostatic pressure. These slabs shall be designed to comply with the water-tightness requirements of this Section.

#### 2.30.4.2.9.5 Excavation & Shoring

The Design-Builder shall provide design and construction of the shoring and excavation for the Bridge Maintenance Facility building. Shoring walls for the excavation shall include a permanent CIP concrete fascia designed to resist all lateral pressures. Shotcrete shall not be used for the permanent CIP concrete fascia but may be considered for temporary applications.

The Design-Builder shall coordinate Bridge Maintenance Facility and Dock excavations with adjacent sub-grade structures to assure structural stability and integrity of prior and existing work.

The design of the excavation and shoring shall consider several factors, including, but not limited to the following:

- Soil and groundwater conditions
- Width and depth of excavation
- Configuration of the structure to be constructed within the cut
- Size, foundation type and proximity of adjacent structures
- Utilities crossing the excavation, or adjacent to the excavation
- Traffic and construction equipment surcharge adjacent to the excavation
- Settlements of adjacent structures

- Noise restrictions

## 2.30.4.3 BRIDGE MAINTENANCE DOCK

### 2.30.4.3.1 General

The Bridge Maintenance Dock (BMD) consists of two components: the Service Platform and the Approach Pier. The Service Platform shall provide a berth for a Workboat and Personnel Tender. The Approach Pier shall connect the Service Platform with the shoreline and the Bridge Maintenance Facility building.

The BMD shall serve as the routine access point to the Pontoons of the floating bridge. This necessitates a stable, safe working platform at the boat moorage. The BMD shall be a fixed, and not a floating structure.

The BMD shall be immediately adjacent to the Bridge Maintenance Facility building. It shall allow servicing of the Workboat and Personnel Tender including the following utilities: diesel fuel, potable water, sanitary sewer, electrical power and compressed air.

Utilities to support the Workboat and Personnel Tender shall be properly sheathed to prevent spills and protect the utilities from wind and wave damage. They shall be either incorporated into the superstructure, or hung at or just below the deck of the Approach Pier.

The BMD shall be illuminated as described in this Section.

Mechanical lifts and launches are not permitted for the Workboat.

Accumulation of water on the deck shall be prevented. Adequate drainage must be provided to remove overtopping water either with drainage holes through the deck or a curb and gutter system with scuppers.

A minimum of 1.5 feet vertical clearance from Normal High Lake Level to the soffit of the BMD superstructure shall be provided.

The BMD shall not extend more than 100 feet perpendicular from the shoreline at Normal High Lake Level.

#### 2.30.4.3.1.1 Water Surface Elevations

The following lake level elevations shall be used for design. Vertical elevations are in feet and refer to NAVD88.

- Extreme High Lake Level = +19.52 feet
- Normal High Lake Level (Project Lake Level defined in Section 2.1) = +18.72 feet
- Normal Low Lake Level = +16.72 feet

Typically, the seasonal water surface at the site (outside of unusual events) ranges between Normal High Lake Level in the summer and Normal Low Lake Level in the winter. Water surface elevations and wave heights at the site will be affected by rainfall; wind direction, velocity and duration; and channel traffic.

## 2.30.4.3.2 Dock Configuration

### 2.30.4.3.2.1 Service Platform

The Service Platform shall support simultaneous docking and servicing of a Workboat and Personnel Tender.

**General Layout and Dimensions**

Two mooring berths shall be provided at the Service Platform. The Workboat berth shall be positioned outboard of the Service Platform. On the inboard side of the Service Platform, a berth for a smaller Personnel Tender shall be provided. Water depth for the Workboat shall be maximized and shall not be less than 6 feet at the Normal Low Lake Level. Dredging of the berths or approaches to the berths to achieve deeper water is not permitted.

**Workboat and Personnel Tender Requirements**

The design and construction of the BMD shall be compatible with the Workboat and Personnel Tender. Workboat performance specifications are given in Appendix B13. The Personnel Tender will be an all-weather craft whose purpose is to transport personnel between the BMD and the floating bridge pontoons. The length overall (LOA) will be less than 25 feet. The maximum beam will be less than 12 feet. The draft will be less than 2 feet. The displacement will be less than 15 tons.

The Service Platform shall be oriented to be parallel to the contours of the existing bathymetry as shown in the Conceptual Plans (Appendix M1).

The Service Platform shall be a minimum of 14 ft wide at the intersection with the Approach Pier. The Service Platform length shall be a minimum of 50 ft, but provisions for bow and stern line mooring attachment points at least 10 ft beyond the ends of the Workboat shall be provided. These must be made accessible by catwalk if not part of the Service Platform.

The Service Platform elevation shall be set so that the crew can enter and exit the vessel at a height comparable to the elevation of the Workboat gunwale at Normal Low Lake Level. At Normal High Lake Level, adequate space on the Service Platform shall be provided to accommodate steps or block platforms for Workboat access without interfering with other activities on the platform.

Aluminum ladders extending into the water at least two rungs below Normal Low Lake Level shall be fixed to the Service Platform adjacent to the Workboat and Personnel Tender berths to facilitate personnel access to the vessels and removal of persons from the water.

A minimum of five industrial grade stainless steel sliding mooring cleats (Tideslide MY Series Mega Yacht Class or approved equal) shall be provided for the Workboat at positions acceptable to WSDOT. Attachment of the cleats to the Service Platform shall be in accordance with vendor recommendations based on the size of the Workboat as provided in Appendix B13. Similar adjustable cleats as described above shall also be provided for the Personnel Tender.

A 6 inch by 6 inch bull rail/curb shall be provided around the periphery of the Service Platform to prevent vehicles from falling into Lake Washington except where it would interfere with personnel access or utilities.

Due to the open exposure of the Service Platform, mooring of both vessels will take place during storm events up to the Operational Event as defined later in this section. The

vessels will be moved to the lee side of the floating bridge or diverted to other sheltered berthing during storm events exceeding the Operational Event.

#### 2.30.4.3.2.2 Approach Pier

The Approach Pier alignment shall be located on a straight line between the Bridge Maintenance Facility building shop door and the Service Platform.

The Approach Pier shall be a minimum 10 ft wide. The minimum clear width usable by personnel shall be 9 feet at the top of the deck and 9 feet, 3 inches between the safety railings. Portions of the Approach Pier directly over Lake Washington shall have a minimum of 20% open surface area (grating) for light penetration. Grating shall be located outside of vehicle wheel paths. The pier spans shall be as long as structurally practical to minimize in-water substructure.

Safety railing meeting the requirements of Section 2.15 shall be provided on the Approach Pier as shown in the Conceptual Plans (Appendix M1) and the Bridge Maintenance Facility Architectural Concept (Appendix L10).

### 2.30.4.3.3 Materials

The structure of the Bridge Maintenance Dock shall be reinforced concrete and steel.

The surfaces of the Service Platform and Approach Pier shall be textured concrete to provide traction for personnel and vehicles during wet conditions. Bull rails/curbs shall be reinforced concrete. The grating shall be steel or FRP and shall include a non-slip surface.

Exposed steel components for structure and railing shall be ASTM A276 Type 316 stainless steel.

### 2.30.4.3.4 Navigation & Public Safety

Navigation and obstruction lights shall be provided. Navigation lights shall be placed at the northwest and southwest corners of the Service Platform, at a minimum. Final placement shall be subject to U.S. Coast Guard approval.

Obstruction lights shall be white with 360 degree reflective lenses and of sufficient candlepower to be visible at a distance of at least three nautical miles.

White retro-reflective markers shall be placed along the Service Platform and all in-water structure at intervals no greater than 50 ft.

Retro-reflective signage shall be installed on the BMD directing public vessels away from the BMD.

### 2.30.4.3.5 Scour

Scour shall be considered for substructure elements located in Lake Washington or near the Lake Washington shoreline.

Minimum local depth of scour shall be equivalent to the diameter for circular columns, or the least cross-sectional dimension for other substructure shapes. In no case shall the minimum scour depth be less than 3 ft below the existing grade.

#### 2.30.4.3.6 Fendering

A fender system shall be provided to prevent the Workboat and Personnel Tender from being caught beneath the Service Platform. Required fendering for the Workboat and Personnel Tender at the berth shall be determined using the Workboat side berthing energy.

At a minimum, fendering for the Service Platform shall consist of a horizontal row of Trelleborg 12-inch x 12-inch DD fenders (or equivalent) between vertical Trelleborg 12-inch x 12-inch DD fenders (or equivalent) at an approximate 4 ft spacing along the face of the Service Platform and extending at least one foot below the Normal Low Lake Level.

At a minimum, fendering for the Approach Pier shall consist of a horizontal row of Trelleborg 12-inch x 12-inch DD fenders (or equivalent) placed along each side of the Pier between the Service Platform and DW Sta. 10+68.00.

#### 2.30.4.3.7 Design Loading

##### 2.30.4.3.7.1 Live Load

Live loads shall include both pedestrian and maintenance vehicle traffic as described in AASHTO LRFD Guide Specifications for Design of Pedestrian Bridges. The vehicle load shall be an AASHTO H-10 design vehicle. The minimum uniform live load shall be 100 PSF.

The Approach Pier and Service Platform shall accommodate a vehicle transporting payloads. The Service Platform and Approach Pier shall be configured such that the vehicle can be turned at the Service Platform without the need to back the vehicle back across the Approach Pier.

##### 2.30.4.3.7.2 Wind & Wave Loads

The Design-Builder shall determine design wind and waves at the BMD. A source for the wind and wave climate in Lake Washington in the vicinity of the SR 520 floating bridge during strong wind storms is summarized in the *Lake Washington Wind and Wave Climatology Report* (Appendix S5). Wave conditions reported in Appendix S5 may be used as the boundary conditions for the analysis. Waves from multiple directions including both north and south and intermediate directions in between shall be simulated for the range of lake levels. Wave loads shall be considered as a “water load” (load designation WA) as per AASHTO’s Guide Specifications for Bridges Vulnerable to Coastal Storms.

Design storm events for determination of wind and wave forces shall include the following two events based upon wind speed return periods:

- Operational Event = 5 year return period.
- Survival Event = 100 year return period.

An acceptable condition for wave splash and overtopping shall be proposed by the Design-Builder for acceptance by WSDOT. The conditions shall achieve the following performance requirements.

During the Operational Event the BMD shall:

- Survive and be serviceable.

- Allow maintenance personnel to safely traverse the BMD, enter/exit the Workboat and Personnel Tender and load equipment into and out of the Workboat and Personnel Tender.
- Allow the vessels to be maneuvered into and out of their berths safely.
- Be designed for lake level elevations between Normal High Lake Level and Normal Low Lake Level.
- Consider the effects of passing vessels.

During the Survival Event the BMD shall:

- Be serviceable with some repairs after the storm event.
- Be designed for lake level elevations between Extreme High Lake Level and Normal Low Lake Level.

For the Strength Limit State a load factor of 1.75 shall be used as described in the AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms.

All portions of the BMD between the maximum wave crest and the mudline shall be designed for vertical and horizontal wave loads. Wave calculations shall account for relevant wave transformation processes including diffraction, refraction, shoaling, breaking, setup, wave-current interaction, etc., as applicable. Wave loads on the structure shall be calculated for the controlling combination of wind speed, wind direction, water level, and structure orientation.

### Vertical Loads

Vertical uplift loads shall consider wave induced forces on the underside of the Service Platform and Approach Pier. Service Platform and Approach Pier superstructure with less than 4 ft of vertical clearance above the maximum wave crest shall consider a minimum factored uplift force (unreduced by slab dead load reaction) of 8 kip per foot width of connection between the substructure and each slab sub-unit at each end as described in AASHTO Guide Specifications for Bridges Vulnerable to Coastal Storms.

### Horizontal Loads

- Load cases:
  - Operational Event: BMD is occupied by maintenance personnel, and Workboat and Personnel Tender are both moored at the facility.
  - Survival Event: BMD is not occupied by maintenance personnel, and neither the Workboat nor Personnel Tender is moored at the facility.
- Horizontal loads for the Operational Event shall include loads transposed to the BMD from moored vessels. These loads shall be calculated based on the physical properties of the Workboat and Personnel Tender.
- Wave loadings shall be based on the largest wave force possible at any water level impacting directly on the BMD.
- Lateral wave loads shall be computed assuming a maximum design water level at Extreme High Lake Level plus an allowance for wind and wave setup which shall be no less than 1 ft.
- Drag loads from currents shall be considered in combination with wave impact and pressure loads. The minimum current speed shall be 3.1 feet per second or

3% of the wind speed, whichever is greater, acting on the projected area of the BMD and moored vessels.

- Calculation of wind forces shall be performed considering all potential loading directions.
- Wind load calculations shall be based on a vessel profile height no less than 20 percent of the slip length.
- Each cleat and bolted connection shall be capable of withstanding the maximum of (1) the entire mooring load applied by the Workboat at the Operational Event or (2) 12 kips.

#### 2.30.4.3.7.3 Impact Loadings

Impact loadings on the BMD shall be absorbed by energy absorbing rubber fender elements which transmit forces to the structural dock elements. Fenders may be direct contact, rubber elements or rubber fender elements with a structural contact face to distribute loads and energy absorption. Stresses or factored forces in dock structural elements shall not exceed allowable stresses or nominal strength of dock elements at factored loads, during impact loading. Energy absorbing fender elements shall be proportioned to not exceed 90% of their manufactured rated energy. Dock elements which resist resulting fender loads, shall be designed to resist the reaction that results from the calculated berthing energy and the selected fender. Fender deflections shall be limited to amounts that are consistent with chosen geometry of the vessel/fender/dock interface and accommodate vessel access requirements.

Effects of eccentric loading may be considered, where appropriate, to reduce energy absorption requirements. Impact loadings shall not be considered simultaneously with seismic effects. Impact loadings shall be considered in conjunction with wind velocities associated with the Operational Event, except for the case of floating debris, where the wind velocity shall be that associated with the Survival Event. Impact loads and wind loads shall be combined with dead and live loads to produce the largest forces in the structure.

The BMD, and related fenders, shall be designed to withstand the effects of impact loading from berthing forces from the Workboat for which this facility provides permanent mooring.

Methods of determining and resolving impact forces shall be based on reasonable engineering design methods that are based on the kinetic energy of a moving object being transformed into static force resisted by the structure. The structure itself shall not be considered to absorb energy. Fender systems shall be designed to absorb energy from impact and transmit the resulting static force to the dock structure. The dock structure shall be designed to resist these lateral forces simultaneously with other loads in the specified load combinations.

A fender system shall be provided to absorb the energy of the workboat while berthing. The vessel parameters of the Workboat (Appendix B13) shall be used to determine vessel berthing energies.

It shall be assumed that the longitudinal axis of the workboat is at an angle of 15 degrees to the face of the Service Platform upon contact and has a velocity of 1.5 feet per second (0.46 m/s) perpendicular to the Service Platform face at the point of contact. The distance from the bow to contact point or from the stern contact point to the center of mass of the workboat shall be based upon the geometry of the hull relative to that of the

fender system for all water levels. Hull rub rails or other hull protrusions shall be considered for their impacts on transferring energy to the fender system and actual length of fender element used to absorb the required energy.

A factor of 1.25 shall be multiplied times the workboat mass, when calculating required energy absorption, to account for the water that is moving with the workboat. This loading shall be considered as a part of the Operational Event. This loading shall not be considered concurrently with Vessel Allision.

Workboat berthing forces shall be considered as a live load (load designation LL) as per AASHTO's Guide Specifications for Bridges Vulnerable to Coastal Storms.

#### 2.30.4.3.7.4 Rails & Appurtenances

Hand rails, safety railing, luminaries, utilities and other miscellaneous appurtenances shall be designed for wave action and overtopping water. Vertical surfaces shall be designed to withstand a minimum horizontal force from overtopping water of 30 psf of exposed surface.

## 2.30.4.4 ELECTRICAL

The Design-Builder shall perform all Work necessary to design and construct the electrical systems relevant to the Bridge Maintenance Facility and Dock for the Project.

### 2.30.4.4.1 General

Design and construction of all electrical systems including but not limited to: electrical service and distribution, lighting and branch wiring, lighting equipment, emergency light and power, power receptacle system, security system, communication systems, special systems and devices, snow melt and de-icing system, power distribution equipment, etc. shall conform to parameters indicated in the Conceptual Plans (Appendix M1).

The Design-Builder shall be responsible for coordination of the Bridge Maintenance Facility and Dock electrical systems with the requirements of other Sections including 2.10, 2.16, 2.17, 2.18 and 2.32, applicable to other portions of the Work.

### 2.30.4.4.2 Electrical Service and Distribution

The Design-Builder shall provide the independently metered Bridge Maintenance Facility and Dock electrical service and distribution. Utility connections and such shall conform to local utility requirements and Section 2.30.2.

Design and construction of the Bridge Maintenance Facility and Dock electrical service and distribution shall conform to WAC Title 51 (Washington State Building Code) and NFPA 70 requirements.

Electrical service and distribution includes 480VAC service power distribution panels, step down transformers, branch circuit panels, enclosed circuit breakers, motor control centers, conduit and wiring to circuit panels, and raceways. Electrical distribution includes connections to other systems and grounding.

All equipment located at the Bridge Maintenance Facility and Dock shall be rated NEMA-4X (or NEMA-3R if NEMA-4X is not available for the equipment). The Design-Builder shall design the facility electrical equipment to be capable of withstanding a water based fire suppression system without damage or failure.

The Design-Builder shall coordinate the LEED compliance requirements with the Technical Requirements located herein. The Design-Builder shall identify any changes to the technical requirements that are recommended to meet the LEED Design compliance and clearly identify any changes for review and comment by WSDOT.

#### 2.30.4.4.3 Coordination

The Design-Builder shall fully coordinate all Work that shall be located in the Bridge Maintenance Facility and Dock. This Work includes but is not limited to:

- Incoming 12kV Service, Automatic Transfer Switch and Power Distribution Panel: Located in the building on the mechanical level.
- Diesel Generator: Free standing unit with enclosure located in the parking lot.
- Bridge Control System Main Control Panel: Located in the Communication Room.
- Closed Circuit Television (CCTV) Main Console and Cameras: The console shall be located in the Crew Room. There shall be security cameras located such as to view the dock, the parking lot, and the street approach to the parking lot gate.
- Navigation Lights: The lights provided on the Dock shall be of the same manufacturer and type to the Pontoon lights on the bridge.

#### 2.30.4.4.4 Lighting and Branch Wiring

The Design-Builder shall provide the design and construction of the Bridge Maintenance Facility and Dock lighting and branch wiring.

Design and construction of the Bridge Maintenance Facility and Dock lighting and branch wiring systems shall conform to WAC Title 51 and NFPA 70 requirements.

Lighting and branch wiring includes branch wiring & devices for all lighting fixtures, receptacle, and electrically operated equipment.

All equipment for the Dock shall be designed and constructed such that:

- No power stations may be positioned such that a power extension cord is required to cross a walking pathway in order to provide service.
- All wiring, splices and connections shall be installed appropriate to a wet environment.
- All splices and junctions shall occur above the waterline as called for in the most recent national electrical and fire codes.
- If transformers are used on the BMD, the transformer and transformer housing shall be specifically constructed and selected for long term use in a marine environment.
- A separate circuit shutoff shall be located at the shoreward end of the BMD.

##### 2.30.4.4.4.1 Lighting Equipment

The Design-Builder shall provide the specification, selection and installation of the Bridge Maintenance Facility and Dock lighting equipment.

Bridge Maintenance Facility and Dock lighting equipment shall conform to WAC Title 51 and NFPA 70 requirements.

Illumination levels inside the Bridge Maintenance Facility shall be per the IBC for occupied areas. All lights in areas that do not have critical or dangerous work performed in them shall be equipped with motion sensor style light switches for the rooms. Areas such as the Shop, Electricians Work Room, Communications Room, Mechanical Closet, Mechanical Level and elevator work areas shall use standard light switches to ensure the lights do not turn off due to lack of motion, when the work is too minimal in movement to activate the sensors.

Exterior lighting shall be provided in the parking lot, the street approach to the parking lot, Bridge Maintenance Facility entrances and exits, the route to the Dock, and at the dock. In general, all fixtures shall be high efficiency, low maintenance, LED style fixtures where possible. Follow the standard illumination per the IBC and IESNA Lighting Handbook for locations, except for the Dock location. The illumination level at the Dock shall be provided in two systems:

- One system shall be low level, foot path lighting. This lighting shall be intended to illuminate the dock walkway and illuminate at night to a maximum level of 30 lx (3 footcandles) at measured at the foot level plane. They shall be cutoff type to not disperse light into the water. The lighting system shall be designed to provide no more than 0.2 lx (0.02 footcandles) at the water level to match the moonlight level. The lights shall be all on a single circuit and shall be provided two 'on-off-automatic' switch. The automatic position shall have the lights be activated when a photo-electric sensor indicates that the area is dark to turn on the lights automatically. The switches shall be located adjacent to the shore entrance to the Dock and the other switch shall be located adjacent to the boat entrance to the Dock.
- The other system shall be a full lighting system that will illuminate the Dock to a lighting level of 200 lx (20 footcandles). The system shall provide switches located adjacent to each light. The switches and controls shall be designed to allow the crew to partially illuminate the dock to the lighting level of their requirements, in the style of a dimmer switch locally at each light location.

Provide 360° red pier lights on the Dock in accordance with the Coast Guard Regulations, with a minimum of two red lights. Refer to Section 2.17 for pier light specifications.

Provide guards on all light fixtures in the Shop and workrooms. Provide additional wall mounted task lighting in the Shop over each work station and work bench to provide additional lighting. This lighting shall be in addition to the overhead lighting in the area as shown in the Conceptual Plans (Appendix M1).

#### 2.30.4.4.4.2 Emergency Lights

The Design-Builder shall be responsible for the design, specification and installation of Bridge Maintenance Facility and Dock emergency lightings. The emergency lights shall provide sufficient battery operated lighting fixtures to allow safe egress from the facility and conform to WAC Title 51.

### 2.30.4.4.5 Receptacles

The Design-Builder shall provide the design and construction of a power receptacle system in the Bridge Maintenance Facility and Dock. The receptacles shall be located in accordance with the NFPA 70 (National Electrical Code). Provide a minimum of at least one 120VAC receptacle in all rooms and areas, and provide dedicated receptacles in locations as required to power specific equipment. Comply with the NEC to provide a receptacle at least every 12 feet. Receptacles shall be rated for their location. Outdoor and Mechanical Level receptacles shall be fully weatherproof with gasketed covers.

**Office Special Requirements:** Each office space shall be provided at least one receptacle on each wall.

**Charging Station Special Requirements:** Provide dedicated charging stations for electric vehicles in the upper level parking lot and the lower level Shop.

**Shop Special Requirements:** Provide one 120VAC GFCI receptacle every 10 feet along the walls. Integrate the NEC requirements for the mounting height of the receptacles with the selection of the work benches, such that the receptacles are easily accessible without moving the work benches. Provide multiple circuits to the receptacles in the Shop such that use of multiple pieces of equipment at receptacles does not trip circuit breakers.

Provide additional receptacles in the shop area with dedicated circuit breakers. At each permanent fixture or work bench (for a minimum of 8 locations along the North and South walls), provide a full suite of wall mounted receptacles:

- One 240VAC, 3 Phase, 4 Wire receptacle
- One 240VAC, 2 Phase, 3 Wire receptacle
- One 208VAC, 3 Phase, 4 Wire Receptacle
- One 208VAC, 2 Phase, 3 Wire receptacle

**Dock Service Platform Special Requirements:** Provide service 120VAC receptacles every 10 feet in outdoor rated, weatherproof enclosures.

**Dock Approach Pier Special Requirements:** Provide service 120VAC receptacles every 25 feet in outdoor rated, weatherproof enclosures.

**Maintenance Facility Exterior Receptacles:** Provide service 120VAC receptacles at the corners of the building along the exterior walls in outdoor rated, weatherproof enclosures. Coordinate the mounting height with the landscaping so the receptacles are easily accessible.

### 2.30.4.4.6 Security Systems

The Design-Builder shall provide the design and construction of a security system for the maintenance facility. The system shall consist of card readers, door sensors, a security gate, and an alarm panel.

The system shall use WSDOT standard card readers to allow entry. There shall be one card reader located:

- At the security gate along the street approach to the parking lot
- At the entrances between the access drive and the parking lot

- At the parking lot passenger elevator and freight elevator entrances
- At the parking lot stair entrance and all other entrance doors into the building
- At the dock entrance
- At the secondary stair access between the maintenance facility and the mainline SR 520 pedestrian/bicycle path.
- Allow for remote operation of doors and security gate by personnel in the Bridge Maintenance Facility. This operation shall be performed in conjunction with the intercom and the two systems shall be coordinated such that the intercom and security system are located adjacent and integrated.

Design and construct a sliding gate at the street approach to the parking lot. The gate shall be automatically operated by the card reader or remotely operated from the crew room. Provide all required supports and platforms for the gate. Provide a local, lockable gate control enclosure and provide manual bypass controls inside the gate enclosure to open or close the gate.

Provide door sensors and monitoring for all entrance doors into the facility. Integrate the card reader and monitoring system into a single alarm panel. The alarm panel shall be capable of autodialing in the event of an emergency. The Design-Builder shall coordinate the contact with WSDOT. Provide an alarm output to the PLC Control System.

#### 2.30.4.4.7 Communications

The Design-Builder shall provide the design and construction of communications and security systems including infrastructure for them as indicated in subsections below.

Communication systems include telephone systems, intercom systems, radio systems.

Provide a minimum of two telephone jacks and two computer communication jacks in all rooms. High occupancy areas, such as the Crew Room, require at least six telephone and six computer jacks. Each telephone jack and each computer jack shall be wired individually to the communications center and terminated to the telephone board. Each jack shall be clearly labeled and the corresponding jack in the telephone panel shall be labeled to match.

All data communications shall be installed to meet WSDOT standards protocol for networks.

Design and construction of communications system infrastructure shall conform to applicable code.

##### 2.30.4.4.7.1 Telephone Systems

The Design-Builder shall provide design and construction of infrastructure for Bridge Maintenance Facility and Dock telephone systems.

##### 2.30.4.4.7.2 Intercom

The Design-Builder shall provide design and construction of infrastructure for the Bridge Maintenance Facility Intercom system. The Intercom system shall connect the Bridge Maintenance Facility Parking entrance, the parking lot, the Crew Room, Shop, Lead Tech Office and Supervisor Office.

#### 2.30.4.4.7.3 Marine Band Radio

The Design-Builder shall be responsible for the design and construction of a marine radio. The radio shall be a complete system, with power and mounting equipment. The radio shall be rated to communicate fully with the entire lake. Antennae and repeaters shall be provided as required to provide a full and complete signal and reception. Provide surge protection on all equipment routed through the building exterior walls and roof.

#### 2.30.4.4.7.4 Band Radio

The Design-Builder shall be responsible for the design and construction of a stand, receptacle, and antennae mounting and routing of cables. WSDOT shall supply the band radio and antennae, but it will need a mounting location, power, and an antennae connection. Provide all penetrations, supports, and interconnection cable to install the radio and antennae.

### 2.30.4.4.8 Special Systems & Devices

The Design-Builder shall be responsible for the design and construction of a fiber optic interface hub that shall allow communication between the Bridge Control System and the ITS.

The Design-Builder shall be responsible for the design and construction of a fuel leak detection system for the diesel piping. Coordinate the location of detectors with the diesel piping catch basins and any other spill containment locations. These detectors shall provide a local annunciation (light and alarm), as well as provide a failsafe input to the PLC control system.

The Design-Builder shall be responsible for the design and construction of a sanitation line leak detection system for the sanitary pipe lines. Coordinate the location of detectors with the sanitation piping catch basins and any other spill containment locations. These detectors shall provide a local annunciation (light and alarm), as well as provide a failsafe input to the PLC control system.

### 2.30.4.4.9 Snow Melt and De-icing System

The Design-Builder shall be responsible for the design and construction of a snow melt and de-icing system for the pavement between the Shop exit and the dock, and along the entire dock. The system shall be electrical and use heating elements providing approximately 50W per square foot to maintain a safe temperature; a system using pumped fluid shall not be acceptable.

A separate controller shall be provided for the Dock and for the pavement. Each controller shall be provided weatherproof NEMA-4x stainless steel enclosures. The controllers shall be wall mounted or provided a support to mount the controller.

The snow melt and de-icing system for the dock shall be temperature controlled, activating when the temperature lowers to approximately 34°F (but this temperature setting shall be easily field adjustable) prior to any ice actually forming. The snow melt and de-icing system for the dock shall not include a precipitation detector. The controller shall also offer a manual bypass with a timer to allow operation as required for up to 24 hours.

The snow melt and de-icing system for the pavement shall be controlled by both a temperature and precipitation sensor, activating when the temperature lowers to approximately 34°F (but this temperature setting shall be easily field adjustable) prior to

any ice actually forming and there is precipitation. The precipitation detector shall be easily field adjusted to select the level that matches field icing conditions. The controller shall also offer a manual bypass with a timer to allow operation as required for up to 24 hours.

All the heating elements shall be rated to keep the area free from snow and ice. The Design-Builder shall use the historical weather data of the area to provide the design and design calculations.

The system shall be easily maintained and if any heating element fails, it shall be easy to replace without damaging or taking apart the pavement or dock. The Design-Builder shall design and construct permanent sheathes or conduits into which the heating elements shall be installed.

All equipment shall be weatherproof and rated for use in wet locations.

### 2.30.4.4.10 Power Distribution Equipment

The Design-Builder shall provide a complete power distribution, wiring, raceway, and associated equipment for the Bridge Maintenance Facility and Dock. Provide a 100A service to the dock to provide power to the Workboat while the vehicle is moored at the dock. All code requirements and design standards listed herein shall be part of the design criteria.

Provide power, starters, and controls for all pumps, air compressors, HVAC equipment, gates, and equipment. All equipment shall be provided local disconnect switches and local manual bypasses to operate the equipment.

The Design-Builder shall provide service distribution panels (and associated step down transformers) at the 480VAC three phase level, 240VAC three phase level, and 120/208VAC service.

A. Transformers: The transformers core shall be constructed from high grade electrical steel and all windings shall be copper. Coil and core shall be mounted on rubber insulation mounting pads. Sound levels are not to exceed 45db as measured by NEMA ST20. The windings and core and coil assembly shall be treated and built to resist the effects of dirt and moisture. The enclosure shall be rated NEMA-3R with a weathershield.

   The transformers shall meet the following specifications:

   1. Temperature rise: 150 Degree C rise.
   2. Cycles: 60 Hz.
   3. Phase: 3
   4. Primary voltage rating: 480 Volts
   5. Impedance ratings: under 5.0% on rated KVA base with a maximum tolerance of 7.5%.

B. The panelboards shall be rated NEMA 4X stainless steel and be of the dead-front type and shall be provided with circuit breakers. Each panelboard enclosure shall be code gauge galvanized steel with ANSI 61 light gray enamel finish. Each panelboard shall have a screw cover with a hinged door and flush lock.

   The panelboards shall be provided with copper lugs in the mains, copper bus and with a full-sized copper neutral bar. The panelboards shall be provided a copper

ground bus. All branch circuits shall be numbered, and a typewritten directory shall be provided on the inside of each door.

Each circuit breaker shall be a quick-make, quick-break, thermal-trip, ground fault current interrupting, branch circuit breakers. Each breaker shall trip free of the operating handle, and the handle shall indicate the position of the breaker. Circuit breakers shall meet the requirements of UL Standard 489.

C. The panelboards shall be furnished with a 20% spare spaces, 10% spare circuit breakers, and the number of circuit breaker with interrupting capability in accordance with the design.

D. The Design-Builder shall design and furnish a complete wire and cable system. All wire and cable shall be in accordance with WSDOT Standard Specifications as supplemented here-in.

All wire and cable shall be of a nationally recognized brand, acceptable to the Engineer. All wire and cable shall be factory labeled or marked in the standard manner of that manufacturer, with the minimum information to identify the wire gauge and insulation type. Before wire and cable orders are placed with any manufacturer, the Design-Builder shall submit for review and comment, typical published test data for the type of insulation proposed, showing that it meets the requirements of NEMA Pub. No. WC7. Single conductor wiring, including the insulating material, shall have been factory-tested to demonstrate that it meets the specified requirements. The copies of the test reports shall indicate that the testing was performed as stipulated in NEMA Pub. No. WC7, Part 6 and shall be submitted for review and comment.

Any wire that is routed outside the Bridge Maintenance Facility shall be XHHW. Any wiring for systems with technical requirements in Section 2.17 shall be wired in accordance with that section.

Wire tags for marking the conductors shall be as specified in the Standard Specifications. Each wire tag shall be permanently, mechanically printed with the wire number. No hand written tags shall be allowed.

E. All conduit and fittings shall be in accordance with Standard Specification Sections 8-20.3(5), 20.3(9), and 9-29.1 as supplemented in this Section.

Conduit shall be:

- Rigid non-metallic Polyvinyl Chloride (Type PVC) Schedule 80 conduit conforming to NEC Article 352.
- Liquidtight Flexible Nonmetallic Conduit (Type LFNC) conforming to NEC Article 356.
- Rigid Galvanized Steel (Type RGS) conduit, conforming to NEC Article 344.

All exposed conduit and conduit for the Bridge Maintenance Facility and Dock shall be rigid galvanized steel conduit.

All conduit on the Shop Level (except the vestibule and toilet room), Mezzanine, Mechanical Level and Parking Level shall be surface mounted RGS conduit. Conduit elsewhere in the facility may be recessed.

F. The Design-Builder shall design and furnish all conduit and fittings in accordance with WSDOT Standard Specifications as supplemented in this Special Provision.

All junction and terminal boxes and cabinets installed shall be NEMA 4X, 14-gauge, type 316 stainless steel enclosures with hinged, 14-gauge, stainless steel doors supported by a continuous stainless steel hinge with removable pin.

Surface mounted interior and exterior boxes shall be provided with external mounting lugs. No box shall be drilled for more conduits or cables than actually enter it. No conduits shall enter the top of an enclosure. All conduit entries shall be bottom entry. Exterior boxes shall be provided with one-half inch combination drain and breather fittings. Fitting shall not affect the NEMA-4X enclosure rating of the enclosure.

Terminal boxes shall be of sufficient size to provide ample room for the terminal blocks and interior wiring, and for the installation of conduit terminations and multi-conductor cable fittings. Interior panels shall be provided for mounting the terminal blocks. Terminal blocks shall be provided in each terminal box for the connection of all conductors including spare conductors entering the box plus at least 10 percent spare terminals.

The interior of all boxes shall be provided with insulated supports from which bundled cables may be supported.

#### 2.30.4.4.11 Spare Parts

The Design-Builder shall determine the spare parts required for the electrical systems. At a minimum, the Design-Builder shall furnish the following spare parts for the Bridge Maintenance Facility and Dock electrical systems:

- Two packages of six fuses of each kind and size installed.
- One circuit breaker of each kind and size installed for every 5 of each kind and size installed, with a minimum of one.
- A set of contacts and contact fingers for each kind or size of contactor and starter installed. (Note: For units that do not incorporate replaceable contacts, furnish a complete unit with coil.)
- One coil for every five of each size relay and contactor installed, with a minimum of one.
- One complete relay, timer, contactor and starter for every five of each kind and size installed, with a minimum of one.
- One spare power supply for each type supplied.
- One spare transformer for each type installed.
- One spare light for each type of light installed.
- Five spare batteries for each type of battery installed.
- Five spare door sensors and motion sensors for each type installed.

### 2.30.4.5 MECHANICAL

The Design-Builder shall perform all Work necessary to design and construct the mechanical systems relevant to the Bridge Maintenance Facility and Dock for the Project.

Design and construction of all mechanical systems including but not limited to HVAC, control and instrumentation systems, fire protection system, elevators, bridge crane hoist, jib hoists, diesel fuel system, potable water system, sanitary sewer system, compressed air system, dock utilities, etc. shall conform to parameters indicated in Section 2.32 (Mechanical Bridge and Support Services) and the Conceptual Plans (Appendix M1).

### 2.30.4.5.1 HVAC

The Design-Builder shall provide the design and construction of HVAC systems in conformance with WAC Title 51 and other applicable codes as listed in Section 2.32.

The Design-Builder shall coordinate design and construction of HVAC with requirements of other portions of this contract. HVAC system requirements include indoor design conditions, design velocities for air distribution, noise criteria, air distribution system design, pressure losses, supply air registers and diffusers, variable air volume terminals, exhaust and return air grilles, volume dampers, splitter dampers, fire dampers and fire/smoke dampers, backdraft and relief dampers, air extractors, turning vanes, access doors, flexible duct connectors, insulation, supports, equipment foundations, equipment access, equipment handling, vibration isolation, air filtration, and condensate drainage. Refer to Section 2.32 Bridge Mechanical and Support Services for HVAC system requirements. Specific requirements for the Bridge Maintenance Facility HVAC are included in this Section.

The Design-Builder shall provide the design and construction of HVAC systems to satisfy LEED credits for silver certification.

HVAC systems for the Bridge Maintenance Facility include heating and cooling equipment, packaged equipment, fan equipment, and control and instrumentation. Equipment installation shall conform to manufacturer's recommended practice. Packaged and rooftop equipment shall be installed at the mechanical level as indicated on Conceptual Plans (Appendix M1). Submit alternate locations for WSDOT review and comment.

HVAC for high-bay shop area shall take into account specific requirements for natural ventilation. System shall introduce outside air to shop area and relieve indoor air to atmosphere via a ventilation shaft as indicated on Conceptual Plans (Appendix M1). Provide adjustable ceiling fans for air circulation where required. Ceiling fans shall not interfere with the bridge crane hoist. Submit alternate systems for WSDOT review and comment.

HVAC for Electrician's Workroom and Hydraulics Workroom shall take into account specific requirements for clean work environment. Provide MERV 15 rated filters with impregnated activated carbon for improved air quality.

HVAC for Communications Room shall take into account specific requirements for stand-alone system for reliability and 24/7 operation. Provide computer room unit to serve the Communications Room only.

### 2.30.4.5.2 Controls & Instrumentation

The Design-Builder shall provide the design and construction of Bridge Maintenance Facility and Dock control and instrumentation systems as they relate to HVAC, plumbing, fire protection, diesel fuel, and compressed air systems. Refer to Section 2.32

Bridge Mechanical and Support Services for system requirements. Specific requirements for control and instrumentation are included in this Section.

Control and instrumentation for energy monitoring shall take into account specific requirements for LEED credits. Provide controllers with all HVAC panels and/or package equipment. Controllers shall have output to rack-mounted hardware in the Communications Room. Refer to Section 2.17 for Bridge Electrical and Support Services.

Control and instrumentation for fire protection shall be in accordance with local codes. Provide fire control panel as indicated on Conceptual Plans (Appendix M1) with remote panel in the supervisor's office. Submit alternate locations for WSDOT review and comment.

Design and installation of the Bridge Maintenance Facility and Dock control and instrumentation systems shall maximize energy efficiency.

### 2.30.4.5.3 Fire Protection Systems

The Design-Builder shall provide the design and construction of fire protection systems in conformance with local building codes and other applicable codes.

The Design-Builder shall coordinate design and construction of fire protection with requirements of other portions of this contract. Fire protection system requirements include automatic sprinkler, standpipes, fire hydrants, water supply, fire protection connections, portable fire extinguishers, fire protection valves, and fire protection piping. Equipment installation shall conform to manufacturer's recommended practice and UL product listing. Refer to Section 2.32 Bridge Mechanical and Support Services for fire protection system requirements. Specific requirements for fire protection are included in this Section.

Fire protection for Communications Room shall take into account specific requirements for pre-alarm using double-interlock system for safe-guarding computer electronics. Smoke detectors shall be used for early warning of smoke conditions and fire sprinklers will discharge water upon activation of fusible link.

Fire protection for Shop area, Electrician's Workroom, Hydraulics Workroom, Communications Room, Mechanical Level and Parking Level shall take into account the specific requirement for fire extinguishers in these areas. Provide 10# extinguishers with A, B, C fire classification, as appropriate for these areas.

Fire protection for the Bridge Maintenance Dock shall take into account specific requirements for a dry pipe standpipe as required by local authorities. Provide fire department connection at access to Bridge Maintenance Facility as shown in the Conceptual Plans (Appendix M1) with hose valves at shop level and hose valves at approach pier to the dock service platform. Locate hose valves, piping, and fire extinguishers outside the travel clearance zone along the approach pier. Submit alternate locations for WSDOT review and comment.

### 2.30.4.5.4 Elevators

The Design-Builder shall provide design and construction of elevator hoistways.

The Design-Builder shall provide Technical Specifications, installation, and coordinate installation inspections and permits for the Bridge Maintenance Facility elevators. Design, specification and installation of Bridge Maintenance Facility elevators shall conform to the following regulatory requirements:

Elevator Standards

A. The elevators shall comply with the all requirements of ASME A17.1 (Safety Code for Elevators and Escalators), latest edition.

B. Structural design shall comply with the latest edition of the American Institute of Steel Construction (AISC) specification for the design, fabrication, and erection of structural steel for buildings.

C. The electrical system shall comply with ANSI/NFPA National Electrical Code (NEC), latest edition.

D. The National Electrical Manufacturers Association (NEMA) shall be the standard for purchased electrical components such as motors and control components.

E. Machinery shall be designed to the latest American Gear Manufacturers Association (AGMA) design standards.

F. Welding shall comply with the American Welding Society Code D1.1, latest edition.

G. Washington State regulations shall apply, including Chapter 296-96 WAC, Safety Regulations and Fees for all elevators, dumbwaiters, escalators, and other conveyances.

H. ASTM A167, Steel, Sheet Stainless

I. ASTM A366, Steel, Sheet, Carbon, Cold Roller, Commercial Quality

J. NFPA 80: Standard for Fire Doors and Other Opening Protectives.

K. United States Access Board ADA Accessibility Guidelines (ADAAG)

Electrical materials shall meet and bear evidence of meeting the requirements of Underwriters Laboratories or Factory Mutual Systems. The Design-Builder shall design and furnish:

One passenger elevator with a minimum load rating of 2 Tons.

- Car Speed: 125 Feet per minute.
- Leveling: Plus or minus 3/8 inch with any load.
- Operation: Automatic operation as normal mode, Car-Switch Automatic Stop mode or functional equivalent with a selector switch.
- Control: Solid State Microprocessor.
- Primary Power Supply: 480VAC, 3 Phase, 60 Hertz.
- Secondary Power Supply: 120VAC, 1 Phase, 60 Hertz.
- Number of Stops: 4.
- Number of Openings: One at front of hoistway, three at back of hoistway.
- Type of Doors for Car and Hoistway Entrances: Single speed, center opening.

One freight elevator with a minimum load rating for a Class C1 Industrial Forklift Loading of 7 Tons.

- Car Speed: 125 Feet per minute.

- Leveling: Plus or minus 3/8 inch with any load.
- Operation: Automatic operation as normal mode, Car-Switch Automatic Stop mode or functional equivalent with a selector switch.
- Control: Solid State Microprocessor.
- Primary Power Supply: 480VAC, 3 Phase, 60 Hertz.
- Secondary Power Supply: 120VAC, 1 Phase, 60 Hertz.
- Number of Stops: 4.
- Number of Openings: One at front of hoistway, three at back of hoistway.
- Type of Doors for Car and Hoistway Entrances: Single speed, center opening.
- Minimum Interior Car Dimensions: 8 feet wide, 10 feet deep.
- Minimum Door Opening Sizes: 8 feet wide, 8 feet height.

Elevators include hydraulic passenger elevators, elevator hoistways, elevator equipment and services for code compliant operation. The elevators shall be of a well tested design and have a minimum of five years of field operation with success. The elevators shall not be experimental or unique in design and operation. Only non-proprietary control systems are acceptable. Due to the site conditions the pit depth shall be minimized. No penetrations below the pit shall be allowed. Care shall be taken to waterproof equipment at pit location.

The elevators shall be equipped with the following:

- Internal Lighting shall be designed to IBC standards with long life, low maintenance fixtures that are rated for emergency operation.
- Telephone and intercom systems shall be provided for emergency contact
- Integration into the standard security system card reader and approval shall be required to operate the elevators at the parking lot level.
- All required safety features, fire code requirements, and any other local requirements.
- Fault and maintenance alarms shall be provided both locally and to the PLC monitoring system.
- Provide all hydraulic pumps, jacks, and associated equipment to the standards of the Elevator Safety Code. Provide elevator pit with adequate working space and access, and provide an emergency stop switch in the pit. Provide steel spring buffers.
- The car enclosure shall be 14 gauge (minimum) stainless steel, exhaust fan ventilated, and manufacturer standard finishes except as noted in the finish schedule. Car doors shall be provided protective devices to prevent closure.
- The hoistway entrances shall be 14 gauge (minimum) stainless steel, with guides, fascia plates, and toe guards.
- All equipment shall be designed and located for ease of access and maintenance. Provide access ladders to elevator pits.

- Controls inside the car shall be equipped with tamper resistant buttons marked to correspond to the landings, emergency call button, keyed stop switch, door open, door close, and the emergency call button shall activate an alarm bell. Raised Braille markings shall be provided with each button. Provide a car position indicator in the elevator.
- Traveling cable shall be used for all connections, with three spare lighting/utility circuits and 6 spare control circuits. All cables conductors shall be terminated on a terminal board that matches the schematic wiring.
- Provide a duplex receptacle, work light and switch to illuminate cartop operating system, hoistway door mechanisms, car locator mechanism, and limit switches.
- At each terminal landing provide recessed, tamper resistant pushbuttons. The buttons shall be provide 'up' and 'down' at all intermediate landings, and a single 'up' or 'down' shall be provided at the top or bottom floor. Furnish Braille markings on each pushbutton. Provide direction lanterns, chimes, and current floor number at each landing.

Submit layout drawings, all pertinent information, and code compliance information as required by WAC 296-96 to the authority having jurisdiction.

The Design-Builder shall provide a full set of installation and functional tests. At a minimum the following tests shall be performed:

- Running test of the elevator loaded to its rated capacity and operate for 30 minutes over the full travel, stopping at each level and then proceeding to the next. Record motor temperature rise, motor current, speed raising and lowering. The motor must operate with manufacturers tolerances. The speed must be within 10% of design speed. The leveling must be within plus or minus 3/8 inch.
- Provide a copy of 5-Year safety test to Contracting Agency.

The Design-Builder shall provide maintenance service for one year from the date of final acceptance, both routine and emergency. Maintenance service shall respond within 24 hours of any call or contact.

### 2.30.4.5.5 Bridge Crane Hoist

The Design-Builder shall design and construct a complete bridge crane hoist. The crane shall be located in the shop and have full operating range to move equipment from any side of the room to the opposite side or adjacent sides, approximately 40 feet by 80 feet.

Design, specification and installation of the bridge crane hoist shall conform to the following regulatory requirements:

- Occupational Safety and Health Act (OSHA)
- State and Local Codes
- American Gear Manufacturers Standards (AGMA)
- American National Standards Institute (ANSI) B30.10 Hooks
- American National Standards Institute (ANSI) B30.16 Overhead Hoists (underhung)

- American National Standards Institute (ANSI) B30.17 Overhead and Gantry Cranes (top running bridge, single girder, underhung hoist)
- American National Standards Institute (ANSI) HST-4M Performance Standard for Overhead Electric Wire Rope Hoists
- Crane Manufacturers Association of America (CMAA) Specification #70, specifications for electric overhead traveling cranes
- National Electric Manufacturing Association, Inc.
- National Electric Code (NFPA 70)

The Design-Builder shall design and furnish a complete bridge crane hoist consisting of complete erection, supporting steel for rails, runway rail, complete electrical drives and motors, brakes, and complete electrical controls. The crane shall be rated for operating 2 tons and Design Class D (Heavy Service). It shall be a top running or underhung crane with underhung hoist double girder design. It shall be equipped with a warning light and horn to provide warning of operation. The control pendant shall be free traveling. The crane shall be stainless steel or high carbon steel. The crane support steel and connections to the structure shall be stainless steel or high carbon steel. The Design-Builder shall design the support and connections in accordance with the structural requirements in this section.

The hoist trolley shall be run along the shorter dimension of the room along the bridge girder. The end truck shall be run along the longer dimension of the room. The height of the crane shall be such that the operator can move equipment from the upper mezzanine to the lower level while providing the greatest possible safe working mounting height. The Design-Builder shall take care such that the crane will not impact or interfere with the ceiling lighting or air handling equipment. The crane shall be run the entire length of the Shop in both directions. Crane runway support steel, runway rails and crane runway stops will be provided by Design-Builder. The runway shall be designed with sufficient strength and rigidity to prevent undue lateral or vertical deflection for the wheel loading of the crane. The runway rails will be installed straight, parallel, and level, at the same elevation and center-to-center distance. The rails will be standard ASCE sections. The runway shall be wall or ceiling supported. No floor supported system shall be allowed.

#### 2.30.4.5.5.1 Crane Requirements

- Power: 480VAC, 3 Phase, 60 Hertz.
- Capacity: 2 Ton.
- Bridge Speed: Selectable between 40, 80, 120 feet per minute.
- Crane: CMAA Crane Service Class D (Heavy Service).
- Hoist: HST-4M, H4.
- Hoist Speed: 3.3 and 20 FPM, two-speed.
- .Beam Steel ASTM A36 or A992.
- End Trucks Steel: ASTM A36.
- Trolley Steel: ASTM A36.
- Wheels: Steel.

- Hooks: Forged steel.

#### 2.30.4.5.5.2 Bridge

The bridge shall consist of a single girder fabricated of structural steel sections. Sections shall be braced for rigidity and securely fastened to the end trucks to maintain proper alignment. The bridge shall be provided with sufficient support to minimize deflection. Deflection shall not exceed 1/4 inches, for both the bridge and trolley spans. The end trucks shall consist of structural sections bolted to the bridge beam. A long wheel base shall be provided for proper weight distribution. Each end truck shall be supplied with large diameter, heat treated, double-flanged, steel wheels.

End truck wheels shall be of the fixed axle type equipped with anti-friction bearings. Substantial guards shall be provided in front of each wheel. These shall project below the top of the runway rail. Safety lugs shall be furnished on each end truck to prevent excess drop in case of axle failure. The bridge shall be motor-driven through suitable gear reducers. Gearing shall be enclosed and operate in an oil bath in a drip-proof case. An electro-mechanical brake shall be supplied on the motor drive. Rubber bumpers shall be furnished on the bridge end trucks.

#### 2.30.4.5.5.3 Trolley

A monorail type trolley shall be furnished to support the equipment and operate on the bridge girder. Hardened tread wheels with anti-friction bearing shall be provided. The trolley shall be motor-driven through a suitable gear reducer. An electric brake shall be furnished on this drive. The drive shall be shock free on starting and stopping. The trolley frame shall be welded or cast steel construction. It shall be of rigid construction designed to transmit the imposed load to the bridge girder without undue deflection. Safety lugs shall be furnished on each trolley.

#### 2.30.4.5.5.4 Hoist

A hoisting machine of proper capacity shall be mounted on the trolley. It shall consist of a motor, gear reducer, hoist drum, sheaves, load block, hook, and hoisting rope. An electric brake and mechanical load brake shall be supplied on the hoist. The motor shall be designed specifically for hoisting duty. The electric brake shall be of suitable size to promptly stop the motor rotation in either direction, and hold the load. The mechanical load brake shall be of the friction disc type and be capable of holding and controlling the lowering speed of the load under all conditions. Precision cut, full depth teeth, heat treated forged steel gears shall be used in the gear reducer. These gears shall be provided with oil bath lubrication and enclosed in a drip proof case.

The hoist drum and sheaves shall be of large diameter to permit maximum rope life. The drum diameter shall be at least 20 times the rope diameter and shall be grooved to provide for the entire lift without overlapping the rope. The drum flanges shall be guarded so that the rope cannot wedge between the drum and the hoist frame. A paddle or weight-operated type upper final limit switch shall be provided to protect against hoisting beyond safe limits of travel. This switch shall be connected to open a main line contactor. The switch system must be designed in such a manner that the switch operator mechanism cannot be over traveled and allow the switch to become inoperative.

A loading limit control device shall be provided to prevent over stressing the system. This device shall de-energize the hoist motor and immobilize the upcircuit when an over

capacity lift is attempted. This switch must be set to overcome dynamic loading conditions but not exceed 125% rated capacity.

Geared upper and lower limit switches shall be furnished to restrict motion beyond the normal operating travel. These switch contacts shall be connected in the respective motor control circuits. The hoisting rope shall be improved plow steel, of suitable diameter, with a factor of safety of at least five. Connection to the drum shall be made adequately and shall be easily detachable for replacement. The load block shall be of the enclosed type and equipped with a swivel type safety latch hook.

#### 2.30.4.5.5.5 Motors

All motors shall be totally enclosed, non-ventilated induction type. They shall be 480 volts, 3 phase, and rated for 30 minutes of continuous operation under full load.

#### 2.30.4.5.5.6 Controls

A pendant type multi-button push-button station shall be provided to control the motions of the bridge, trolley, and hoist. The push-button station shall be suspended on a chain or cable, from a track mounted on the bridge, to a position 4 feet above the operating floor level from the bottom of the station. It shall be possible to move the station along the bridge independent of the trolley. The push-button enclosure shall be of lightweight construction. The push-button station shall consist of lightweight enclosure and a cover with button guards.

Limit switches shall be provided on the bridge and trolley and wired into the respective control circuits to stop the driving motors at the extremes of travel.

Speed control shall be provided for all travel and hoisting motions. All single motions shall be controlled by across-the-line, reversing type motor starters. The control circuit voltage shall not exceed 120 volts. This voltage shall be supplied from a dry type transformer of proper capacity.

Overload protective relays shall be furnished in the ungrounded phase leads of all motor feeders. Fuse or circuit breaker protection shall be furnished for each individual crane motor. Forward and reverse motor contactors must be interlocked mechanically and electrically to prevent motor damage if the operator pushes the direction buttons simultaneously.

All electrical equipment shall be mounted in NEMA Type 4X Stainless Steel, or better, enclosures.

#### 2.30.4.5.5.7 Wiring and Conduit

A four-bar, enclosed type conductor system shall be provided along the full length of the runway. Three of these conductors will be used to supply electric power to the crane. The remaining conductor will be used for equipment grounding.

A multi-conductor, flat, neoprene insulated, festooned flexible cable shall be provided along the bridge to supply electric power to the hoist and trolley. Three of these conductors will be used to supply electric power. The remaining conductor will be used for equipment grounding. The cable shall be connected to a terminating box at one end of the bridge.

All wiring connections within the electrical control enclosures shall be made with 600 volt, 90 degrees Celsius machine tool wire. Wiring connections between control enclosures and other electrical devices shall be made with 600 volt type THWN

conductors and run in rigid conduit. Flexible metal conduit may be used to devices requiring position adjustment or run less than three feet. All wiring connections to electrical equipment in control enclosures shall be terminated on terminal strips with lugs or spades and properly identified.

Conduits shall be terminated at all enclosures and boxes in drilled holes or knockouts. Conduits one-inch and smaller shall be fastened to the enclosure by the use of dished type lock nuts with trailing knife edge. Conduits 1-1/4 inch and larger shall be terminated in a threaded hub fitting inserted in a drilled hole knockout. Insulated bushings shall be furnished on all conduit terminations. Threaded conduit fitting shall be issued for all other connections.

A grounding system shall be furnished to effectively maintain the enclosures of all electrical equipment such as motors, brakes, starters, push button stations, boxes, etc, at zero potential.

#### 2.30.4.5.5.8 Safety Design

The Design-Builder shall specify, as part of his design, total connected load (kVA) and maximum expected load current (amperes.) Also, the Design-Builder is to recommend feeder size and fuse size.

All labels and nameplates must be machine produced. Handwritten labels are not acceptable.

All equipment furnished to be welded in accordance with the appropriate codes and standard of the American Welding Society.

All equipment non-standard design to fulfill special requirements shall, in addition, meet the following:

- All critical welds, the failure of which would cause potential accidents or injuries to personnel, are to be executed with special attention as outlined in this section.

- An audit is to be made by the Design-Builder to determine those welds to be in the critical category. Such welds are to be given special attention by the Design-Builder to insure adequate quality control.

#### 2.30.4.5.5.9 Painting

All surfaces of the structural parts of the crane shall be painted and finished. All surfaces of electrical and mechanical parts shall be painted and finished

#### 2.30.4.5.5.10 Testing and Inspection

Inspection by WSDOT during fabrication shall be permitted by the Design-Builder. These inspections shall be performed to determine the general adherence to these specifications and, in particular, to determine the quality of welding and painting provided.

Final acceptance will be made after the entire installation has been completed and a satisfactory trial has been made. All tests required to prove the ability of the bridge crane hoist shall be made by the Design-Builder.

### 2.30.4.5.6 Jib Hoists

The Design-Builder shall design and construct two complete free standing jib hoist systems, including pedestal, anchor bolts, trunnion roller assembly, safety channel and pivot assembly, bottom collector ring, tagline and festooning, exterior/marine duty paint, motorized rotation package, cabling, controls and associated components, to match the jib hoists provided on the Floating Bridge Pontoon. One shall be located on the Dock Service Platform adjacent to the Workboat berth and one shall be located in the Parking Lot adjacent to the Freight Elevator. The Parking Lot jib hoist shall be located such that it can be swung out of the way of vehicular movement and lockable when not in use.

Provide full web gussets plates, welded to the mast and base plate, about the mast for stability and reinforcement. Provide round, structural steel pipe stationary mast welded to steel base plate. Provide I-beam or wide flange boom, reinforced for lateral stability if required, per manufacturer's standard design. Design jib hoist system for load capacity plus 25% of rated load for impact and plus 15% of rated load for weight of hoist and trolley. Design mast with sufficient strength to resist bending, buckling, crushing, and wear of the trunnion roller assembly. Coordinate the Jib Hoist selection and mounting requirements with the structural design of the Dock.

Code Compliance: Comply with requirements of the latest revision of the following standards with respect to jib hoist manufacturing, installation, and use.

- OSHA: Occupational Safety and Health Administration
- CMAA: Crane Manufacturer's Association of America
- HMI: Hoist Manufacturer's Institute
- ANSI: American National Standards Institute
- NEMA: National Electric Manufacturer's Association

The jib hoist requirements are as follows:

- Span: 16'
- Mounting plate to under boom height: 12'
- Boom to dock height: 14'
- Capacity: 2 Tons
- Hoist Type: Jib Crane, 65 FPM, stepless
- Hoist Speed: 3.3 and 20 FPM, two-speed
- Hoist Type: Electric wire rope CXT4410050P
- Hoist Lift Required: 20' at dock Service Platform and 14' in Parking Level
- Collector: Bottom entry
- Beam Steel: ASTM A36 or A992
- Trolley Steel: ASTM A36
- Wheels: Cast iron or steel
- Hooks: Forged steel

Design the jib hoists to withstand dead load, live load, wind load, hoist load, and inertia forces caused by movement of the crane, components and loads during standard operation. Standard capacity ratings will represent the net rated load at the hook of any type of hoist with the same load rating installed on the crane having a hoist and trolley weight within the established limits. Base design load for stress calculations upon capacity plus 15% for the weight of the hoist and trolley and an additional 25% for impact (capacity x 1.4). Design load for deflection calculations will be based upon the capacity plus 15% for the weight of the hoist and trolley (capacity x 1.15). Design allowance must also accommodate removal of items from water such as a Personnel Tender. Clearly label the load capacity of each crane easily read from the dock level.

The electric chain hoist shall be equipped with a high duty motor to tolerate voltage fluctuations. The hoist shall be equipped with brakes that automatically lock during a power failure. All equipment shall be rated NEMA-4X for outdoor, wet installations. The hoist shall be provided a control station pendant that provides 120VAC control operation of the hoist. The hoist shall internally convert the three phase, 230VAC supply power to 120VAC control power. Provide a strip heater to prevent condensation and corrosion.

### 2.30.4.5.7 Diesel Fuel System

The Design-Builder shall provide design and construction of the diesel fuel storage and handling (referred to as the diesel fuel system). The diesel fuel system shall consist of storage, piping and valves for diesel generator operation and for dock fuel dispensing operation. The tank capacity shall be sized for 2,500 gallons.

The diesel fuel system shall consist of aboveground tanks with gravity connections to the diesel generator day tank and diesel fuel dispenser on the dock. Underground tanks are not permitted. The system includes all requirements for filling and operating the system with vault, containment, tank accessories, piping and valves, diesel fuel maintenance system, liquid-level gage system, leak detection and monitoring system. Refer to Section 2.32 Bridge Mechanical and Support Services.

Supply and return piping from the diesel generator shall be acceptable to the generator manufacturer and diesel fuel dispenser manufacturer.

Fill piping shall be accessible from the access door in tank enclosure for aboveground tank. The fill pipe shall terminate in the vault in a manner designed to minimize spillage when the filling hose is disconnected. Provide lockable fill cap.

Vent piping shall terminate outside of building in an acceptable manner. Vent(s) shall have a weatherproof hood and shall have a minimum free open area equal to the cross-sectional area of the vent pipe and shall not employ screens finer than No. 4 mesh.

Diesel fuel piping to the dock fuel dispenser is included elsewhere in this Section.

### 2.30.4.5.8 Potable Water

The Design-Builder shall provide the design and construction of a potable water system in conformance with local building codes and other applicable codes.

The Design-Builder shall coordinate design and construction of a potable water system with requirements of other portions of this contract. Potable water system requirements include piping, hot water, plumbing fixtures, domestic water heaters, eyewash facilities, pipe unions or flanges, valves, piping accessories, pipe expansion joints, flexible pipe connectors, pipe supports, hangers, guides and anchors, insulation, and freeze protection. Refer to Section 2.32 Bridge Mechanical and Support Services for potable

water and plumbing system requirements. Specific requirements for potable water are included in this Section.

Potable water systems for the Bridge Maintenance Facility include hot and cold water systems, make-up water systems where applicable, and water supply. Equipment installation shall conform to manufacturer's recommended practice.

Potable water shall take into account the specific requirement for backflow prevention, pressure-reduction and servicing requirements. Locate backflow prevention and pressure-reduction station as indicated on the Conceptual Plans (Appendix M1). Submit alternate locations for WSDOT review and comment. Provide a separate pressure reducing station for the water utility servicing the dock service platform. This will allow a higher pressure to be utilized for the potable water utility to the dock.

Potable water for exterior building use shall take into account specific requirements for placement of hose bibs. Provide 1/2 inch piping to hose bibs on each of the four sides of the Bridge Maintenance Facility as indicated on the Conceptual Plans (Appendix M1). Submit alternate locations for WSDOT review and comment.

Potable water requirements for the dock are included elsewhere in this Section.

### 2.30.4.5.9 Sanitary Sewer

The Design-Builder shall provide the design and construction of a sanitary sewer system in conformance with local building codes and other applicable codes.

The Design-Builder shall coordinate design and construction of a sanitary sewer system with requirements of other portions of this contract. Sanitary sewer system requirements include piping, plumbing fixtures, plumbing drains, traps, cleanouts, soil and waste systems, vent systems, sewage ejection systems (if applicable), sanitary facilities, and pipe supports. Refer to Section 2.32 Bridge Mechanical and Support Services for sanitary sewer and plumbing system requirements. Specific requirements for sanitary sewer are included in this Section.

The sanitary sewer system for the Bridge Maintenance Facility shall include drainage systems in the shop areas; and soil and waste systems for the mechanical closet, toilet rooms, shower and crew room facilities. Equipment installation shall conform to manufacturer's recommended practice.

Drainage systems in the shop areas shall take into account the specific requirement for oil separation. An oil collection vault shall be 4 x 4 x 4 feet in size for periodic testing for oily waste and for manual cleanup with absorbent materials. The oil collection vault shall have a minimum 12-inch oil trap with discharge piping extended to low point in vault. Connect all drains in the shop area, electrician workroom and hydraulics room to the oil collection vault. Locate oil collection vault as indicated on the Conceptual Plans (Appendix M1). Submit alternate locations for WSDOT review and comment. The oil collection vault shall discharge to building sanitary sewer.

Soil and waste system shall take into account the specific requirements for sanitary drainage of mechanical closet, toilet rooms, shower, crew room facilities and condensate drains. The soil and waste system shall discharge to building sanitary sewer. The building sanitary sewer shall have a lateral to the existing sewer utility.

Sanitary sewer requirements for the dock are included elsewhere in this Section.

### 2.30.4.5.10 Compressed Air

The Design-Builder shall provide the design and construction of a compressed air system in conformance with piping codes and maintenance requirements.

The Design-Builder shall coordinate design and construction of a compressed air system with requirements of other portions of this contract. Compressed air requirements include piping, quick couplers, filter/lubrication stations, pipe unions or flanges, valves, piping accessories, pipe expansion joints, flexible pipe connectors, pipe supports, hangers, guides and anchors. Refer to Section 2.32 Bridge Mechanical and Support Services for compressed air and plumbing system requirements. Specific requirements for compressed air are included in this Section.

The compressed air system for the Bridge Maintenance Facility and Dock includes a single air compressor unit with storage and distribution piping for hand tools and compressed air service. Equipment installation shall conform to manufacturer's recommended practice.

Compressed air for shop areas shall take into account specific requirements for placement of quick coupler air outlets. Provide 1/2 inch piping to each air outlet at each work station. The maximum number of work stations shall be eight as indicated on the Conceptual Plans (Appendix M1). Submit alternate locations for WSDOT review and comment. Size compressor air header for 1/2 inch at most remote single outlet; 3/4 inch at most remote 2 outlets; and 1 inch at most remote 3 outlets. Provide filter/pressure-regulator stations at all work benches as indicated on the Conceptual Plans (Appendix M1). Final locations of work benches and air outlets shall be accepted by WSDOT.

Compressed air requirements for the dock are included elsewhere in this Section.

### 2.30.4.5.11 Bridge Maintenance Dock Utilities

The Design-Builder shall provide design and construction of dock utilities including diesel fuel, compressed air, potable water and sanitary sewer. The dock utilities will be extended from the bridge maintenance facility to the dock service platform with the exception of the sanitary sewer which shall have a connection from the dock service platform to the existing sewer line located at the shoreline. The dock utilities will consist of all piping and valves, utility vaults and precast piping, couplings and connectors, terminations and/or dispensers, and control and monitoring equipment. Utility sizing is based on minimum pipe size or flow requirements as required for the work boat or as indicated herein.

The utility vaults and precast piping are used as a concrete duct bank in the dock structure. The duct bank has containment piping for carrier pipes with diesel fuel and compressed air. The duct bank also has containment piping for carrier pipes with potable water and sewage which have heat trace. The utility vaults are used for pipe connections and couplings. Utility vaults for containment of diesel fuel shall be sealed against leakage to ground or lake water. All utility vaults shall be stainless steel construction with non-skid, bolted, cover plates for maintenance access. The cover plates shall be sealed against water intrusion into the vault. Cover plates shall meet structural loading of dock equipment.

Fire protection piping for the dock is included in the section on fire protection systems. Provide life ring and fire extinguisher on stanchion or 5x5 wide flange column similar to other utility supports identified in this section.

### 2.30.4.5.11.1 Dock Diesel Fuel

Diesel fuel shall utilize flexible double containment piping inside the precast duct bank. The diesel fuel piping shall extend from the bridge maintenance facility to the dock fuel dispenser. The diesel fuel piping shall terminate at the fuel dispenser's sump for transition to the fuel dispenser.

Fuel dispenser shall be located as indicated on the Conceptual Plans (Appendix M1). Submit alternate locations for WSDOT review and comment. Fuel dispenser shall have hose reel and fuel nozzle for fueling operations. Fuel dispenser shall permit manual draining of diesel fuel piping between the facility manual shutoff and the dispenser nozzle. Provide vacuum breaker or anti-siphon valve at manual shutoff for drainage. Diesel fuel that is not drained at the nozzle shall be drained to the dispenser sump. The sump size shall be based on capturing the low point diesel fuel in the system.

### 2.30.4.5.11.2 Dock Compressed Air

Compressed air shall utilize flexible hose inside the precast duct bank. The compressed air shall extend from the Bridge Maintenance Facility to the dock air outlet. The compressed air piping shall terminate at a dock utility vault designed to interface with a vertical pipe riser and compressed air outlet.

The compressed air outlet on the dock shall be located as indicated on the Conceptual Plans (Appendix M1). Submit alternate locations for WSDOT review and comment. The compressed air piping shall extend from a filter/pressure regulator inside the Bridge Maintenance Facility to the dock air outlet. The dock air outlet shall have a pipe support consisting of 5.x 5 wide flange column, 4'-6" above dock level, welded to the utility vault frame. The pipe support shall include a minimum of two steel struts to receive the vertical pipe riser with air outlet. The air outlet shall include a 3/8" quick coupler with 90 degree fitting for horizontal hose attachment. The vertical pipe riser shall connect to the utility vault through a penetration in the vault cover plate.

### 2.30.4.5.11.3 Dock Potable Water

Potable water shall utilize service piping inside the precast duct bank. The potable water shall extend from the Bridge Maintenance Facility to the dock potable water outlet. The potable water piping shall terminate at a dock utility vault designed to interface with a vertical pipe riser and potable water outlet.

Potable water outlet shall be located as indicated on the Conceptual Plans (Appendix M1). Submit alternate locations for WSDOT review and comment. The potable water piping shall extend from the water shutoff inside the bridge maintenance facility to the dock potable water outlet. The design and installation of the pipe support and water outlet shall be similar in concept to the compressed air piping and air outlet. Provide pipe support, steel struts, and penetration to the utility vault cover plate. The water outlet shall include a 3/4" hose bib with 90 degree fitting for horizontal hose attachment.

### 2.30.4.5.11.4 Dock Sanitary Sewer

Sanitary Sewer shall utilize service piping inside the precast duct bank. The sanitary sewer shall extend from the dock service platform sanitary sewer inlet to the existing shoreline sewer. The sanitary sewer piping shall terminate at a pier utility vault designed to interface with a vertical pipe riser and cleanout. The vertical pipe is secured to the pier support column with accepted sewer lateral to the existing sewer utility. The vertical pipe shall be compatible with the shoreline retaining wall and existing sewer at this location.

The sanitary sewer inlet shall be located as indicated on the Conceptual Plans (Appendix M1). Submit alternate locations for WSDOT review and comment. The design and installation of the pipe support and inlet shall be similar in concept to the compressed air piping and air outlet. Provide pipe support, steel struts, and penetration to the utility vault cover plate. The utility vault or sump shall have air-operated sump pump to discharge effluent to service piping in precast duct bank and shall terminate piping at the pier utility vault designed to interface with a vertical pipe and sewer lateral to the existing sewer utility. Pipe size shall be minimum 3-inch pipe size with 4-inch connection to sewer lateral from cleanout at sewer utility vault. Provide threaded cap and chain on 3-inch pipe.

Air-operated sump pump for the sanitary sewer shall have float controls and compressed air line with regulator for pump control. Provide sealed containment pipe in precast for compress air connection to sanitary utility vault on service platform.

#### 2.30.4.5.12 Spare Parts

The Design-Builder shall determine the spare parts required for the mechanical systems. At a minimum, the Design-Builder shall furnish the following spare parts for the Bridge Maintenance Facility and Dock mechanical systems:

- Provide spare belts and lubrication. Provide quantities for 2 years of operation.
- Provide air filters and test kit to determine filter replacement. Provide quantities for 2 years of operation.
- Provide package of fuses of each kind and size installed.
- Provide spare sprinklers heads and cabinet as required by fire code.
- Provide 2 quick-couplers and 2 filter-regulator-lubricators for the compressed air system.

## 2.30.5 CONSTRUCTION CRITERIA

### 2.30.5.1 GENERAL

Construction shall meet the requirements of this section, the Structures Minimum Standards (Appendix B2), and the Bridge Shaft Mandatory Standard (Appendix B5).

The Design-Builder shall not operate cranes, drill rigs and other construction equipment exceeding the legal load on structures without WSDOT's written acceptance.

The apparent prohibition against the construction of raised crossbeams expressed in BDM Chapter 2.7.1 is suspended for this Project when raised crossbeams serve the better interests of the Project and the protection of the falsework conforms to Standard Specifications Division 6.

Construction of sign structure shaft foundations that are four-feet in diameter or greater, or where the shaft depth is 15-feet or greater, shall conform to the requirements of Shafts for Sign Structure Foundations in the Structures Minimum Standards.

Form liner finishes for concrete structures shall meet the requirements of Section 2.15 (Landscape and Aesthetics Design).

The Design-Builder shall accommodate all inspections as required by the City of Medina. Additionally where required, the Design-Builder shall provide Special Inspections as required by the City of Medina.

The existing SR 520 east approach is an active elevated structure and is directly adjacent to the Bridge Maintenance Facility construction. The Design-Builder shall support, secure, and exercise care with respect to the existing structures to avoid damage to them, and ensure their continued safe operation and structural integrity.

#### 2.30.5.2 PERMANENT GROUND ANCHORS

The Design-Builder shall perform verification testing of permanent ground anchors for ground anchors in clays or soils that are known to be potentially problematic, especially with regard to creep. At least one verification test shall be performed in each soil type within the anchor zone.

### 2.30.6 OPERATIONS AND MAINTENANCE MANUALS, TRAINING, COMMISSIONING AND WARRANTIES

#### 2.30.6.1 OPERATIONS AND MAINTENANCE MANUALS

The Design-Builder shall compile and develop an operation and maintenance manual for all newly installed equipment in accordance with the requirements in Section 2.25 'Control of Materials' and supplemented in this Section. Provide the following information in the title page:

Operation and Maintenance Manual
Evergreen Point Floating Bridge Maintenance Facility and Dock
SR 520 Bridge No. 520/8
Contract No. ____
Date of Preparation

All drawings shall be as follows:

- All as built drawings shall be originals. No photocopies shall be permitted.
- All as built catalog cuts shall be identified with part identifiers, contract number, complete manufacture's part number, pertinent information highlighted and non-pertinent information crossed out.
- All as built drawings showing equipment assemblies shall be documented with part identifiers.

Operation and maintenance manuals for mechanical equipment shall contain the following minimum information:

1. Schedule of newly installed mechanical (pumps, cranes, elevators, HVAC, etc.) apparatus and modified existing apparatus.
2. Descriptive leaflets, bulletins, maintenance instructions, and drawings covering all items of equipment furnished and installed under this Contract.
3. Names, addresses, websites and telephone numbers of vendors and suppliers.
4. Maintenance instructions for all newly installed mechanical equipment and modified existing mechanical equipment, including warnings and precautions to be observed during maintenance actions, provided under this Contract.

Operation and maintenance manuals for electrical equipment shall contain the following minimum information:

A. Manufacturer's Information

1. Schedule of newly installed electrical apparatus.
2. Descriptive leaflets, bulletins, maintenance instructions, and drawings covering all accepted items of equipment furnished and installed under this Contract.
3. Names, addresses and telephone numbers of vendors and suppliers.
4. Maintenance instructions for all newly installed electrical equipment and modified existing electrical equipment, including warnings and precautions to be observed during maintenance actions, provided under this Contract.

B. Spare Parts Directory

C. Electrical System Wiring Diagrams and Panel Drawings

1. Complete electrical shop/working drawings prepared by the control system vendor.
2. Control desk, control panels, equipment panels, motor control center, motor drives and PLC control panel layouts and wiring diagrams for the work covered in this Contract.
3. Schedule of newly installed (pumps, cranes, elevators, etc.) apparatus and modified existing apparatus.
4. Descriptive leaflets, bulletins, maintenance instructions, and drawings covering all items of equipment furnished and installed under this Contract.

D. Electrical Installation Shop/Working Drawings

1. Conduit layout drawings.
2. Mounting and construction detail drawings for electrical components.
3. All complete shop/working drawings related to the electrical installation.

The material for the operation and maintenance manual shall be assembled to form a book with heavy plastic covers. Each book shall be approximately 9 inches by 12 inches, three-ring binder with 3-inch "D" rings, and vinyl cover to allow title sheet inserts. Each book shall be neatly entitled with a descriptive title, the name of the bridge, the Contracting Agency, the contract number, date of installation, and Design-Builder. Copies of drawings shall be in black on a white background and shall be easily legible. Sepia and/or blue line drawings shall not be used. Each section/subsection shall be separated with laminated tabbed divider sheets. Each tab shall be suitably titled. All literature, descriptive materials for inclusion in the manuals shall have all sheets numbered and listed by section in the Table of Contents. The arrangements of the booklets, the method of binding, material to be included, and the text shall all be submitted to WSDOT for review and comment.

The Design-Builder shall submit a 90% preliminary copy of the maintenance manual to WSDOT for review and comment, prior to the 100% review copy. The manuals shall be submitted to WSDOT for review and comment prior to commencement of the training session specified. The manuals shall also be made available at the bridge site for use during the start up and commissioning period. Three copies of the final operation and maintenance manuals shall be submitted to WSDOT for review and comment to verify all comments have been incorporated. After this final review, three bound copies and one electronic copy of the final operation and maintenance manuals shall be delivered to WSDOT 14 days before the schedule date for the first day of the instruction period begins.

All Operation and Maintenance Manuals shall be completed by the Design-Builder prior to final acceptance testing of the Bridge Maintenance Facility and Dock.

### 2.30.6.2 TRAINING

The Design-Builder shall provide training services to WSDOT. The Design-Builder shall submit at least two weeks (14 days) prior to the schedule date for the first day of the instruction training session, a complete training syllabus outlining topics to be covered, timeframes and training location for said topics and materials to be furnished as part of the training sessions. The training sessions shall be organized and be administered to a multi-disciplined group. Training sessions shall be devoted to theory of operation, maintenance and trouble shooting of the Bridge Maintenance Facility and Dock equipment.

Each session shall be capable of training no more than 25 people at the Maintenance Facility. The Design-Builder shall furnish all necessary instruction sheets, student training aids, paper, and booklets to supplement training.

The Design-Builder shall submit to WSDOT for review and comment a detailed outline of topics to be covered and training material for review. The outline of topics shall consist of a schedule of training based upon a detailed list of topics, including start and finish times for each topic each day.

It shall also be the Design-Builder's responsibility to coordinate with WSDOT. Supplying of visual aid equipment and other miscellaneous items required for training shall be the responsibility of the Design-Builder.

The Design-Builder shall provide copies of step-by-step operating instructions for each trainee.

Training shall not commence until the floating bridge and Bridge Maintenance Facility & Dock are operational and the systems have been conditionally accepted by WSDOT. Refer to Section 2.34 (Commissioning).

### 2.30.6.3 START UP AND COMMISSIONING

The Design-Builder shall demonstrate that all the Bridge Maintenance Facility and Dock electrical and mechanical systems have been correctly installed and function properly.

This work shall be coordinated with the requirements in Section 2.34.

Conduct all tests in the presence of WSDOT, except when WSDOT allows the test to be performed otherwise. The Design-Builder's Comissioning Authority (CxA) shall submit the dates for any testing for approval. Testing shall not commence until the date is accepted by WSDOT.

Maintain a written record of all tests showing date, personnel making test, equipment or material tested, tests performed, manufacturer and serial number of testing equipment and results. All test reports and data shall be submitted to WSDOT for review and comment.

All Start Up and Commissioning shall be completed prior to allowing traffic on the bridge.

### 2.30.6.3.1 Start Up and Commissioning Stages

The Design-Builder shall provide all test equipment, safety equipment, personnel and monitoring devices necessary to show each piece of equipment has been installed, operates properly, is in proper operating condition, and integrated into the control system. This work shall be coordinated with control system vendor and the installing Design-Builder. All start-up and commissioning shall be completed prior to allowing traffic on the bridge.

The work shall include:

Stage 1 – Pre-Functional Checkout (PC)

The Design-Builder shall adjust, calibrate and test all equipment, place the integrated system in service, and test the integrated system.

The Design-Builder shall perform an approved test procedure and verify everything is operational.

Once the PC is completed the system enters the Pre-Acceptance Phase.

Stage 2 - Acceptance Phase: Functional Performance Testing (FPT) and Integrated Performance Testing (I-FPT)

Upon successful completion of Stage 1 Pre-Functional Checkout (PC) and its review and comment by WSDOT, the Design-Builder shall demonstrate that the completed control systems comply with the contract requirements.

The Functional Performance Testing (FPT) and Integrated Performance Testing (I-FPT), as required, shall not commence until receipt by the Design-Builder of written permission from WSDOT, based on the Design-Builder's Stage 1 written report. This shall include certification of successful completion of Stage 1- Pre-Functional Checkout (PC), as required above. WSDOT may terminate this portion of the testing at any time when the system fails to perform as specified.

Upon a failure resulting in termination of testing by WSDOT or by the Design-Builder, the Design-Builder shall commence an assessment period. The Design-Builder shall identify all failures, determine the cause of all failures, repair all failures, and deliver a written report to WSDOT. The report shall explain in detail the nature of each failure, corrective action taken, results of tests performed, and shall recommend the point at which the testing should be resumed. After delivering the written report, the Design-Builder shall convene a test review meeting at the job site to present the results and recommendations to WSDOT. As part of this test review meeting, the Design-Builder shall demonstrate that all failures have been corrected by performing the appropriate portions of the conditional acceptance functional checkout test. Based on the Design-Builder's report and test review meeting, WSDOT will determine the retest date.

Upon successful completion of the conditional functional checkout testing, the Design-Builder shall deliver test reports and other documentation specified to WSDOT for review and comment prior to commencing the endurance test.

Stage 3 – Acceptance Phase: Endurance Test

The endurance test shall not be started until WSDOT notifies the Design-Builder, in writing, that the Stage 2- Acceptance Phase: Functional Performance Testing (FPT) and Integrated Performance Testing (I-FPT) has been completed and correction of all outstanding deficiencies have been satisfactorily completed.

The Design-Builder shall provide one qualified person to direct WSDOT's operator how to operate the system as required during Phase I and Phase II of the Endurance Testing. WSDOT may terminate testing at any time the system fails to perform as specified. Upon termination of testing by WSDOT or by the Design-Builder, the Design-Builder shall commence an assessment period as described for Phase II. Upon successful completion of the Endurance Test, the Design-Builder shall deliver test reports and other documentation required to WSDOT for review and comment.

Phase I (Testing): The test shall be conducted 24 hours per day for 30 consecutive calendar days, including holidays, and the system shall operate as specified without fault or failure. The Design-Builder shall make no repairs during this phase of testing unless authorized by WSDOT in writing. If the system experiences no failures during Phase I testing, the Design-Builder may proceed directly to Phase III testing, after receipt of written permission from WSDOT.

Phase II (Failure Assessment): If Phase I is unsuccessful, the Design-Builder shall identify all failures, determine causes of all failures, repair all failures, and deliver a written report to WSDOT. The report shall explain in detail the nature of each failure, corrective action taken, results of tests performed, and shall recommend the point at which testing should be resumed. After delivering the written report, the Design-Builder shall convene a test review meeting at the job site to present the results and recommendations to WSDOT. As a part of this test review meeting, the Design-Builder shall demonstrate that all failures have been corrected by performing appropriate portions of the conditional acceptance functional checkout test. Based on the Design-Builder's report and the test review meeting, WSDOT will determine the restart date, or may require that Phase I be repeated. If the retest is completed without any failures, the Design-Builder may proceed directly to Phase III testing after receipt by the Design-Builder of written permission from WSDOT.

Phase III (Completion): If Phase I is successful, the Design-Builder shall prepare and submit a written report to WSDOT. The report shall explain in detail the length of operation and any issues that occurred. WSDOT will review and comment on the Design-Builder's report.

### 2.30.6.3.2 Other Testing and Inspection Requirements

The following test shall be performed as part of the Pre-Functional Checkout (PC) and the results submitted to WSDOT for review and comment:

- Perform insulation resistance testing on all electrical conductors installed under this contract.

- Perform inspection of pump and elevator motors and motor starters installed under this contract.
- Perform ground measurement testing on all electrical panels installed under this contract.

Conduct all tests in the presence of WSDOT, except when WSDOT allows the test to be performed otherwise. The Design-Builder shall submit the dates for any testing for WSDOT review and comment. Testing shall not commence until the date is accepted by WSDOT.

Maintain a written record of all tests showing date, personnel making test, equipment or material tested, tests performed, manufacturer and serial number of testing equipment and results. All test reports and data shall be submitted to WSDOT for review and comment.

A. Resistance to Ground Measurements

Measure the resistance to ground at the service entrance, each ground rod, and each motor control center in the Bridge Maintenance Facility and Dock. Use a hand held ground resistance meter and leakage current meter. The contractor shall record the resistance to ground and leakage current at each location. Failure of the ground resistance to be 25 ohms or less shall result in the Design-Builder providing additional ground rods until the correct resistance is achieved.

B. Ground Fault Interrupting Receptacle Tests

Test all ground fault interrupting receptacles for proper connection and operation with methods and instruments prescribed by the manufacturer. The Design-Builder shall record each location of the receptacle and each receptacle identifier, and whether the equipment passed or failed the test. Failure of a receptacle to pass the test shall result in the replacement of the faulty receptacle.

C. Wire Conductor Insulation Resistance Test

An insulation resistance test shall be performed for all conductors after said conductors have been installed but prior to being connected to a device at either end of the conductor. The insulation resistance of each conductor shall be tested to ground and to every other conductor in the raceway bonded together. The tests shall follow the recommendations of IEEE Standard No. 4 and shall be completed in the presence of WSDOT. The conductor installation shall be rejected if the insulation resistance is lower than 10 megohms. Rejected conductors shall be removed and replaced. Then all conductors in the raceway with the replaced conductor shall then be tested as described above.

D. Wire Continuity Tests

The continuity of all wires shall be tested before energizing the circuit. Any conductor that is not continuous shall be investigated for poor connection to terminal blocks or other concern. If the discontinuity is not determined the conductor shall be replaced. The new conductor shall then be tested for proper continuity.

E. Fiber Optic Testing Requirements

Test each fiber in the cable for attenuation (or decibel loss) in dB/kM. Return loss of light reflected back through the fiber from the far end. This value shall be less than -20dB. Measure and record the propagation delay. Measure and record the time domain reflectometry (TDR). Record any faults along the cable. If the fiber optic cables are found

to have faults or signal loss that will interfere with the operation of the equipment the cable shall be replaced.

F. Coaxial Cable Testing Requirements

Test each cable for attenuation (or decibel loss) in dB/kM. Return loss of signal reflected back through the cable from the far end. This value shall be less than 20dB. Measure and record the propagation delay. Measure and record the time domain reflectometry (TDR). Record any faults along the cable. If the cable is found to have faults or signal loss that will interfere with the operation of the equipment the cable shall be replaced.

G. Additional Wire and Cable Testing Requirements

If the insulation resistance test or the continuity tests fail, WSDOT may request additional tests on the conductors in the same raceway in order to guarantee the quality of the installation. Proposed test equipment shall be subject to WSDOT review and comment. Test instruments shall have been calibrated within the last six months by a calibration facility approved by the manufacturer of the test instruments. Written certification of calibration shall be submitted to WSDOT for review and comment prior to executing the tests.

### 2.30.6.3.3 Start Up, Commissioning, and Testing Submittals

The Design-Builder shall provide a written procedure for Stages 1 and 2 testing to WSDOT at least FORTY working days prior to commencing any testing. These procedures shall be reviewed and approved before any testing may be performed. All written test procedures shall be the step by step, with pass or fail, check marks as required. At a minimum the test shall include but are not limited to:

- Each light switch operates properly and energizes the lights.
- Each jib hoist shall be tested.
- Each elevator shall be tested.
- Each hoist crane shall be tested.
- Each receptacle operates at the proper voltage and phasing.
- Each transformer is providing the correct voltage at the correct phasing.
- All navigation lights operate properly.
- All maintenance facility equipment operates properly.
- Submit calibration and certification documents for all testing equipment.
- Submit test equipment certifications.
- Submit all wire testing, pump motor starters and motors, and ground measurements test results. Test reports shall identify each conductor by its wire number and its test results shall be tabulated and submitted to WSDOT for review and comment.
- Submit all final test reports. All reports shall be organized, bound and signed by the Design-Builder.

#### 2.30.6.3.4 Quality Assurance

Furnish and use safety devices such as rubber gloves and blankets, protective screens, barriers and danger signs to adequately protect and warn all personnel in the vicinity of the tests.

Test equipment shall be calibrated and certified. Certification data shall be dated within six months of the testing.

All testing shall be performed after the equipment has been fully installed at its final location.

The Design-Builder shall be responsible for all damage to the equipment or material as a result of any test procedures, improper testing, or test apparatus handling. The Design-Builder shall replace or restore to the original condition any damaged equipment or material.

All repairs and replacements shall be made to the satisfaction of WSDOT. All repairs and replacements shall be made and tested before proceeding to the next stage.

### 2.30.6.4 WARRANTIES

#### 2.30.6.4.1 Warranties by Design-Builder

The Design-Builder warrants that:

a) All design work performed pursuant to the Contract Documents shall conform to all professional engineering principles generally accepted as standards of the industry in the State;

b) The Project shall be free of defects, including design defects, deficiencies, errors and omissions, except to the extent that such defects are inherent in prescriptive specifications included in the Technical Requirements;

c) Materials and equipment incorporated into the Work shall be of good quality and except as noted in the Technical Requirements, when installed, shall be new;

d) Equipment provided by the Design-Builder shall be of modern design and in good working condition;

e) The Work shall meet all of the requirements of the Contract Documents;

f) The specifications and/or drawings selected or prepared for use during construction are appropriate for their intended use; and

g) The Project shall be fit for use for the intended function.

#### 2.30.6.4.2 Project Warranty Term

Warranties for all equipment supplied in accordance with Sections 2.30.4.4 and 2.30.4.5 shall remain in effect for 1 year after Project Physical Completion, including both product and workmanship. Before the Warranty commences, a complete Materials Certification Package shall be submitted to WSDOT for review and comment.

If any of the work fails to meet the standards set forth in this section at any time within the applicable warranty period, then the Design-Builder shall correct such Work in accordance with this section.

### 2.30.6.4.3 Corrective Work

WSDOT, as the owner of the project, shall have full authority to undertake enforcement of the Warranties. Within seven days of receipt by Design-Builder's of notice from WSDOT specifying a failure of any Work to satisfy the Design-Builder's Warranties, of any Subcontractor warranty, or of any Manufacturer warranty, guarantee or obligation which Design-Builder is responsible to enforce, Design-Builder and WSDOT shall mutually agree when and how Design-Builder shall remedy such violation; provided however, that in case of an emergency requiring immediate curative action, Design-Builder shall implement such action as it deems necessary and shall notify the WSDOT on an expedited decision. Design-Builder and WSDOT shall agree on such remedy (or an alternate remedy, if necessary) as soon as reasonably practicable. If Design-Builder does not use its best efforts to proceed to effectuate such remedy within the agreed time, or if Design-Builder and WSDOT fail to reach such an agreement within such seven day period (or immediately, in the case of emergency conditions), then WSDOT, after notice to Design-Builder, shall have the right to perform or have performed by third parties the necessary remedy, and the costs thereof shall be borne by the Design-Builder.

### 2.30.6.4.4 Cost of Corrective Work

Design-Builder shall be responsible for obtaining any required approvals from WSDOT in connection with any such corrective Work. Design-Builder shall bear all costs for correcting any rejected Work, including additional testing and inspection, and shall reimburse WSDOT and pay WSDOT's expenses made necessary thereby within 10 days after Design-Builder's receipt of invoices therefor. If WSDOT agrees to accept any Nonconforming Work without requiring it to be fully corrected, Design-Builder shall be responsible for obtaining any required Governmental Approvals or other consents from any other Person in connection with the Warranty Work.

### 2.30.6.4.5 Warranty of Corrective Work

The Warranties shall apply to all Work redone, repaired, corrected or replaced pursuant to the terms of the Contract. The Warranties as to each redone, repaired, corrected or replaced element of the Work shall extend beyond the original warranty period if necessary to provide at least one-year warranty period for any re-done Work.

### 2.30.6.4.6 Subcontractor Warranties - Assignment

Design-Builder shall obtain from all Subcontractors and suppliers and cause to be extended to the WSDOT, appropriate representations, warranties (for period of at least co-extensive in duration with Design-Builders Warranties for such Work), guarantees and obligations with respect to the design, materials, workmanship, equipment, tools and supplies furnished by each Subcontractor and suppliers under their Subcontracts or supply agreements. These representations and warranty shall supplement the representations and warranties of Design-Builder hereunder. All representations, warranties, guarantees and obligations of Subcontractors and suppliers (a) shall be written so as to survive all WSDOT and Design-Builder inspections, tests and approvals hereunder, and (b) shall run directly to and be jointly and severally enforceable by Design-Builder and/or WSDOT and their respective successors and assigns. Design-Builder hereby assigns to WSDOT all of Design-Builder's rights and interest in all extended warranties for any periods exceeding the applicable Warranty period which are received by Design-Builder from any Subcontractors or suppliers.

#### 2.30.6.4.7 Subcontractor Warranties – Enforcement

Upon receipt from WSDOT of notice of a failure of any of the Work to satisfy any Subcontractor or supplier warranty, representation, guarantee or obligation, Design-Builder shall enforce or perform any such representation, warranty, guarantee or obligation, in addition to Design-Builder's other obligations hereunder. WSDOT rights under this section shall commence at the time such representation, warranty, guarantee, or obligation is furnished, and shall continue until the expiration of Design-Builders relevant Warranty (including extensions thereof under this section). Until such expiration, Design-Builder shall be responsible for the cost for any equipment, material, labor (including re-engineering) or shipping, and Design-Builder shall be responsible for the cost of any equipment material, labor (including re-engineering) or shipping, and Design-Builder shall be required to replace or repair defective equipment, material or workmanship furnished by any Subcontractor or supplier.

#### 2.30.6.4.8 Manufacturer Warranties

Design-Builder shall obtain from all Manufacturers and cause to be extended to the WSDOT, appropriate representations, warranties (for period of at least co-extensive in duration with Design-Builders Warranties for such Work), guarantees and obligations with respect to the installation of pre-manufactured items that are furnished with a Manufacturer's Warranty. This includes Manufactured equipment furnished by Subcontractors and suppliers under their Subcontracts or supply agreements. These representations and warranty shall supplement the representations and warranties of Design-Builder hereunder. The Design-Builder shall provide extended Manufacturer Warranties for equipment to be extended to include the full one-year warranty period. The warranty cards and other documents shall be submitted to the WSDOT as a complete package, with the WSDOT as the owner. Design-Builder hereby assigns to WSDOT all of Design-Builder's rights and interest in all extended warranties for any periods exceeding the applicable Warranty period which are received by Manufacturers.

## 2.30.7 SUBMITTALS

WSDOT will review and comment on all scheduled submittals and will return comments to the Design-Builder. All Final Design Documents shall bear the stamp and signature of the appropriate design professional, unless otherwise noted herein.

Refer to Section 2.2 (Project Documentation) and Section 2.28 (Quality Management Plan) for additional requirements.

### 2.30.7.1 DESIGN SUBMITTALS

#### 2.30.7.1.1 Plans

The Design-Builder shall submit Preliminary, Final, and Released for Construction (RFC) Bridge Maintenance Facility and Dock Plans on WSDOT standard sheets and in accordance with Section 2.2 (Project Documentation), Section 2.28 (Quality Management Plan) and Section 2.32 (Mechanical Bridge and Services).

##### 2.30.7.1.1.1 Preliminary Architectural and Systems Design Submittal

The Design-Builder shall prepare building architecture and systems plan sheets in accordance with Section 2.28, and the WSDOT Plans Preparation Manual.

The Design-Builder shall submit the Preliminary Design plans for the building architectural and systems. The plans shall include, but are not limited to, the following items:

- SITE PLAN - A detailed site plan describing the existing and proposed developments.
- ELEVATION PLANS – Elevation views with particular emphasis on describing those portions of a structure that require a design departure from existing City of Medina Land Use Code requirements.
- INTERIOR ELEVATIONS - Elevation views with particular emphasis on material and surface treatments.
- BUILDING SECTIONS – Provide building sections of proposed and existing structures showing the use of all building area and construction materials.
- FLOOR PLANS – Provide floor plans of proposed and existing structures showing the use of all floor area.
- LANDSCAPING AND OPEN SPACE PLANS – All projects must show landscaping meeting City standards.
- CONTEXT MAP – A map illustrating the subject property in relation to developments in the vicinity may be provided to give support to the application.
- ZONING VARIANCES OR DESIGN DEPARTURES – Provide a list of the variances or departures (if any) where the design of the building does not meet the requirements of the Medina Land Use Code.
- SYSTEM EQUIPMENT ACCESS, REMOVAL and REPLACEMENT PLANS – Provide floor plans of proposed spaces showing the paths and clearances between major electrical and mechanical equipment.

#### 2.30.7.1.1.2 Final and RFC Architectural and Systems Design Submittals

The Design-Builder shall prepare Final and RFC building architecture and systems plan sheets in accordance with Section 2.28, and the WSDOT Plans Preparation Manual (Appendix D12).

The Design-Builder shall submit the Final and RFC plans for the building architectural and systems. The plans shall include, but are not limited to, the following items:

- Site Plans
- Floor Plans
- Life Safety Plans
- System Equipment Access, Removal and Replacement Plans
- Landscape Plans
- Building Sections
- Wall Assembly Sections (for each typical wall conditions)
- Exterior Building Elevations
- Enlarged Floor Plans

- Interior Elevations
- Reflected Ceiling Plans
- Building Details (Interior and Exterior)
- Schedules:
  - Openings
  - Doors
  - Partitions
  - Finish
  - Hardware

Provide all submittals as determined by Local and State Authorities necessary for construction permitting, commissioning and occupancy. These are to include, but are not limited to:

- Architectural
- Structural
- Mechanical
- Electrical
- Energy Code
- Conveyance
- Fire Alarm
- Boilers and Pressure Vessels
- HVAC - Heating and Refrigeration
- Side Sewer
- Plumbing
- Signs

#### 2.30.7.1.2 Technical Specifications

In accordance with Section 2.2 (Project Documentation) and Section 2.28 (Quality Management Plan), the Design-Builder shall submit Preliminary, Final and Released For Construction Technical Specifications for the Bridge Maintenance Facility and Dock.

#### 2.30.7.1.3 Structural Design Calculations

The Design-Builder shall provide complete sets of calculations to support all structural designs described in this Section on 8.5-inch by 11-inch sheets. Complete sets of calculations shall be included with each design review submittal.

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; results; member capacities; geotechnical calculations; horizontal and vertical settlement calculations; deflection diagrams; long term creep diagrams for horizontal flexural members; pertinent computer input and output data, and the QA/QC signature sheet in the BDM, Section 1.5-A3-1. Electronic files of all spreadsheets and computer input/output files shall be submitted.
- Special Design Features – Provide a brief narrative of major design decisions, assumptions, or revisions and the reason for them.

### 2.30.7.1.4 Electrical and Mechanical Calculations

The Design-Builder shall provide complete sets of calculations to support all electrical and mechanical designs described in this section. Complete sets of calculations shall be included with each design review submittal.

All final design calculations shall include the stamp of the appropriate design professional.

Refer to Sections 2.17 and 2.32 for design calculation requirements.

#### 2.30.7.1.4.1 Electrical Design Calculations

The Design-Builder shall perform a complete design and perform all calculations and studies required for the project. The Design-Builder shall provide the following calculations and submit them for review prior to construction:

- Short Circuit Analysis: The short circuit analysis shall be used to size the over current protection equipment interrupting capability.
- Fuse/Relay/Circuit Breaker Coordination Study: This study shall analyze all over current protection devices from the medium voltage equipment to the 208/120VAC equipment.
- Voltage Drop Study: The short circuit analysis shall be used to size the protection equipment interrupting capability.

### 2.30.7.1.5 LEED

Submit checklist of credits to pursue for WSDOT review and comment.

Submit list of specification sections impacted by LEED requirements for WSDOT review and comment.

### 2.30.7.1.6 Durability Report

Submit a Durability Report which shall include at a minimum concrete additives, concrete strength, fabrication/curing techniques, cover to reinforcement, coated reinforcement, construction/erection expedients, steel protective coating systems, steel detailing, etc., which shall demonstrate how Project requirements shall be fulfilled with respect to durability. The Durability Report shall be submitted with the design documentation package submittal to WSDOT for review and comment.

## 2.30.7.2 CONSTRUCTION SUBMITTALS

### 2.30.7.2.1 LEED

The Design-Builder shall provide a proposal for all LEED conformance items and clearly identify any conflicts between the technical requirements and any proposed LEED options. All LEED options shall be submitted to WSDOT for review and comment.

Construction submittals shall meet the requirements for the applicable LEED standard.

### 2.30.7.2.2 Falsework, Forms and Temporary Structures Submittals

The Design-Builder shall submit Working Drawings with supporting design calculations for falsework, forms, construction work bridges, temporary retaining walls, temporary bridges, and other temporary structures. WSDOT will review and comment on the Working Drawings and calculations.

The Design-Builder shall submit procedures and Working Drawings with supporting design calculations for critical construction processes. Critical construction processes include, but are not limited to, bridge demolition and shaft installation.

All final design plans and calculations for the falsework, forms, construction work bridges, temporary retaining walls, temporary bridges, other temporary structures, demolition, and installation shall bear the stamp and signature of a Professional Civil or Structural Engineer, licensed under Title 18 RCW, State of Washington.

### 2.30.7.2.3 Shop Drawing Submittals

The Design-Builder‘s Quality Management Plan (Section 2.28) shall include submittal of shop drawings for all Bridge Maintenance Facility and Dock structural and architectural systems, elements and components pre-fabricated specifically for the project as well as for coordination and installation of electrical and mechanical systems and elements for the Bridge Maintenance Facility and Dock . WSDOT shall review and comment on these shop drawings. 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.
- Strand or steel reinforcing bar placement.
- Post-tensioning reinforcement tensioning procedure, stress calculations, and elongations.
- Post-tensioning anchorage details.
- Fabrication-reaming, drilling and assembly procedures.
- Penetrations in walls.
- Erection, installation and coordination procedures.

- Handling and erection procedures for precast concrete elements, including complete details of all temporary supports, bracing, and inserts placed for lifting, assembly and erection.
- Architectural systems.
- Other building systems to include, but are not limited to:
  - Stairs;
  - Exterior Wall;
  - Structural;
  - Energy;
  - Conveyance;
  - Cranes; and
  - HVAC.
- Equipment items and fabrications.

### 2.30.7.3 END OF PROJECT SUBMITTALS

All Design Documents submitted at the end of Project shall bear the stamp and signature of the appropriate design professional.

Refer to Section 2.2 (Project Documentation) and Section 2.28 (Quality Management Plan) for additional requirements.

#### 2.30.7.3.1 Plans

The Design-Builder shall prepare As-Built Plans for all structures as described in Section 2.2 and Section 2.28.. The Design-Builder shall submit the final approved shop drawings.

##### 2.30.7.3.1.1 Electrical and Mechanical As-built Documentation

After completion of all work, the Design-Builder shall prepare a new set of prints and shall mark the prints to show all departures from the accepted Plans. Indicate exact circuiting and wire numbers. The Design-Builder shall make the markings with red indelible pen and shall deliver these prints to WSDOT.

As-Built drawings shall be detailed such that any part can de identified and sized based upon the documents.

As-Builts shall be as follows:

The Design-Builder shall make complete working drawings for the electrical equipment. The tracings, or translucent copies thereof on cloth, mylar or equivalent, shall become the property of WSDOT after they have been corrected to show the work as constructed. These drawings shall include:

1. Complete wiring interconnection diagrams, giving complete termination identification of wires and cables, and sizes and numbers of all wires and cables, and the make and capacity of all apparatus. Schematic diagrams shall include three-line power diagrams showing the scheme of connections including detailed apparatus and complete control schematic diagrams which shall include the

control panels. The number of each wire and an individual device designation for each electrical device or piece of apparatus shall be shown on the control schematic diagram. This device designation shall be used to identify each piece of apparatus on all assembly and installation drawings. Assembly drawings shall include locations to scale of all external and internal identified components including terminal blocks contained on or in the control panels, panels, transformers and terminal boxes.

2. Complete conduit drawings, which show the physical routing and the size of each conduit and the wire number and size of each wire therein. These drawings shall show the exact location and method of support of all conduits, ducts, boxes and expansion fittings, and each conduit shall be given an individual conduit designation.
3. A suitably coordinated conduit and cable schedule.
4. Installation drawings giving locations of all cables, conduits, transformers, panels, circuit breakers, cathodic protection equipment, annodes, cathodes, navigation lighting, lighting, service equipment, control panels, float switches, CCTV equipment, switches, lights, pump receptacle stations, receptacles, and all other apparatus.
5. Final drawings of all installed mechanical and electrical components including layout and installation drawings.
6. Drawings showing the general construction and dimensions of the control panels and the arrangement of all apparatus thereon.
7. Certified dimension prints of all electrical apparatus.
8. Detailed construction drawings of all boxes, troughs, ducts, and raceways other than conduit.
9. Special apparatus shall be designated by the manufacturer's name and catalog reference.

The marked up prints shall be submitted to WSDOT for review and comment. The Design-Builder shall incorporate any comments and marked up prints into a final CADD set. The Design-Builder shall submit a complete set of printed drawings and an electronic copy of all drawings on CD-ROM for all As-Built drawings.

### 2.30.7.3.2 Calculations

The Design-Builder shall revise all calculations as necessary for the design covered by the Scope of Work to accommodate field changes as described in Sections 2.2 and 2.28

### 2.30.7.3.3 Operations and Maintenance Manuals

The Design-Builder shall submit Operations and Maintenance Manuals.

The Design-Builder shall provide a preventive maintenance schedule.

### 2.30.7.3.4 Start Up, Commissioning and Testing

The Design-Builder shall submit Start Up, Commissioning and Testing submittals as described in Section 2.30.6.

### 2.30.7.3.5 Warranties

The Design-Builder shall submit Warranties as described in Section 2.30.6.

End of Section

# 2.31 TEMPORARY TRANSIT FACILITY DEMOLITION AND PAVEMENT RESTORATION

## 2.31.1 GENERAL

The Design-Builder shall conduct all Work necessary to demolish temporary portions of the Evergreen Point Road transit facility as defined in the Conceptual Plans (Appendix M1). Demolition shall include, but is not limited to, the following:

- The temporary westbound walkway and the connecting walkway to the permanent platform.
- Temporary barriers, fencing, walls, slabs, footings and foundations at the temporary westbound platform, temporary connection walkway, and temporary fencing or construction barriers on the permanent platform.
- Salvage, for reuse by King County, of all temporary transit shelters, transit furniture, transit platform signage, trash receptacles and other King County transit property.
- Protection and preservation of the existing transit facility and pavement during demolition of the temporary portions of the transit facility.
- Off-site disposal of all removed materials that are not salvaged for reuse by King County Metro.

## 2.31.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction related to this section. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- WAC Title 51, General Administration, Department of (Building Code Council).
- WSDOT Amendments to the Standard Specifications (Appendix B1).
- WSDOT *Standard Specifications* (M41-10) (Appendix D18).
- WSDOT *Design Manual* (M22-01) (Appendix D3).
- WSDOT *Local Agency Guidelines* (M36-63) (LAG) (Appendix D8).
- WSDOT *Plans Preparation Manual* (M22-31) (PPM) (Appendix D12).
- WSDOT *Construction Manual* (M41-01) (Appendix D2).
- WSDOT *Materials Manual* (M46-01) (Appendix D10).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- WSDOT *Qualified Products List* (M46-02) (QPL) (Appendix D13).

- National Fire Protection Association (NFPA) 241, *Standard for Safeguarding Construction, Alteration, and Demolition Operations*.
- ANSI A10.6-1990: Safety Requirements for Construction and Demolition.

## 2.31.3 PERFORMANCE REQUIREMENTS

The Design-Builder shall perform demolition of the temporary westbound walkway and the connecting walkway at the Evergreen Point Road transit facility and construct new HMA and PCCP pavement in a manner that is consistent with the Basic Configuration, Appendix M1 and these technical requirements. The Design-Builder shall construct a barrier as shown in the Conceptual Plans (Appendix M1), landscaping and irrigation as shown in the Conceptual Plans (Appendix M1), and shall construct stormwater collection and conveyance adjustments in accordance with Section 2.14 (Stormwater Management). The Design-Builder shall remove existing improvements systematically and only to the extent required.

The Design-Builder shall provide temporary barricades and other protection required to prevent injury to people and damage to adjacent structures and facilities to remain. The Design-Builder shall conduct demolition and debris-removal operations to ensure minimum interference with the use of the adjacent facilities.

### 2.31.3.1 TRANSIT STATION CLOSURES

During demolition and removal of the temporary westbound platform, and the connecting walkway and construction of the new pavement, the Design-Builder shall comply with Section 2.22 (Maintenance of Traffic). Demolition and construction operations related to the work of this section shall be complete within 30 days of Substantial Completion.

### 2.31.3.2 RESTORATION AND CONSTRUCTION

Following demolition work described in this section, the Design-Builder shall construct new improvements in the area affected by demolition. Required improvements shall include but are not limited to pavement, pavement marking, storm drainage collection and conveyance,, landscaping and irrigation, and barriers.

Completion of the roadway shall conform to the requirements of Section 2.7 Pavement, Section 2.11 (Roadway Design), Section 2.14,, Section 2.15 (Landscape and Aesthetics Design), Section 2.20 (Pavement Marking) and the Conceptual Plans (Appendix M1).

## 2.31.4 CONSTRUCTION REQUIREMENTS

### 2.31.4.1 PROTECTION OF EXISTING TO REMAIN STRUCTURES

The Design-Builder shall restore any damage to, and clean any soiling of, the permanent transit facility that results from the Design-Builder's operation.

The Design-Builder shall restore any damage to the permanent transit facility as a result of the Design-Builder's operation. Any damage will be repaired with methods and materials that maintain the appearance and function of the permanent transit facilities.

#### 2.31.4.2 MECHANICAL/ELECTRICAL AND ITS SYSTEMS

The Design Builder shall maintain services/systems to remain and protect them against damage during demolition operations, and shall comply with requirements for interruptions specified in Section 2.16 (Illumination and Roadway Electrical Systems), Section 2.17 (Electrical Bridge and Services), and Section 2.18 (Intelligent Transportation Systems).

The Design Builder shall locate, identify, disconnect, and seal or cap off mechanical/electrical and ITS systems serving areas to be demolished.

#### 2.31.4.3 REMOVAL AND SALVAGE OF TRANSIT AMENITIES

King County will salvage the following property from the temporary platforms at the Evergreen Point Road transit facility: signs, litter receptacles, passenger shelters, benches and other items for public transit. Any items not salvaged by King County shall become the property of the Design-builder.

The Design-Builder shall coordinate any communication with King County through the WSDOT Project Engineer. The Design-Builder shall notify WSDOT and King County (Paul Sorensen at 206-684-2254) a minimum of 30 Calendar Days prior to the closure of the temporary transit platform. The notification shall include the date by which King County will need to remove its transit amenities. WSDOT will work with King County and the Design-Builder to determine the removal items, access requirements and protocols, and the timeline for the removals.

#### 2.31.4.4 CLEANING

The Design-Builder shall clean adjacent structures and improvements of dust, dirt and debris caused by demolition operations.

### 2.31.5 DEMOLITION SUBMITTALS

#### 2.31.5.1 DESIGN SUBMITTALS

##### 2.31.5.1.1 Pre-demolition Photographs

The Design-Builder shall submit pre-demolition photographs showing existing conditions of adjoining construction and improvements before demolition work begins. The photographs shall specifically illustrate interface surfaces and connections between the permanent transit facility and the temporary platform and connection walkway to be demolished.

##### 2.31.5.1.2 Inventory

After demolition is complete the Design-Builder shall submit a list of items that have been salvaged by King County.

End of Section

# 2.32 MECHANICAL BRIDGE AND SERVICES

## 2.32.1 GENERAL

The Design-Builder shall conduct all Work necessary to design, furnish and install complete the mechanical systems for the Project. Mechanical systems are listed in this section to provide a consistent and uniform approach for the Design-Builder. Mechanical systems have both general requirements as well as application-specific requirements. Where mechanical system requirements have extensive application-specific requirements, they are referenced to and included in a separate section of this document.

The systems and facilities include those for the Bridge Maintenance Facility, Bridge Maintenance Dock, Bridge Sheds, and Bridge Fire Protection.

Elements of Work shall include, but are not limited to HVAC systems, plumbing systems, fire protection systems, mechanical services for boat moorage, diesel fuel system, compressed air system, LEED-NC rating system, and local and remote network control and instrumentation

The mechanical systems shall each be designed and constructed to result in a system that provides functionality, durability, ease of maintenance, and safety.

The mechanical systems shall be designed and constructed to include standard parts and detailing for similar functionality, durability, ease of maintenance, and safety.

The following sections supplement the requirements listed herein:

- Section 2.30 – Bridge Maintenance Facility and Dock
- Section 2.12 – Floating Bridge

## 2.32.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction of mechanical systems on the Project. This is not a comprehensive list; other technical publications societies and associations for the listing of equipment and current practices, and for the testing and rating of equipment may also be applicable to complete the design and construction. The list of societies and associations adopted for this Project shall be the current ASHRAE Fundamentals Table of Codes and Standards. If conflicts between standards occur, the more stringent requirement shall be used. 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- WSDOT Standard Specifications (M41-10) (Appendix D18).
- WSDOT Maintenance Manual (M51-01) (Appendix D9).
- WSDOT Plans Preparation Manual (M22-31) (Appendix D12).
- WSDOT Construction Manual (M41-01) (Appendix D2).
- WSDOT Standard Plans (M21-01) (Appendix D17).
- Bridge Maintenance Facility Mandatory Specifications (Appendix B12).

- Bridge Maintenance Facility Building Code, Zoning and Land Use Analysis (Appendix S13).
- Bridge Maintenance Facility Sustainability Checklist (Appendix S14).
- Workboat Performance Specification (Appendix B13).
- Medina Municipal Code.
- National Fire Protection Association (NFPA), NFPA 502, *Standard for Road Tunnels, Bridges, & Other Limited Access Highways, 2008*, Quincy, Massachusetts.
- International Building Code (IBC), Building, Mechanical, Fire, Fuel Gas, City of Medina amendments.
- Washington Industrial Safety and Health Act (WISHA), *Legislation enacted to regulate safety and health in the workplace*.
- Washington Administrative Code (WAC) 51-57, *Uniform Plumbing Code*, City of Medina amendments.
- WAC 51-13, *Washington State Ventilation and Indoor Air Quality Code*.
- WAC 51-11, *Washington State Energy Code*.
- WAC Title 296, *Labor and Industries, Safety Standards*.
- NFPA Handbook, *Automatic Sprinkler System Handbook*.
- NFPA, NFPA 13, *Installation of Sprinkler Systems, 2010*, Quincy, Massachusetts.
- NFPA, NFPA 14, *Installation of Standpipe, Private Hydrant and Hose Systems, 2010*, Quincy, Massachusetts.
- NFPA, NFPA 24, *Private Fire Service Mains, 2010*, Quincy, Massachusetts.
- NFPA, NFPA 25, *Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems, 2008*, Quincy, Massachusetts.
- NFPA, NFPA 30, *Flammable and Combustible Liquids Code*, 2008, Quincy, Massachusetts.
- NFPA, NFPA 30A, *Code for Motor Fuel Dispensing Facilities and Repair Garages*, 2008, Quincy, Massachusetts.
- NFPA, NFPA 31, *Standard for the Installation of Oil-Burning Equipment,* 2006, Quincy, Massachusetts.
- NFPA, NFPA 54, *National Fuel Gas Code, 2009*, Quincy, Massachusetts.
- NFPA, NFPA 70, *National Electrical Code 2008*, Quincy, Massachusetts.
- NFPA, NFPA 72, *National Fire Alarm Code 2010*, Quincy, Massachusetts.
- NFPA, NFPA 90A, *Installation of Air Conditioning and Ventilation Systems, 2009*, Quincy, Massachusetts.
- NFPA, NFPA 92A, *Smoke Control Systems, 2009*, Quincy, Massachusetts.

- American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE), *List of Societies and Associations* (adopted for the listing of equipment, current practices, testing and rating procedures) Fundamentals, 2009, Atlanta, Georgia.
- ASHRAE, *Sound and Vibration Control, Applications, 2007*, Atlanta, Georgia.
- ASHRAE, *Corrosion Control and Water Treatment, Applications, 2007*, Atlanta, Georgia.
- Sheet Metal and Air Conditioning Contractor's National Assoc (SMACNA), *HVAC Systems – Duct Construction Design, 4th Edition, 2006*, Chantilly, Virginia.
- SMACNA, *HVAC Systems – Applications, 1987*, Chantilly, Virginia.
- SMACNA, *Seismic Restraint Manual, 3rd Edition, 2008*, Chantilly, Virginia.
- Manufacturer's Standardization Society (MSS SP 58), *Pipe Hangers and Supports – Materials, Design and Manufacture, 2002*, Vienna, Virginia.
- Underwriters Laboratories (UL), *Fire Protection Equipment Directory*.
- *The Occupational Safety and Health Act (OSHA)*.
- State of Washington, *General Administration Facilities Design Guidelines and Construction Standards*.

## 2.32.3 PERFORMANCE REQUIREMENTS

### 2.32.3.1 GENERAL

The requirements and criteria specified within this section are applicable to all mechanical systems and other work included within this performance specification.

### 2.32.3.2 HEATING VENTILATION, AND AIR CONDITIONING (HVAC)

The following outdoor design conditions will be used, based on Recommended Outdoor Design Temperatures, Washington State compiled and published by the Puget Sound Chapter of ASHRAE 1986 edition for the University of Washington, and assuming 0.5 percent summer and 99.4 percent winter, annual cumulative frequency of occurrence:

- Summer: 84 degrees F dry bulb (db), 66 degrees F wet bulb (wb)
- Winter: 22 degrees F db

Specific indoor temperatures will be established after the facility occupancy criteria (equipment and personnel) are determined. See Table 2-32.1 for indoor design conditions for maintenance facility and maintenance sheds. Various HVAC equipment shall be provided, such as air supply and exhaust fans, air conditioning units of various types, heating units (either electric or hot water), as required. An air distribution system consisting of but not limited to fans, sheet metal ducts, dampers, grilles, registers, diffusers, etc. will be provided.

### 2.32.3.3 PLUMBING AND DRAINAGE

The plumbing and drainage systems for the maintenance facilities shall include water service, domestic hot and cold water, fuel (diesel or gas as applicable), sanitary and storm drainage, as necessary.

Water service for the buildings shall be connected to an approved municipal water main. The connecting pipe shall be sized based on the peak water demand of the plumbing fixtures and heating boiler if provided. Water meters and/or reduced pressure backflow preventers shall be provided as required.

Hot and cold water shall be supplied to various plumbing fixtures located within the buildings as necessary. The hot water shall be provided by a domestic hot water tank or tankless hot water heaters.

Diesel oil or gas will be required if a boiler is used. Natural gas is preferred for the heating system. If gas service is not available, diesel oil may be used for building and domestic water heating.

Sanitary drainage shall be provided for the plumbing fixtures and shall be sized and installed in accordance with the code requirements. The sanitary drainage, including floor drainage shall discharge by gravity or shall be pumped to the city sanitary or combined sewer system. If the sanitary drains are located below the elevation of the city sewer main, a sewage ejector shall be provided.

### 2.32.3.4 FIRE PROTECTION

The fire protection system design for the maintenance facilities shall be based on applicable International Fire Code (IFC), Medina Building Code and NFPA. The facility sprinkler and standpipe systems and/or portable fire extinguishers shall be provided based on the type of area to be protected and occupancy.

Water for the systems operation shall be provided by the city water supply main. A hydrant flow test shall be required to determine the flow and pressure capacity of the main supply line. In the unlikely event that the city water supply is not adequate, a fire pump may be required.

### 2.32.3.5 SEISMIC PROTECTION

The seismic design of mechanical equipment and systems shall include comprehensive engineering analysis by a qualified professional engineer using performance requirements, codes and standards, and design criteria. The engineering analysis shall establish criteria based on the International Building Code and shall verify requirements of authorities having jurisdiction.

### 2.32.3.6 LEED CERTIFICATION

In support of current legislation, the building shall incorporate the US Green Building Council's Leadership in Energy and Environmental Design Green Building Rating System (LEED). The Bridge Maintenance Facility shall obtain LEED Silver Certification.

For the purposes of LEED Certification, the design of mechanical equipment and systems shall be coordinated with Section 2.30.3.1. Key green building strategies shall consider addressing stormwater, sustainable site features, low energy buildings, high performance equipment, renewable energy, potable water use reduction, natural ventilation and day lighting.

### 2.32.3.7 COORDINATION MEETINGS

The Design-Builder is required to hold various types of coordination meetings for design, construction, fire/life safety and other issues as necessary throughout the design and construction of the Project. These meetings shall include WSDOT, local agency building and fire departments, and State and Federal agencies, as necessary. See Sections 2.28 and 2.30 for additional requirements including design task forces and over-the-shoulder reviews.

The Design-Builder is required to hold the following systems meetings for each system or group of systems:

- Presentation Meeting of System Design Concept;
- Resolution of Comments on System Concept (additional meetings may be necessary to resolve all critical comments); and
- Presentation of System Documentation, including analysis, plans and details, equipment selections, estimating and scheduling.

### 2.32.3.8 COORDINATION OF DESIGN

The Design-Builder's design of the mechanical systems requires coordination with SR 520 Eastside Transit and HOV Project and SR 520 Pontoon Construction Design-Build Project Contractors, other design disciplines and local agencies as necessary.

### 2.32.3.9 ENVIRONMENTAL DESIGN CONDITIONS

The mechanical equipment and systems shall take into account the facility location with adverse environmental conditions such as high humidity and corrosive atmospheres.

All embedded electrical and electronic panels shall have the ability to shed water or have drain outlets to prevent the accumulation of water.

### 2.32.3.10 ENGINEERING DESIGN CALCULATIONS

The Design-Builder shall prepare engineering design calculations for WSDOT review and for permit review as required by Code. See Section 2.28 for additional requirements.

### 2.32.3.11 ENGINEERING DESIGN SOFTWARE

Life cycle cost analysis software shall be used in the mechanical system design of the facilities to determine the least cost alternative over the life of the facility/equipment. Acceptable energy estimating software shall be Carrier HAP, Energy Plus, DOE-2 and variations or Trane Trace 700 or approved equal.

The Design-Builder may propose to use software other than those listed above, however the software must meet or exceed the capabilities of those listed and have its capabilities fully validated for its intended use. The Design-Builder shall submit a list of all software to be used to WSDOT for review and comment. To the extent the Design-Builder uses software not currently used by WSDOT, the Design-Builder shall provide all necessary licenses and training.

# 2.32.4 DESIGN REQUIREMENTS – GENERAL

## 2.32.4.1 PERSONNEL REQUIREMENTS

The Engineer of Record shall be licensed as a Mechanical Professional Engineer under Title 18 RCW.

The Engineer of Record for the mechanical system design shall be responsible for the facility mechanical design including HVAC, plumbing and fire protection and other mechanical systems.

The Engineer of Record for bridge fire protection shall be licensed as Mechanical or Fire Protection Professional Engineer under Title 18 RCW. Refer to Section 2.35 for bridge fire protection.

## 2.32.4.2 HVAC DESIGN REQUIREMENTS

### 2.32.4.2.1 Indoor Design Conditions

The following are indoor design conditions for general HVAC systems. These conditions are supplemented by conditions for application specific requirements in other sections of these Technical Requirements. Winter temperatures shall be minimum indoor design temperatures and summer temperatures shall be maximum indoor design temperatures. Ventilation requirements shall be determined from mandatory codes and standards, and air circulation shall be determined from system design.

All other rooms not specifically mentioned in this table shall have comparable requirements for indoor conditions in accordance with this criteria, and mandatory codes and standards.

Table 2-32.1 – HVAC Indoor Design Conditions for Bridge Maintenance Facility

| Space | Winter (F DB) | Summer (F DB) | (Percent RH) |
|---|---|---|---|
| Parking | (5) NR | (5) NR | |
| Generator | 55 | (4) | |
| Elevator Machine Room | 55 | (3) EX | --- |
| Elevator Hoistways | 55 | (5) NR | --- |
| Ventilation Shafts | 55 | (5) NR | --- |
| Stair | 55 | (5) NR | --- |
| Electrician Workroom | 68 | 78 | --- |
| Crew Room | 68 | 78 | 50 |
| Lead Tech Office | 68 | 78 | 50 |
| Supervisor Office | 68 | 78 | 50 |
| Communication Room | 68 | 72 | 50 |
| Shop | 68 | (1) | --- |
| Mezzanine/Shop Storage | 68 | (1) | --- |
| Compressor Room | 55 | (3) EX | --- |
| Tool Storage | 55 | (3) EX | --- |
| Equipment Storage | 55 | (3) EX | --- |
| Hydraulics | 68 | 78 | --- |
| Record Storage | 55 | (3) EX | --- |
| Emergency Storage | 55 | (3) EX | --- |
| Mechanical Room | 55 | (4) | --- |

| | | | |
|---|---|---|---|
| Janitor Closet | 68 | (1) | --- |
| Unisex Toilet/Shower | 68 | 78 | --- |
| Men's Toilet | 68 | (2) | --- |
| | | | |

Notes:
(1) Outside air ventilation, ambient + 10 degrees.
(2) Supply from adjacent space.
(3) Exhaust only (EX).
(4) Refer to equipment manufacturer for temperature tolerances.
(5) Not regulated (NR). Equipment should be designed accordingly.

Table 2-32.2 – HVAC Indoor Design Conditions for Maintenance Sheds

| Space | Winter (F DB) | Summer (F DB) | (Percent RH) |
|---|---|---|---|
| Work Areas | 68 | (1) | --- |
| Equipment Storage | 55 | (1) | --- |
| Electrical Equipment | (4) | (4) | --- |

Notes: (1) Outside air ventilation, ambient + 10 degrees.
(2) Supply from adjacent space.
(3) Exhaust (EX) only.
(4) Refer to equipment manufacturer for temperature tolerances.
(5) Not regulated (NR). Equipment should be designed accordingly.

### 2.32.4.2.2 Design Velocities for Air Distribution Systems

Supply registers shall be selected for throw and noise criteria. Noise criteria are stated in Section 2.32.5 in system requirements. Throw must be consistent with room architecture. Variable air volume (VAV) terminals shall be selected for required airflow, pressure, and noise criteria. Diffusers shall be selected for throw and noise criteria. Exhaust and return grilles shall have a capacity based on maximum velocity of 500 fpm over the gross area. Transfer grilles shall have a maximum velocity of 250 fpm over the gross area. Fan sound attenuators have a maximum air velocity of 2,000 fpm over the gross area.

### 2.32.4.2.3 Noise Criteria

Sound control for environmental control systems shall be designed in accordance with the procedure outlined in the Sound and Vibration Control chapter of the Handbook of Systems and Applications (ASHRAE), latest edition, and shall comply with City of Medina codes and ordinances.

The Design-Builder shall provide acoustical screening for rooftop mechanical equipment as required to maintain sound levels in accordance with the Medina Municipal Code at the vertical plane of the adjacent property lines.

### 2.32.4.2.4 Air Distribution System Design

Supply duct sizes shall be selected for an equal pressure drop or static regain method as appropriate.

Ducts shall be constructed of hot-dip or electroplate galvanized steel unless otherwise noted, to a pressure class of not less than four-inch water gage, seal class A, and in accordance with HVAC Duct Construction Standards by the SMACNA.

#### 2.32.4.2.5 Pressure Losses

Pressure loss calculations shall be performed in accordance with the ASHRAE Handbook of Fundamentals. The static pressure differential across any supply or return air terminal shall not exceed 0.25 inch water gauge when the system is operating at full capacity.

#### 2.32.4.2.6 Supply Air Registers and Diffusers

All supply air registers and diffusers shall be selected to provide the required throw and spread within the noise criteria. All registers shall be provided with adjustable and double-deflection louvers and spin taps or opposed-blade adjustment volume dampers. Volume dampers shall be key-operable through the face of the register. All ceiling diffusers shall be the square, rectangular, circular or linear type with adjustable throw, opposed-blade adjustable volume dampers, and adjustable air extractors.

#### 2.32.4.2.7 Variable Air Volume Terminals

When provided, variable air volume (VAV) terminals shall be pressure-independent and shall reset air volume as determined by the space thermostat regardless of any changes in system air pressure. Terminal shall be system powered and shall require no more than 1-inch water gauge static pressure regardless of air quantity. The casing shall be of double shell construction meeting SMACNA standards with sandwiched “foamed in place” insulation. Terminal shall be complete with factory furnished system powered actuators, controls, and thermostats. Outside air requirements shall be maintained throughout the range of VAV operation.

#### 2.32.4.2.8 Exhaust and Return Air Grilles

Either exhaust or return air grilles shall be equipped with fixed, non-see-through blades or louvers, or the duct behind the grille shall be painted matte black. All grilles shall be equipped with opposed-blade, adjustable-volume dampers key-operated through the face.

#### 2.32.4.2.9 Volume Dampers

The Design-Builder shall provide adjustable, opposed-blade volume dampers for all branch ducts serving multiple outlets. All dampers shall be equipped with locking quadrants with blades sufficiently stiffened at the edges to effectively close off the duct. Under all conditions of operation, they shall be free from vibration.

#### 2.32.4.2.10 Splitter Dampers

Splitter dampers may be used in multiple duct fittings for initial balancing in place of individual opposed-blade volume dampers in each branch of the multiple duct fitting. These splitters shall be adjustable through locking quadrants and shall be single-bladed. The blades shall have edges sufficiently stiffened to avoid vibration under all conditions of operation.

### 2.32.4.2.11 Fire Dampers and Fire/Smoke Dampers

Fire dampers shall be provided in ducts that pass through fire-rated floors, walls, and barriers. Fire/smoke dampers (FSD) (Leakage Rated Dampers) shall be provided where required for smoke control. FSD shall have electric actuator for smoke control and may be used instead of a motorized damper. All fire dampers shall be Underwriters Laboratories, Inc. (UL) listed. Dampers shall be tested in accordance with UL555 for fire dampers, and UL555S for fire smoke dampers. Fire dampers, including their sleeves, smoke dampers, and ceiling dampers shall be installed in accordance with the conditions of their listings and the manufacturer's installation instructions. The Design-Builder shall provide limit switches to the signal control system of open or closed status.

### 2.32.4.2.12 Backdraft and Relief Dampers

Backdraft or motorized shutoff dampers shall be used on exhaust fans where more than a single fan discharges into a common exhaust. Weighted relief dampers shall be used in exhaust ducts and openings where a positive pressure is required to be maintained by a forced air supply and relief exhaust. All backdraft and relief dampers shall be the multi-bladed gravity type with neoprene cushioning on blade edges.

### 2.32.4.2.13 Air Extractors

Air extractors or 45-degree entry shall be used in branch duct connections. Air extractors are used for registers and diffusers where there is inadequate space for installing multi-bladed volume dampers. All air extractors shall be the movable blade, pivoted type.

### 2.32.4.2.14 Turning Vanes

All elbows shall have a full centerline radius at least 1.5 times the width of the duct. Where full-radius curves are not feasible, elbows shall be provided with turning valves. All turning vanes shall be the double radius type.

### 2.32.4.2.15 Access Doors

Access doors shall be included in ducts and plenums to provide access to fans, dampers, duct-smoke detectors, fire dampers, turning vanes, coils, filters, other devices, and where required by code. Door edges shall rest against neoprene gaskets to form an airtight enclosure. Access doors in plenums shall be hinged and furnished with latches operable from both inside and outside. Duct access doors shall be hinged or fastened by toggle tabs or wing nuts. Access doors in insulated ducts and plenums shall be insulated using sheet metal-insulation-sheet metal construction. Access door site shall be appropriate for the task. Where ducts are stacked and access is needed to the upper ducts, special consideration shall be given to the access method. Access doors shall be designed for their intended purpose and shall be in accordance with NFPA 91.

### 2.32.4.2.16 Flexible Duct Connectors

Flexible duct connectors shall be used on all fan and air-handling units to connect units to ductwork. The length of each joint shall be selected to adequately accommodate both horizontal and vertical deflections of the fan units. The flexible material shall not be less than two inches.

### 2.32.4.2.17 Insulation

The insulation on indoor ductwork shall be composite insulation with a metal jacket or an aluminum facing. The adhesive used on jacket or facing to the insulation shall meet fire and smoke hazard ratings as tested by the American Society for Testing Materials ASTM E84 procedure, the NFPA 255 procedure, and the Underwriters Laboratories, Inc. UL 723 procedures. In addition to meeting these ratings, the adhesive shall not exceed a flame spread of 25, a fuel contribution of 50, and a smoke development of 50. Accessories such as adhesives, mastics, cements, tapes, and cloths for fittings shall be similar component ratings.

Insulation shall be provided for the heating and A/C supply and return ducts, except inside air conditioning space, and ducts subject to condensation (including these inside conditioned space).

### 2.32.4.2.18 Supports

Supports shall conform to SMACNA standards as appropriate for the pressure class and seismic zone. Hangers and supports shall be designed to carry weight of duct and shall be in accordance with NFPA 91. Hangers and supports shall conform to SMACNA Seismic Restraint Guidelines.

### 2.32.4.2.19 Equipment Foundations

All floor-mounted equipment shall be placed on reinforced concrete housekeeping pads at least four inches high. Pads shall be tied to the floor by floor-reinforcing bar grid, dowels or anchor bolts.

### 2.32.4.2.20 Equipment Access

Provisions shall be made for the installation and removal of each completely factory-built item of equipment. The installation and removal of equipment from underground mechanical equipment rooms preferably shall be accommodated by providing hatches in slabs and/or providing removable gratings at grade.

### 2.32.4.2.21 Equipment Handling

Provisions shall be made in the form of monorails, lifting hooks and removable panels for the installation and removal of equipment. Structural openings shall be sized so that each complete factory-built item of equipment can be installed or removed without disassembly or special construction/demolition. The design shall include illustrated guidelines showing how equipment can be installed originally and later removed and replaced through portals or structure doorways and openings.

### 2.32.4.2.22 Vibration Isolation

All equipment that produces vibrations shall be isolated from the structure by spring or rubber-in-shear vibration isolators. All piping and ducts attached to rotating and oscillating equipment shall be isolated from such equipment by flexible connections. Inertia blocks shall be provided as required. Vibration control for environmental control systems shall be designed in accordance with the sound and vibration control chapter of the Handbook of Systems and Applications (ASHRAE).

#### 2.32.4.2.23 Air Filtration

Supply air units shall be provided with replaceable media filter sections arranged in banks as appropriate. Air filter material shall be rated UL Class 1.

#### 2.32.4.2.24 HVAC Drainage System

All drainage from HVAC systems shall be removed through waste drains only. No mechanical equipment drain shall be connected directly into any drain system. Indirect drain connectors with an air gap shall be used. Oil separators shall be installed where required by code.

### 2.32.4.3 PLUMBING AND PIPING DESIGN REQUIREMENTS

#### 2.32.4.3.1 General

The following are design conditions for general plumbing systems. These conditions are supplemented by conditions for specialty systems identified in the general heading for this section. These conditions are also subject to LEED requirements where accepted by WSDOT.

The plumbing systems shall comply with the Uniform Plumbing Code as adopted by the State of Washington and as amended by the City of Medina.

All piping systems shall be designed to meet the requirements of American National Standards Institute (ANSI) B.31 (all applicable sections) unless otherwise indicated herein. All pipe fittings, flanges, valves, and accessories shall comply with ANSI B16.10 (all applicable sections for dimensional requirements). All piping systems shall be designed and arranged for neat appearance. They shall be properly sloped for drainage and venting, and properly supported, guided, and anchored to provide complete flexibility and to maintain the integrity of all systems without any damage or leaks under all operating conditions. All valves and accessories shall be installed in a systematic manner in places accessible for operation without the use of chains or additional operating platforms. Sleeves and escutcheons shall be provided wherever pipes pass through walls. Fire-rated assemblies shall be provided for pipe passing through fire-rated walls and floor/ceiling assemblies.

#### 2.32.4.3.2 Potable Cold Water Systems

The domestic water service connection to each facility shall be sized for the total peak demand. Each service shall have a main shutoff valve and backflow preventer immediately inside the structural wall of the building. The domestic water service shall be provided with a pressure-reducing valve when city pressure at the lowest point of use inside the structure is higher than 60 pounds per square inch (psi). Water hammer arresters shall be provided for long pipe runs and branches with flush valves. In addition to the main shutoff valve, isolation valves shall be provided in branch lines and for each floor level to facilitate maintenance in individual areas without losing service for the entire facility. Pressure-reducing valves and backflow preventers shall be provided where automatic makeup for heating, ventilating, and air-conditioning (HVAC) equipment is connected to the potable water system.

#### 2.32.4.3.3 Hot Water Systems

Hot water systems for facilities having lavatories, showers, and service sinks shall include water heaters or tankless water heaters, circulating hot water pumps, hot water

distribution piping, and pipe accessories. Circulating hot water pumps shall be provided where hot water service to a fixture exceeds 20 feet in length of hot water piping. All hot water pipes serving more than a single fixture shall be sized for the simultaneous fixture demand with a minimum pipe size of 3/4 inch. All pipes shall be arranged in a systematic manner and provisions made for thermal expansion and drainage. All hot-water pipes shall be insulated. Isolation valves shall be provided for all branches to facilitate maintenance.

#### 2.32.4.3.4 Plumbing Fixtures

Water closets shall be wall-hung, of the siphon-jet, elongated-bowl type, and provided with a flush valve. Urinals shall be wall-hung, of the siphon-jet type, and provided with a flush valve. Lavatories shall be wall-hung. All wall-hung fixtures shall be supported by standard chair supports. Service sinks shall be of stainless steel or monolithic precast terrazzo equipped with a stainless steel rim guard. Water coolers shall be wall mounted, and shall have a bubbler of vandal-proof design. The service sink in the battery room shall be acid-resistant and equipped with a wall hanger, rim-guard, and standard trap. Showers shall be private compartments complete with partitions, receptors, curtain rails and curtains. The wash fountain shall be of precast terrazzo, circular or semi-circular, and foot-operated with supplies from below, and shall have a vent-off drain, powdered soap dispenser with chrome finish hardware.

Fixtures for persons with disabilities shall be as follows: In facilities having more than one toilet (for each sex), plumbing fixtures in one toilet for each sex shall be installed to accommodate persons with disabilities in wheelchairs where required. In facilities having only one toilet, plumbing fixtures shall be installed to accommodate persons with disabilities in wheelchairs in accordance with ANSI codes and the applicable provisions of the IBC and City of Medina amendments.

Hose bibs and box hydrants shall be as follows: Hose bibs shall be provided in toilet and trash rooms; battery rooms; in the vicinity of the elevator pits; at maintenance facility entrances; and other areas where periodic cleaning is required. For shops in maintenance facilities, a 3/4 –inch hose bib shall be provided with additional hose bibs so that any point of the work area is not more than 75 feet from a hose bib. All hose bibs shall be installed in walls in stainless steel boxes with flanges flush with the wall. All exterior hose bibs shall be installed in exterior walls in brass boxes with flanges flush with the wall. All exterior hose bibs and box hydrants in unheated areas shall be a non-freeze type. All exterior hose bibs shall be tamper-proof design. Hose bibs in battery rooms shall have an acid-resistant finish.

#### 2.32.4.3.5 Domestic Water Heaters

Domestic water heaters of 30 gallons or less capacity shall be electric and shall not have water softeners. Above 30 gallons, all water heaters shall be a natural gas or oil-fired type (with natural gas preferred). Water heaters shall be properly sized for the plumbing fixture demand and shall be UL listed and bear the American Society of Mechanical Engineers (ASME) stamp of approval. The requirements for water softeners and their type shall be determined by the source water quality. Water heaters shall be seismically secured in place. Where judged to be necessary, or showers are provided, a hot water return pump shall be provided for circulation. The operation of the hot water return pump shall be controlled with an aquastat located in the hot water return piping immediately before the heater.

Gas-fired water heaters shall be as follows: All gas-fired water heaters shall be of storage type, with approximately 100F recovery capacity sized for the demand of plumbing

fixtures to be served by each heater. Heaters shall be provided with electronic ignition. Heaters shall be glass-lined and equipped with temperature and safety control, and thermal insulation.

Electric water heaters shall be as follows: Electric water heaters with a capacity of 10 gallons or less shall be the instantaneous type. All electric water heaters with a capacity above 10 gallons shall be the storage type, with approximately 100F recovery capacity sized for plumbing fixture demand served by the heater. Heaters shall be glass-lined and equipped with fast–acting, dual element immersion heating, temperature and safety controls, and thermal insulation.

#### 2.32.4.3.6 Eyewash Facilities

In maintenance facilities and other buildings with water service, each battery room shall have one wall-mounted emergency eye-and-face-wash fixture, with bowl, connected to the cold-water piping system and with a direct drain to the sanitary sewer system. Where the battery room is located in a facility without water service, the capability for eye protection shall be provided by a portable eyewash apparatus. Safety equipment shall be in accordance with OSHA 29 CFR 1910.151.

#### 2.32.4.3.7 Plumbing Drains

All floor, area, and roof drains shall be of the bottom outlet type wherever possible. All drains used in membrane waterproof floors and roofs shall be provided with flashing collars securely clamped to the waterproof membranes or flashing. Floor drains in public areas shall be bronze or stainless steel finish. Finish is to be determined by floor material, which must be coordinated with the architectural requirements. Floor drains in public spaces shall be installed with vandal-proof screws. Drains for fire protection piping shall comply with NFPA 13.

Floor drains shall have trap primers. Neutralizing sump shall be provided for drains from battery rooms. Materials shall be selected to resist corrosion prior to discharge to the sanitary system.

#### 2.32.4.3.8 Traps

All traps shall be of plain pattern having a seal of not less than 2-1/2 inches and not greater than 4 inches. All traps shall be of the same material as that used for the piping system to which they are connected. All exposed traps in toilet rooms shall have chrome finish. Trap primers shall be provided where floor drains are not used frequently and as required by local codes.

#### 2.32.4.3.9 Cleanouts

Cleanouts shall be provided on all soil, waste, and drain lines for each pair of 45-degree bends and for each 90-degree bend, and for each 50 feet of straight run. All cleanouts brought to finished floors shall terminate with removable clean-out brass covers at paved tile floors, or stainless steel cover on concrete floors, flush with the floor. Cleanouts shall be of the same size as the size of pipes served for pipe that measures 4 inches and smaller; 4 inches for pipe sized 4 inches to 5 inches, and 6 inches for pipe sized larger than 6 inches. No floor cleanouts in public areas shall be provided. Floor cleanouts from public areas shall be extended to non-public areas.

### 2.32.4.3.10 Soil and Waste Systems

The soil and waste system for facilities shall include soil and waste piping from all plumbing fixtures and floor drains, sewage ejector stations, and ejector discharge piping for tunnel stations. All soil and waste pipes shall be sized for fixture demand, and as required by applicable plumbing codes and ordinances.

### 2.32.4.3.11 Vent Systems

Complete vent systems shall be provided for all soil and waste systems and sized in compliance with applicable plumbing codes and ordinances. All horizontal vent pipes shall be kept as short as possible, pitched at 1/4 inch per foot toward soil and waste pipe, than rise to the outside in the most direct way. Each vent riser shall be properly flashed at roof penetration. Vent risers for underground facilities, terminating in planting areas shall be provided with vandal-proof and rodent-proof caps.

### 2.32.4.3.12 Sewage Ejection Systems

Consideration shall be given to performance, noise, durability, standardization, and handling characteristics when selecting equipment for the sewage ejection systems. All equipment selected for the sewage ejection systems shall be a manufacturer's standard product of "suitable for competitive pricing." Subsurface facilities having toilets shall be provided with sewage ejector stations. Sewage ejector stations shall be of electric duplex vertical centrifugal wet pit sump pumps with an appropriate controller from the same manufacturer. The controller and a separate overflow alarm float shall be wired to the building information management system.

### 2.32.4.3.13 Sanitary Facilities

All drains from mop sinks, lavatories, water closets, and other miscellaneous drains/sanitary waste shall be run by gravity where feasible to existing public sanitary sewers. If gravity run cannot be accomplished, drains/sanitary waste lines shall be run to sewage ejector pits equipped with a sump equipped with non-clog duplex vertical centrifugal wet pit sump pumps as described in "Sewage Ejection Systems". The discharge shall then be pumped to the nearest public sanitary sewer line.

### 2.32.4.3.14 Pipe Unions or Flanges

To facilitate easy removal for servicing, unions or flanges shall be provided on both the inlets and the outlets of all apparatus, isolation valves, control valves, and accessories. Wherever two pipes made of dissimilar metals are connected, a dielectric union shall be used to isolate the two pipes from each other. Dielectric unions and flanges may also be required for cathodic protection, if used or planned.

### 2.32.4.3.15 Valves

Isolation valves shall be provided on both sides of such apparatus as chillers, cooling towers, pumps, heating coils, control valves, multiple installations, and piping branches. The installation of all valves shall be designed to give a neat appearance and provide easy grouping with all parts accessible for operation and maintenance. Valve stems shall be horizontal wherever possible.

### 2.32.4.3.16 Piping Accessories

To ensure the trouble-free operation of all piping systems, all required piping accessories shall be provided. These accessories shall include strainers, vent cocks, dirt-and-drop legs with drain-and-flush connections, expansion tanks, liquid flow indicators, balancing cocks, relief valves, pressure and temperature gauges, etc. All piping accessories requiring maintenance or replacement of parts shall be installed in accessible places. All dials of gauges and indicators shall be of sufficient size and arranged to be easily seen and read.

### 2.32.4.3.17 Pipe Expansion Joints

The use of pipe expansion joints shall be avoided wherever possible. Pipe systems shall be arranged to have sufficient offsets and expansion loops to accommodate thermal expansion and vibration. Pipe expansion joints may be used only where pipe expansion loops are impractical. All such expansion joints shall be of stainless steel or monel metal. They shall be the double-compensating type with an anchor in the middle. These shall be guided on both sides in strict accordance with the manufacturer's recommendation. All expansion joints shall be flanged to facilitate easy and quick replacement.

### 2.32.4.3.18 Flexible Pipe Connectors

The use of flexible pipe connectors to connect piping to heating and cooling apparatus shall be restricted to cases where providing piping offsets for flexibility is impractical. Where flexible pipe connectors are used, flexible pipe connectors shall be of stainless steel or monel construction with flanged ends for quick and easy dismantling from the pipe systems. They shall be of sufficient length to provide an overall stiffness less than the resilient mounts used for supporting the apparatus.

### 2.32.4.3.19 Pipe Supports, Hangers, Guides and Anchors

Pipe supports, hangers, guides and anchors shall be designed to assure proper alignment of all pipes for operating conditions. The forces caused by seismic events, the motion of the fluid, the weight of the fluid, piping, valves and insulation and thermal expansion/contraction shall be accounted for. All hangers and supports shall be so arranged as to prevent the transmission of vibration from the piping to the structure. Anchors and guides shall be designed to allow pipes to expand and contract without a build-up of excessive stress. Pipe rollers shall be used with all hangers where pipe movement due to expansion or contraction exceeds 0.5 inch. Spring hangers of constant or variable load types, as the case requires, shall be used when piping is connected to vibrating equipment and where supporting vertical pipes. Seismic calculations for piping supports shall be sealed by a structural engineer registered in the State of Washington.

### 2.32.4.3.20 Insulation

Composite insulation with a metal jacket or aluminum facing shall be used on indoor piping as appropriate. The adhesive for the jacket or facing to the insulation shall meet the fire and smoke hazard ratings as tested by procedures ASTM E84, NFPA 255, and UL 723. In addition, this adhesive shall not exceed a flame spread of 25, a fuel contribution of 50, and a smoke development of 50. Accessories such as adhesives, mastics, cements, tapes, and cloths for fittings shall have similar component ratings. Insulation for chilled water supply and return piping, and cooling tower condenser return (to water chiller) piping shall be two-piece, heavy density, sectional insulation jacketed with an embossed

vapor barrier laminate. Insulation for refrigeration suction piping shall be a 2-inch thick (minimum) slip-on-type premolded cellular glass.

#### 2.32.4.3.21 Freeze Protection

All water-filled piping in unheated space shall be protected from freezing during winter months. Electric-resistance tape shall be provided in addition to insulation. Provisions shall also be made to allow for the drainage of piping that will be subject to freezing temperatures.

#### 2.32.4.3.22 Domestic Water Circulation Pumps

All hot water storage systems shall have domestic hot water circulation for showers and hot water service sinks. Pumps shall be interlocked to building system controls for programming time-of-day use and energy conservation.

### 2.32.4.4 FIRE PROTECTION DESIGN REQUIREMENTS

#### 2.32.4.4.1 General

The following are design conditions for general fire protection systems and fire protection systems identified in this section. These conditions are supplemented by conditions for specialty systems identified in the general heading for this section.

The fire protection systems design shall comply with the International Fire Code, Chapter 9 as adopted by the State of Washington and amended by the City of Medina. Automatic sprinkler systems shall comply with IBC/IFC Section 903 including local amendments.

#### 2.32.4.4.2 Automatic Sprinkler Systems

The automatic sprinkler systems shall include main water supply, back-flow preventer, fire department inlet connections, all piping from inlet connections and water supply mains to sprinkler heads, drain lines, provisions for connection to remote alarm devices, pipe fittings, valves, hangers, inserts, sleeves, escutcheons, necessary tools, and appurtenances.

Automatic sprinklers shall be in accordance with NFPA 13 and Section 903 of the IFC. Piping in unheated spaces shall be freeze-protected. Where piping is subject to freezing temperatures, heat tracing or a dry pipe sprinkler system of the pre-action type with deluge valve activated through smoke/heat detectors shall be provided.

Sprinkler density and area coverage for office areas, locker rooms, storage areas, workshops, trash rooms and mechanical rooms shall be in compliance with NFPA 13.

#### 2.32.4.4.3 Standpipe Systems

Standpipe systems shall conform to the requirements of installation of Standpipe and Hose Systems, NFPA 14 and Section 905 of the IFC. Standpipe systems shall include fire department inlet connections, main water supply, piping from inlet connections to mains, hose valves, fire hose cabinets, drain lines, pipe fittings, control valves, hangers, sleeves, tools and appurtenances as required for a complete and working system.

Standpipes shall be located in every required stairway. A hose connection shall be provided for each floor level above and below grade. Hose connections shall be located at

intermediate floor level landings between floors, unless otherwise approved by the fire code official.

Fire hose cabinets shall be identified in an approved manner by a permanently attached sign with letters not less than 2 inches high in a color that contrasts with the background color, indicating the equipment contained therein in accordance with the IBC/IFC 905.7.1

#### 2.32.4.4.4 Fire Hydrants

A fire hydrant of the type approved by the Medina Fire Department shall comply with Chapter 9 of the IFC and shall be provided within 100 feet of each fire department connection to a standpipe system.

#### 2.32.4.4.5 Water Supply

A water supply system separate from a domestic water supply system shall be provided for all automatic sprinkler and standpipe systems. The adequacy of water supply shall be determined flow tests or other suitable means. Where flow tests are made, the flow rate in gallons per minute together with the static and residual pressures shall be indicated on the plans and included with calculations.

#### 2.32.4.4.6 Fire Protection Connections

Fire department connections for automatic sprinkler and standpipe systems shall be located at the primary entrance to the Bridge Maintenance Facility and Dock as determined in accordance with local municipal code, and IFC Section 612, or as approved by the Fire Code officials.

#### 2.32.4.4.7 Portable Fire Extinguishers

Portable fire extinguishers shall be provided in accordance with NFPA 10 and as modified by these criteria.

Portable fire extinguishers, carbon dioxide type, shall be provided in power substations, signaling rooms and communication rooms in addition to ABC extinguishers. Maximum travel distance to the nearest group of extinguishers shall be 50 feet.

#### 2.32.4.4.8 Fire Protection Valves

All valves for water service shall be made of bronze with screwed ends for up to 2-inch sizes, and IBBM (iron body, bronze mounted) with flanged ends for 2-1/2 inches and larger sizes. Valves shall be tagged and charted. All control valves in water supply piping to the automatic sprinkler and standpipe systems shall be continuously monitored with the use of tamper-proof switches, which are UL listed.

#### 2.32.4.4.9 Fire Protection Piping

All piping systems shall be designed to meet the requirements of the Code of Pressure Piping, ANSI A21, B31, and B125 in all applicable sections. All pipe fittings, flanges, valves, and accessories shall comply with the requirements of ANSI B16, in all applicable sections for dimensional requirements. All piping systems shall be design and arranged for neat appearance, properly sloped for drainage and venting, properly supported, guided, and anchored to provide complete flexibility, and maintaining the integrity of all systems. Piping shall be accessible and shall not be embedded in concrete structures unless embedment is unavoidable because of architectural or structural requirements.

Fire protection system piping must be acceptance tested by the State of Washington or City of Medina inspector prior to burying or covering.

#### 2.32.4.4.10 Electronic Detection and Fire Alarm Integration

Provide intelligent interface devices at each sprinkler flow and OS&Y valve and annunciate alarm and supervisory/trouble alarms in the fire alarm system by unique location name as agreed to by WSDOT.

Preaction Systems: Fire alarm system will provide intelligent interface device and monitor and annunciation alarm or trouble supervisory signals. Alarm and supervisory / trouble signals shall be identified by unique location name as agreed to by WSDOT.

Fire alarm system automatic and manual fire alarm devices: Addressable and alarms shall be annunciated and identified by unique location name as agreed to by WSDOT.

### 2.32.4.5 DIESEL FUEL STORAGE AND HANDLING DESIGN REQUIREMENTS

#### 2.32.4.5.1 General

The following are design conditions for general diesel fuel storage and handling systems. These conditions are supplemented by conditions for specialty systems identified in this section.

The diesel fuel system shall comply with the NFPA 30 Flammable and Combustible Liquids Code, the International Mechanical Code and the International Fire Code as adopted by the State of Washington and amended by the City of Medina.

All piping systems shall conform to the above standards, shall be rated for the operating temperatures and pressures of the system, and shall be compatible with the type of liquid. Fittings and valves shall be approved for the piping systems, and shall be compatible with the piping. Flexible connections and hoses shall be listed and labeled in accordance with UL listing. Proper allowance shall be made for expansion, contraction, jarring and vibration without impairing the tightness of the piping connections.

#### 2.32.4.5.2 Aboveground Storage Tanks

The aboveground diesel fuel storage tank shall be the product of a manufacturer regularly engaged in diesel fuel tank design and installation. Tank shall be UL 142, single-wall, vertical, steel tank with concrete vault and containment (See section below on concrete vaults and containment) or UL142, double-wall, vertical, steel tank with primary and secondary containment walls and interstitial space, and located in a building space acceptable to building department. Fabricate with welded, carbon steel suitable for operation at atmospheric pressure and for storing diesel fuel with specific gravity up to 1.1 and maintained temperature up to 150 deg F.

The Design-Builder shall size tanks for intended service as listed in Section 2.30. Provide all necessary pipe connections and include manhole with ladders for cleaning. Tank shall be painted with manufacturer's standard prime coat to exterior steel surface and standard two-component epoxy finish coats.

#### 2.32.4.5.3 Concrete Vault and Containment

Where acceptable to the local authority, single-wall tanks are acceptable if installed with concrete walls for secondary containment using interstitial space and high rim access for oil containment.

### 2.32.4.5.4 Diesel Fuel Tank Accessories

Tank manholes shall be 22-inch minimum diameter, bolted, flanged and gasketed, on top and at side of tank.

Threaded pipe connection fittings on top of tank shall have fill, supply, return, vent, and gage. Include cast iron plugs for shipping.

Lifting lugs for handling and installation and ladders. Carbon-steel ladder inside tank, anchored to top and bottom, including reinforcement of tank at bottom of ladder. Carbon-steel ladder outside tank, anchored to top and side wall.

### 2.32.4.5.5 Diesel Fuel Valves

The diesel fuel supply line shall have an approved antisiphon valve or other siphon-breaking device where the supply level is above the inlet connection and where the supply line is taken from the top of the tank.

Diesel fuel valves shall include a supply shutoff installed at the tank and shall be capable of stopping the flow of diesel fuel to appliances served. An appliance shutoff valve shall be installed at the connection to each appliance where more than one diesel fuel appliance is installed. A relief valve shall be provided between shutoff valves when the pressure is expected to exceed the limitations of the system. The discharge line shall connect to the diesel fuel tank.

### 2.32.4.5.6 Diesel Fuel Piping

Piping systems shall conform to the reference standards listed above. Piping outside the maintenance facility, including the approach pier and dock diesel fuel piping, shall be double-containment type. The Design-Builder shall install piping in sleeves and furnish and install sumps where necessary for transitions.

Flexible, double-containment piping shall comply with UL 971 and shall be the product of Environ Products, Inc or OPW Manufacturer or approved equal. The Design-Builder shall include listed pipe materials for carrier pipe and containment pipe and couplings, sumps, sump entry boots, pipe adapters with test ports and tubes, coaxial fittings and couplings, transition fittings and assemblies with a provision for field installation of a cable leak-detection system in annular space between carrier and containment piping.

System piping shall include strainers, manual air vents, manual shutoff valves, pressure relief valves, oil-safety valves, emergency shutoff valves and mechanical leak detection.

### 2.32.4.5.7 Diesel Fuel Maintenance System

The Design-Builder shall provide a fuel maintenance system for diesel engine-driven equipment. The system shall include a diesel fuel maintenance test plan to circulate diesel fuel from the storage tank through filter and back to storage tank to remove particulates, biogrowth, and moisture that accumulates as the fuel ages. The test plan shall take into account diesel fuel use by periodic replacement of diesel fuel and by periodic addition of stabilizers.

The Design-Builder shall submit a diesel fuel maintenance test plan for review abd comment. The system shall be factory fabricated and wired for diesel fuel filtration with enclosure, filter, diesel fuel pump, and controls; and shall be FM approved, listed and labeled by an NRTL acceptable to authorities having jurisdiction.

#### 2.32.4.5.8 Liquid-level Gage System

An aboveground tank shall be provided with devices for both visual and audible indication during filling operations. The Design-Builder shall provide a remote annunciator panel with visual and audible high-tank-level and low-tank-level alarms, a diesel fuel indicator with registration in gallons, and an overfill alarm. The Design-Builder shall include a gage volume range that covers diesel fuel storage capacity.

#### 2.32.4.5.9 Leak-Detection and Monitoring System

The Cable and Sensor System for leak detection shall comply with UL 1238. The system shall include probes and other sensors, and a remote alarm panel for diesel fuel storage tanks and diesel fuel piping.

### 2.32.4.6 COMPRESSED AIR DESIGN REQUIREMENTS

#### 2.32.4.6.1 General

The following are design conditions for general compressed air systems. These conditions are supplemented by conditions for specialty systems identified in the general heading for this section.

The compressed air system design shall comply with Chapter 30 of the International Fire Code and the International Mechanical Code for pressure vessels as adopted by the State of Washington and City of Medina.

The compressed air system design for the Bridge Maintenance Facility and Bridge Maintenance Dock shall produce power for hand tools only. Air for process, i.e. to mix or aerate; air for instruments, i.e. to initiate or modulate; or breathable air is not a requirement. Air for power tools shall be maintained at 90 psi plus 10% for line losses.

#### 2.32.4.6.2 Air Compressor, Receiver and Aftercooler

The compressor with receiver shall be factory assembled, wired, piped, and tested; and shall be electric motor-driven, air cooled, continuous-duty type. The control panel shall include a motor controller, motor overload protection, a starting device, instrumentation devices and alarm signal devices. Receivers shall include a pressure rated tank, corrosion-resistant interior finish, safety valve, pressure gage, drain, pressure reducing valve and mounting frame.

The air compressor shall be lubricated, reciprocating type, horizontal arrangement. The Design-Builder shall provide a 20 hp, 1750 rpm unit unless otherwise noted.

The inlet air filter shall have housing for a replaceable, dry-type filter element, with silencer tubes or another method of sound reduction. The capacity of the inlet air filter shall match the capacity of the air compressor with a filter having the collection efficiency of 99 percent retention of particles larger than 10 micrometers. The silencer shall meet both interior and exterior noise requirements as specified in the City of Medina noise ordinance, and interior (occupied areas) noise requirements as specified in ASHRAE references.

The Air-Cooled, Compressed Air Aftercooler shall be an electric-motor-driven, fan-operated, finned-tube unit sized to cool compressed air in compressor-rated capacities to within 10 degrees above summertime maximum ambient temperature. The unit shall include a moisture separator and automatic drain. The Design-Builder shall provide piping to drain locations.

For Equipment Foundation, Equipment Access, Equipment Handling and Vibration Isolation, refer to Section 2.32.4.2

#### 2.32.4.6.3 Piping, Fittings and Valves

All piping systems shall be designed to meet the requirements of ASTM B88, Type L. All pipe fittings, flanges, valves and accessories shall comply with manufacturers' recommendations and ASTM standards for wrought-copper fittings, cast-copper alloy flanges and copper unions. Joining materials shall be solder or brazing filler metals. All piping systems shall be designed and arranged for a neat appearance; properly sloped for drainage, with drop-legs at all branch connections; properly supported, guided and anchored to provide complete flexibility. A flexible, compressed air hose shall be used for precast duct bank on the pier and dock structure. Hose assemblies shall have compatible hose clamps and couplings suitable for compressed air service and rated for 300 psig. Hose reinforcement shall be single wire braid, with a cover to permit ease of installation in precast duct bank.The hose size shall limit pressure drop to achieve the desired operating pressure of 90 psi. For more information, refer to Section 2.30.

#### 2.32.4.6.4 Dielectric Fittings or Flanges

Dielectric fittings or flanges shall be used with assembly of copper alloy and ferrous materials. The Design-Builder shall provide separating nonconductive insulating material, and shall include end connections compatible with the pipes to be jointed.

#### 2.32.4.6.5 Flexible Pipe Connectors

Flexible pipe connectors shall be used at the air compressor discharge for vibration isolation and where necessary to preserve the integrity of the system.

#### 2.32.4.6.6 Safety Valves

Safety valves shall be provided in accordance with building and mechanical code requirements. Valves shall be certified, labeled and factory sealed.

#### 2.32.4.6.7 Pressure Regulators, Filters, Lubricators

Air line pressure regulators shall be diaphragm operated, direct acting, spring-loaded and manually operated for the desired pressure setting.

Coalescing filters shall have activated carbon capable of removing water and oil aerosols and changing color to indicate carbon is saturated.

Air line lubricators shall have a drip chamber and sight dome for observing the oil level in the air steam.

#### 2.32.4.6.8 Automatic Drain Valves

Drain valves shall be capable of automatic discharge of collected condensate. The Design-Builder shall provide an automatic drain valve on the receiver tank.

#### 2.32.4.6.9 Quick Couplings

The Design-Builder shall provide an assembly with a locking mechanism feature for quick connection and disconnection of the compressed air hose. Quick couplings shall be used at all hose connections. Quick couplings shall be manufactured by Aeroquip, Parker Hannifin, Swagelok or accepted equal.

# 2.32.5 MATERIAL SPECIFICATIONS AND SYSTEM REQUIREMENTS

## 2.32.5.1 GENERAL

The Design-Builder shall provide design and construction for Mechanical Bridge and Services in accordance with the material specifications and system requirements listed herein.

The Design-Builder shall provide non-corrosive bolts, anchors and other attachments. All steel fabrication shall be hot-dipped galvanized. Exposed steel components on the Maintenance Facility Dock shall be ASTM A276 type 316 stainless steel.

The technical specifications as listed are intended to compliment work in the Architectural portion of Section 2.30. If conflicts between sections occur, the requirement in Section 2.30 shall take precedence.

The technical specifications as listed are intended to compliment work for the Maintenance Sheds and other enclosures in Section 2.12.

### 2.32.5.1.1 Plumbing Piping

Drain, Waste, Rainwater, and Vent Piping (Below Grade) shall be service weight cast iron meeting ASTM 74/ASTM 120 requirements. Soil pipe and fittings shall have bell and spigot joints or, no-hub cast-iron pipe with elastomeric sealing sleeves and stainless steel clamps, conforming to CISPI 301 requirements if permitted by local plumbing authority.

Drain, Waste, Rainwater, and Vent Piping (Above Grade) shall be service weight cast iron meeting ASTM 74/ASTM 120 requirements. The Design-Builder shall use no-hub cast-iron pipe with an elastomeric sealing sleeve and a stainless steel clamp conforming to CISPE 301, or galvanized steel with cast-iron drainage type fittings meeting ASTM C564 and CISPE 310 requirements.

Condensate and Drip Drainage Piping shall be copper DWV piping with drainage fittings.

Water Piping (Above Grade) shall be Type L hard drawn seamless copper water tube meeting ANSI H23.1 and ASTM B88 requirements, and cast brass or wrought copper pressure fittings meeting ASNI B16.22 requirements.

Water Piping (Below Grade) shall be Type K soft copper tube meeting ANSI H23.1 and ASTM B88 requirements.

Fittings shall be copper pipe fittings with cast brass or wrought copper pressure fittings, meeting ANSI B16.22 requirements; or cast bronze brazed/solder joint fittings and screwed adapters, meeting ANSI B16.18 requirements.

Fittings shall be copper pipe fittings with cast brass or wrought copper pressure fittings, meeting ANSI B16.22 requirements; or cast bronze brazed/solder joint fittings and screwed adapters, meeting ANSI B16.18 requirements.

### 2.32.5.1.2 Plumbing Valves

Gate valves shall be 150-pound bronze with a screwed or brazed/solder end, union bonnet, rising stem, solid bronze disc, and shall be repackable under pressure. It shall meet ASTM B62 requirements.

Globe or Angle valves shall be 150-pound bronze with a screwed or brazed/solder end, union bonnet, rising stem, solid bronze 500 BHN disc and seat ring or Teflon disc, and shall be repackable under pressure. It shall meet ASTM B62 requirements.

Check valves shall be 150-pound bronze with a screwed or brazed/solder end, screwed cap, Y-pattern, swing disc and regrindable seat, and shall meet ASTM B62 requirements.

Ball valves shall have a 150-pound bronze or brass body, ball and stem; brazed/soldered or screwed ends, and three-piece construction with a Teflon seat and seal.

#### 2.32.5.1.3 Plumbing Hangers

The Design-Builder shall provide plumbing hangers in accordance with Federal Specification WW-H-171D and MSS SP-69.

Acceptable Manufacturers are ITT-Grinnell, Fee & Mason, Elcen, Unistrut, Powerstrut, and Superstrut.

The Design-Builder shall match piping material at the point of contact with piping; carbon steel, cast iron, or malleable iron for black steel pipe; carbon steel, malleable iron with zinc coating or cadmium-plated for galvanized steel pipe; carbon steel or malleable iron with copper finish or PVC plastic coated for copper pipe or plastic pipe.

Rods shall be hot rolled steel, meeting ASTM A36 requirements, and be sized in conformance with the following:

| Rod Diameter (Inches) | Pipe Size (Inches) | Load at 650F (Pounds) |
|---|---|---|
| 3/8 | 2 and smaller | 610 |
| 1/2 | 2.5 and 3.5 | 1,130 |
| 5/8 | 4 and 5 | 1,810 |
| 3/4 | 6 | 2,710 |
| 7/8 | 8 to 12 | 3,770 |

Ring hangers that are 2 inches and smaller shall be the adjustable swivel type, Grinnell 97 or 104. 2.5 inches and larger shall be the adjustable split-ring swivel type, Grinnell Figure 104.

Clevis hangers shall be Grinnell Figure 260.

Trapeze hangers and multiple pipe supports shall be structural steel, supported by rods or structural steel shapes as required.

Horizontal pipes at walls that are 2.5 inches and smaller shall be malleable iron, one-hole clamp. Grinnell 126. 3 inches and larger shall be welded–steel bracket. A Grinnell Figure 213, 194, 195, 199 shall be used in conjunction with ring or clevis hangers.

Vertical pipes at walls that are 1 inch and smaller shall be galvanized steel pre-formed metal shapes, of the Unistrut P1100 Series with P2024 clamps for OK tubing and P2909 clamps for pipe. Vertical pipes at walls that are 2.5 inches and smaller shall be galvanized steel pre-formed metal shapes, of the Unistrut P1100 Series with P2558 pipe straps. Vertical pipes at walls that are 3 inches and larger shall be welded-steel brackets as specified for horizontal pipes at walls, connected to a Grinnell Figure 212 pipe clamp with a Figure 110R eye socket.

Insulation Protection: The Design-Builder shall coordinate with the insulation subcontractor.

### 2.32.5.1.4 Heat Tracing Tape

The Design-Builder shall use self-regulating heat tracing tape system manufactured specifically for protection of piping from freezing. The system shall include all disconnects, power, thermostat control required. Installation and connection to the proper circuit shall be coordinated with building electrical.

The Design-Builder shall apply and test any heat tracing tape or freeze protection after pipe has passed pressure testing, but prior to applying insulation.

### 2.32.5.1.5 Plumbing Piping Insulation

The Design-Builder shall comply with requirements of the Washington State Energy Code for thermal value, density, and thickness. Generally piping subject to moisture or condensation shall be insulated with closed cell rubber foam insulation complying with required fire and flame spread ratings. Dry piping shall be insulated with rigid glass fiber product or closed cell rubber foam. The Design-Builder shall provide all exposed insulated piping with an abrasion resistant-cover to prevent damage to insulation from incidental contact. The Design-Builder shall protect piping insulation exposed outdoors with embossed soft aluminum sheet.

Underlavatory Guard: The Design-Builder shall provide white, antimicrobial, molded-vinyl covering for supply and rain piping assemblies intended for use at accessible lavatories to prevent direct contact with and burns from piping. The Design-Builder shall provide components, as required, for applications indicated with flip tops at valves that allow services access without removing coverings.

### 2.32.5.1.6 Domestic Water Circulation Pumps

Acceptable manufacturers shall be Armstrong, Bell and Gossett, and Taco. Type shall be in-line centrifugal, bronze fitted for domestic water service, 125 psi working pressure, 230 degrees Fahrenheit working temperature. Pump shall be bronze casing with non-ferrous impeller. Seal and bearings shall be the mechanical type, ceramic with carbon faces. The motor shall be a permanent split capacitor or electronically commutated.

### 2.32.5.1.7 Typical Plumbing Fixtures

Floor Drains: The Design-Builder shall provide a general room floor drain. An outlet shall be provided that is compatible with drainage loading with a minimum 6-inch-diameter grid strainer. A cast iron body shall also be provided with flashing collar, nickel bronze adjustable strainer head, and a trap primer connection.

Floor Drain Funnel: Same as Floor Drain above, with funnel.

Cleanouts and Cleanout Access Covers: The Design-Builder shall provide a caulked or threaded type cleanout access cover extended to the finished floor or wall surface. Provide ample Ample clearance at cleanout shall be insured for rodding of drainage system. Floor cleanout access covers in unfinished and finished areas shall be round with nickel bronze scored frames and plates. Round access covers shall be provided in finished areas with a depressed center section to accommodate the floor finish. Wall cleanouts shall have chrome-plated caps.

Water hammer arrestors must be the bellows type, with a compression chamber pre-charged with inert gas, stainless steel casing, and bellows. Sizes must comply with PDI Stand WH-201; Wade, Zurn, or accepted equal.

Trap primers shall be provded at all drains; they must be Zurn Z-1022, JR Smith S-2699, Josam 1465, or Precision Plumbing Products P-1 or P-2.

### 2.32.5.1.8 Plumbing Hardware

Trim shall be provided that has brass faucet handles; exposed metal parts, and be comprised of chrome plate over nickel.

Escutcheons shall be provided by the Design-Builder at each point where a pipe or other fitting enters the wall or ceiling, and at each plumbing fixture.

Anchors: No equipment or fixture anchors shall be plastic. Anchors and supports shall be cast iron or welded steel channel and galvanized.

Stops: The Design-Builder shall provide stops in water connections to lavatories, and sinks; a compression inlet; and a loose key pattern with shield, as manufactured by Speedway, Brasscraft or accepted equal. No plastic stems shall be used, only chromed brass. Check stops shall be provided for mixing fixtures and faucets. However, no added stops are required where shower mixing valves or service sink faucets have check stops as part of the assembly. Exposed supplies from stops to faucets for lavatories shall be 1/2 inch outer diameter. Tubing shall have one end brazed or formed for the compression joint.

Traps shall be chrome plate 17 gage brass seamless tubing manufactured by Bridgeport, Frost, or Brasscraft, and imprinted with the manufacturer's name and gauge, and be of ground joint brass connection Sterling Series 24000, or Frost No. 6440 or 6457 Series, on outlet of each trap.

### 2.32.5.1.9 Water Closets

Water closets shall have a bowl, a wall-mounted elongated siphon jet, and a water saver of 1.5 gallons per flush. Seats shall be an open front seat type, less the cover. Flush valves shall be 1.6 gallons per flush maximum and consist of a dual flush, automatic flush valve. Carrier shall be double or single, as required. Cast iron no-hub pipe, pipe connections, and a 2-inch vent shall be provided with an adjustable faceplate, foot support, coupling, fixture bolts, trim, and gasket. Manufacturer should be Zurn 1200 or an accepted equal.

Water Closet Type Accessible shall be wall hung and accessible, similar to above. The Design-Builder shall verify the mounting height and shall perform installation in accordance with SBC and Washington State amendments and WAC 51-40.

### 2.32.5.1.10 Lavatories

Lavatories shall be the self-rimming vitreous china oval type. Faucets shall be the single facet mixing type. Thermostatic mixing valve assembly shall consist of one for each lavatory and provide 80 to 120 degrees Fahrenheit mixing range. Valve shall have in-line check valves and 1/2 inch connections. Installation shall include check valves under the counter and behind the hinged access panel, and be set to 100 degrees Fahrenheit delivery temperature. Traps shall have insulated trap wrappings. The Design-Builder shall provide a Trubro "LavGuard," Brocar "TrapWrap."

### 2.32.5.1.11 Sinks

Counter sink shall be of self-rimming 18-gauge stainless steel and be ADA compliant. The Design-Builder shall provide counter sinks with a 6.5-inch depth, cup strainers, tailpieces, traps, and stops. Faucet shall be deck mounted with four-inch centers and

blade handles that permit the spout to swivel. The High Temperature Hot Water Dispenser shall have an instant hot water heater with water heated to 190 degrees Fahrenheit; be of 1/2 gallon tank size, 750 watts, and 115V. Insulated trap wrappings shall be used on traps. The Design-Builder shall provide a Trubro "LavGuard," Brocar "TrapWrap."

Service Sink shall be the floor-mounted vitreous china service sink type. Faucet shall be wall mounted with a bucket hook and a vacuum breaker.

#### 2.32.5.1.12 Urinals

Urinals shall be the water-saving vitreous china type with a 1.25-inch spud inlet, and provide a two-inch threaded outlet, low flow, and 0.5 gallons per flush. The carrier shall be steel uprights with an adjustable plate support system, a bottom bearing plate, support feet, bearing jacks and mounting fasteners. The Flush Valve shall be 0.5 gallons per flush with an automatic flush valve. The power wiring to the power converter shall be in accordance with Section 2.17. The plumber shall retain a low-voltage electrician to provide and install low voltage wiring between the converter and sensor, and the sensor and valve operator, as part of this Project.

#### 2.32.5.1.13 Drinking Fountain

The drinking fountain shall be dual level. The Design-Builder shall provide a fountain fabricated from stainless steel, including bottom cover plates and drain and trap assembly. Standard stainless steel satin finish, mounting plate, and all installation accessories shall be provided.

#### 2.32.5.1.14 Recessed Non-Freeze Wall Hydrant

Recessed non-free wall hydrant shall be enclosed and automatically self-draining. The hydrant shall be complete with non-freeze backflow prevention, all bronze interior parts, and bronze casing. The hydrant should be a nickel bronze box with a hinged key access cover with "Water" cast into cover.

#### 2.32.5.1.15 Emergency Shower / Eyewash

The Design-Builder shall provide a combination shower and eye/face wash with a showerhead wrap around the eye/face wash. A pull rod activated shower shall be provided. A push flag or foot treadle shall activate the eye/face wash. Emergency shower/eyewash shall be certified by CSA to meet the ANSI Z358.1 shower head with an integral 20 gpm flow control. The pull rod shall be comprised of stainless steel with a handle. The eye/face wash head eyewash flow control shall have a 6.25 gpm flow control assembly. The assembly controls shall regulate the water flow rate when flow pressure is between 30 and 90 psi. A dust cover and receptor shall be provided. Covers shall be the Omni-Flow face spray type, and be Model SP225 chrome-plated brass stay-open ball valve, equipped with a stainless steel ball and stem. Signage shall be coordinated with WSDOT health and safety. The Design-Builder shall provide tempered water blending systems if required to maintain the required discharge water temperature.

#### 2.32.5.1.16 Shower

Showers shall be the fiberglass insert type, or constructed in place and finished with tile. The Design-Builder shall provide a valve and head pressure balanced shower valve, shower head, arm and flange, and integral service stops.

ADA Accessible Shower shall include a pressure balanced shower valve, shower head, arm and flange, integral service stops, and be ADA compliant. A wand, wall fitting, and stainless steel hose shall be provided.

Shower Floor Drain shall be the 6-inch diameter type with a grid strainer. The drain shall have a cast iron body with flashing collar, a nickel bronze adjustable strainer head, and a trap primer connection.

#### 2.32.5.1.17 Pressure Reducing Valves

Pressure reducing valves shall have a bronze body construction, a stainless steel replaceable seat, an integral strainer, be self-operated, and spring and diaphragm activated. The valve shall be furnished with a built-in thermal expansion bypass check valve.

#### 2.32.5.1.18 Main Area Roof Drain

The main area roof drain shall have a cast iron body, a cast iron clamp device, an integral gravel guard, a polyethylene dome strainer, a sump receiver, and an underdeck clamp. The overflow roof drain shall be similar and be provided with a 2-inch wire assembly or be mounted 2 inches higher than the main drain assembly.

#### 2.32.5.1.19 Double check Valve Assembly (DCVA)

The double check valve assembly shall have a double check valve backflow preventer. It should be of bronze construction, spring loaded, and have stainless steel check assemblies. It should be pressure rated to 175 psi over an operating temperature range of 32 to 140 degrees Fahrenheit. The Design-Builder shall provide the assembly as approved by local jurisdiction and/or municipality for cross connection control; manufactuers shall be Febco, Zurn, or an accepted equal.

#### 2.32.5.1.20 Domestic Hot Water Heaters

The domestic hot water heater shall be natural gas fired/electric domestic, with a storage capacity as required by application. The heater shall have a glass-lined tank and be rated at 150 psi working pressure. The heater shall be listed by UL and satisfy ASHRAE 90 requirements. The heater should be furnished installed with a temperature and pressure relief valve.

The water heater expansion tank shall be bladder type and be sufficient to accommodate system expansion.

The seismic brace shall be a galvanized steel strap brace and be secured with its back to the wall. Manufactuer shall be Hold Rite or an accepted equal.

#### 2.32.5.1.21 Incinerating Toilet

The toilet for bridge maintenance shed(s) shall be the electric type for full-time heavy use, with bowl liners. The Design-Builder shall provide venting and ventilation as recommended by the manufacturer. Toilet shall be Incinolet or equal and have NSF certification.

#### 2.32.5.1.22 Sleeves

The footing encasement sleeve shall be Schedule 80 PVC sleeve.

Floor, wall and roof sleeves shall be Schedule 40 steel pipe, ASTM 120/A53, standard weight. Floor sleeves shall be extended up a minimum of 2 inches beyond penetration and the seal perimeter to provide a dam for accidental spills. The annulus between the pipe and sleeve shall be sealed with intumescent (fire sealant) caulk.

Below grade walls, floors shall be a rubberized link assembly fitting in the wall/pipe annulus with compression/expansion adjusted by through bolts. Manufacturer shall be Link Seal or an accepted equal.

## 2.32.5.2 HVAC MATERIALS SPECIFICATIONS

### 2.32.5.2.1 Fans and Air Handling Equipment

The Design-Builder shall connect factory–assembled, air-handling units for HVAC application to a hot water heating and chilled water cooling HVAC system.

### 2.32.5.2.2 Heat Pumps

The Design-Builder shall furnish and install high-efficiency water source heat pumps as required to comply with requirements and with adequate capacity to condition anticipated loads. A sound attenuation package shall be provided, as required, along with safety controls and a hot gas bypass option as required for partial load operation, a pleated air filter, neoprene reinforced fiberglass flexible connections between heat pump connections to supply and return ductwork, metal braided hoses for pipe connections, and supplemental auxiliary heating units where required.

### 2.32.5.2.3 Computer Room Air Conditioning

Cooling units shall be designed to control temperature and humidity conditions in rooms containing sensitive equipment or with activities and functions with stringent environmental tolerances. The system shall be self-contained with fans, coils, compressors, humidifiers, controls and sensors to condition and control the temperature and humidity.

Cooling units shall be selected by considering the global aspects of the building mechanical systems (water source heat pump, chilled/heating water, etc,) environmental conditioning tolerances, redundancy requirements (N+1), and other requirements as may be applicable.

The arrangement of cooling units considered for the purposes of this specification have been with a standard “hot isle – cold isle” arrangement. The cooling units blow down into a raised floor plenum, and the plenum has openings into the bottom, or in front of (with perforated floor tiles) equipment racks. The air movement through racks may generally favor distribution in front of the rack. “Chimneys” may be utilized to discharge warm air to a ceiling plenum to separate warm air discharged from the racks from cool air supplied by the floor.

Unit shall include an infrared type humidifier to reheat coils with SCR control for capacity modulation, refrigerant R-407C or other refrigerant complying with sustainability requirements, a seismic rated floor stand, a return air plenum sleeve, and a water connection to the humidifier.

### 2.32.5.2.4 Fans and Air Moving Devices

Fans shall be of the arrangement and configuration as required by the design application.

Fans exceeding 1/3 horsepower shall have airfoil fan wheels that are non-overloading, and are fully welded to the solid backplate and inlet shroud.

Fans 1/3 horsepower and less shall have forward curved fans with blades that are mechanically fastened in an accepted manner. The use of propeller type fans is discouraged.

Drives shall be the V-belt type with cast iron sheaves, Browning or equal. Motor sheaves shall be the adjustable pitch diameter type in sizes to 7.5 horsepower. Drive belt sets shall be factory matched, Gates or equal. Drive assemblies shall be rated at 150 percent of the nominal motor horsepower.

Motors shall be standard NEMA frames. Integral horsepower motors shall be ball bearing, rigid mounted, TEFC with sealed and permanently lubricated bearings. Motor speeds shall not exceed 1750 rpm. Motors shall be rated in writing by the manufacturer for variable frequency drive service.

#### 2.32.5.2.5 Variable Air Volume Terminals

The Design-Builder shall provide variable air terminal units as required for the application.

The air volume damper, fans (where applicable) shall be factory assembled into a single cabinet. Cabinets shall be a minimum of 22 gauge galvanized steel. Internal surfaces shall be acoustically and thermally insulated with 1-inch-thick glass fiber material, surface treated to prevent erosion, and having a UL approval meeting NFPA 90A. The air volume damper assembly shall be located within the unit casing and shall be constructed from galvanized steel. The air damper shall be constructed to prevent air leakage in excess of 2 percent of rated air quantity at 1-inch inlet static pressure.

Fan powered terminal units shall be the forward curved centrifugal type with a direct drive ECM motor with infinitely adjustable speed control. Fan/motor assembly shall be internally mounted and isolated from the casing on rubber isolators to minimize vibration transmission. Unit shall have a single point electrical connection to a factory unit-mounted and wired, fused disconnect switch. Terminals shall have been tested in complete accordance with the latest revision of ARI Industry Standard 880 for Air Terminal in the laboratory that is ARI-certified to conduct the acoustical test.

Performance shall be based on a test conducted using ASHRAE Standard 36 and ADC Standard 1062R4 as guidelines, where applicable, with no ductwork located between the unit discharge and the measurement room.

Terminal unit controls shall be EMCS Energy Management and Control System (EMCS). Terminal units shall come with a factory-installed air average velocity sensor that is compatible with the EMCS and Temperature Control System. Units shall be UL or ETL listed.

Terminal unit sound power levels for radiated and ductborne sound shall comply with acoustical specifications.

The bottom of each terminal unit shall be marked with the required CFM (maximum and minimum primary air) and mechanical drawing call-out. The notation on each unit shall be clearly visible and easily read from a standing position on the floor.

### 2.32.5.2.6 Dust Collection

The Design-Builder shall provide a cartridge or bag style dust collector as required by application.

Cartridge Style: The collector shall be an aspirated cartridge, continuously operating, and be the self-cleaning type. Construction shall be of galvanized steel sheets and tubular steel structural members. Major sections shall be of welded construction. Cartridges shall be installed and removed, accessible by hinged and gasketed access doors.

Welded lifting lugs shall be provided. The unit shall be available with resettable Brixton latch type explosion vents on the side of the collector should conditions require use of an explosion vent(s).

The hopper section shall contain the hoppers and integral fabricated support legs. Support legs shall be adjustable in height to accommodate different dust discharge devices, or meet specific height clearance conditions. Hopper(s) shall accommodate 55-gallon drums via a transition, flex connector, slide gate (for isolation) and drum cover. A rotary air lock shall be provided if required.

Fans shall be designed for mounting on the collector, radial wheel, direct drive, and be AMCA rated. Fan wheels shall be of steel or spark-resistant aluminum construction, as required. Fan shall be sized to handle static pressure requirements of the collector and external system. A mounted damper shall be supplied with the fan for capacity control. A mounted fan silencer shall be provided to control sound levels generated by the dust collector. A fan sized adequately to accommodate pressures imposed by the collector and dust collection duct system shall be provided. Standard enclosures shall be NEMA rated as applicable.

A mounted secondary safety filter shall be provided to filter recirculated air. Safety filters available shall be a minimum ASHRAE 95-percent efficiency. Safety filters shall be mounted on the dust collector package.

The collector shall be phosphatized, painted with zinc chromatic primer, and finished in an enamel top coat. An epoxy-based finish topcoat shall be provided.

### 2.32.5.2.7 Electrical Unit Heater

A wall mounted, fan powered electrical heater of size and capacity shall be provided, as required by application. The electrical heating elements shall be the low temperature type, and be enclosed-style made of steel with the spiral fin copper brazed to the element. The unit shall utilize a line voltage control circuit and include an automatic high limit. A control contactor shall be provided in heating housing.

Heater housing shall be fabricated of welded steel construction and finished in baked enamel. The heater shall be UL listed; manufacturers shall be King, Vulcan, or an approved equal.

### 2.32.5.2.8 Ductwork

All ductwork shall be fabricated exclusively from new galvanized steel sheet or coil stock and comply with SMACNA HVAC Duct Construction Standards, Metal and Flexible, galvanized steel. Construction shall be in accordance with SMACNA HVAC Duct Construction Standards. Product conveying ductwork shall have construction and gauge in accordance with pressure class and SMACNA Duct Construction Standards.

Ductwork Fittings: Branches shall be fabricated with increased area take-offs, with a 45-degree taper fitting boot connection to the main duct. Elbows shall be the fabricated radius type with a minimum turning radius to width ratio of 1.5. Rectangular elbows shall be fabricated with turning vanes.

Turning vanes shall be the acoustical double thickness type with runners; manufactuers shall be Acousti-San or an accepted equal. Rectangular elbows with turning vanes shall be provided.

Hangers, supports, and anchor bolts for sheet metal work and equipment shall be provided, and shall comply with SMC, SMACNA, Mandatory Standards, and other applicable industry standards.

Fume ductwork shall be 18-gauge butt-welded 316L stainless steel or other approved materials in accordance with SMACNA HVAC Duct Construction Standards. Consider providing weatherproof fans on mechanical room level to keep the fume ductwork under negative pressure as it routes through the building. Ducts that are round, non-combustible with liquid and air tight joints shall be provided.

Duct leakage testing shall be performed in accordance with SMACNA requirements. Leakage shall conform to the limits specified by SMACNA for the appropriate duct seal class. All leaks disclosed by testing shall be repaired and re-tested to confirm compliance.

#### 2.32.5.2.9 Duct Insulation

All ductwork shall be insulated to comply with the thermal, thickness, and density requirements of the Washington State Energy Code.

Insulation subject to moisture or condensation shall be closed cell rubber foam, with fire and flame spread rating for application. Duct insulation in concealed spaces may be the flexible fiberglass blanket type with kraft-faced duct wrap. Exposed ductwork shall be insulated with rigid fiberglass board and finished to resist abrasion with embossed soft aluminum sheathing material.

Insulation shall be applied only after duct leak and pressure testing is completed and all leaks disclosed and repaired, and after the ductwork is pronounced sound.

#### 2.32.5.2.10 Coils

Copper tube that is mechanically bonded to non-ferrous fins with continuous fin collars and sleeved end supports shall be provided with maximum fins per inch as required by the design application. Coil tubing wall thickness shall be a minimum 0.035 inches. Coils shall be leak tested to 300 psi, maximum working pressure to 200 psi, and rated in accordance with ARI Standard 441-70.

A stainless steel drain pan shall be furnished with solderless connections with a minimum of a 1-inch-thick foam insulating liner.

A maximum of 500 fpm face velocity cooling coils shall be provided, or a maximum of 600 fpm face velocity heating coils shall be provided. Coils shall be sized for capacity and a 1.25 safety factor.

#### 2.32.5.2.11 Air Control Dampers

Air control dampers shall be the opposed blade, low leakage type. Gasket blade and edge seals shall be mechanically fastened. Blade ends shall be sealed with aluminum “arc”

seals. The damper frame shall be of heavy gauge, welded steel construction and have 1/4-inch plate bearing bars and a bronze or iolite insert bearing. Linkage shall be arranged for opposed blade operation. Dampers shall be rated as the low leakage type. A matching motorized damper shall be provided as required.

### 2.32.5.2.12 Fire and/or Smoke Dampers

Combination fire and smoke dampers shall be provided as required; each with a steel angle frame and sleeve. Dampers shall conform to SMACNA Fire, Smoke and Radiation Damper Installation Guide, SBC and SMC. The damper rating requirement must coordinate with partition and ceiling fire ratings; be rated in accordance with UL Standard UL 555S, and comply with SBC standards. An actuator/fusible link rating shall be provided as required by code and/or local authority. Fire smoke damper actuators shall be coordinated with power and controls. Dampers in horizontal applications shall be rated for horizontal use.

Size: The area inside sleeves shall be free and within the damper stop, with a 90-percent minimum area of connecting duct; the size shall be increased as required, above the connected duct to maintain this free area.

Sleeves: 14-gauge minimum steel shall be provided with attachment lugs or straps; and be anchored to the wall and be independent of ductwork; a slip fit shall be provided, the connection to ducts tightly fitted, sealed with mastic, and riveted on 6-inch centers.

Fire Damper Access Panels shall be located as required, provided in walls, ceilings and ducts as required to reach dampers and to replace fusible links; the minimum size shall be 12 inch by 12 inch; they shall be gasketed, attached by sheet metal screws, and spaced a maximum of 6 inches on centers. The fire damper motor shall be within convenient reach for service through the access panel.

### 2.32.5.2.13 Duct Attenuators

The duct sound attenuator shall be manufactured and tested specifically for the application of attenuating sound transmitted through heating, ventilation and air conditioning system ductwork. Attenuators shall be constructed of galvanized steel sheets, with lock-formed seams sealed with approved mastic. The outer casing shall be a minimum of 22 gauge; the inner panels shall be a minimum of 24 gauge, perforated sheets. Inner panels shall be die stamped with nosing to form a bellmouth entrance and a perforated air passage. Interior components shall be secured by spot welding on not less than 3-inch centers. Acoustical filler shall be fiberglass and tested to ASTM E84 standard. Submitted duct attenuator performance characteristics shall be tested for dynamic loss, self-generated noise, and pressure loss in both forward and reverse flow in accordance with ASTM E477.

### 2.32.5.2.14 Flexible Ductwork

Flexible ductwork shall only be applied above lay-in suspended ceilings where it can be inspected and repaired if required. Flexible ductwork shall not exceed a total installed length of six feet. Flexible duct shall be the insulated type and be 1.25-inch-thick fiber glass bonded to vinyl coated spring steel helix. Outer jacket shall be reinforced mylar/neoprene laminate reinforced with fiberglass scrim.

### 2.32.5.2.15 Supply and Exhaust Air Register and Diffusers

Air diffusion and return devices shall be included in grilles, register, and diffusers.

Diffusers and grilles shall be selected to prevent drafts and "dumping" on building occupants. The location of air diffusion elements shall be designed to maintain even space temperatures, prevent tactile thermal gradients, and stratification. Diffusers, registers, and grilles shall be selected with a minimum of 5 NC points below the space sound criterion to allow for the installation of multiple diffusers and reverberant sound build-up.

The location, ceiling frame type, and fire rating requirement shall be coordinated with the interior architectural finish color palette.

### 2.32.5.2.16 Balancing Quadrants

Every air inlet and discharge outlet shall be provided with a balancing quadrant or damper in accordance with SMACNA HVAC Duct Construction Standards. In addition, where ductwork cannot be designed to branch ductwork volumes equally or consistently based on imposed pressure of length of ductwork, balancing quadrants shall be provided at branches to allow the branch duct to be balanced, prior to the take-offs to individual air diffusion and return elements.

Quadrants Where Ducts Are Accessible through Suspended Ceilings: Acceptable Manufacturers are Duro-Dyne, Young, Ventfabrics. Catalog numbers listed are Duro-Dyne. For blades with maximum dimension less than 10 inches, catalog no. KS-145 shall be used, which includes a dial regulator with a locking nut, a round–end, spring-in bearing, and a square-end damper bearing. For blades with a maximum dimension of 10 inches to 20 inches, catalog no. KSR-195 shall be used, which includes a dial regulator with a locking nut, a round–end, spring-in bearing, and a square-end bearing. For blades with a maximum dimension over 20 inches, catalog no. 12 shall be used, which includes a damper quadrant with 1/2-inch-size damper bearings.

Quadrants where ducts are not accessible or concealed above hard ceilings shall be the flush mounted, concealed type. Ventfabrics catalog type 66, or Young Regulator no. 301 Series shall be used.

### 2.32.5.2.17 Louvers

Louvers shall be the stationary, extruded aluminum, weatherproof type, and be drainable-style blades in a louver frame. Each factory-assembled louver section shall be designed to withstand wind loading of 25 pounds per square foot (100 MPH wind equivalent). Frames shall be 0.061-inch wall thickness and blades shall be 0.061 inch wall thickness. Each louver shall be equipped with a framed, removable rear-mounted screen of 3/4-inch expanded aluminum bird screen. The color and finish shall be coordinated with WSDOT. Acceptable manufacturer are Greenheck or an accepted equal.

### 2.32.5.2.18 Gas Fired Equipment Breeching and Vent

Gas-fired equipment with atmospheric burners shall have a Type B gas vent. All components and accessories shall be UL certified. All components and accessories including cleanout, terminal, drawbands, supports and brackets shall be from the same manufacturer. Acceptable manufacturers are Metalbestos, Ampco, or an accepted equal.

Gas-fired equipment with condensing fire boxes shall be provided with a breeching system as recommended by the manufacturer.

Gas-fired equipment with power burners, pressurized fireboxes shall have double wall, insulated stainless steel breeching. All components and accessories shall be UL certified.

All components and accessories including cleanout, terminal drawbands, supports and brackets shall be from the same manufacturer. Acceptable manufacturers are Metalbestos, Ampco, or an accepted equal.

### 2.32.5.2.19 Filters

Filters shall be the standard product regularly manufactured and applied to the HVAC industry. All outside air introduced to the HVAC system shall be filtered and recirculated prior to encountering fans, coils, and air distribution ductwork.

Filters shall be readily accessible and filter racks shall be designed with adequate space available to allow replacement without removing any building or mechanical components other than the filter access door.

MERV 15 filters shall be provided where building flush-out or air quality requirements mandate high-efficiency filtration requirement. Application with project requirements shall be verified. Acceptable manufacturers are Farr or an accepted equal.

### 2.32.5.2.20 Boilers

A boiler with adequate capacity shall be selected to meet comfort and/or process heating needs as required by the design application. Multiple boiler packages shall be used to maintain redundancy and maximize firing efficiency. The high efficiency, natural gas-fired, firetube condensing type design shall be provided for hydronic heating applications. Boilers shall be UL and/or CSA labeled.

Stainless steel tubes, tube sheets, and a furnace for high durability in condensing operation shall be provided. The tube design shall feature an extended heating surface to ensure the highest operating efficiency regardless of firing rate.

Burner shall comply with Low NOx emissions standards at 20 PPM or less. The boiler shall operate with full and part load efficiencies up to 99 percent. The boiler shall have a minimum of 5 stages (0, 20, 40, 60, 80, and 100 percent). The boiler shall be available with a sealed combustion option. Sound generated by the boiler shall not exceed 70 dBA at full fire, and 50 dBA at low fire at a distance of 6 feet.

Warrantees shall include a 20-year thermal shock warranty or a 10-year fireside corrosion warranty.

The boiler vendor shall review the project control requirements, contact the building automation vendor, coordinate the boiler control package with the building automation system, and deliver the boiler compatible and ready for operation with the building automation and temperature control system with no exception or exclusions.

Boilers shall be manufacturerd by Cleaver Brooks, Clearfire Boiler, or an accepted equal.

### 2.32.5.2.21 High Bay Infrared Heaters

The system shall be of gas-fired, negative pressure, dry, non-condensing design and shall utilize one or more burners on a single vacuum pump. The system shall be warranted for a period of three years. Heating system shall be Roberts-Gordon or an accepted equal.

Burners shall be fully automatic with ignition controls and safeties. Radiant tubing shall be 4-inch-diameter, 16-gauge, aluminized steel, with 0.024-inch aluminum reflector. Pumps shall be the vacuum type, be constructed of heavy duty cast iron, and be acoustically isolated from the system with flexible boots.

### 2.32.5.2.22 Chillers

Water chillers shall be selected to accommodate anticipated comfort and process water chilled loads with an adequate margin of safety as required by the design application. Air cooled chillers generally shall be considered for loads below 300 tons, and split water cooled chillers for 500 tons or more.

The refrigerant type and mass content requirements with sustainability shall be considered. Chiller manufactuers shall be Carrier, Trane, or an accepted equal.

### 2.32.5.2.23 Cooling Towers, Fluid Coolers

Cooling towers shall be sized to accommodate anticipated load and for environmental conditions with an adequate margin of safety as required by the design application. Realistic, typical summer wet bulb temperatures shall be considered that occur when the tower or cooler operation will be most heavily loaded. The induced draft draw-through high efficiency type shall be considered. Manufacturers shall be Baltimore Air Coil, Evapco, or an accepted equal.

### 2.32.5.2.24 Motor-Operated Pumps

Motor-operated pumps shall be the base–mounted type, with an end suction horizontal inlet, and include vertical discharge, split-coupling, frame-mounting, be single-stage, electric-motor driven, have 150 psi working pressure, and 230 degrees Fahrenheit of working temperature.

Shaft seals shall be mechanical, ceramic-carbon faces with Buna-N bellows.

Construction shall be comprised of cast-iron casing, a bronze impeller, a forged alloy steel shaft, bronze, replaceable casing wear rings, a bronze sleeve, ball or tapered roller bearings, and flanged connection(s).

Gauge connections shall have tappings in the pump suction and discharge connection flanges for pressure-gauge connections.

The motor shall be the NEMA Standard drip proof with a single speed and a rpm of 1750.

An alignment template shall be provided for installation to assure shaft and bearing alignment.

The pump base shall be comprised of cast iron or steel, and be of all welded construction with intermediate ribs, closure plates, and reinforcing, as required, to provide a rigid frame structure. All pumps shall be supported by spring-isolated concrete inertial bases, a minimum of 4 inches thick and fabricated from a structural steel channel frame filled with concrete. Height savings brackets shall be furnished for spring isolation support.

### 2.32.5.2.25 Air-Operated Pump

A compact, non-metallic, air-operated, double diaphragm pump shall be provided with an air inlet of 1/4 inches, a typical flow of 30 gpm, an inlet of 1 inch, an outlet of 1 inch, and a maximum solids diameter of 1/8 inch. Body material shall be polypropylene; check material shall be PTFE – diaphragm, and ball material shall be PTEE. Self priming shall be 15 feet dry. Pump shall have float controls for sump pump operation at a BMF dock sanitary connection.

### 2.32.5.2.26 Mechanical Piping

Mechanical piping shall be coil condensate, drip drainage Piping with DWV copper.

HVAC circulating fluid piping, chilled and heating water piping, condenser supply and return shall be copper or black steel as specified herein.

Steel pipe, 2 inches and smaller, shall be ASTM A120/A53, Grade B, type E or S, Schedule 40 standard weight. Steel pipe, 2.5 inches and larger, shall be ASTM A120/A53, Grade B, Type E or S, Schedule 40 standard weight.

Copper pipe, above grade, shall be Type L hard drawn seamless copper water tube, ANSI H23.1, ASTM B88. Copper pipe, below ground, shall be Type K soft copper tube, ANSI H23.1, ASTM B88.

### 2.32.5.2.27 Mechanical Pipe, Steel Fittings

Stell fittings larger than 2 inches shall be Schedule 40 steel, welded.

Couplings, 2 inches and smaller, shall be malleable or ductile iron, threaded.

Unions, 2 inches in diameter and less, shall be 150-pound black malleable iron, threaded, ASTM A197, brass seat.

Unions, 2.5 inches in diameter and greater, shall be as follows: Flanges shall be 125-pound, cast-iron, welded, ASNI B16.1 and ASTM A126, Class B; 150-pound forged steel weld neck or slip-on, ANSI B16.5 and ASTM A181, Grade I; 150-pound forged steel socket weld, ANSI B16.5 and ASTM A181, Grade I.

Strainers shall be 150-pound cast iron, Y-pattern, with 0.045-inch perforations, and a stainless steel screen.

Joint compound shall be Teflon based.

### 2.32.5.2.28 Mechanical Pipe, Copper Fittings

Copper fittings, above grade, shall be cast brass or wrought copper pressure fittings, ANSI B16.22.

Copper fittings, below grade, shall be cast brass or wrought copper pressure fittings, ANSI B16.22; cast-bronze solder joint fittings and screwed adapters, ANSI B16.18

Unions for similar materials shall be wrought-copper solder joint unions, ANSI B16.22; cast bronze solder joint fittings, ANSI B16.18.

Unions for dissimilar materials: Please see Dielectric Unions below.

Flanges and flanged fittings shall be cast bronze, 125-pound Class, and meet ASME Standards.

Joint compound shall be the Teflon type.

Brazing compound shall be manufacturerd by Sil-fos, Sil-braz, or an accepted equal.

Strainers shall be 250-pound cast bronze, Y-pattern, have a screwed or solder end, have ASTM B61; 0.045-inch perforations, and a brass screen of ANSI B2.1.

### 2.32.5.2.29 Mechanical Valves, General

Every coil, equipment item, device, pump, etc., shall be isolated with local isolation valves that permit the item to be serviced without requiring an extensive drain down of

the system under service. Valves shall be compatible with their application and service. Where valves are located behind doors or access panels, they shall be made conveniently accessible within arm's reach of the opening.

### 2.32.5.2.30 Mechanical Valves, Steel Piping

For mechanical valves, 2 inches and smaller, the following shall be provided:

A gate that is comprised of a 150-pound bronze, threaded, union bonnet, rising stem, and solid bronze disc, and is repackable under pressure, ASTM B61.

A Globe and Angle that is comprised of a 150-pound bronze, threaded, union bonnet, rising stem, and a 500 BHN stainless steel plug and seat, ASTM B61.

A Check that is comprised of a 150-pound bronze, screwed cap, Y-pattern, swing disc, and a regrindable seat, ASTM B61.

A Ball that is comprised of a 150-pound bronze or brass body, ball and stem; threaded, three-piece construction, with Teflon seat and seal. The 2-inch size may have a carbon steel body and pipe ends.

For mechanical valves, 2.5 inches and larger, the following shall be provided:

A Gate that is comprised of a 150-pound bronze, flanged, union bonnet, and is repackable under pressure and includes a solid bronze disc, ASTM B61.

A Globe that is comprised of a 150-pound bronze, flanged, union bonnet, rising stem, and a 500 BBHN stainless steel plug and seat, ASTM B61.

Butterfly valves shall have a 175 minimum psi working pressure for all sizes provided; they shall include an ethylene propylene rubber liner molded with a steel or plastic fiber composition reinforcing ring that is integral to the liner or molded integral with the valve body. The valve body must be of cast iron or ductile iron and include an aluminum bronze disc and a stainless steel stem. The lever handle type operator shall have a 10-position latch-lock handle and a visible stem position indicator.

Gaskets shall be manufactured by Crane, Garlock, US Rubber, Anchor, or Flexitallic.

Strainers shall be manufactured by Armstrong, McAlear, Sarco, Hoffman, Crane, or Nicholson.

### 2.32.5.2.31 Mechanical Valves, Copper Piping

A Gate shall be comprised of a 150-pound bronze, screwed or solder end, union bonnet, rising stem, and a solid bronze disc that is repackable under pressure, ASTM B62.

A Globe or Angle shall be comprised of a 150-pound bronze, screwed or solder end, union bonnet, rising stem, and a solid bronze 500 BHN disc and seat ring or Teflon disc that is repackable under pressure, ASTM B62.

A Check that is comprised of a 150-pound bronze screwed or solder end, screwed cap, Y pattern, swing disc, and a regrindable seat, ASTM B62.

A Ball that is comprised of a 150-pound bronze or brass body, ball and stem; solder or screwed ends, and be of three-piece construction with a Teflon seat and seal.

### 2.32.5.2.32 Pipe Hangers and Pipe Insulation

Refer to Plumbing Piping Hangers and Plumbing Piping Insulation.

### 2.32.5.2.33 Compressed Air Equipment

All air compressors shall be a reciprocating type and consist of air-cooled motor compressors, an air receiver, an after cooler, a pressure-reducing station, spring isolators, overload protection, and operating controls.

### 2.32.5.2.34 Compressed Air Piping

The compressed air distribution system shall be a looped design with an air header that is a minimum of 1 inch. Piping shall be ASTM B88 Type "L" copper tubing. All piping shall be sloped to an accessible drain point. Piping drops should be taken from the top of the header so that moisture will not enter the drops and outlets. Capped drip legs 6 inches long shall be located at the base of the vertical riser and at the ends of main piping runs with a drain pipe and valve at the nearest floor or hub drain.

The compressed drop air outlets shall have 3/8 inch (minimum) female speed couplers with a filter and regulator with a pressure gauge. Each drop shall have a shut-off valve and a union adjacent to the valves.

Piping should be routed to each shop with a minimum of one compressed air drop on each wall of the shop. Each air drop should be wall mounted 48 inches above the finished floor above the workbench height.

## 2.32.5.3 BRIDGE MAINTENANCE FACILITY

System requirements for the Bridge Maintenance Facility are identified in the following table. All other rooms not specifically mentioned in this table, shall have comparable system requirements in accordance with this criteria, and mandatory codes and standards. Also refer to Section 2.30.

HVAC indoor design conditions are included in Table 2.32-1.

Table 2-32.1 – Bridge Maintenance Facility - Systems Requirements

| Space | Special Systems | HVAC Acoustical Criteria (4) | Plumbing/ Equipment/ Fixture | Fire Protection/ Equipment |
|---|---|---|---|---|
| Parking | DF Storage | None | Stormwater Drain(1)<br>Hose Bibs | Dry Sprinklers |
| Generator | | | | |
| Elevator Machine Room | | H&V | | Wet Sprinklers |
| Elevator Hoistways | | | Dry Sumps | Wet Sprinklers |
| Ventilation Shaft | | Natural Vent | | Wet Sprinklers |
| Stairs Adjacent to elevators | | | | Wet Sprinklers |
| Stairs (secondary for internal circulation) | | | | Wet Sprinklers |
| Electrician Workroom | Comp Air | H&V<br>MERV 15 Filters<br>NC45 | | Wet Sprinklers<br>Fire Ext |
| Crew Room | | HVAC<br>NC35 | CW, HW, Drains | Wet Sprinklers |
| Lead Tech Office | | HVAC | | Wet Sprinklers |

| | | | | |
|---|---|---|---|---|
| | | NC35 | | |
| Supervisor Office | | HVAC<br>NC35 | | Wet Sprinklers |
| Communication Room | | CRAC<br>NC45 | | Pre-Action Sprinklers |
| Shop | Comp Air | Ventilation<br>Infrared Htrs<br>NC45 | Shower/Eye Wash, Drains | Wet Sprinklers<br>Fire Ext |
| Mezzanine/Shop Storage | | Ceiling Fans<br>NC45 | | Wet Sprinklers |
| Compressor Room | Comp Air | Vent | Drains | Wet Sprinklers |
| Tool Storage | | H&V | | Wet Sprinklers |
| Equipment Storage | | H&V | | Wet Sprinklers |
| Hydraulics | Comp Air | H&V<br>MERV 15 Filters<br>NC45 | | Wet Sprinklers |
| Record Storage | | H&V | | Wet Sprinklers |
| Emergency Storage | | H&V | | Wet Sprinklers |
| Mechanical Room | | Open to Atmos (3) | Hose Bibs | Wet Sprinklers |
| Janitor Closet | | H&V<br>NC45 | CW, HW, Drains | Wet Sprinklers |
| Unisex Toilet/Shower | | H&V<br>NC45 | CW, HW, Drains | Wet Sprinklers |
| Men's Toilet | | H&V<br>NC45 | CW, HW, Drains | Wet Sprinklers |
| Abbreviations: | DF – Diesel Fuel<br>Comp Air – Compressed Air<br>CRAC – Computer Room AC<br>Fire Ext – Fire Extinguisher | | • CW – Domestic Cold Water<br>• HW – Domestic Hot Water<br>• H&V – Heating & Ventilation<br>AC – Air Conditioning<br>HVAC – Heat, Vent, AC | |

**Notes:**

(1) Drainage for parking shall conform to Section 2.14 (Stormwater Management).

(2) Natural Ventilation Concept shall be developed for LEED Credit.

(3) Mechanical Room shall be open to atmosphere with Outside Air Louvers.

(4) Acoustical Criteria and NC Criterion shall conform with Section 2.30.

In accordance with Section 2.30: Janitor rooms generally require doors with 20-minute rating. To facilitate their closure, but discourage the propping open of doors, all should have 180 degree hold open and be connected to the fire alarm system.

In accordance with Section 2.30: Area drains shall be designed to accept the complete rate of flow from a 100-year storm as contributed from the deck, adjacent walls, and other run-off without requiring water storage on the deck surface.

In accordance with Section 2.30: Freeze-proof hose bibs shall be installed near roof access doors and hatches to provide water for roof cleaning. All valves and shut-offs shall be located inside the structure to prevent freezing.

Interior walls shall have acoustic insulation for meeting noise criteria (NC) curves as required by ASHRAE and as identified in the Bridge Maintenance Facility -- System Requirements Table.

Painting of equipment surfaces shall be included in Section 2.30.4.3. Identifying labels shall be provided for all equipment, ductwork, piping, and conduit and be coordinated with Section 2.30.4.3.

Painting shall be in compliance with the requirements defined in NFPA 33. Cartridge filters shall be provided as part of the equipment application and in accordance with the manufacturer's recommendations.

In accordance with Section 2.30: Environmental graphics shall be provided for the Bridge Maintenance Facility and shall include all fire department required signs.

Design and construction of Bridge Maintenance Facility drainage elements shall be coordinated. Drainage elements shall include gutters and downspouts adequate for controlled conveyance of run-off from roofs and canopies to drainage systems designed and constructed as required in Section 2.14, Stormwater Management.

In accordance with Section 2.30: Fire code requirements shall be provided for all Bridge Maintenance Facility elevators.

### 2.32.5.4 BRIDGE MAINTENANCE DOCK

System requirements for the Bridge Maintenance Dock are identified in the following table. All other rooms not specifically mentioned in this table, shall have comparable system requirements in accordance with this criteria, and mandatory codes and standards. Also refer to Section 2.30.

HVAC indoor design conditions are included in Table 2.32-1.

Table 2-32.2 – Bridge Maintenance Dock Systems Requirements

| Space | Special Systems | HVAC | Plumbing/ Equipment/ Fixture | Fire Protection/ Equipment |
|---|---|---|---|---|
| Maintenance Building – Dock Access Area | | | Hose Bibs | Dry Standpipe |
| Pier | | | | Dry Standpipe |
| Service Platform | Diesel Fuel, Comp Air | | CW, Drains | Dry Standpipe |
| Abbreviations | DF – Diesel Fuel<br>Comp Air – Compressed Air | | CW – Domestic Cold Water | |

### 2.32.5.5 MAINTENANCE SHEDS

Maintenance Sheds are provided for work rooms, electrical equipment rooms, and equipment storage. All other rooms not specifically mentioned in this table, shall have comparable system requirements in accordance with this criteria, and mandatory codes and standards. Refer to Section 2.12.

HVAC indoor design conditions are included in Table 2.32-1.

Table 2-32.3 – Maintenance Sheds, Systems Requirements

| Space | Special Systems | HVAC | Plumbing/ Equipment/ Fixture | Fire Protection/ Equipment |
|---|---|---|---|---|
| Work Areas | | H&V<br>NC45 | Incinerating Toilet | |
| Equipment Storage | | H&V | | |
| Electrical Equipment | | H&V | | Fire Ext |
| • Abbreviations: | Fire Ext – Fire Extinguisher | | H&V – Heating & Ventilation | |

There is no domestic water piping or sanitary piping required for the maintenance sheds. Alternate methods shall be employed for hygiene and sanitation.

### 2.32.5.6 STANDPIPE FIRE PROTECTION PIPING

Refer to Section 2.35 for details about the Floating Bridge Standpipe System.

### 2.32.5.7 DIESEL FUEL STORAGE AND HANDLING

For more information, refer to Section 2.30.4.5.

### 2.32.5.8 COMPRESSED AIR PIPING

For more information, refer to Section 2.30.4.6.

### 2.32.5.9 SPARE PARTS

The Design-Builder shall determine the spare parts required for the mechanical systems. At a minimum, the Design-Builder shall furnish the following spare parts for the Bridge Maintenance Facility and Dock mechanical systems:

- Provide spare belts and lubrication. Provide quantities for 2 years of operation.
- Provide air filters and test kit to determine filter replacement. Provide quantities for 2 years of operation.
- Provide package of fuses of each kind and size installed.
- Provide spare sprinklers heads and cabinet as required by IFC.
- Provide 2 quick-couplers and 2 filter-regulator-lubricators for the compressed air system.

## 2.32.6 SYSTEM CONFIGURATION

### 2.32.6.1 GENERAL

System configurations are based on concepts expressed on the reference drawings. The Design-Builder may elect to provide a system with similar features or provide a new system with similar functionality, durability, ease of maintenance, and safety.

### 2.32.6.2 HVAC ENERGY MANAGEMENT AND CONTROL SYSTEM (EMCS)

## POINTS SCHEDULE

The Design-Builder shall provide the capability for WSDOT to monitor and adjust the EMCS for the Bridge Maintenance Facility, Bridge Maintenance Dock, and Maintenance Sheds at the offsite location at the Traffic Management Center (TMC) in Shoreline, Washington. The system resident in the TMC is a Barber Colman Network 8000 system. The system shall provide access through either the existing Barber Colman network 8000 or Web-based browsers. The "dashboard" or graphic user interface at the TMC could reside side by side with the Barber Colman's user interface on the same computer, but would not share the same system elements.

Architecture: An Open License Infrastructure shall be provided by Honeywell Tridium/Niagara AX or an accepted equal by WSDOT.

Server: A personal computer server Tridium Web-Supervisor AX software package and Work-Place Pro AX programming software package shall be provided.

Laptop: A laptop computer with a copy of the Tridium Work Place Pro AX programming software shall be provided.

If a manufacturer-specific programming tool is required to program or configure any EMCS controller, a copy of that software shall be provided on both the PC server and laptop computer.

The EMCS consists of hardware, software, wiring, sensors, thermostats, control valves, dampers and operators, indicating devices, interface equipment and other apparatus and accessories required to operate mechanical system, and perform the required functions.

The global controller(s) shall be Honeywell Tridium/Niagara JACE AX open license.

The EMCS controllers shall be Honeywell EMCS Lonworks / LonMark and/or BACnet certified controllers. All EMCS controllers shall be fully programmable and configurable by the Tridium / Niagara software. No proprietary software packages for the EMCS controllers shall be allowed.

The EMCS shall be comprised of a network of interoperable, stand-alone digital controllers communicating via LonMark™/LonTalk™ and/or BACnet™ communication protocols to a Network Area controller (NAC).

The Design-Builder shall provide a PC server-based workstation in the Bridge Maintenance Facility, with a complete set of software that allows full programming and configuration of every EMCS controller, global controller, network management device, and graphical user interface software station (graphics generation, alarm, trends, schedules, remote access, etc).

The EMCS shall be comprised of Network Area Controller or Controllers (NAC) within each facility. The NAC shall connect to WSDOT's local or wide area network, depending on configuration. Access to the system, either locally in each building or remotely from a central site or sites, shall be accomplished through standard WEB browsers, via the local area network. Each NAC shall communicate to LonMark™/LonTalk™ IDC (Integrated Digital Controller) and/or BACnet™ SBC (Session Border Controller) controllers and other open protocol systems.

The EMCS shall monitor and control equipment as required by equipment operation sequences and point list.

The Design-Builder shall include detailed graphical descriptions of each mechanical system.

The Design-Builder shall provide a complete and operable EMS, including all controllers (IDC and SBC), control devices, control panels, controller programming, and controller programming software, controller input/output and power wiring and controller network wiring.

The Design-Builder shall be responsible for the Network Area Controller(s) (NAC), software and programming of the NAC, graphical user interface software (GUI), development of all graphical screens, Web browser pages, setup of schedules, logs and alarms, installation of all sensors, wiring, programming, implementation of operational sequences, monitoring and control of all points as indicated and required in this section. The Design-Builder shall coordinate and arrange for EMCS system power for all components in accordance with Section 2.17.

- All required power shall be provided in accordance with the Contract.
- Power wiring and conduit required by the control system components.
- Provision, installation and wiring of smoke detectors.

Maximum acceptable response time from any alarm occurrence (at the point of origin) to the point of annunciation shall not exceed 5 seconds for local network connected user interfaces.

The Local Area Network (LAN) shall be 100 Megabit/sec Ethernet network supporting LonMark™/LonTalk™ (IDC), BACnet (SBC), Java, XML, HTTP, and SOAP for maximum flexibility for integration of building data with enterprise information systems and providing support for the multiple Network Area Controllers (NACs), user workstations and, if specified, a local server.

Local area network minimum physical and media access requirements:

- Ethernet; IEEE standard 802.3
- Cable; 100 Base-T, UTP-8 wire, category 6
- Minimum throughput; 100Mbps

Design-Builder shall coordinate network requirements with WSDOT to provide EMCS communication between Bridge Maintenance Facility and the TMC.

For Local Area Network installations, the Design-Builder shall provide access to the LAN through standard WEB browser.Design-Builder

The Design-Builder shall provide EMCS communications protocols that are compatible with the PLC system (see Section 2.17).

The Design-Builder shall provide HVAC EMCS trouble indications to the PLC-based remote monitoring system in Section 2.17. The Design-Builder shall provide a list of trouble indications with auto-dialer responses for review and comment by WSDOT. The trouble indication shall report system trouble that requires maintenance attention on a 24 hour basis. The Design-Builder shall provide HVAC and Mechanical System alarm conditions to the PLC based remote monitoring system in Section 2.17. The Design-Builder shall provide a list of alarm indications with auto-dialer responses for review and comment by WSDOT. The alarm indication shall report system failure with potential damage to facility or equipment; and thereby, requires immediate attention. System failure shall include but be limited to fuel oil leak detection, freeze protection, system alarms, etc.

The Design-Builder shall provide fire alarms to a licensed third-party monitoring station and TMC. The fire indication shall be routed to the PLC based remote monitoring system in Section 2.17. The Design-Builder shall provide zone alarms with auto-dialer responses for review and comment by WSDOT. A separate remote monitoring panel shall be provided for the Bridge Maintenance Facility, supervisor's office.

### 2.32.6.3 NETWORK AREA CONTROLLER (NAC)

The Design-Builder shall supply one or more Network Area controllers (NAC) as part of this Project. The number of area controllers required is dependent on the type and quantity of devices.

### 2.32.6.4 ADVANCED UNITARY CONTROLLER

The controller platform shall be designed specifically to control HVAC – ventilation, filtration, heating, cooling, humidification, and distribution. Equipment includes: constant volume air handlers, VAV air handlers, packaged RTU, heat pumps, unit vents, fan coils, natural convection units, and radiant panels. The controller platform shall provide options and advanced system functions, programmable and configurable.

### 2.32.6.5 ADVANCED TERMINAL UNIT CONTROLLER

The controller platform shall be designed specifically for room-level VAV control-pressure-independent air flow control, pressure dependent damper control, supply and exhaust pressurization/de-pressurization control; temperature, humidity , complex CO2, occupancy, and emergency control. Equipment includes: VAV terminal unit, VAV terminal unit with reheat. Series fan powered terminal unit, parallel fan powered terminal unit, supply and exhaust air volume terminals, and constant volume dual-duct terminal unit. The controller platform shall provide options and advanced system functions, programmable and configurable using Niagara AX Framework™, that allow standard and customizable control solutions required in executing the required sequence of operation.

The system shall be capable of supporting clients using a standard Web browser such as Internet Explorer™.

The Web browser shall provide the same view of the system, in terms of graphics, schedules, calendars, logs, etc., and provide the same interface methodology as is provided by the Graphical User Interface. Systems that require different graphic views, different means of graphic generation, or that require different means of interacting with object such as schedules, or logs, shall not be permitted.

A central server shall be provided. The server shall support all Network Area Controllers (NAC) connected to the customer's network whether local or remote.

Local connections shall be via Ethernet LAN. Remote connections can be via WSDOT network from the TMC.

Server Hardware Requirements: The server hardware platform shall have the following requirements:

The computer shall be, at minimum, an Intel Core 2 Duo Processor based computer (minimum processing speed of 2.66 GHz with 2 GB RAM and a 120-gigabyte minimum SATA hard drive). It shall include a DVD-RW Drive, 1GB Non-ECC DDR2 (1 module), mouse, keyboard, asynchronous serial port, and 2-USB ports. A minimum 17 inches flat

panel color monitor, 1280 x 1024 optimal preset resolutions with a minimum 80 HZ refresh rate shall also be included.

The server operating system shall be Microsoft Windows XP Professional. Include Microsoft Internet Explorer 6.0 or later.

Connection to the EMCS network shall be via an Ethernet network interface card, 100 Mbps, at a minimum.

### 2.32.6.6 SYSTEM CONFIGURATION TOOL

The workstation Graphical User Interface software (GUI) shall provide the ability to perform system programming and graphic display engineering as part of a complete software package. Access to the programming functions and features of the GUI shall be through password access as assigned by WSDOT.

### 2.32.6.7 GRAPHICAL USER INTERFACE COMPUTER HARDWARE (DESKTOP)

The browser workstation shall be an Intel Dual-Core Intel® Processor based computer (minimum processing speed of 1.86 GHz with 1 GB RAM and a *)-gigabyte minimum SATA hard drive). It shall include a DVD-RW Drive, 1 GB Non-ECC DDR2 (1 module), mouse, keyboard, asynchronous serial port, and 2-USB ports. A minimum 17 inches flat panel color monitor, 1280 x 1024 optimal preset resolutions, with a minimum 80 HZ refresh rate shall also be included.

Connection to the EMCS network shall be via an Ethernet network interface card, 100 Mbps, at a minimum.

A system printer shall be provided. Printer shall be laser type with a minimum 600 x 600-dpi resolution and rated for 60-PPM print speed minimum.

### 2.32.6.8 SEQUENCES OF OPERATION

Provide sequence of operation for WSDOT review for each item of controlled equipment. Refer to requirements, herein, especially City of Medina Energy Code for sequences that may be uniquely required in the municipality, such as economizer cooling for small cooling applications.

### 2.32.6.9 POINTS SCHEDULES

The HVAC EMCS system shall include all control points required to adequately control, monitor and supervise the systems and achieve the required action, condition and state. The following schedules are an example of points that require control and monitoring. Review system points with WSDOT to insure that equipment control and supervision meets their approval and requirements.

### 2.32.6.10 HVAC POINTS SCHEDULES

Table 2-32.1 – HVAC Points Schedules

Legend: AI – Analog Input; AO – Analog Output; DI – Digital Input; DO – Digital Output

| Point Name | AI | AO | DI | DO |
|---|---|---|---|---|
| ***Plumbing Pumps*** | | | | |
| Pump On/Off | | | | ✓ |
| Pump C.T. (status) | ✓ | | | |

| | | | | |
|---|---|---|---|---|
| Differential Pressure (where applicable) | | ✓ | | |
| Pump volume (speed, where applicable) | ✓ | | | |
| High fluid Level | | | ✓ | |
| Low Fluid Level | | | ✓ | |
| Safety | | | ✓ | |
| Temperature | ✓ | | | |

1

| **Point Name** | **AI** | **AO** | **DI** | **DO** |
|---|---|---|---|---|
| ***Hot Water Heating*** | | | | |
| Heater On/Off | | | | ✓ |
| Temperature Staging | | | | ✓ |
| Temperature | ✓ | | | |
| Status | | | ✓ | |
| Safety | | | ✓ | |

2

| **Point Name** | **AI** | **AO** | **DI** | **DO** |
|---|---|---|---|---|
| ***Mechanical HVAC Pumps*** | | | | |
| Pump ON/Off | | | | ✓ |
| Pump C.T. (status) | ✓ | | | |
| Differential Pressure | | ✓ | | |
| Pumps Speed (volume) | ✓ | | | |
| Safety | | | ✓ | |

3

| **Point Name** | **AI** | **AO** | **DI** | **DO** |
|---|---|---|---|---|
| ***Circulating Heating and Cooling Fluid*** | | | | |
| Heating Source supply Temperature | ✓ | | | |
| Heating Source return temperature | ✓ | | | |
| Cooling Source Supply Temperature | ✓ | | | |
| Cooling Source Return Temperature | ✓ | | | |
| Circulating Heating Supply Temperature | ✓ | | | |
| Circulating Heating Return Temperature | ✓ | | | |
| Condenser Water Supply Temperature | ✓ | | | |
| Condenser Water return Temperature | ✓ | | | |
| Outside Air Temperature | ✓ | | | |

4

| **Point Name** | **AI** | **AO** | **DI** | **DO** |
|---|---|---|---|---|
| ***Heating, Cooling Equipment Control*** | | | | |
| Heat Source Enable | | | ✓ | |
| Heat Source Staging | | | ✓ | |
| Cooling Source Enable | | | ✓ | |
| Cooling Source Staging | | | ✓ | |
| High Temperature | ✓ | | | |
| Low Temperature | ✓ | | | |
| Trouble | ✓ | | | |
| Status | ✓ | | | |

1

| Point Name | AI | AO | DI | DO |
|---|---|---|---|---|
| ***Air Handlers, Fan Coils*** | | | | |
| Enable | | ✓ | | |
| Fan On/Off | | ✓ | | |
| Fan Status (C.T.) | | | ✓ | |
| Fan Volume (speed) | | | ✓ | |

2

| Point Name | AI | AO | DI | DO |
|---|---|---|---|---|
| ***Coil Control*** | | | | |
| Discharge Air Temperature | ✓ | | | |
| Mixed Air Temperature | ✓ | | | |
| Return Air Temperature | ✓ | | | |
| Space Temperature | ✓ | | | |
| Relief Damper | | ✓ | | |
| Outside Air Damper | | ✓ | | |
| Mixed Air Damper | | ✓ | | |
| Building Pressure | ✓ | | | |
| Outdoor Pressure | ✓ | | | |
| High Pressure | | | ✓ | |
| Low Pressure | | | ✓ | |
| Filter Differential Pressure | ✓ | | | |
| Fire Alarm Shutdown | | | | ✓ |

3

| Point Name | AI | AO | DI | DO |
|---|---|---|---|---|
| ***Heat Pumps*** | | | | |
| On/Off | | | | ✓ |
| Fan | | | | ✓ |
| Compressor | | | | ✓ |
| Valve | | | | ✓ |
| Staging | | | | ✓ |
| Supply Air Temperature | ✓ | | | |
| Mixed Air Temperature | ✓ | | | |
| Return Air Temperature | ✓ | | | |
| Mixing Dampers | | ✓ | | |
| Outside Air Dampers | | ✓ | | |
| Status | | | ✓ | |
| Fire alarm | | | ✓ | |
| Trouble | | | ✓ | |

4

| Point Name | AI | AO | DI | DO |
|---|---|---|---|---|
| ***Air Conditioners*** | | | | |
| On/Off | | | | ✓ |
| Fan | | | | ✓ |
| Compressor | | | | ✓ |

| | | | | |
|---|---|---|---|---|
| Valve | | | | ✓ |
| Staging | | | | ✓ |
| Supply Air Temperature | ✓ | | | |
| Return Air Temperature | ✓ | | | |
| Humidity | ✓ | | | |
| Humidifier On/Off | | | | ✓ |
| Humidifier Staging | | | | ✓ |
| Status | | | ✓ | |
| Fire alarm | | | ✓ | |
| Trouble | | | ✓ | |

1

| **Point Name** | **AI** | **AO** | **DI** | **DO** |
|---|---|---|---|---|
| ***Fans*** | | | | |
| Enable | | | | ✓ |
| On/Off | | | | ✓ |
| Status (C.T.) | ✓ | | | |
| Volume (speed) | | ✓ | | |
| Damper | | ✓ | | |
| Duct Pressure | ✓ | | | |
| Differential Pressure | ✓ | | | |
| High Pressure | ✓ | | | |
| Low Pressure | ✓ | | | |
| Trouble | | | ✓ | |
| Safety | | | ✓ | |

2

| **Point Name** | **AI** | **AO** | **DI** | **DO** |
|---|---|---|---|---|
| ***Coils – Fluid; Hydronic; Water*** | | | | |
| Control Valve | | ✓ | | |
| Valve Position | ✓ | | | |
| Return Temperature | ✓ | | | |
| Discharge Temperature | ✓ | | | |
| High Limit | | | ✓ | |
| Low Temperature | | | ✓ | |
| Freeze | | | ✓ | |
| Trouble | | | ✓ | |
| Status | | | ✓ | |

3

| **Point Name** | **AI** | **AO** | **DI** | **DO** |
|---|---|---|---|---|
| ***Coils - Electric*** | | | | |
| Enable | | | | ✓ |
| Operate Stages | | | | ✓ |
| Return Temperature | ✓ | | | |
| Discharge Temperature | ✓ | | | |
| High Limit | | | ✓ | |
| Low Temperature | | | ✓ | |

| | | | | |
|---|---|---|---|---|
| Trouble | | | ✓ | |
| Status | | | ✓ | |

1

| Point Name | AI | AO | DI | DO |
|---|---|---|---|---|
| ***Motorized Dampers*** | | | | |
| Damper Position | ✓ | | | |
| Damper Motor | | ✓ | | |
| End Switch | | | ✓ | |

2

| Point Name | AI | AO | DI | DO |
|---|---|---|---|---|
| ***Heat Trace Tape*** | | | | |
| Heat Trace Tape Status | | | ✓ | |

3

| Point Name | AI | AO | DI | DO |
|---|---|---|---|---|
| ***Moisture Sensing*** | | | | |
| Moisture Sensing Status | | | ✓ | |

4

| Point Name | AI | AO | DI | DO |
|---|---|---|---|---|
| ***Lighting*** | | | | |
| Interior Lighting | | | | ✓ |
| Exterior Lighting | | | | ✓ |

5

| Point Name | AI | AO | DI | DO |
|---|---|---|---|---|
| ***Miscellaneous*** | | | | |
| Smoke Detectors | | | ✓ | |
| Fire Smoke Dampers | | | ✓ | |
| Trending | | | | |
| Power – Mechanical equipment | | | ✓ | |
| Power – Lighting | | | ✓ | |
| Power – Convenience Outlets | | | ✓ | |
| Power – Building Total | | | ✓ | |
| Water – Building | | | ✓ | |
| Water – Mechanical Makeup | | | ✓ | |
| Water – Irrigation | | | ✓ | |
| Natural Gas | | | ✓ | |

6

## 2.32.7 CONSTRUCTION REQUIREMENTS

7 The Design-Builder shall construct each system with the level of quality in alignment, fit,
8 attachment, and equipment appropriate for the required use, and shall coordinate the
9 construction of systems with other construction works. The construction shall be such
10 that the design performance and assumptions are not compromised, impacted, or
11 degraded due to the final as-constructed conditions, and that the mechanical systems
12 function as intended. The mechanical systems, as installed and constructed, must meet
13

the requirements of local building codes as well as other related performance specifications included in the RFP documents.

The Design-Builder shall accommodate all inspections as required by the Medina Building Code. Additionally, where required, the Design-Builder shall provide Special Inspections as required by the Medina Building Code.

### 2.32.7.1 CONSTRUCTION WORK PLAN REQUIREMENTS

The Design-Builder shall provide WSDOT with a construction work plan detailing the following information:

- Timeline for:
  - Equipment acquisition
  - Equipment installation (including which devices have to be installed in which order)
  - Software installation
  - Equipment and software integration
  - Device testing
  - System acceptance testing
- Integration with other disciplines, such as electrical and communications
- Sequencing with other projects

### 2.32.7.2 MECHANICAL SYSTEMS COMMISSIONING

The Design-Builder shall prepare a commissioning plan memo that consists of individual equipment performance and quality assurance tests, as well as a complete installation testing plan that assures that the systems function and operate as intended.

Field testing of the mechanical systems shall be performed to verify that all system operating modes function as intended. The Design-Builder shall be responsible for performing field testing in accordance with standard manufacturer's test procedures for all operable equipment. The Design-Builder shall prepare field test procedures and submit to WSDOT for review prior to commencement of any testing. Final testing of safety systems will be witnessed and accepted by SFD.

Testing of diesel fuel piping shall be in accordance with NFPA 31, Standard for the Installation of Oil-Burning Equipment.

See Section 2.34 for additional requirements on commissioning.

## 2.32.8 SUBMITTALS

All submittals including design submittals, plans, calculations, engineering software, energy estimating/modeling software, maintenance manuals, shop drawings, and plan sheet revisions shall be in accordance with the Project Documentation and Project Quality Management Plan. The Design-Builder shall provide six (6) copies for review and distribution unless otherwise noted in these Technical Requirements or accepted by WSDOT. See Section 2.2 and 2.28 for additional requirements.

The initial proof-of-concept design submittal shall include but not be limited to:

- Proposed System Description

- Proposed System Operation
- Piping & Instrument Diagram or Schematic Diagram
- Preliminary Type, Size and Location of Equipment
- Graphic User Interface for EMCS and proposed EMCS hardware and software

### 2.32.8.1 DESIGN SUBMITTALS

Design submittals shall include plans, calculations, and engineering software as noted herein.

#### 2.32.8.1.1 Plans

The Design-Builder shall submit the Preliminary Design plans for the mechanical systems. The plans shall include, but are not limited to, the following items:

- HVAC Plan Set, each building or facility
- Plumbing Plan Set, each building or facility
- Fire Protection Plan Set, each building or facility and approach pier/dock.
- Diesel Fuel Storage and Handling Plan Set for Bridge Maintenance Facility and bridge maintenance dock.
- Compressed Air Piping for Bridge Maintenance Facility and bridge maintenance dock.

See Section 2.28 for additional requirements for final design and released for construction submittals. This includes requirements for SFD submittals for review and comment.

The Design-Builder shall submit Released For Construction Documents on WSDOT standard sheets for the mechanical systems. The plan set for the mechanical systems shall include staged construction plans.

All final design documents shall include the stamp of the Engineer of Record with mechanical license in the state of Washington under Title 18 RCW.

#### 2.32.8.1.2 Calculations

The Design-Builder shall provide complete sets of calculations to support the mechanical systems design described in this section. Complete sets of calculations shall be included with each design review submittal.

In accordance with Section 2.30: The analysis of the expected sound level at the closest adjacent property lines shall be performed to meet the design criteria. The analysis shall include the predictions of sound levels at the closest adjacent property lines, mitigation measures including, but not limited to, sound barriers, construction, and acoustical performance of the sound barriers.

All final design calculations shall include the stamp of the Engineer of Record with mechanical license in the state of Washington under Title 18 RCW.

#### 2.32.8.1.3 Engineering Software

If the Design-Builder proposes to use software other than those listed in this section, the Design-Builder shall submit a list of all software to be used to WSDOT for Review and Comment. To the extent the Design-Builder uses software not presently used by WSDOT, the Design-Builder shall provide all necessary licenses and training. Reports shall be hard-copies of computer output with sufficient documentation and inserted text to identify context and numerical values.

### 2.32.8.2 MAINTENANCE MANUAL AND WARRANTY REQUIREMENTS

The Design-Builder shall prepare information for maintenance during construction. Elements of Work shall include operation, maintenance, and repair of the existing facilities, and facilities constructed as part of this Project beginning at NTP 2, and ending on the day of Physical Completion.

The Design-Builder shall coordinate with WSDOT during the design and construction of the Bridge Maintenance Facility and Dock, Bridge Sheds and Bridge Fire Protection systems, and shall develop a preventive maintenance schedule for the facility and equipment therein.

Preventive maintenance is defined as anytime-based or meter-based, repetitive, preplanned, or regularly-scheduled maintenance work or routine inspection activity. This type of work is scheduled at intervals necessary to prevent equipment breakdown and to maintain proper facility and equipment operations. Inspection, calibration, adjustment, cleaning, lubrication, and parts replacement are examples of preventive maintenance work.

WSDOT uses a Computerized Maintenance Management System (CMMS) to track and plan all facility maintenance. The Design-Builder shall provide all product and equipment information required to develop, in conjunction with WSDOT, a preventive maintenance methodology that offers a strategic and proactive approach for regularly evaluating facility assets, detecting potential problems, and scheduling maintenance work to prevent problems and minimize the frequency of corrective maintenance work. As a minimum, this information shall include:

- Description of Component or Assembly
- Schedule of Maintenance and Preventive Maintenance Check Sheets
- Process Chart or Design Schematic
- Electrical Diagram and Controls (i.e., External Control Schematic)
- Expanded View of Component or Assembly for repair/replacement
- Parts List and Ordering Information

Provide illustrated guidelines and procedures for all equipment handling as defined in this section on design requirements and equipment handling.

Design-Builder shall meet all warranty requirements as identified in Section 2.1.

#### 2.32.8.2.1 Hard-Copy Maintenance Manuals

The material for the operation and maintenance manual shall be assembled to form a book with heavy plastic covers. Each book shall measure approximately 9 inches by 12 inches, consist of a three-ring binder with three-inch “D” rings, and include a vinyl cover

to allow title sheet inserts. Each book shall neatly show a descriptive title, the name of the bridge, the Contracting Agency, the contract number, the data of installation, and the name of the Design-Builder. Copies of drawings shall be in black on a white background and shall be easily legible. Sepia and/or blue line drawings shall not be used. Each section/subsection shall be separated with laminated tabbed divider sheets. Each tab shall be suitably titled. All literature, descriptive materials for inclusion in the manuals shall have all sheets numbered and listed by section in the Table of Contents. The descriptive materials shall include data presented for CMMS as a comprehensive reference.

The arrangement of the booklets, the method of binding, material to be included, and the text shall all be as approved by the Engineer.

The Design-Builder shall submit a 90% preliminary copy of the maintenance manual to the Engineer for review prior to the 100% review copy. The manuals shall be submitted to the Engineer for review and shall be approved prior to commencement of the training session specified. The manuals shall also be made available at the bridge site for use during the start up and commissioning period. Three copies of the final operation and maintenance manuals shall be submitted to the Engineer for review to verify all comments have been incorporated. Upon this final approval, six bound copies of the final approved operation and maintenance manuals shall be delivered to the Engineer 14 days before the schedule date for the first day of the instruction period begins.

Final approval of each volume of the Operation and Maintenance Manual shall be obtained by the Design-Builder prior to the final acceptance test of the Bridge Maintenance Facility and Dock.

See Section 2.28 and 2.30 for additional requirements for maintenance manuals.

#### 2.32.8.2.2 Training

The Design-Builder shall provide training services for WSDOT's bridge maintenance personnel. The Design-Builder shall submit at least two weeks (14 days) prior to the schedule date for the first day of the instruction training session, a complete training syllabus outlining topics to be covered, timeframes, and training location for said topics and materials to be furnished as part of the training sessions. The training sessions shall be organized and be administered to a multi-disciplined group. Training sessions shall be devoted to theory of operation, maintenance and trouble shooting of the Maintenance Facility and Bridge equipment, electrical control. and power distribution systems.

Each session shall be capable of training no more than 25 people at the Maintenance Facility. The Design-Builder shall furnish all necessary instruction sheets, student training aids, paper, and booklets to supplement training.

### 2.32.8.3 SHOP DRAWING SUBMITTAL

The Design-Builder shall conduct all Work necessary to provide temporary and permanent construction final records for the Project. See Section 2.28 for additional requirements.

The following shop drawings shall be included but not limited to:

- Shop drawings of all operable equipment and fabrications.
- Shop drawings of fire protection systems in accordance with Medina Fire Code requirements.

End of Section

# 2.33 PONTOON CASTING FACILITIES

## 2.33.1 GENERAL

This section describes Technical Requirements for Pontoon Casting Facilities (PCFs). Some Technical Requirements pertaining to specific elements of the Work at each of these Sites are not included in this section, but are included in other sections of these Techncial Requirements.

### 2.33.1.1 SCOPE

The Design-Builder shall conduct all Work necessary to develop the PCF for the Project.

Elements of Work in the scope of this section include, but are not limited to, design and construction of the following mandatory elements of the PCFs:

- Civil Site improvements, including:
  - Perimeter security fencing; and
  - Parking.
- Required improvements, if any.

The following are elements the Design-Builder need not include in the PCFs unless required by Applicable Law or other portions of the Contract Documents. However, if an element in this list is provided by the Design-Builder at the Grays Harbor Site, it shall remain part of the PCF upon Completion of the Project. Final disposition of improvements and site restoration required at other PCFs shall be addressed pursuant to the applicable leases entered into between the Design-Builder and the property owner. This list is not intended to be all-inclusive, but is representative of elements included in conceptual engineering and environmental planning documentation.

- Civil Site improvements, including:
  - Site power distribution and permanent Site lighting;
  - Laydown area for storage of materials and assembly and fabrication of components for Pontoon construction; and
  - Railroad spur.
- Crane support structures, with crane rails.

Other structures Work not already explicitly listed above excluding the Pontoons and Pontoon casting system.

## 2.33.2 MANDATORY STANDARDS

### 2.33.2.1 MANDATORY STANDARDS FOR MODIFICATIONS TO THE EXISTING GRAYS HARBOR SITE PCF

Any modifications to the Grays Harbor PCF shall be made in accordance with the applicable standards shown below.

The following is a list of publications that shall be used for 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication, including the supplemental interim revisions, as of the RFP publication date shall be used.

Although the following Mandatory Standards do not necessarily specifically address each element anticipated at the PCF, the intent of this section is that the elements at the PCF conform to these Standards as closely as possible. For the purposes of applying and interpreting the requirements of the Mandatory Standards, the components and elements of structures at the PCF shall meet the requirements for similar components and elements of bridges and other structures specifically addressed in the Mandatory Standards.

For non-structural Work at the PCFs that is not addressed in this section, refer to the applicable section of the Technical Requirements for Mandatory Standards.

- WSDOT Bridge & Structures Office Design Memoranda ("BSODM") (Appendix B4), as modified for Design-Build.
- WSDOT *Bridge Design Manual* (M 23-50) (BDM) (Appendix D1).
- Structures Minimum Standards (Appendix B2).
- Bridge Shaft Mandatory Standard (Appendix B5).
- Amendments to the Standard Specifications (Appendix B1).
- WSDOT Standard Specifications (M 41-10) (Appendix D18).
- WSDOT *Geotechnical Design Manual* (M 46-03) (GDM) (Appendix D5).
- AASHTO *Guide Specifications for LRFD Seismic Bridge Design*.
- AASHTO *LRFD Bridge Design Specifications*, Customary U.S. Units.
- Local agency municipal code.
- WSDOT *Design Manual* (M 22-01) (Appendix D3).
- WSDOT *Plans Preparation Manual* (M 22-31) (PPM) (Appendix D12).
- WSDOT *Construction Manual* (M 41-01) (Appendix D2).
- WSDOT *Materials Manual (M 46-01) (Appendix D10*).
- WSDOT Standard Plans (M 21-01) (Appendix D17).
- AASHTO LRFD Bridge Construction Specifications.
- AASHTO *Standard Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.
- Structural Welding Code - Steel: AWS D1.1/D1.1M.
- Structural Welding Code - Reinforcing Steel: AWS D1.4/D1.4M.
- Bridge Welding Code: AASHTO/AWS D1.5M/D1.5.
- American Concrete Institute, ACI 350-06.

- United States Army Corps of Engineers – Seattle District, Dredged Material Evaluation and Disposal Procedures, Dredged Material Management Program, July 2008.
- United States Army Corps of Engineers, EM 1110-2-5025 : *Engineering and Design – Dredging and Dredged Material Disposal*, 1983.
- United States Army Corps of Engineers, EM 1110-2-5027 : *Engineering and Design – Confined Disposal of Dredged Material*, 1987.
- Washington State Aquatic Habitat Guidelines Program, *Integrated Streambank Protection Guidelines*, 2002.
- United States Army Corp of Engineers, EM 1110-2-1100: *Coastal Engineering Manual*, Parts I – IV and Appendix A, August 2008.
- CUR/RWS, *Manual on the Use of Rock in Hydraulic Engineering*, CUR/RWS Report 169, Netherlands Centre for Civil Engineering Research and Codes, 1995 edition or later.
- United States Army Corp of Engineers, EM 1110-2-1003: *Hydrographic Surveying*, January 2002 with April 2004 Change.
- United States Army Corps of Engineers EM 1110-2-2504 : *Engineering and Design - Design of Sheet Pile Walls*, 1994.
- United States Army Corps of Engineers EM 1110-2-2503: *Engineering and Design - Design of Sheet Pile Cellular Structures: Cofferdams and Retaining Structures*, 1989, with 1990 errata.
- World Association for Waterborne Transport Infrastructure (PIANC), *Guidelines for the Design of Fenders Systems*: 2002, MarCom Report of WG 33 2002.
- United States Department of Defense, UFC 4-159-03, *Design: Moorings*, 2005.
- United States Federal Emergency Management Agency, Flood Insurance Rate Map—City of Aberdeen, Washington, Grays Harbor County, Panel 3 of 4: Community Panel Number 5300580003B, 1984.
- Conformed Pontoon Construction Project Technical Requirements Section 2.13 for Pontoon Casting Facilities (November 11, 2009) (Appendix B8).

### 2.33.2.2 MODIFICATIONS TO THE WSDOT BRIDGE DESIGN MANUAL (BDM)

The BSODM (Appendix B4) shall apply to the Project, except that the references to the Project advertisement dates shall not apply.

The BDM (Appendix D1), as modified by the BSODM (Appendix B4), shall be further modified for Design-Build as follows:

- Rights and Responsibilities - The following clarifies which rights and responsibilities discussed in the BDM (Appendix D1) are applicable to the Design-Builder:
  - The Design-Builder shall complete all analyses, evaluations, load ratings, plans, and specifications discussed in the BDM (Appendix D1);
  - All such analyses, evaluations, load ratings, plans, and specifications are subject to review and comment by WSDOT; and

- All references to WSDOT sections, offices, and engineers shall mean WSDOT.

- The Design-Builder shall obtain WSDOT's written approval for all proposed deviations from the provisions of the BDM (Appendix D1), except as included in these Technical Requirements.

#### 2.33.2.3 INTENTIONALLY OMITTED

### 2.33.3 PCF SITE AVAILABILITY

The State will make the following sites available to the Design-Builder to use for the construction of Pontoons and other Project components:

- Grays Harbor Site;
- Concrete Technology Corporation Site ;
- Port of Tacoma Site; and
- Port of Olympia Site.

It is the Design-Builder's responsibility to determine which sites should be used (if any) to meet the delivery schedule required for this project. The Design-Builder may also choose alternate site(s) for Pontoon construction. All sites provided by WSDOT are for the convenience of the Design-Builder and are provided as is. WSDOT does not warrant any of the sites as suitable for the Design-Builder's needs for the Project.

#### 2.33.3.1 GRAYS HARBOR SITE

The Grays Harbor PCF will be available for the Design-Builder on July 11, 2014. The Design-Builder shall not begin any operations at this PCF until this date.

The Design-Builder shall not begin any operations at this PCF until all environmental review is completed, permits are obtained, and environmental requirements are met.

If this PCF becomes available before July 11, 2014, the Design-Builder may request permission to utilize this facility for the period of time in advance of July 11, 2014. However, the Design-Builder shall not begin any construction work at the Grays Harbor PCF until all of the Pontoon Construction Project (PCP) Pontoons are completed and the facility is 100% available for this contract. Although the Grays Harbor site will be provided to the Design-Builder for use as a casting facility rent free as to the site itself, the Design-Builder shall be responsible for all costs of any nature to modify the existing facility in compliance with the Contract Documents should the Design-Builder choose to do so, and operate and maintain the facility.

Prior to mobilization onto the Grays Harbor Site, the Design-Builder shall perform a joint (coordinated) pre-mobilization inspection of the PCF with WSDOT. This inspection shall be videotaped and recorded on DVD or other recording media acceptable to WSDOT. The joint inspection shall be documented by the Design-Builder in a written inspection report with photos as applicable, and include the condition of the PCF in general and each component and system of the PCF in particular, including, but not limited to the following, if present:

- Casting basin, including fish exclusion and collection systems;
- Casting basin gate system and hydraulic control structures (HCS);
- Crane support structures;

- Building structures and foundations;
- Launch channel dolphins;
- Laydown areas for storage of materials and assembly and fabrication of components for Pontoon construction;
- Perimeter security fencing;
- Site paving and grading;
- Access connection(s) to public street Right-of-Way;
- Stormwater, groundwater, and process water facilities;
- Fire suppression system;
- Site power distribution and permanent Site lighting;
- Potable water distribution systems;
- Sanitary sewer system; and
- Shoreline protection.

### 2.33.3.2 CONCRETE TECHNOLOGY CORPORATION SITE

Should the Design-Builder in its discretion choose to use the Concrete Technology Corporation (CTC) site, the site will be available by lease on November 1, 2011. The Design-Builder may occupy the Site after this date in compliance with the terms of the lease. However, the Design-Builder shall not begin any construction activities or operations at this site until such time as NTP 2 is issued, and all environmental review is completed, permits are obtained, and environmental requirements are met for the CTC site as provided in Section 2.8.

Upon mobilization to the CTC site, the Design-Builder shall be solely responsible for operation and maintenance of the facility in accordance with the lease, the requirements of this Section 2.33, as well as all other Contract Documents and Applicable Law.

WSDOT has negotiated a lease agreement for the CTC site (Appendix R3) that allows for exclusive use of the facility and support properties for the Project. Upon notification from the Design-Builder that it wants to use the facility, WSDOT will assign the lease agreement attached as Appendix R3 to the Design-Builder using the Assignment and Assumption of Lease form in Appendix R3. The Design-Builder agrees to assume the lease and perform all the covenants and conditions required therein as the Design-Builder's sole responsibility. Any reimbursements for lease payments shall be in compliance with Section 1-09.9(4) of the General Provisions.

The Design-Builder shall notify WSDOT in writing within 30 Calendar Days after NTP 2 of whether or not the Design-Builder has chosen to use the CTC site. The Assignment and Assumption of Lease form shall be executed within 30 Calendar Days after receipt by WSDOT of the Design-Builder's decision to use the site.

### 2.33.3.3 PORT OF TACOMA AND PORT OF OLYMPIA SITES

The Design-Builder may choose to utilize, at its sole discretion and cost, sites located at the Port of Tacoma and/or Port of Olympia as upland facilities for Pontoon casting or for construction of other Project components. These sites have not been environmentally

cleared or permitted by the State. The Design-Builder will be responsible to obtain, at the Design-Builders sole cost, all necessary environmental clearances and/or permits prior to use of the sites. The Design-Builder shall be responsible, in accordance with Section 2.8, for securing local agency, third party, environmental or other Governmental permits and/or agreements necessary to utilize these sites. In addition, the Design-Builder shall be responsible for all costs of any nature to operate/maintain and/or develop either site including dealing with hazardous material.

WSDOT has negotiated lease agreements for both sites. Port of Tacoma lease agreement is provided in Appendix R12. The Port of Olympia lease agreement is provided in Appendix R7. Each lease includes Term A provisions which address interim use of the premises and Term B provisions which address use of the respective sites during construction of the Project. The Term B provisions are in the form of a lease which shall be executed directly between the Design-Builder and the respective Port owners should the Design-Builder choose to use a site.

The Design-Builder shall notify WSDOT in writing within 30 Calendar Days after NTP 2 whether the Design-Builder has chosen to use either or both of the Port sites. Within 30 Calendar days after WSDOT's receipt of written notice that Design-Builder intends to use one or both sites, the Design-Builder shall execute the respective Term B Lease with the respective Port owner. In addition, the Design-Builder shall comply with all requirements of the respective Term A provisions as applicable.

Any reimbursements for lease payments shall be in compliance with Section 1-09.9(4) of the General Provisions.

#### 2.33.3.4 OTHER UNNAMED SITES

The Design-Builder may utilize other existing casting facilities which have not been environmentally cleared or permitted by the State as Pontoon casting facilities, provided such sites receive all necessary environmental clearances and permits prior to use.

The Design-Builder shall be responsible, in accordance with Section 2.8, for securing any local agency, third party, environmental or other Governmental Approvals and/or agreements necessary to utilize these sites. In addition, the Design-Builder shall be responsible for any and all costs of any nature to operate/maintain and/or develop any alternate site.

Any reimbursements for lease payments related to such sites, should the Design-Builder choose to use an alternate unnamed site, shall be in compliance with Section 1-09.9(4) of the General Provisions.

### 2.33.4 PERFORMANCE REQUIREMENTS

#### 2.33.4.1 INTENTIONALLY OMITTED

#### 2.33.4.2 GRAYS HARBOR SITE PONTOON CASTING FACILITY

The Grays Harbor PCF will be built under the PCP Contract. Construction of this facility is expected to begin in the Spring of 2011. Conceptual design drawings for this facility are included in Appendix M10, but do not necessarily represent the configuration or contents of the as-built PCF when it becomes available for the Design-Builder's use. Released for construction plans and as-built drawings will be provided to the Design-

Builder as they start becoming available in 2011. The conformed technical requirements relating to the Grays Harbor PCF issued for the PCP Contract are included in Appendix B8 for reference only.

#### 2.33.4.2.1 Civil Site Improvements

##### 2.33.4.2.1.1 Fencing

Security fencing shall be maintained around the perimeter of leased areas, in accordance with the requirements of this section. Where existing fencing does not exist, does not meet the requirements of this section, or is damaged due to construction, new fence shall be installed. The Design-Builder shall install and maintain a locking gate at each access point. The fence and access point gates shall prevent vehicles and pedestrians from accessing the Site from adjacent properties, including along the shoreline, during all non-working hours.

##### 2.33.4.2.1.2 Parking

Parking shall be maintained at the PCF in accordance with the applicable municipal codes.

##### 2.33.4.2.1.3 Stormwater, Groundwater, and Process Water Facilities

Stormwater, groundwater, and process water facilities shall be based on existing facility design and permit conditions.

##### 2.33.4.2.1.4 Utilities

###### *2.33.4.2.1.4.1 General Requirements*

The following performance requirements shall apply to onsite utilities as defined by the Grays Harbor Site:

- The Design-Builder shall Protect in Place all Utilities encountered at the Grays Harbor Site from damage resulting from the Work. The Design-Builder shall design and construct any modifications to the Grays Harbor Site, if any, so that no Utilities are required to be relocated. The Design-Builder shall coordinate all Protection in Place with the respective Utility Owners. All costs to perform Protection in Place and coordination with Utility Owners shall be included in the Contract Price.
- At the end of the Project and on an as-needed basis as determined by WSDOT, the Design-Builder shall inspect all onsite at-grade utility appurtenances. As directed by WSDOT, the Design-Builder shall adjust these appurtenances to match existing grade. If corrective action needs to be taken, the Design-Builder shall coordinate all such activities to minimize disruption to on-site activities. WSDOT will provide as-builts for utilities as they are available.

All Work related to Utilities at the Grays Harbor Site shall comply with the standards set forth in Section 2.10.2.1. Unless specifically noted otherwise, the requirements of Section 1-07.17 do not apply to Utilities on the Grays Harbor Site.

#### *2.33.4.2.1.4.2 Intentionally Omitted*

#### *2.33.4.2.1.4.3 Utility Information Supplied by WSDOT*

Utility Information for the Grays Harbor Site is provided in Appendix M18. This information shall not be utilized for determining utility locations. Unless specified otherwise, the Design-Builder's reliance on any Utility Information is at the Design-Builder's sole risk.

##### *2.33.4.2.1.4.3.1.1 Project Utility Easements*

WSDOT investigations have identified the following Utilities that have easement rights within the property boundary limits of the Grays Harbor Site:

- City of Aberdeen Sanitary Sewer Interceptor Easement (Recorded August 18th, 1958 under File No. 37345 in Volume 388 of Deeds on Page 67 to the City of Aberdeen).
- City of Aberdeen Drainage Easement (File No. 54280, Col. 137 of Deeds, Page 742).

WSDOT has not identified Utility easements outside of the Grays Harbor Site limits. The Design-Builder shall identify all Utilities and Utility easements impacted by construction activities necessary to complete the Work.

### 2.33.4.2.2 Casting Basin

The casting basin is configured so that Pontoons are constructed in a dry condition and then launched by floating them out of the basin through a gate and into the launch channel on their own hulls. A dry condition is defined as the condition where the basin gate(s) is closed; Pontoons, if present, are in full contact with the basin floor; and the basin is completely drained of all water, except for ongoing collection and treatment of Stormwater, process water, or ground water.

The existing casting basin facility design incorporates equipment and facilities for collecting fish that become trapped in the flooded casting facility structure after gate closure and returning them to the launch channel or adjacent navigable waterway. Permit conditions are based on this configuration, and any change would be in accordance with the requirements of Section 2.8.

Appendices M10 and M11 provide additional information concerning the technical requirements governing the design of the Grays Harbor PCF currently underway under the PCP Contract. Released for construction plans and as-built drawings will be provided to the Design-Builder as they start becoming available in 2011.

### 2.33.4.2.3 Maintenance of Launch Channel

The launch channel connects the adjacent navigable waterway to the casting basin at its gate location.

Maintenance of the launch channel is not covered by the environmental documentation or permits being provided by WSDOT. If maintenance dredging is required, the responsibility for obtaining new or modified environmental clearances and permits shall be in accordance with Section 2.8.

If the Design-Builder uses the Grays Harbor PCF, they will be responsible for determining the scope of the maintenance requirements for the launch channel.

The following are expected minimum maintenance requirements for the channel:

1. The channel width at the bottom of its side slopes shall be at least as wide as the associated clear opening of the gate system.
2. The channel bottom shall be maintained, including scour protection, such as to prevent fouling of the gate system and the water intake for the HCS.
3. The launch channel shall be maintained so that Pontoons with 13 feet - 0 inches of draft can be floated through the launch channel with a minimum of 2 feet -0 inches of clearance between the Pontoon keel and the channel bottom.

Sedimentation is expected to occur within the channel. Refer to Appendix C1 (Environmental Commitments) for other dredging-related requirements.

If the Design-Builder uses the Grays Harbor PCF, at least two graduated tide staffs shall be maintained within or adjacent to the launch channel. An electronic tide gauge shall also be maintained and calibrated to automatically report water surface elevation within the launch channel at an interval not to exceed six-minutes. The tide gauge readings shall be transmitted to a personal computer or handheld electronic device for real-time monitoring of water levels in the launch channel. Collected data shall be stored by the Design-Builder for submittal to WSDOT in accordance with the requirements of this section.

#### 2.33.4.2.4 Other Civil Site Improvements

##### 2.33.4.2.4.1 Site Power Distribution and Permanent Site Lighting

The Design-Builder shall maintain Site power distribution and Site lighting .

##### 2.33.4.2.4.2 Potable Water Distribution

The Design-Builder shall maintain potable water distribution system to support the Grays Harbor Site as required by the local agency municipal code.

##### 2.33.4.2.4.3 Sanitary Sewer

The Design-Builder shall maintain sanitary facilities to support the Grays Harbor Site as required by the local agency municipal code.

#### 2.33.4.2.5 Operational Requirements

Refer to Section 2.29 for maintenance during construction, and Section 2.12 for Pontoon construction and launching.

An Operation and Maintenance Manual will be prepared as part of the PCP Contract. The requirements for this manual are included in Appendix B8. A copy of this Operation and Maintenance Manual will be provided to the Design-Builder as it becomes available. The Design-Builder shall follow the procedures in this Manual for operation of the facility and its systems, and at a minimum carry out the recommended maintenance procedures at the recommended frequencies as detailed in this Manual.

#### 2.33.4.2.6 Grays Harbor PCF Turnover to WSDOT

Prior to the Design-Builder turning over the Grays Harbor PCF to the State, the following criteria shall be met:

- The casting facility gates are closed and the casting facility is drained;

- An updated version of the Operation and Maintenance manual for the PCF defined in Appendix B8 has been submitted to WSDOT and training defined in that section has been completed;
- WSDOT has full and unrestricted use and benefit of the facility, both from the operational and safety standpoint;
- The Design-Builder is fully demobilized from the Grays Harbor Site; and
- The PCF is in as the same or better condition as when it was provided to the Design-Builder, as documented in the pre-mobilization inspection report required by this section.

### 2.33.4.3 CTC SITE PONTOON CASTING FACILITY

The dry dock facility at the CTC site in Tacoma, WA, is available for the Design-Builder to use in constructing Pontoons for this Project. See Section 2.33.3.

#### 2.33.4.3.1 Existing Facilities

Appendix M10 contains reference drawings of the CTC site's dry dock and adjacent area. Appendix A2 contains basemap information for the CTC site. These drawings do not necessarily represent the most current state of the facility. The Design-Builder is responsible to perform its own investigation of the facility as it deems prudent.

#### 2.33.4.3.2 Modifications to Existing Facilities

Environmental documents and Permits obtained by WSDOT for the Project are based on the existing configuration of the CTC site.

Any modifications to the CTC site below the waterline, to the gate system, to the dock, to the shoreline, or modifications which impact stormwater or water quality will require additional environmental clearances and permitting.

The Design-Builder shall be responsible for environmental clearances or additional permitting, in accordance with Section 2.8 for modifications to the existing facility as necessary to allow for Pontoon construction.

Modifications and the disposition of said modifications upon completion of the Project shall be coordinated with the lessor and are subject to the terms of the lease agreement for the site. See Section 2.33.3.2.

#### 2.33.4.3.3 Parking

Parking shall be provided at the CTC site in accordance with the applicable municipal codes. Parking spaces shall be included and reserved for each WSDOT office space provided on the CTC site by the Design-Builder in accordance with the requirements of Section 2.1. If the office space required by Section 2.1 is not located on the CTC site, parking spaces shall be provided at the CTC site for WSDOT personnel as directed by WSDOT, but need not exceed 30 spaces.

#### 2.33.4.3.4 Operational Requirements

Refer to Section 2.8 for environmental requirements affecting use of the CTC site, including, but not limited to, the existing permits for the dry dock facility.

### 2.33.4.4 PORT OF OLYMPIA, PORT OF TACOMA AND OTHER ALTERNATE UPLAND SITES

The Design-Builder may choose to utilize, at its discretion, sites located at the Port of Olympia, Port of Tacoma and/or other unnamed upland sites for Pontoon casting or for construction of other Project components.

#### 2.33.4.4.1 Modifications to Existing Facilities

If the Design-Builder chooses to use an alternate PCF, the Design-Builder shall be responsible for modifications to the existing facilities as necessary to allow for Pontoon construction, including, but not limited to, the following:

- Design and construction of Pontoon casting slabs. Casting slabs shall be designed and constructed such that the Pontoon fabrication tolerances and Pontoon geometry control requirements in Section 2.12 are met, taking into consideration the overall and differential settlement and deflection of the casting slabs under all load patterns and combinations.

  The casting slabs shall be designed and constructed to prevent cracking of Pontoons caused by overall and differential settlement and deflection of the casting slabs, under all load patterns and combinations.

- Design and construction of structures and equipment needed to transport and launch Pontoons.

- Design and construction of Stormwater systems and water quality systems required by Federal and State resource agencies as conditions of use of the facility.

It will be the Design-Builder's responsibility to obtain environmental clearances or additional permitting, in accordance with Section 2.8, for modifications to an existing facility as necessary to allow for Pontoon construction.

Modifications and disposition of modifications upon completion of the Project shall be coordinated with the lessor and are subject to the terms of the respective lease agreement. See Section 2.33.3.3.

#### 2.33.4.4.2 Intentionally Omitted

#### 2.33.4.4.3 Parking

Parking shall be provided at the PCF in accordance with the applicable municipal codes. Parking spaces shall be included and reserved for each WSDOT office space provided on the Site by the Design-Builder in accordance with the requirements of Section 2.1 (General Information). If the office space required by Section 2.1 is not located on the Site, parking spaces shall be provided at the PCF for WSDOT personnel as directed by WSDOT, but need not exceed 30 spaces.

#### 2.33.4.4.4 Operational Requirements

Refer to Section 2.8 for environmental requirements affecting use of upland PCFs.

# 2.33.5 DESIGN CRITERIA

## 2.33.5.1 GENERAL DESIGN CRITERIA

Any modifications made to the Grays Harbor Casting Basin shall be in accordance with the Mandatory Standards in this Section.

All structure elements shall be designed in accordance with the BDM (Appendix D1).

The Mandatory Standards in this section take precedence over the standards listed in Section 2-09.3(3)D of the Standard Specifications for design of shoring and cofferdams.

Any modifications or improvements made to Concrete Technology Corporation Site shall also be required to meet any criteria set by these owners in accordance with the appropriate lease requirements (see Appendix R3 ).

If the Design-Builder utilizes alternate PCFs , then modifications or improvements to these sites shall be coordinated with the property owners in accordance with the applicable lease language. This coordination shall be the responsibility of the Design-Builder.

It will be the Design-Builder's responsibility, in accordance with Section 2.8, to obtain environmental clearances or additional permitting for modifications to an existing facility as necessary to allow for Pontoon construction.

### 2.33.5.1.1 Design Personnel Requirements

The Design-Builder shall provide a Structural Lead Designer with a minimum of 15 years of experience in the design and construction of cast-in-place and precast, prestressed and concrete structures and marine structures such as piers, wharves, docks, bulkheads, and dolphins. The Structural Lead Designer shall be a Structural Engineer, licensed in the State of Washington under Title 18 RCW, and shall be in responsible charge of the structural design elements of the Project.

The Design-Builder shall provide a Site Civil Lead Design Engineer with a minimum of 10 years of experience in the design of site civil facilities for site development projects, with an emphasis on industrial installations. The Site Civil Lead Design Engineer shall be licensed in the State of Washington under Title 18 RCW as a Professional Engineer, and shall be in responsible charge of the site civil work elements of the Project.

The Design-Builder shall provide a Coastal Engineer with a minimum of 10 years of experience in the permitting, design, and construction of marine dredging, industrial marine facilities, and shoreline protection projects. The Coastal Engineer shall be a Civil Engineer licensed in the State of Washington under Title 18 RCW, and shall be in responsible charge of the design of shoreline modifications and, if required, shoreline protection design elements of the Project.

The Design-Builder shall provide a Utilities Lead Designer with a minimum of five years of experience in design and construction of utilities, including, but not limited to potable water systems, fire suppression systems and sanitary sewers systems for industrial applications. The Utilities Lead Designer shall be a Professional Engineer, licensed in the State of Washington under Title 18 RCW, and shall be in responsible charge of the utility design elements of the Project.

## 2.33.5.2 GRAYS HARBOR SITE PONTOON CASTING FACILITY

### 2.33.5.2.1 Fire Suppression System – Grays Harbor Site PCF

A fire suppression system consistent with the requirements of the local agency will be existing at the Grays Harbor Site PCF and shall be maintained by the Design-Builder. However, if modifications to the Grays Harbor Site by the Design-Builder result in the need to modify the existing fire suppression system, the Design-Builder shall be responsible for the design and construction of the modifications in accordance with this section.

The calculations and analysis for fire suppression systems shall include, but will not be limited to the following:

- Calculation of demand flows;
- Hydraulic analysis;
- Line and meter sizing;
- Fire hydrant, stand pipe, and valve spacing;
- Pressure reduction valve design;
- Backflow preventer design;
- Vault design (structurally designed as necessary); and
- Locations of post indicator valves.

The Design-Builder shall coordinate with the local agency to determine the specific requirements of the local agency. The Design-Builder shall design and construct the fire suppression system in accordance with the Mandatory Standards herein and any additional requirements requested by the local agency.

### 2.33.5.2.2 Meter Vaults and Buried Utility Structures- Grays Harbor Site

Meter vaults and buried structures should be structurally designed in accordance with this Section. Meter vaults should be designed for the applicable meter size with a minimum of 15 inches between the vault wall and meter flange connection or as directed by the local agency. The meter box shall be plumbed and designed with floor drains or other drain system so that the box does not fill with storm or ground water.

### 2.33.5.2.3 Protection of Utility Appurtenances – Grays Harbor Site

All proposed above ground utility appurtenances located within areas that are susceptible to vehicular traffic and damage by collision shall be protected by bollards or another protective measure. If bollards are used, the Design-Builder shall space bollards around the appurtenance such that all gaps are a maximum of 6.0 feet between successive bollards.

All above ground utility structures shall be painted with a long lasting, high visibility color.

#### 2.33.5.2.4 Temporary Construction Trailers, Temporary Office Space and Material Lab Trailers – Grays Harbor Site

The Design-Builder shall design all utility service hook ups and or provide utility services in accordance with this section to onsite temporary office trailers and material lab trailers. Refer to Section 2.1 for additional requirements.

#### 2.33.5.2.5 Casting Slabs

Casting slabs shall be constructed of reinforced concrete.

Casting slabs shall be designed and constructed in such a manner that the Pontoons shall be free to shorten during post-tensioning.

#### 2.33.5.2.6 Non-Structural Design Criteria

For non-structural Work, the local agency municipal code shall be moved up in precedence in the list of Mandatory Standards in 2.33.2.1 so that it comes before the Drilled Shaft Mandatory Standard.

Site access and egress for emergency vehicles shall be maintained in accordance with the requirements of the local agency municipal code.

Design for personnel access, egress, and safety shall be in accordance with the local agency municipal code and other Applicable Law.

#### 2.33.5.2.7 Laydown Area

The design of areas used for storage of materials and assembly and fabrication of components for Pontoon construction, as well as areas used for vehicle circulation, shall be in accordance with the applicable sections of the Technical Requirements.

## 2.33.6 SUBMITTALS

### 2.33.6.1 DESIGN SUBMITTALS

#### 2.33.6.1.1 Preliminary Design Submittal

The preliminary design submittal shall include drawings detailing the design of proposed modifications to any PCFs. A preliminary design submittal for PCFs is not required if there are no modifications to these PCFs.

The preliminary design submittal shall include a preliminary version of the structural and mechanical basis of design report. The structural and mechanical basis of design report shall consist of narratives and figures including, but not limited to:

- General descriptions of facilities to be constructed that require structural or mechanical design, and operating procedures for those facilities;
- Design criteria, including, but not limited to, design loads and settlement and deflection tolerances for the casting slabs;
- Design assumptions;
- Description of gravity and lateral load resisting systems for each structure;

- Description of foundation systems to be used and related geotechnical design criteria;
- Key dimensions and elevations for the PCF; and
- Supplemental design codes and references not part of the Mandatory Standards.

See Sections 2.2 (Project Documentation) and 2.28 (Quality management Plan) for other general requirements.

#### 2.33.6.1.2 Final Design Submittal

The final design submittal shall include drawings and specifications for the PCF Work.

The final design submittal shall include the final version of the structural and mechanical basis of design report.

See Sections 2.2 and 2.28 for other requirements.

#### 2.33.6.1.3 Released For Construction Document Submittal

The Design-Builder shall submit RFC drawings on sheets formatted in accordance with the BDM (Appendix D1) and *Plans Preparation Manual* for the PCF Work.

RFC documents related to structural Work, including drawings, specifications, calculations, and reports, shall include the stamp of a Structural Engineer, licensed in the State of Washington under Title 18 RCW.

RFC documents related to non-structural Work, including Plans, Specifications, Calculations, and Reports shall include the stamp of a Professional Engineer, licensed in the State of Washington under Title 18 RCW.

See Sections 2.2 and 2.28 for other requirements.

#### 2.33.6.1.4 Structural Design 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 the Final Design submittal and the Released For Construction (RFC) submittal. The RFC submittal calculations shall include the stamp of a Structural Engineer, licensed in the State of Washington under Title 18 RCW.

The calculations sets 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 Name, designer/checker initials, date (month, day and year), and supervisor's initials shall be listed; and
- Design calculations - These shall include design criteria, loadings, structural analysis, and pertinent computer input and output data (reduced to an 8.5 inch by 11 inch sheet size).

See Sections 2.2 and 2.28 for other requirements.

#### 2.33.6.1.5 Non-Structural Design Calculations

The Design-Builder shall provide complete sets of calculations to support all non-structural designs described in this section. Complete sets of calculations shall be

included with the Final Design submittal and the RFC submittal. The RFC submittal calculations shall include the stamp of a Civil Engineer, licensed in the State of Washington under Title 18 RCW.

The calculations sets 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 Name, designer/checker initials, date (month, day and year), and supervisor's initials shall be listed; and
- Design calculations - These shall include design criteria, loadings, Site conditions analysis, and pertinent computer input and output data (reduced to an 8.5 inch by 11 inch sheet size).

See Sections 2.2 and 2.28 for other requirements.

### 2.33.6.2 PRE-MOBILIZATION INSPECTION REPORT

The Design-Builder shall submit the pre-mobilization inspection report of the Grays Harbor Site PCF required by this section, along with the accompanying videos of the inspection, to WSDOT prior to mobilizing onto the Grays Harbor Site.

### 2.33.6.3 WORKING DRAWINGS

#### 2.33.6.3.1 Working Drawings for Structures

The Design-Builder shall submit shop drawings for all steel elements and precast concrete elements, and reinforcing for cast-in-place and precast concrete elements in accordance with Section 2.28 to WSDOT for review and comment prior to implementation. The following information shall be included in the shop drawings or other Working Drawings, as applicable:

- Size of member and fasteners;
- Length dimensions;
- Finish, such as galvanizing, anodizing, and painting;
- Weld size and type and welding procedures, if required;
- Strand or steel reinforcing bar placement, jacking procedure, stress calculations, and elongations;
- Fabrication-reaming, drilling, and assembly procedures;
- Wall penetrations; and
- Erection procedures.

#### 2.33.6.3.2 Working Drawings for Falsework, Forms, and Temporary Structures

The Design-Builder shall prepare working drawings with supporting design calculations for all falsework, forms, and temporary structures. Design-Builder shall submit the Working Drawings to WSDOT for review and comment prior to implementation.

See Section 2.28 for other requirements.

#### 2.33.6.3.3 Working Drawings and Other Construction Submittals for Mechanical Work

The Design-Builder shall submit to WSDOT working drawings, manufacturer's data, and material certifications for all mechanical systems, equipment, and fabrications related to the gate system and HCS for review and comment prior to implementation.

### 2.33.6.4 WARRANTIES

Warranties provided by manufacturers for all equipment and components shall be transferred from the Design-Builder to WSDOT and the warranty documentation shall be submitted to WSDOT.

### 2.33.6.5 OPERATION AND MAINTENANCE MANUAL

The Design-Builder will be provided with the Operation and Maintenance (O&M) manual prepared by the previous contract when it is available.

The Design-Builder shall update this O&M manual to include any new procedures or requirements based on the Design-Builder's modifications to the Grays Harbor casting facility. The following information shall be provided in the comprehensive updated (O&M) manual for the Grays Harbor Site PCF:

- Casting Basin:
  - Structural design criteria, including loading diagrams for the floor; and
  - Operating plan and sequence for flooding the basin, excluding fish from the basin during flooding, launching Pontoons, draining the basin, and the collection and release of fish left in the casting facility after gate closure.
- Gate and Hydraulic Control Structure:
  - Operating plan and instructions for the hydraulic control structure as a complete system;
  - Operating instructions for the gate or gates as a complete system; and
  - Operations and maintenance information for individual pieces of installed equipment meeting the following requirements:
    - Each type of device furnished shall be identified in the O&M Manual using the same identification as shown in the Plans and Specifications. The information and exact equipment installed shall be indicated, not the complete line of the manufacturer. Where sheets show the equipment installed, as well as other equipment, the installed equipment shall be neatly and clearly identified on such sheets.
    - Equipment submittals shall contain step-by-step circuit description information designed to acquaint maintenance personnel with equipment operation in each mode of operation.
    - Parts lists shall give full ordering information assigned by the original parts manufacturer. Relabeled or renumbered parts information as reassigned by the equipment supplier is not acceptable.
    - The following information shall be provided for each device:
      - Manufacturer's name, address, and phone number;

- Local supplier's name, address, and phone number;
- Complete parts lists, including exploded views, quantities, and manufacturer's part numbers;
- Installation instructions;
- Recommended maintenance items, including maintenance procedure and recommended interval of maintenance listed in hours of operation, calendar units, or other similar time unit. Maintenance data shall be organized in tabular format for ease of use; and
- Copies of test reports.

- Owner's manual and manufacturer's operations and maintenance data for the electronic tide gauge.
- Pre- and post-dredging hydrographic surveys of the launch channel for each dredging event.
- Launch channel dredging cut volumes and disposal location for each dredging event.
- Wave and tidal data collected. A hard copy submittal is not required for this element. This element shall be submitted as one or more electronic files in the spreadsheet format specified in Section 2.1.
- Structural design criteria and loading diagrams for dolphin structures and all other berthing and mooring structures and hardware.
- Structural design criteria for other structures at the Grays Harbor Site PCF, including batch plant and equipment foundations, and crane support structures.

End of Section

# 2.34 COMMISSIONING

## 2.34.1 GENERAL

The Design-Builder shall perform all Work necessary to meet the requirements for commissioning of the Project's components and systems. The commissioning process does not reduce the responsibility of the Design-Builder to provide finished and fully functional systems and equipment. The Design-Builder shall provide a Commissioning Authority (CxA) at the beginning of the design phase, and the CxA shall be a member of the Quality Assurance Team.

### 2.34.1.1 COMMISSIONING INTENT

- Undertake commissioning to bring the floating bridge, landings, Bridge Maintenance Facility and Dock to a fully operational state and free of deficiencies in the most effective and timely manner available.
- Provide a CxA at the beginning of design to plan and coordinate the commissioning process.
- Incorporate inspections and quality assurance activities as design and construction progresses, including design reviews, start-up, system demonstration, performance verification, fine tuning of control loop, and operator training.
- Fully document all tests and inspections performed during the construction, at start up and during performance verification and fine-tuning. Incorporate into final commissioning documentation.
- Provide direct training to designated staff responsible for the operation and maintenance of the bridge equipment and systems.

### 2.34.1.2 COMMISSIONING OVERVIEW

- Commissioning is a systematic process of ensuring that all the floating bridge, landings, Bridge Maintenance Facility and Dock systems perform interactively according to the design intent and WSDOT's operational needs.
- Commissioning is a planned program of tests; procedures and checks carried out systematically throughout the design and construction process on systems and integrated systems of the finished Project.
- Commissioning activities supplement field quality and testing procedures described in relevant Technical Requirements Sections.
- Commissioning is conducted in concert with activities performed during all stages of Project delivery – issues identified in design stages are addressed during reviews with design team and facility operational personnel.
- Complete inspection and verification activities as required by the Technical Requirements, Technical Specifications and Mandatory Standards as construction progresses. This includes those activities that are necessary to ensure that the Project is substantially complete to permit the execution of the commissioning process for the Project.

### 2.34.1.3 DEFINITIONS

- **Owner's Project Requirements (OPR)** –this formal document, prepared by the owner, which will be tracked for changes throughout the Project, outlines the Project, and is a major document used by the CxA when back-checking the drawings, submittals and BOD for scope conformance. The Contract will be used as the OPR.
- **Basis of Design (BOD)** – this formal document may contain drawings as well, and it is an earlier, if not initial, deliverable of the design team. It is developed after the OPR and uses the information contained in the OPR to advance the Project into schematic (preliminary) design documents. It is a major document used by the CxA when back-checking the drawings and submittals for scope conformance with the OPR.
- **Pre-Acceptance Phase** – Phase of construction after initial checkout, then start-up, and component functional testing by the Design-Builder in preparation for system functional tests.
- **Testing, Adjusting & Balancing – (TAB)** is an action or set of actions performed by the Design-Builder. Project equipment is adjusted after it is installed and under goes start-up to meet the performance specifications. The TAB is performed as outlined in the CxA prepared construction schedule. It will be conducted in accordance with the OPR, and will be completed prior the Acceptance phase.
- **Pre-Functional Checks – (PC)** are a list of items for equipment and systems that need to be complete prior to the start-up of the equipment or systems. The CxA, with the cooperation of the vendor and Design-Builder, will prepare these check sheets.
- **Acceptance Phase** – Phase of construction following the pre-acceptance phase (after initial checkout (PC) and after startup and TAB) when system functional performance tests (FPT), and integrated function performance testing (I-FPT) is performed. Also, it is the phase in which endurance testing commences once the I-FPT testing is approved. Systems that require endurance testing to continue for a period of time, as required in the specific Contract section, will have the endurance testing performed in this Phase.
- **Post Acceptance Phase** – Phase of construction following the acceptance phase where O&M documentation is reviewed, training occurs and is documented.
- **Approval** – Acceptance that a piece of equipment or system has been properly installed and is functioning in the tested modes according to the Contract Documents.
- **CxA** – a resource separate from the design resource, who shall report to the Executive Management of the Design-Builder. The CxA communicates, directs and coordinates the day-to-day commissioning activities.

## 2.34.2 GUIDELINES

The following are accepted industry guidelines for the commissioning process and example form. Proposed deviation from this specification shall be in accordance with one or more of these guidelines.

- GSA – General Service Administration Commissioning Guidelines
- ACG – Associated Commissioning Group Guidelines
- BCx – Building Commissioning Guidelines

The CxA shall be certified and registered by ACG or BCx.

## 2.34.3 PERFORMANCE REQUIREMENTS

### 2.34.3.1 GENERAL

Commissioning during the design phase is intended to achieve the following specific objectives:

- Verify the BOD is aligned with the OPR.
- Verify the Design Documents are aligned with the OPR.
- Resolve misalignments of commissioning issues between OPR, BOD, and Design Documents.
- Prepare a Commissioning Plan that is accepted by the Design-Builder and submit to WSDOT for review and comment.

Commissioning during the construction phase is intended to achieve the following specific objectives:

- Verify that applicable equipment and systems are installed according to the manufacturer's recommendations and to the specified acceptance standards and that they receive adequate operational checkout by installing Subcontractors.
- Verify the PC, FPT, and I-FPT documentation reflect the submitted and approved equipment.
- Resolve misalignments of commissioning issues between OPR, BOD, and Design Documents, and submitted equipment.
- Verify proper ballasting and alignment of Pontoons.
- Verify and document proper performance of equipment and systems.
- Verify that Operations and Maintenance documentation provided is complete.
- Verify that WSDOT's operating personnel are adequately trained, in accordance with WSDOT approved training plan.

## 2.34.3.2 PERFORMANCE VERIFICATION TOLERANCES

### 2.34.3.2.1.1 Application Tolerances

Specified range of acceptable deviations of measured values from specified values or specified design criteria shall be defined in the Commissioning Plan. Any deviation shall be within the range of +/- 5 percent of specified values, except as otherwise noted.

### 2.34.3.2.1.2 Instrument Accuracy Tolerances

All testing instruments shall be calibrated within one year of use and have a traceable national lab certificate on site, and the tolerance shall be of higher order of magnitude than equipment or system being tested.

### 2.34.3.2.1.3 Measurement Tolerances During Verification

Unless otherwise specified in the Commissioning Plan actual values to be within +/- 2 percent of recorded values.

## 2.34.3.3 WSDOT'S PERFORMANCE TESTING

In addition to the I-FPT, and other testing described in the Commissioning Plan, WSDOT maintains the right of performance testing of equipment or systems by WSDOT staff during the construction, and these activities will not relieve the Design-Builder from compliance with specified start-up and testing procedures.

Commissioning of the fire protection systems shall witnessed by WSDOT, the Seattle Fire Department, the Bellevue Fire Department and the CxA.

## 2.34.3.4 WITNESSING COMMISSIONING

The CxA shall witness commissioning activities and record results.

The Commissioning Plan shall define the percent of each system the CxA must witness. Some systems shall require 100 percent sampling.

## 2.34.3.5 NON-CONFORMANCE TO PERFORMANCE VERIFICATION REQUIREMENTS

Should equipment, system components, and associated controls be incorrectly installed or malfunction during any of the Commissioning activities, the Design-Builder shall correct deficiencies, re-verify equipment and components within the malfunctioning system and include related systems as deemed required by the Commissioning Authority (CxA) and design engineers, to verify effective performance.

In addition, non-conformance issues discovered by the Design-Builder and CxA during any separated witnessing or testing shall be recorded in the Commissioning Log, corrected, and shall be retested at the request of the Design-Builder or CxA.

When testing has identified nonconformance, all corrective work, additional tests, and inspections shall be completed to determine acceptability and proper performance.

# 2.34.4 COMISSIONING TEAM AND COORDINATION

## 2.34.4.1 COMMISSIONING TEAM

The members of the commissioning team consist of the CxA, the Design-Builder's Project Manager, QC Manager, and Design Manager, and the Discipline Engineers of Record (Structural, Marine, Mechanical, Electrical, Traffic Surveillance and Security), appropriate Subcontractors or suppliers of equipment. In addition, WSDOT will assign personnel to be member(s) of the commissioning team. The CxA will prepare a Commissioning Plan during the design phase to supplement the team, roles, responsibilities and communication protocols defined in this section.

## 2.34.4.2 ROLES OF COMMISSIONING TEAM

### 2.34.4.2.1 Commissioning Authority Responsibilities

The CxA plans, directs and coordinates the commissioning process and activities; writes the commissioning plan and reviews modifications to the Commissioning Plan and documents the performance testing results. All reports and findings are sent directly to WSDOT.

Responsibilities include:

- Plan, organize and lead the commissioning team.
- Provide Commissioning Plan.
- Convene commissioning team meetings.
- Provide Project-specific commissioning pre-functional checklists (PC) and FPT, I-FPT commissioning process test procedures (information from the construction start-up checklists).
- Verify the execution of commissioning process activities using random sampling.
- Prepare and maintain the Commissioning Issues Log (Cx-log) and tracking of issues resolution.
- Prepare and maintain completed Construction Commission Checklist Log.
- Provide input to the construction schedule on the commissioning activities and their sequence.
- Witness systems, assemblies, equipment, and component startup.
- Compile test data, inspection reports, and certificates, include them in the systems manual and Commissioning Report.

### 2.34.4.2.2 Design Team Responsibilities

Design Team's Representatives shall participate in and perform commissioning process activities including, but not limited to, the following:

- Attend commissioning team meetings.
- Assist in the coordination of the commissioning process activities with construction schedule.

- Review Commissioning checklists provided by the CxA.
- Review commissioning process test procedures provided by the CxA.
- Evaluate performance deficiencies identified in test reports and, in collaboration with the Construction Team and the entity responsible for the system and equipment installation, provide a corrective action.
- Cooperate with the CxA for resolution of issues recorded in the Commissioning Issues Log.
- Prior to Substantial Completion, review the completed commissioning function testing record and advise if systems are ready for Acceptance.

#### 2.34.4.2.3 Construction Team Responsibilities

Construction Team's Representatives shall participate in and perform commissioning process activities including, but not limited to, the following:

- Attend commissioning team meetings.
- Integrate, maintain, and coordinate commissioning process activities with construction schedule.
- Review and accept construction Commissioning checklists provided by the CxA.
- Complete electronic construction checklists as Work is completed and provide to the CxA on a weekly basis.
- Review and accept commissioning process test procedures provided by the CxA.
- Complete commissioning process test procedures.
- Complete seasonal testing and commissioning testing as deemed required by the CxA.
- Evaluate performance non-conformances identified in test reports and, in collaboration with entity responsible for system and equipment installation, take corrective action.
- Cooperate with the CxA for resolution of issues recorded in the Commissioning Issues Log.
- Prior to Substantial Completion, complete commissioning function testing.
- Signify Acceptance of systems.

#### 2.34.4.2.4 WSDOT's Representatives Responsibilities

WSDOT's Representatives (including engineering, operations and maintenance personnel) shall participate in and perform commissioning process activities including, but not limited to, the following:

- Attend commissioning team meetings.
- Review and Comment on O&M training plans.
- Review and Comment on PC and FPT checkout forms.
- Attend testing meetings.

- Training in operation and maintenance of systems, subsystems, and equipment.
- Attend demonstration of operation of systems, subsystems, and equipment.

#### 2.34.4.3 SCHEDULING

The CxA shall:

- Provide a Draft Cx Plan at the Mid Design point.
- Provide the initial schedule of primary commissioning events/milestones at the initial commissioning scoping meeting.
- Work with the Design-Builder accordingly to establish protocols to schedule and maintain the integrated schedule with the commissioning activities.
- Schedule Training milestones – The CxA will work with all team member to identify the training milestones requested and required for each system, communicate and coordinated them with the team and verify that the training has be conducted to the satisfaction of WSDOT.
- Unless noted otherwise in the specific section, at a minimum provide 30 Calendar Days notice to WSDOT for scheduling commissioning activities. The CxA shall be fully responsible for coordinating witnessed testing with WSDOT and providing sufficient time for the correct individuals to be available for the testing.
- Adjust the commissioning schedule as construction progresses and more detailed schedules are available from the Design-Builder.
- At a minimum provide 30 Calendar Days for WSDOT review and comment.

The Design-Builder shall integrate all commissioning activities into the master schedule. All parties will address scheduling problems and make necessary notifications in a timely manner in order to expedite the commissioning process.

#### 2.34.4.4 MEETINGS

##### 2.34.4.4.1 Commissioning Scoping Meeting

Within 90 Calendar Days after NTP 2 for the Design-Build Contract, the CxA will schedule, plan, and conduct a commissioning scoping meeting with the entire commissioning team in attendance. The scoping meeting will address the bridge systems to be commissioned as well as bridge related systems installed by others, including commissioning requirements, and completion and start-up schedules. Information gathered from this meeting will allow the CxA to revise the Commissioning Plan.

The CxA will distribute meeting minutes and the revised Commissioning Plan to all parties in attendance at the Commissioning scoping meeting.

##### 2.34.4.4.2 Additional Meetings

Other meetings will be planned and conducted by the CxA as design and construction progresses. The purpose of these meetings is to cover coordination, monitor progress, identify issues and deficiencies, and resolve issues relating to the commissioning with

the Design-Builder and its particular Subcontractors and relevant manufacturer representatives.

The CxA will plan these meetings and will minimize unnecessary time being spent by the Design-Builder, and its Subcontractors. These meetings will be held monthly, until the final 6 months of construction, when they may be held as frequently as once per week. The CxA will distribute meeting minutes to all parties.

## 2.34.5 SYSTEMS TO BE COMMISSIONED

The Project's components and systems to be commissioned include, but are not limited to, all systems within the project limits and the following:

- Floating Bridge –Section 2.12
- Illumination and Roadway Electrical Systems –Section 2.16
- Electrical Bridge and Services –Section 2.17
- Intelligent Transportation Systems –Section 2.18
- Control of Materials - Section 2.25
- Moorage and Towing –Section 2.27
- Bridge Maintenance Facility and Dock –Section 2.30
- Transit Facilities –Section 2.31
- Mechanical Bridge and Services –Section 2.32
- Bridge Fire Protection – Section 2.35

Specific requirements for the commissioning of each system are included in the commissioning and testing requirements in the related Technical Requirements sections, and will be further developed under the Work of this section during the writing of the Commissioning Plan.

## 2.34.6 COMMISSIONING PROCESS

### 2.34.6.1 SR 520 COMMISSIONING PLAN

The SR 520 Commissioning Plan (a.k.a. Commissioning Plan) provides direction for the Commissioning process during design and construction, provides resolution for issues such as scheduling, roles and responsibilities, lines of communication and reporting, approvals and coordination. The CxA will provide samples of the documents at the beginning of the commissioning process that will not be available until the plan is implemented.

No traffic will be allowed on the new floating bridge until all testing and commissioning has been completed and concurrence has been received from WSDOT. WSDOT will not provide maintenance or accept any equipment until all the testing and commissioning is completed and concurrence has been received.

#### 2.34.6.1.1.1 Components of the Commissioning Plan

The Commissioning Plan prepared by the CxA shall include, but is not limited to the following:

- Commissioning Goals and Objectives
- General Project information
- Systems to be commissioned
- Commissioning Team members, roles and responsibilities
- Commissioning communication protocol, coordination, meetings and management
- Document outlining WSDOT's Project Requirements (OPR)
- Verification of the service requirements for the following systems: Fire Protection, Mechanical, Electrical, Plumbing, Water, Sewer, and Natural Gas.
- Coordination with Tolling commissioning requirements.
- Development of a response plan to address the Phased Commissioning requirements.
- Documentation of OPR review and Resolution tracking of commissioning issues.
- Documentation of design review and resolution tracking of commissioning issues
- Documentation of the design drawing reviews and resolution tracking of commissioning issues
- Plan for delivery and review of submittals
- Plan for the verification and delivery of the as-constructed drawings
- Plan for the delivery and review of system manuals, training manual, and other documents and reports
- Plan for the electronic delivery, review and implementation of the commissioning process in electronic format such as pdf, including any photographs, video's, etc.
- Definition of sampling rates per system for auditing and witnessing of tests by the CxA
- Systems and equipment Pre-functional test checklists (PC)
- Review and Comment of the PC by WSDOT
- Systems and equipment Functional test procedures (FPT)
- Review and Comment of the FPT and I-FPT by WSDOT
- System integrated functional test procedures to verify system performance (I-FPT)
- Define Commissioning activities to be integrated into the construction schedule
- Define and document the start of the equipment and system warranty period
- Reports to capture deficiencies
- Plan for the acceptance of the training plans by WSDOT and the CxA.

- Plan for the delivery and recording of system training to WSDOT's operating staff
- Commissioning Issues and Resolution tracking log (Cx-log)
- System Acceptance certificates

### 2.34.6.2 COMMISSIONING PROCESS

The following narrative provides a brief overview of the typical commissioning tasks during this Design-Build Project and the general order in which they occur:

- Prepare a draft of the Commissioning Plan.
- Scoping meeting conducted by the CxA where commissioning process is reviewed with commissioning team. (This scoping meeting will be repeated at each design milestone when others are joining the team. Not less than annually, this meeting will also be repeated during the construction phase as major Subcontractors are joining the team, and at least three times during the first year of construction.)
- Review of the CxA Plan (review and comment on CxA plan by WSDOT and all parties).
- Review of the OPR.
- OPR commissioning Resolution tracking meeting and documentation.
- Commissioning Resolution tracking meeting and documentation.
- Review of the design drawings.
- Early Design commissioning Resolution tracking meeting and documentation.
- Mid Design commissioning Resolution tracking meeting and documentation.
- Late Design commissioning Resolution tracking meeting and documentation.
- Additional meetings to plan, scope, coordinate, and schedule future activities and to resolve problems.
- Equipment documentation is submitted to CxA, which includes detailed start-up procedures.
- CxA begins the process of compiling the system manuals.
- CxA provides pre-functional checklists (PC) to be completed by the Design-Builder during the construction process.
- CxA audits the completion of the as-constructed documents, and provides its opinion of the level of completion on how thoroughly this Work is capturing the actual installed Work. Random sampling of RFIs and other means will be used. The CxA will conduct this task monthly and offer their opinion.
- CxA provides performance test procedures (FPT) to be completed by the Design-Builder during the construction process.
- CxA works with Design-Builder to develop startup activity lists, schedule and start-up documentation. CxA provides prefunctional checklists to be completed by Design-Builder during startup process.

- Checkout and performance verification proceeds from simple to complex or equipment, systems, and intersystem levels. In each case, prefunctional checklists are completed, submitted, and approved before functional testing begins.
- CxA will perform sample auditing of the pre-functional testing documentation and witness a sample actual testing.
- Commissioning issues are captured on the Cx-log.
- CxA will perform sample auditing of the Functional Testing Procedures documentation and witness a sample actual testing.
- Commissioning issues are captured on the Cx-log
- System Training for WSDOT's staff is conducted and recorded
- As-Built Plans are received by WSDOT.
- Systems acceptance certificates are signed by CxA, and Design-Builder's Project Manager.
- WSDOT grants Physical Completion, and the bridge operations are turned over to WSDOT.

## 2.34.7 COMMISSIONING DOCUMENTATION/CHECKLISTS

The following documentation shall be defined in the Commissioning Plan. Also, the standard for this documentation where not defined in this section shall be equal to or better than the standards described by GSA, ACG and/or BCx.

**Checklists**

- Commissioning Checklists
  - OPR review and Resolution Tracking
  - BOD review and Resolution Tracking
  - Drawing review and Resolution Tracking
- Pre-functional Checklists (PC)
- Start-up Checklists
- Functional Performance Test (FPT) Checklists
- Integrated Functional Performance Test (I-FPT) Checklists

**Commissioning Documentation**

- Acceptance Certificates by System with O&M, and Training Manuals
- Verification As-Constructed drawings have been completed by the Design-Builder.
- Test and Inspection Reports
- Corrective Action Documents
- Commissioning Issues Log (Cx-log)
- Commissioning Report

### 2.34.7.1 COMMISSIONING – TRAINING

The Design-Builder shall be responsible for training coordination and scheduling and ultimately for ensuring that training is completed.

The CxA will be responsible for documenting the training, and obtaining the pre-approval of the training by WSDOT. Provide copies of training video to WSDOT in electronic storage format such as DVD.

Verify the scheduling and timing of the training will be close to the time of system final acceptance, and respond to operation shifts.

Verify the training is broken down and conducted in the following levels:

- Operators level training
- Maintenance level training
- Engineering level training
- WSDOT Management level training

Verify the training is recorded as follows: tripod mounted Video training with micro phoned audio.

## 2.34.8 SUBMITTALS

### 2.34.8.1 GENERAL

The CxA shall be responsible for the submittals as described herein and listed below:

- Basis of Design
- Commissioning Plan
- Test Checklists and Report Forms
- Test and Inspection Reports
- Corrective Action Documents
- Certificates of Readiness
- Final Commissioning Report

### 2.34.8.2 O&M MANUALS

The O&M Manuals for the systems listed in this section are required by the CxA to fulfill its responsibilities. See Section 2.12 for additional O&M requirements

One copy for the CxA of the O&M Manuals for the components of all the systems listed in this section is required to be submitted with the initial equipment product and performance submittal.

O&M Manuals are required to accompany the submittals when they are initially being routed to the engineers and designers for Review and Comment.

Updated O&M manual information: As the equipment submittals are revised because of engineering comments, or as a result of the manufacturing process, the CxA may request updated O&M information and such information will be supplied by the Design-Builder within 30 Calendar Days of the request.

End of Section

# 2.35 BRIDGE FIRE PROTECTION

## 2.35.1 GENERAL

The Design-Builder shall conduct all Work necessary to design, furnish, and install complete fire protection system(s) for the floating bridge, East Approach, the roadway between the East Approach and the Evergreen Point Road Lid. The Design-Builder shall perform all Work necessary to meet the requirements of WSDOT for this Project.

The Authority Having Jurisdiction (AHJ) for the SR 520 Evergreen Point Floating Bridge and Landings Project shall be WSDOT which has overall authority for operation and maintenance of State roadways.

The Design-Builder shall work with WSDOT and local jurisdictions to coordinate jurisdictional requirements. Elements of Work shall include, but are not limited to the following:

- Fire protection standpipe(s) with fire hydrants, drainage, air release/vacuum connections, and piping and all necessary signage and controls in accordance with local agency requirements.
- Perform site inspection and document existing fire protection and municipal water systems to the extent required, to determine necessary equipment and assemblies required to provide a code compliant system.
- Coordinate withWSDOT to determine unique requirements of the municipality.
- Perform calculations, design and layout drawings, pipe, fittings, valves, flow indicators, flow and pressure testing, gauges, alarms, drain pipe, test connections, and all accessories.
- Provide a comprehensive emergency response plan for acceptance and approval by the local agencies and WSDOT with all relevant information on the bridge fire protection system as well as input and executive acceptance to all policy and procedures.

## 2.35.2 MANDATORY STANDARDS

The following is a list of publications that shall be used for all design and construction of the bridge fire protection on the Project. This is not a comprehensive list; other technical publications may also be applicable 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. If a publication date is shown, that version of the publication shall be used for this Project. If no date is shown, the current version of the publication as of the RFP publication date shall be used.

- National Fire Protection Association (NFPA), NFPA 502, Standards for Road Tunnels, Bridges, and Other Limited Access Highways.
- City of Seattle, Amendments to NFPA 502
- NFPA 1, Fire Prevention Code
- NFPA 14, Standard for Installation of Standpipes and Hose Systems
- NFPA 20, Standard for Installation of Stationary Pumps for Fire Protection

- NFPA 24, Standard for Installation of Private Fire Service Mains and Their Appurtenances.
- NFPA 25, Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- NFPA 70, National Electrical Code
- NFPA 72, National Fire Alarm and Signaling Code
- NFPA 101, Life Safety Code
- Underwriters Laboratories, Fire Protection Equipment Directory
- WSDOT Standard Specifications (M41-10) (Appendix D18)
- WSDOT Plans Preparation Manual (M22-31( (Appendix D12)
- WSDOT Construction Manual (M41-01) (Appendix D2)
- WSDOT Standard Plans (M21-01) (Appendix D17)
- City of Medina Municipal Code
- City of Bellevue Municipal Code
- Washington Industrial Safety and Health Act (WISHA), Legislation enacted to regulate safety and health in the workplace.
- Washington Administrative Code (WAC) Title 296, Labor and Industries, Safety Standards
- Manufacturer's Standardization Society (MSS SP 58), Pipe Hangers and Supports – Materials, Design and Manufacture.
- The Occupational Safety and Health Act (OSHA)
- ANSI/HI Hydraulic Institute Standard 3.1-3.5, Rotary Pumps

#### 2.35.2.1 CODES, STANDARDS AND SPECIFICATIONS

The design of the fire protection systems of the SR 520 floating bridge and landing shall be governed by those editions of the applicable codes and standards, and indicative specifications in reference documents.

### 2.35.3 PERFORMANCE REQUIREMENTS

#### 2.35.3.1 GENERAL

This Section describes the fire protection system performance requirements.

The design, construction and testing of the fire protection systems for the floating bridge and landing are subject to the review and approval by WSDOT and coordination with local agency requirements.

Equipment protection shall be provided for the fire pumps, drivers, controllers, water supplies, and power supplies. Protection shall be provided against possible interruption of service through damage caused by explosion, fire, flood, earthquake, rodents, insects, windstorm, freezing, vandalism, and other adverse conditions.

The Design-Builder may propose a more flexible approach for system operation. Revisions proposed to the performance requirements within this Section shall be submitted to WSDOT for review and approval.

### 2.35.3.2 HYDRANT SYSTEM FOR SR 520 FLOATING BRIDGE AND LANDINGS (FBL)

The fire protection system design for the FBL shall be based on the requirements of the City of Bellevue and the City of Seattle. The water supply shall be provided as follows:

- Water for system operation on the Floating Bridge shall be provided from hydrant system and stationary pumps located on the pontoons in accordance with NFPA 20.
- Water for system operation on the East Approach Structure and roadway between the East Approach Structure and the Evergreen Point Road Lid and the Bridge Maintenance Facility shall be provided from the City of Bellevue water utility.
- Hydrants and pumps shall meet structural requirements of the Floating Bridge including pipe clearances and attachments to the bridge's superstructure and pontoons as indicated in Section 2.12 (Floating Bridge). There shall be no pipe crossing at the bridge transition span.

### 2.35.3.3 SEISMIC PROTECTION

The seismic design of fire protection piping and equipment shall include comprehensive engineering analysis by a qualified professional. The engineering analysis shall establish criteria based on bridge seismic requirements in Section 2.12 (Floating Bridge).

### 2.35.3.4 COORDINATION MEETINGS

The Design-Builder is required to coordinate and facilitate meetings for design, construction, fire/life safety and other issues as necessary throughout the design and construction of the Project. These meetings at a minimum shall include WSDOT, local agency building and fire departments, and State and Federal agencies, as necessary. Refer to Sections 2.12 (Floating Bridge) and 2.13 (Bridge and Structures).

The Design-Builder is required to hold the following systems meetings for each system or group of systems:

- Presentation meeting of system design concept;
- Resolution of comments on system concept (additional meetings may be necessary to resolve all critical comments); and
- Presentation of system documentation, including analysis, plans and details, equipment selections, estimating, and scheduling.

### 2.35.3.5 COORDINATION OF DESIGN

The Design-Builder's design of the fire protection systems requires coordination with the SR 520 Eastside Transit and HOV Project and the SR 520 Pontoon Construction Project, other design disciplines and local agencies as necessary.

The City of Medina receives water utility and fire protection services from the City of Bellevue. Local agency coordination shall include requirements from the City of Bellevue where applicable.

#### 2.35.3.6 ENVIRONMENTAL DESIGN CONDITIONS

The fire protection systems shall take into account the facility's location within adverse environmental conditions including water spray and corrosive elements.

## 2.35.4 DESIGN REQUIREMENTS – GENERAL

### 2.35.4.1 PERSONNEL REQUIREMENTS

The Engineer of Record for bridge fire protection shall be licensed as Mechanical or Fire Protection Professional Engineer in the state of Washington under Title 18 RCW and shall have a current NICET Level III certification and a minimum five (5) years experience designing bridge standpipe systems.

### 2.35.4.2 ANALYSIS TECHNIQUES AND PROGRAMS

The Design-Builder shall provide documentation describing any analysis techniques and programs that will be used to calculate, prepare and perform the design of fire protection systems. This includes but is not limited to hydraulic pipe sizing programs, seismic restraints, equipment selections, estimating, and scheduling. The documentation shall be prepared for WSDOT to review and comment.

### 2.35.4.3 HYDRANT SYSTEMS

Hydrant systems constructed for the Project, within the City of Seattle shall conform to the installation requirements of the National Fire Protection Association (NFPA) Standard 502, Standard for Road Tunnels, Bridges, and other Limited Access Highways. This standard has been amended by the Seattle Fire Department for roadways within the City of Seattle. The amended standard includes provisions for fire hydrants for limited access roadways at spacing not to exceed 1000 feet to provide for transportation hazards.

Hydrant systems constructed for the Project, within the City of Medina shall conform to the installation requirements of NFPA 502. This standard has not been amended; however, the City of Medina is anticipated to conform to City of Seattle NFPA 502 amended requirements for the SR 520 Evergreen Point Floating Bridge and Landings Project.

The standpipe system shall also conform to the requirements of installation of Standpipe and Hose Systems, NFPA 14 where applicable. Components of standpipe systems include fire department inlet connections, main water supply, piping from inlet connections to mains, hose valves, fire hose cabinets, drain lines, pipe fittings, control valves, hangers, sleeves, tools and appurtenances as required for a complete and working system.

### 2.35.4.4 WATER SUPPLY

Site fire flow information has not yet been developed or modeled for the ultimate built-out configuration of the municipal water system in the vicinity of the SR 520 East Approach roadway. Existing conditions are reported to be a 6-inch main at Evergreen Point Road in the City of Medina.

The Design-Builder shall coordinate with the SR 520 Eastside Transit and HOV Project.

Verify withWSDOT the analysis and application of fire flow and include all auxiliary flows as might be required such as Floating Bridge Maintenance Facility and Dock domestic water and fire protection water flow demands.

### 2.35.4.5 FIRE FLOW REQUIREMENTS FOR SR 520 ROADWAY

Fire hydrants for limited access roadways shall be provided at a spacing not to exceed 1000 feet to provide for transportation hazards.

Fire hydrants shall be provided at locations accessible from both sides of the roadway at the required spacing or installed in the median divider at the required spacing.

Fire hydrants shall provide a minimum of 1000 gpm at 20 psi flowing independently, and a minimum of 1500 gpm at 20 psi with two fire hydrants flowing simultaneously.

Water shall be supplied to bridge by stationary pumps for fire protection in accordance with NFPA 20. Pumps shall be vertical turbine type with submerged inlet in Lake Washington.

Water shall be supplied to bridge during fire emergencies and shall have provisions for complete draining after use. System drains shall discharge into drainage wells on the SSP's.

### 2.35.4.6 HYDRANT - HOSE CONNECTION OUTLETS

Fire hydrants shall have two 4-inch hose connection outlets, with external threads in accordance with City of Seattle Standard Plan No. 310a, and each outlet provided with a hand-operable valve readily accessible from the roadway. Hose connection outlets for the City of Medina shall have similar external threads with hose adapters for fire department use. The external threads shall be coordinated during design and installation. Approved signage or other approved methods shall be used to indicate type of hose connection.

Hose connection outlets shall be oriented parallel to the roadway and face in both directions of travel.

Hose connection outlets shall be positioned such that the centerline of each outlet is installed not more than 16 inches horizontally from the inside edge of the top and not less than 8 inches above the top of the railing or traffic barrier (if less than 54 inches), and not more than 54 inches above the roadway.

Hose connection outlets shall be provided with caps that are removable with a standard hydrant wrench.

Hose connection outlet caps shall be provided with a 1/8 inch hole and be secured with a short length of chain or cable to prevent falling after removal.

If hose connection outlets are located adjacent to the SR 520 RSUP, the Design-Builder shall provide a 4-inch set back from the roadway and path at the top of the concrete barrier.

### 2.35.4.7 INTENTIONALLY OMITTED

### 2.35.4.8 FIRE FLOW DURING CONSTRUCTION

The Design-Builder shall determine fire protection system requirements for partial or full use of the SR 520 roadway during construction. Fire protection requirements may include alternate means and methods if acceptable to local agencies and WSDOT.

The Design-Builder shall provide submittal which details operation of bridge fire protection systems during construction. Refer to Section 2.22 (Maintenance of Traffic) for additional requirements.

#### 2.35.4.9 INTENTIONALLY OMITTED

#### 2.35.4.10 INTEGRATION WITH STRUCTURE AESTHETICS

All visible portions of the proposed fire protection system shall meet the requirements of Section 2.15 and shall be fully integrated with the Design-Builder's concept for bridge aesthetics.

Painting of all piping, fittings, hangers, pumps, standpipes and hydrants shall meet the requirements of Section 2.15. Such elements shall be painted the same color as the structure to which it is affixed or by which it is supported.

See Section 2.15 for additional requirements.

#### 2.35.4.11 FLOATING BRIDGE STRUCTURE

The bridge fire protection system shall be compatible with bridge structure, pontoon design, pontoon and super-structure and roadway design. The Design Builder shall provide information on pipe layout, hose valves, drain lines, pipe fittings, hangers, sleeves, pipe inserts, and attachments to WSDOT for review and comment.

The bridge fire protection system shall be compatible with bridge structure where the pontoon and super-structure provides a flexible connection to the bridge East Transition Span. This connection is designed for maximum movement of the bridge during all operational events. There shall be no pipe crossing at the bridge East Transition Span.

System configuration is based on concepts expressed in Section 2.35.6 below. The Design-Builder may elect to provide a system with similar features or provide a new system with similar functionality, durability, ease of maintenance, and safety.

All inserts and anchor bolts shall be in accordance with Sections 2.12 (Floating Bridge) and 2.13 (Bridges and Structures). The minimum clearance requirements for bridge maintenance shall not be obstructed or adversely affected by the Design-Builder's proposed system. The movement of equipment for routine bridge maintenance is a priority and every effort shall be made to allow unobstructed movement of maintenance vehicles between the staging areas to the work sites on the pontoon deck for maintenance. Bridge maintenance requirements are included in Section 2.12 (Floating Bridge) and 2.17 (Electrical Bridge and Services).

Refer to Section 2.32 (Mechanical Bridge and Services) for shed fire protection requirements.

#### 2.35.4.12 WEST APPROACH TO FLOATING BRIDGE STRUCTURE

A hydrant system is not required on the WCB.

### 2.35.5 MATERIAL SPECIFICATIONS AND SYSTEM REQUIREMENTS

#### 2.35.5.1 GENERAL

Materials and Equipment – All materials and equipment in the system shall be new and current products of a manufacturer regularly engaged in the production of such

materials and equipment. Where two or more pieces of equipment are required to perform interrelated functions, they shall be products of one manufacturer.

Approval Guides – Unless otherwise indicated, all products shall be listed in the latest publication of Approval Guides for Underwriters Laboratory and Factory Mutual for the service intended.

### 2.35.5.2 FIRE PUMPS

Pump shall be vertical shaft turbine installed on floating bridge in wet pit with suction from Lake Washington. The required submergence shall be obtained from the pump manufacturer.

Pumps shall furnish not less than 150 percent of rated capacity at a total head of not less than 65 percent of the total rated head.

The pump house shall be of such design as will offer the least obstruction to the convenient handling and hoisting of vertical pump parts.

### 2.35.5.3 PUMP SCREENING

Screening shall be ferrous and galvanized and shall meet the requirements of NFPA 20. Screens shall be removable for hose spray cleaning and shall withstand the pressure of the fire pump spray nozzle when operated with hose stream directed at screen panel. The removable portion of the screen enclosure shall meet the 100% requirement of NFPA 20.

### 2.35.5.4 PIPE

Schedule of pipe – All pipe shall be ferrous and galvanized and meet the requirements of NFPA 14. Pipe shall be Schedule 40 for all pipe sizes.

Underground pipe – All piping shall be ductile iron class 52 and cement-mortar lined whether inside or outside of the structure.

Rust inhibitive paint – Coat all exposed threads on galvanized pipe with rust inhibitive paint.

All piping shall be painted in accordance with the Section 2.15 of the Technical Requirements.

### 2.35.5.5 FITTINGS AND COUPLINGS

Rust inhibitive paint – Coat grooved fittings and couplings with a rust inhibiting paint.

Threaded fittings – Threaded fittings shall be cast iron class 125, rated for 175 psi cold water working pressure and shall conform to ANSI B16.4, ASTM 126 and ANSI B2.1 NPT. Malleable threaded fittings will not be permitted.

Grooved fittings – 90's, 45's, Tees, and reducers shall be malleable iron or ductile.

Adapter flanges – Adapter flanges (fittings) shall be cast iron/class 125 conforming to ANSI B-16.1, with a rust inhibiting coating.

Grooved couplings – Grooved couplings and reducers shall be malleable or ductile iron conforming to ASTM A-47. Coupling gasket shall be molded Elastomeric (EPDM) per ASTM D2000. On dry pipe systems use a "FlushSeal" or "Flush Gap" gasket. Grooved couplings and reducers shall be of the same manufacturer as used for the grooved fittings.

All fittings and couplings shall be painted in accordance with the Secion 2.15 of the Technical Requirements.

### 2.35.5.6 HANGERS AND SUPPORTS

Hangers – Provide hangers to support all piping in alignment without sagging or interference, to permit free expansion and contraction, and meet the requirements of NFPA 14.

Hanger rods – Hanger rods shall be Type 316L stainless steel.

C-clamps – Equip all C-clamps (beam clamps) with earthquake retaining straps.

Riser clamps – Riser clamps shall not protrude more than 2 inches beyond the edge of the hole. The riser clamps shall be UL listed.

Concrete anchors – Shall be in accordance with Sections 2.12 (Floating Bridge) and 2.13 (Bridges and Structures).

All hangers and supports shall be painted in accordance with the Section 2.15 of the Technical Requirements.

### 2.35.5.7 VALVES

Outside screw and yoke (OSY) valves – OSY valves shall be cast iron, flanged and rated for 175 psi, non-shock cold water working pressure.

Valves not permitted – Wafer valves are not permitted, unless specifically listed herein.

Isolation/control valves – Above ground control valves shall be gear-operated slow-close butterfly valves with flag type indicator, cast iron lug body, bronze disc, EPDM crowned seat, stainless steel stem with bronze bushings, two internal single-pole, double-throw monitor switches, and locking chain supplied by the valve company.

Drain valves – Drain valves need only be UL Listed, screw-in bonnet bronze globe valves, rated to 175 psi non-shock cold water working pressure.

Check valves – Check valves shall be grooved, iron body, bronze seat, stainless steel clapper with a replaceable rubber seal (a rubber seal integral with the seat is not acceptable), and 175 psi non-shock cold water working pressure.

Circulation relief valve – Valve shall provide flow of sufficient water to prevent the pump from overheating with operating with no discharge.

Discharge and test valve(s) – Valve shall be provided on pump header for flow testing and for maintenance of screens from the pump platform. Valve and hose attachment shall be used for spray washing of intake screens when partial raised above the platform level. Screen cleaning shall be included in maintenance procedures for fire pump operation.

### 2.35.5.8 INTENTIONALLY OMITTED

### 2.35.5.9 INTENTIONALLY OMITTED

### 2.35.5.10 HYDRANT VALVE

Valves shall be 4-inch cast iron gate valve as approved by local agencies.

### 2.35.5.11 PRESSURE GAUGE

Gauge shall be 3½-inch diameter, bourdon type pressure gauge, 0-300 lbs, ¼-inch soft metal seat globe valve with arrangements for draining pipe between gage and valve. Locate valve near each test location.

### 2.35.5.12 SYSTEM DRAINS

The drainage system shall be designed for automatic drainage of system piping to minimize system drain time on the floating bridge and to provide freeze protection during cold weather conditions. Drain controls shall be automatic and shall be coordinated with the pump control system as described in this section.

Hydrant Drains – Coordinate the work with other requirements and provide drains where and as required. For FBL horizontal piping with less than 1/2 percent slope, provide drains at 90 feet centers or slope pipe for greater drainage capability. All drains shall be accessible without ladders or chain-operated valves.

### 2.35.5.13 SIGNS

Signs shall be provided for all control, drain and test valves with signs identifying the type of valve and the area affected by the valve. Signs shall be three layer etched plastic with red letters on a white background. Letters are to be minimum ¼ inch high. The signs are to be hung by a chain from the valve.

Labeling shall be provided for local control panel at each hydrant valve station. Interior panel shall have label "CHARGE SYSTEM" next to pushbutton. Interior panel also shall have directions to include:

- Activate fire control with push-button "CHARGE SYSTEM"
- Indicating light will shine when system flow is detected.
- System must be drained manually. Notify (and list phone number).

### 2.35.5.14 AIR RELEASE / VACUUM VALVES

Valves shall be provided that allow large quantities of air to escape out the orifice when filling a pipeline (and close when the liquid enters the valve) and permit large quantities of air to enter through the orifice when the pipeline is being drained to break the vacuum. Valve shall be cast iron, ASTM A126 Gr B with stainless steel float and Buna-N seat.

### 2.35.5.15 PIPE SUPPORTS

Pipe supports on bridge Pontoons shall be designed in accordance with Section 2.12 (Floating Bridge).

### 2.35.5.16 SPARE PARTS

The Design-Builder shall determine renewable spare parts required for the fire protection system based on two-year operation commencing upon Approval of the commissioning of the system. At a minimum, the Design Builder shall furnish the following spare parts for the Bridge Fire Protection system:

- Provide two (2) spare hydrant valves with valve adaptors.
- Provide six (6) valve caps with chains of each type and size.

- Provide test equipment for periodic pump testing as required by NFPA 25 and local requirements.

## 2.35.6 SYSTEM CONFIGURATION

### 2.35.6.1 GENERAL

System configurations are based on concepts expressed in these criteria. For additional information, refer to the Conceptual Plans (Appendix M1), Volume 2, FP Plan Series. The Design-Builder may elect to provide a system with similar features described herein or provide a new system with similar functionality, durability, ease of maintenance and safety.

### 2.35.6.2 FIRE PUMP DESIGN CONFIGURATION

The Design-Builder shall develop concepts for using fire pumps to supply water to the fire protection system. Consideration shall be given to pump type and location on the bridge and meeting performance requirements.

The design concept for the floating bridge calls for two pump locations. The pumps at each location fill one of two branch pipes which serve either the north side of the bridge or the south side of the bridge. One pump from each location therefore, can fill the entire north side of the bridge or the entire south side of the bridge during a fire incident.

The design concept for the fire pumps call for vertical turbine pumps installed in two drainage wells as part of the SSP pontoons where they are housed and protected. Pump operation is based on local control from push-button controls at each hydrant valve or, remote control from a WSDOT operator. The WSDOT operator shall control system operation from both the Bridge Maintenance Facility and Traffic Management Center (TMC) at Dayton.

#### 2.35.6.2.1 Pump Motor Controllers

The bridge Fire Protection pumping motor controllers shall be a complete and stand alone system. The pump motor controllers shall be provided with the pumps and provided in an outdoor, minimum NEMA-4X enclosure. The motors shall be 480VAC, sized for flow and pressure requirements. The motor controllers shall be provided with an internal heater to prevent condensation. The motor controllers shall be located in sight of the pump motors to serve as disconnect switches.

The Bridge Fire Protection pumping controllers shall also control the motorized valves. Each Bridge Fire Protection pump station (set of two pumps) shall be equipped with two motorized control valves to direct the water to the north side or to the south side of the floating bridge. The motor controllers shall be located in sight of the motorized valves to serve as disconnect switches.

The motor controllers shall provide power distribution to the control system and heating equipment.

Coordinate the electrical requirements with section 2.17.

#### 2.35.6.2.2 Pump Control System

The Bridge Fire Protection pumping control system shall be a complete and stand alone system. The pump motor controller system shall be provided with the pumps and provided in an outdoor, minimum NEMA-4X enclosure. The control system shall be equipped with controls at the pump motors to energize and de-energize the pump motor.

The system shall provide a pushbutton station at each hydrant valve station for energizing the fire pumps from the roadway.

The system shall provide a pushbutton station for de-energizing the fire pump from the roadway. The local shutoff shall be provided at two locations, mid-span on the bridge, one located on the eastbound roadway and one located on westbound roadway. The system shall also have remote de-energizing from a WSDOT operator. The WSDOT operator shall control shut-down from both the Building Maintenance Facility and TMC at Dayton.

The controllers shall provide a communication network that will connect all the local pushbutton stations at the pump motors, the pushbutton stations at each hydrant, and the control at the Bridge Maintenance Facility and TMC. Since the system only requires one pump motor in each pair to operate at a time, the control system shall ensure that only one pump operates at a time. The pushbutton station shall only activate the pump and motorized valve that can pressurize the zone in which it is located. The remote stations at the Bridge Maintenance Facility or TMC shall be capable of energizing or de-energizing the pump and operating motorized valves in either zone.

Push-button controls at each hydrant valve station shall be located in unmarked, stainless-steel cabinet, Recess 1/2-inch from face of concrete barrier facing roadway.

The control system shall monitor the flow of water in the pipes and whether the pipes are pressurized. The control system shall verify that when a pump is energized, that the water flows to pressurize the pipes properly. The control system shall engage the alternate pump if the flow and pressurization does not occur after the first pump is activated. Provide an indicating light at the local pushbutton station at the pump motors, the pushbutton stations at each hydrant, and the control at the Bridge Maintenance Facility and TMC to indicate that water is flowing into the pipes or fully pressurized. The indicating light shall flash while the water is flowing in the system and shall illuminate constantly when the system is fully pressurized.

When a pump is energized and water is flowing into the pipe system or fully pressurized, the control system shall activate roadway level light beacons. There will be four light beacons at the roadway level to indicate the fire pipe system is pressurized with water. The lights shall be 180 degree lights and the color shall be selected such that it will not be confused with the boater navigation lights or traffic control lights. There will be a total of eight beacons, four in each piping zone. The beacon lights shall flash while the water is flowing in the system and shall illuminate constantly when the system is fully pressurized. The beacon lights shall be rated NEMA-4X for outdoor service and equipped with long lasting LED bulbs. Beacon shall be mounted 8 feet above roadway to avoid tampering and have hydrant signage to indicate purpose.

The control system shall provide inputs to the Floating Bridge and Landings local PLC system for the following conditions:

- Bridge Fire Protection Pump 1 Energized
- Bridge Fire Protection Pump 2 Energized
- Bridge Fire Protection Pump 3 Energized
- Bridge Fire Protection Pump 4 Energized
- Bridge Fire Protection Pump 1 De-energized
- Bridge Fire Protection Pump 2 De-energized
- Bridge Fire Protection Pump 3 De-energized
- Bridge Fire Protection Pump 4 De-energized

- Zone 1 motorized control valve energized to the north side
- Zone 1 motorized control valve energized to the south side
- Zone 2 motorized control valve energized to the north side
- Zone 2 motorized control valve energized to the south side
- Zone 1 Bridge Fire Protection Pipe Water Flow and Pressurization Detected to north side
- Zone 1 Bridge Fire Protection Pipe Water Flow and Pressurization Detected to south side
- Zone 2 Bridge Fire Protection Pipe Water Flow and Pressurization Detected to north side
- Zone 2 Bridge Fire Protection Pipe Water Flow and Pressurization Detected to south side

The drainage system shall be designed with piping and controls for automatic drainage of the bridge fire protection system. System controls shall be operated from the Bridge Maintenance Facility and TMC. The electrical requirements shall be in accordance with Section 2.17 (Electrical Bridge and Services).

#### 2.35.6.2.3 Pump Housing

The design concept for the pump housing calls for a structural platform with provisions for safety, pump filters/screen, environmental protection from wind and rain, pump enclosures with heating and ventilation, and adequate freeze protection. The following provisions include:

- Safety shall be of primary importance with the design and removal of handrails and bollards. Pump enclosure shall have domed covers that are hinged and/or protected from blowing over during stormy or windy conditions.
- Pump filter/screen shall include both primary and secondary screening of pump intake. Primary screening shall include area at the pump impeller. Secondary screening shall include area to eliminate debris and/or floatables in the vicinity of the pump and shall be designed to meet minimum design requirements.
- Environmental protection from wind and rain shall include fiberglass reinforced plastic dome or shroud with the purpose of shedding water and providing a lockable enclosure for security. The plastic dome may have a raised curb for conduit, piping and other devices such as heating and ventilation equipment.
- Protective pump housing shall include heating and ventilation. Provide mini-heater and blower type fan in housing curb. Provide relief vent in housing for circulation of air. Heater and fan shall be thermostatically controlled with status and low temperature alarm in the event of failure.
- Protective pump housing shall include beacon. Beacon shall shine what pump is activated. Provide manual test switch for beacon.
- Freeze protection shall be provided. In addition to heating and ventilation of housing, a strip heater shall be provided for the exterior of the pump casing above the water level.

### 2.35.6.3 PIPING DESIGN CONFIGURATION

The design concept for the floating bridge calls for piping along the edge of the roadway structure with hydrant locations accessible to the fire department.

Design-Builder shall determine an efficient routing of pipe for connecting all hydrants on the floating bridge. Alternatives such as a single pipe in the middle of the bridge, requires careful consideration of clearances for electrical conduit and vehicle operation at the pontoon level. The single pipe also may require design deviation(s) to the traffic barrier for encasing the riser pipe.

The design concept for the East Approach Bridge calls for a wet barrel hydrant(s) at the roadway with municipal water supply from the City of Medina.

## 2.35.7 CONSTRUCTION REQUIREMENTS

The Design-Builder shall construct each system with the level of quality in alignment, fit, attachment and equipment appropriate for the required use and shall coordinate the construction of systems with other construction works. The construction shall be such that the design performance and assumptions are not compromised, impacted or degraded due to the final as constructed conditions and that the mechanical systems function as intended. The mechanical systems as installed and constructed must meet the requirements of local building codes as well as other related performance specifications included in the RFP documents.

The Design-Builder shall accommodate all inspections as required by the City of Seattle and the City of Medina and Bellevue Fire Department. Additionally, the Design-Builder shall provide Special Inspections as required by the Medina Building Code.

### 2.35.7.1 CONSTRUCTION WORK PLAN REQUIREMENTS

The Design-Builder shall provide WSDOT with a construction work plan for review and comment detailing the following information:

- Timeline for:
  - Equipment acquisition
  - Equipment installation (including which devices have to be installed in which order)
  - Software installation
  - Equipment and software integration
  - Device testing
  - System acceptance testing
- Integration with other disciplines, such as electrical and communications
- Sequencing with other construction contracts

### 2.35.7.2 FIRE PROTECTION SYSTEMS COMMISSIONING

The Design-Builder shall prepare a commissioning plan memo for review and comment that consists of individual equipment performance and quality assurance tests, as well as a complete installation testing plan that assures that the systems functions and operates as intended.

Field testing of the mechanical systems shall be performed to verify that all system operating modes function as intended. The Design-Builder shall be responsible for performing field testing in accordance with standard manufacturer's test procedures for

all operable equipment to ensure mechanical systems function as intended. The Design-Builder shall prepare field test procedures and submit to WSDOT for review and comment prior to commencement of any testing. Final testing of safety systems will be witnessed and accepted by the City of Seattle and the City of Medina.

Refer to Section 2.34 (Commissioning) for additional requirements.

## 2.35.8 SUBMITTALS

### 2.35.8.1 GENERAL

All submittals shall be in accordance with Section 2.28 (Quality Management Plan Requirements) and Section 2.34 (Commissioning).

Refer to Section 2.28 (Quality Management Plan Requirements) for requirements for final design and Released for Construction submittals.

The Design-Builder shall submit Released for Construction Documents on WSDOT standard sheets for the bridge fire protection systems.

The Design-Builder shall provide complete submittals for review and comment by WSDOT and the Cities of Seattle and Medina. The Design-Builder shall not order, procure or proceed with installation of any equipment or system without Released for Construction Documents. Installation and the subsequent correction of any appliance, equipment or system without acceptance will be done at the Design-Builder's expense.

Submittal shall include:

- Design Plans
- Calculations
- Catalog Cuts describing all piping, systems, equipment, weight, dimensions, power requirements, etc.
- Welding submittals
  - Typical Welding Procedures Specifications (WPS)
  - Typical Design-Builder's Procedure Qualification Test Record (PQR)
  - Typical Design-Builder's Welder Qualification Tests Record

Submittals shall be in accordance with Project Documentation and Project Quality Management Plan. Provide six (6) copies for review and distribution unless otherwise noted in the RFP or accepted by WSDOT. Refer to Section 2.2 (Project Documentation) and 2.28 (Quality Management Plan Requirements) for additional requirements.

### 2.35.8.2 DESIGN SUBMITTALS

#### 2.35.8.2.1 Plans

The Design-Builder shall prepare system plan sheets in accordance with Section 2.28 (Quality Management Plan Requirements), and the WSDOT *Plans Preparation Manual* (Appendix D12).

The Design-Builder shall submit the Preliminary Design plans for the bridge fire protection systems. The plans shall include, but are not limited to, the following items:

- Plans describing complete piping, piping accessories, heads, control cabinets, wiring and wiring terminations complete
- Piping drawings complete in scale, plan and elevation.

- Detailing for all systems.

Refer to Section 2.28 (Quality Management Plan Requirements) for requirements for final design and Released for Construction submittals.

The Design-Builder shall submit Released for Construction Documents on WSDOT standard sheets for the building fire protection systems

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

The Design-Builder shall meet all warranty requirements as identified in Section 2.1 (General Information).

#### 2.35.8.2.2 Calculations

The Design-Builder shall submit design and engineering calculations describing the justification and rationale for selection and sizing of all fire protection equipment, systems and accessories. Complete sets of calculations shall be included with each design review submittal.

Calculations shall be submitted bound in 3-ring binder format, complete and with commensurate content for each design milestone. Calculations shall have separate sections with tabs indicating content.

Calculation submittals shall include, but not be limited to, the following:

- Site Fire Flow.
- Hydraulic network pipe sizing calculations.
- Water hammer and pipe support calculations.
- Seismic restraints for piping and systems.

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

### 2.35.8.3 MAINTENANCE MANUAL AND WARRANTY REQUIREMENTS

The Design-Builder shall prepare information for maintenance during construction. Elements of work shall include operation, maintenance, and repair of the existing facilities, and facilities constructed under the Contract beginning at NTP 2, and ending on the day of Physical Completion.

The Design Builder shall coordinate with WSDOT during the design and construction of the Bridge Maintenance Facility and Dock, Bridge Sheds and Bridge Fire Protection systems and shall develop a preventive maintenance schedule for the facility and equipment therein.

Preventive maintenance is defined as any time-based or meter-based, repetitive, preplanned, or regularly scheduled maintenance work or routine inspection activity. This type of work is scheduled at intervals necessary to prevent equipment breakdown and maintain proper facility and equipment operations. Inspection, calibration, adjustment, cleaning, lubrication, and parts replacement are examples of preventive maintenance work.

WSDOT uses a Computerized Maintenance Management System (CMMS) to track and plan all facility maintenance. The Design Builder shall provide all product and equipment information required to develop, in conjunction with WSDOT, a preventive maintenance methodology that provides a strategic and proactive approach for regularly evaluating facility assets, detecting potential problems, and scheduling maintenance

work to prevent problems and minimize the frequency of corrective maintenance work. As a minimum, this information shall include:

- Description of component or assembly
- Schedule of maintenance and preventative maintenance check sheets
- Process chart or design schematic
- Electrical diagram and controls (i.e. external control schematic)
- Expanded view of component or assembly for repair/replacement
- Parts list and ordering information

The Design-Builder shall meet all warranty requirements as identified in Section 2.1 (General Information).

#### 2.35.8.3.1 Hard-Copy Maintenance Manuals

The material for the operation and maintenance manual shall be assembled to form a book with heavy plastic covers. Each book shall be approximately 9 inches by 12 inches, three-ring binder with 3-inch "D" rings, and vinyl cover with title sheet inserts.

Each book shall be neatly entitled with a descriptive title, the name of the bridge, the Contracting Agency, the contract number, date of installation, and the Design-Builder. Copies of drawings shall be in black on a white background and shall be easily legible. Sepia and/or blue line drawings shall not be used.

Each section/subsection shall be separated with laminated tabbed divider sheets. Each tab shall be suitably titled. All literature and descriptive materials for inclusion in the manuals shall have all sheets numbered and listed by section in the Table of Contents.

The descriptive materials shall include data presented for CMMS as a comprehensive reference. The arrangement of the booklets, the method of binding, material to be included, and the text shall all be as approved by the Engineer.

The Design-Builder shall submit a 90% preliminary copy of the maintenance manual to the Engineer for review, prior to the 100% review copy. The manuals shall be submitted to the Engineer for review and shall be approved prior to commencement of the training session specified.

The manuals shall also be made available at the bridge site for use during the start up and commissioning period. Three copies of the final operation and maintenance manuals shall be submitted to the Engineer for review to verify all comments have been incorporated.

Upon final approval, six (6) bound copies of the approved operation and maintenance manuals shall be delivered to the Engineer 14 days before the scheduled date for the first day the instruction period begins.

Final approval of each volume of the Operation and Maintenance Manual shall be obtained by the Design-Builder prior to final acceptance test of the Bridge Maintenance Facility and Dock.

See TR Section 2.28 (Quality Management Plan Requirements) and 2.30 (Bridge Maintenance Facility and Dock) for additional requirements for maintenance manuals.

#### 2.35.8.3.2 Training

The Design-Builder shall provide training services for WSDOT's bridge maintenance personnel. The Design-Builder shall submit at least two weeks (14 days) prior to the

scheduled date for the first day of the instruction training session, a complete training syllabus outlining topics to be covered, timeframes and training location for said topics and materials to be furnished as part of the training sessions. The training sessions shall be organized and be administered to a multi-disciplined group. Training sessions shall be devoted to theory of operation, maintenance and trouble shooting of the Maintenance Facility and Bridge equipment, electrical control and power distribution systems.

Each session shall be capable of training no more than 25 people at the Maintenance Facility. The Design-Builder shall furnish all necessary instruction sheets, student training aids, paper, and booklets to supplement training.

### 2.35.8.4 EMERGENCY RESPONSE PLAN SUBMITTAL

The emergency response plan shall be submitted for acceptance and approval by the local agencies and authority having jurisdiction and shall include all relevant information on the bridge fire protection system. It shall include, at a minimum, the following:

- Name of plan and the specific facilities the plan covers
- Names of responsible agencies
- Names of responsible individuals
- Dates adopted, reviewed, and revised
- Policy, purpose, scope, and definitions
- Participating agencies, senior officials, and signatures of executives authorized to sign for each agency
- Safety during emergency operations
- Purpose and operation of response centers and alternative location(s) as applicable.
- Procedures for fire emergencies, including a list of the various types of fire emergencies, the agency in command, and the procedures to follow.
- Fire protection equipment and details.
- Maps and plans of the roadway system, including all local streets
- Any additional information that the participating agencies want to include.

Design-Builder shall get input and executive acceptance to all policy and procedures.

### 2.35.8.5 SHOP DRAWING SUBMITTAL

The Design-Builder shall submit shop drawings for the bridge fire protection systems according to Section 2.28 (Quality Management Plan Requirements), for Review and Comment by WSDOT. The following information shall be included in the shop drawings, if applicable:

- The Design-Builder shall submit shop drawings in accordance with Section 2.28 (Quality Management Plan Requirements) for all equipment items and fabrications.
- The Design-Builder shall submit fire protection shop drawings in accordance with Seattle Fire Code.

- Shop drawings shall conform to, and include all items as set forth in NFPA 13 paragraph 1-9.2.

End of Section

## 2.36 FINAL CLEANUPGENERAL

The Design-Builder shall perform final cleanup, as provided in this section, to the Engineer's satisfaction. The Engineer will not establish the Physical Completion Date until this is done. The Highway Right-of-Way, material sites, and all ground the Design-Builder occupied to do the Work shall be left neat and presentable. The Design-Builder shall:

1. Remove all rubbish, surplus materials, discarded materials, falsework, camp buildings, temporary structures, equipment, and debris; and
2. Deposit in embankments, or remove from the project, all unneeded, oversized rock left from grading, surfacing or paving.

The Design-Builder shall not remove warning, regulatory or guide signs unless the Engineer approves.

End of Section