2.13 Bridges and Structures

2.13.1 General

The Design-Builder shall perform all Work necessary to complete the bridges and structures for the Project to satisfy the Basic Configuration requirements.

Elements of Work shall include the following:

1. ***$$1$$***

Additional elements shown in the Conceptual Plan include the following:

1. ***$$2$$***

The plans showing the existing bridges and other structures are located in the *As Builts* (Appendix N). The plans are not guaranteed to be dimensionally accurate or complete. The Design-Builder shall field measure and verify existing dimensions as required for the Work.

2.13.1.1 Forward Compatibility

$$1$$

2.13.2 Mandatory Standards

The following is a list of Mandatory Standards that shall be followed for all design and construction related to this Section as referenced in Section 2.02, *Mandatory Standards*.

1. General Special Provisions (Appendix B)
2. Standard Specifications M 41-10 (Appendix B)
3. WSDOT *Bridge & Structures Office Design Memoranda* (Appendix D)
4. WSDOT *Bridge Design Manual LRFD* M 23-50 (Appendix D)
5. WSDOT *Geotechnical Design Manual* M 46-03 (Appendix D)
6. AASHTO Guide Specifications for LRFD Seismic Bridge Design
7. FHWA *Seismic Retrofitting Manual for Highway Structures: Part 1 - Bridges*
8. AASHTO LRFD Bridge Design Specifications
9. FHWA *Evaluating Scour at Bridges*, HEC-18
10. AASHTO Manual for Bridge Evaluation
11. WSDOT *Design Manual* M 22-01 (Appendix D)
12. WSDOT *Plans Preparation Manual* M 22-31 (Appendix D)

13. WSDOT *Construction Manual* M 41-01 (Appendix D)
14. AASHTO LRFD Bridge Construction Specifications
15. AASHTO Guide Design Specifications for Bridge Temporary Works
16. WSDOT *Materials Manual* M 46-01 (Appendix D)
17. Standard Plans M 21-01 (Appendix D)
18. WSDOT *Qualified Products List* (QPL):

    http://www.wsdot.wa.gov/Business/MaterialsLab/QPL.htm
19. AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals
20. AWS *Structural Welding Code - Steel* (AWS D1.1/D1.1M)
21. AWS *Structural Welding Code - Reinforcing Steel* (AWS D1.4/D1.4M)
22. AASHTO/AWS *Bridge Welding Code* (AWS D1.5M/D1.5)
23. *American Concrete Institute Code Requirements for Environmental Engineering Concrete Structures* (ACI 350)
24. AASHTO LRFD Road Tunnel Design and Construction Guide Specifications
25. AASHTO LRFD Guide Specifications for Design of Concrete-Filled FRP Tubes for Flexural and Axial Members
26. ASCE *Pre-Standard for LRFD of Pultruded FRP Structures*

2.13.2.1 Bridge Design Manual Rights and Responsibilities

The WSDOT *Bridge Design Manual*, as modified by the WSDOT *Bridge & Structures Office Design Memoranda*, allocates responsibilities as follows:

1. Rights and Responsibilities - The following clarifies which rights and responsibilities discussed in the WSDOT *Bridge Design Manual* are applicable to the Design-Builder:
   a) The Design-Builder shall complete all analyses, evaluations, load ratings, Plans, and specifications discussed in the WSDOT *Bridge Design Manual*.
   b) All such analyses, evaluations, load ratings, Plans, and specifications are subject to Review and Comment by WSDOT.
   c) All references to WSDOT Sections, offices, and engineers shall mean WSDOT.
2. Where the WSDOT *Bridge Design Manual* or the WSDOT *Bridge & Structures Office Design Memoranda* requires approval by the WSDOT Bridge Design Engineer, the Design-Builder shall be responsible for obtaining approval from the WSDOT Engineer prior to proceeding with the design.

2.13.3 Personnel Requirements

The Design-Builder shall provide a Structural Lead Engineer (SLE) to manage, coordinate, and review all aspects of the structural Work completed for the Project. The SLE shall provide written certification that the design of all permanent and temporary Work is in conformance with the Contract requirements and the Quality Management Plan for each structural drawing, calculation package, temporary structure package, and design revision during construction.

The SLE shall have a minimum of 10 years of experience in the design of bridges, retaining walls, and other highway related structures. This individual shall be a Structural Engineer.

The Engineer of Record (EOR) for all structural engineering Design Documents for significant structures described in RCW 18.43.020(12) and for all bridges shall have a minimum of 10 years of experience in the design of bridges, retaining walls, and other highway related structures. The EOR shall be a Structural Engineer.

The EOR for all structural engineering Design Documents for all other structures in the Project shall be a Professional Engineer or Structural Engineer.

2.13.4 Design Criteria

The Design-Builder shall analyze and design all new permanent bridges and structures, and all existing or modified structural elements whose load-carrying capacities are altered by the Work, using Load and Resistance Factor Design (LRFD) as defined in the WSDOT *Bridge Design Manual* and the *AASHTO LRFD Bridge Design Specifications*.

The Design-Builder shall design and construct permanent bridges and structures to achieve a minimum design life of 75 years. Minimum clearances shall be as follows and shall be maintained at all times during and after construction:

1. New vehicular structures over a roadway shall provide a minimum vertical clearance of 16’ - 6”.
2. New bike/pedestrian structures crossing a roadway shall provide a minimum vertical clearance of 17’ - 6”.
3. New structures over a railroad shall provide a minimum vertical clearance of 23’ - 6” measured to the top of the rail.
4. New overwater structures shall provide freeboard and maintenance clearance as specified in Section 2.30, *Water Crossings*.
5. For modified existing structures, the minimum vertical clearance shall not be less than the existing clearance.

When multiple minimum clearances are listed the required minimum vertical clearance shall be the greater value.

Minimum foundation cover requirements shall be in accordance with the WSDOT *Bridge Design Manual.*

Refer to Section 2.11, *Roadway*, for design criteria regarding barrier type and height. All structure traffic barriers shall be a minimum 42 inches in height, measured from the top of finished roadway and bridge deck and shall meet the Test Level design criteria in accordance with the WSDOT *Bridge Design Manual*. In addition, the minimum Test level design criteria shall be set for specific project elements as follows:

$$2$$

Fall protection shall be provided at the top of all new retaining walls and retaining wall terraces in accordance with Section 1060 of the WSDOT *Design Manual*. Fall protection shall be a standard guardrail system, as described and in accordance with the requirements in the WAC 296-880-40005. Timber shall not be used as a material type for standard guardrail. The Standard Plan Chain Link Fence Types 3 and 4, and Glare Screen Types 1 and 2 are not acceptable fall protection systems. For fall protection features that are exposed to the public, design of railings shall be in accordance with Chapter 13 of the *AASHTO LRFD Bridge Design Specifications.*

$$3$$

The Design-Builder shall request a bridge number from the Bridge & Structures office for all new structures 20 foot span and greater. The Design-Builder shall include the bridge number on all RFC plan sheets showing the new bridge. The Design-Builder shall install bridge number placards (*Sign Fabrication Manual* I7-301) on all new bridges.

2.13.4.1 Bridge Design Criteria

The following permanent bridge superstructure types are permitted for this Project:

$$1$$

Masonry or timber shall not be used as materials for permanent bridge superstructures or substructures.

For vehicular bridges, a minimum of three girder lines, with exception of two girders lines for tub girders, shall be used to provide redundant load paths. Intermediate hinges shall not be used with permanent bridge structures.

Non-redundant, fracture critical pier caps shall not be used.

2.13.4.1.1 Bridge Seismic Design Criteria

The seismic analyses and design for all new permanent bridge foundations shall be in accordance with the *AASHTO Guide Specifications for LRFD Seismic Bridge Design*, as modified by the WSDOT *Bridge Design Manual*, and the code-based response spectra and coefficients applicable to this Project as defined in Section 2.06, *Geotechnical, and the WSDOT Geotechnical Design Manual*.

All bridges on this Project shall have an operational classification of Ordinary, except for the following bridges:

$$1$$

2.13.4.1.1.1 Liquefaction and Lateral Spread

$$1$$

2.13.4.1.2 Bridge Widening Design Criteria

The Work on bridges to be widened shall be in accordance with the WSDOT *Bridge Design Manual* and shall include the following analysis and retrofit criteria:

1. Determination of minor and major modifications and widening projects as defined in the WSDOT *Bridge Design Manual*.
2. Determination of strength Capacity to Demand (C/D) ratios for the existing and modified structure and determination of displacement C/D ratios for the existing and modified structures using the pushover method of analysis. A summary of C/D ratios shall be provided for each structure.
3. Where the C/D ratio for the existing structure is less than 1.0 or the C/D ratio for the modified structure is less than 1.0, design and construction of the retrofits is required to modify the structure to meet or exceed a C/D ratio of 1.0.
4. Retrofit of the existing bridge foundations may be required in accordance with the differential settlement criteria within this Section.
5. Analysis for seismic demand effects shall be separate from settlement due to liquefaction.

2.13.4.1.3 Load Rating Report

All new, widened, rehabilitated, and detour bridges that carry vehicular loads and are 20 feet or more in span length (measured from back-to-back of pavement seats along the centerline of the roadway) shall be load rated in accordance with the WSDOT *Bridge Design Manual*. Detour bridges, for the purpose of load rating, are defined as bridges that will be in place for more than 90 Calendar Days. The Design-Builder will not be required to retrofit the existing structures for a reduction in the load rating due to existing bridge overlay replacements, removal and replacement of traffic barriers, or both.

2.13.4.1.4 Precast Prestressed Concrete Girders

Precast prestressed concrete girders include both pre-tensioned and post-tensioned girders.

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 as simple span for all single span and multi-span bridges.

2.13.4.1.5 Steel Plate Girders and Steel Box Girders

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.

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.

With the exception of weathering steel that is used east of the Cascades, all structural steel shall be painted in accordance with Section 6-07 of the Standard Specifications.

2.13.4.1.6 Bridge Foundations

The Design-Builder shall construct bridge abutments, wingwalls, and curtain walls with precast or 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 at least 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 shall meet stability requirements defined in Section 2.06 *Geotechnical* and the WSDOT *Geotechnical Design Manual* and shall be no steeper than 1.5H:1V.

2.13.4.1.7 Bridge Decks and Expansion Joints

The Design-Builder shall design and construct all vehicular bridge decks using cast-in-place reinforced concrete or stay-in-place concrete deck panels in accordance with Section 15.5.5 of the WSDOT *Bridge Design Manual*. The bridge deck protection system for new and existing vehicular bridges shall be in accordance with Section 15.5.5.D of the WSDOT *Bridge Design Manual*. Bituminous or bituminous-with-membrane overlays for permanent bridge deck construction on new vehicular bridges shall not be used.

The bridge deck for widened structures shall be continuous between expansion joints and shall match the existing expansion joint locations. Expansion joint headers shall be re-built the entire width of the new and existing bridge deck. Strip seals and compression seals shall be removed and replaced with new seals, in one continuous piece, for the entire width of the new and existing bridge deck.

The Design-Builder shall not use steel finger expansion joints on new bridges. All expansion joints shall be watertight. Longitudinal expansion joints shall not be used on new bridges or widened bridges. The maximum skew for expansion joints on new bridges shall be 30 degrees as measured perpendicular to the centerline of

the bridge deck. Longitudinal joints in overlays on existing bridges needed for construction staging shall be placed along permanent lane lines.

2.13.4.1.8 Slope Protection

Slope protection shall reduce or eliminate the need for maintenance; lessen or eliminate negative visual impacts associated with soil erosion, weed growth, trash accumulation, and vandalism; and conform to the requirements described in the WSDOT *Bridge Design Manual* and Section 2.15, *Roadside Restoration*.

2.13.4.1.9 Bridge Barriers and Railings

Vertical 32-inch height barrier and Bridge Railing Type BP shall be used on both sides of all new and widened bridges with pedestrian access. The Bridge Railing Type BP standard details may be modified by the Design-Builder to incorporate the aesthetic requirements of Section 2.15, *Roadside Restoration*, but shall not adversely affect the strength limit state, extreme event 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 reinforced concrete cast-in-place in the final position.

The Design-Builder shall cast a minimum of two 2-inch diameter 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 and barriers on walls that abut approach slabs or bridges. Each conduit pipe shall terminate at separate Type 1 junction boxes within 15 feet of the exit from a barrier. The Design-Builder shall furnish and install conduit expansion, deflection devices, or both at all expansion joints, points where the conduit exits from the barrier and other locations where movement is expected. Additional conduit shall be installed as needed to meet the Projects utility requirements. Conduit installed but not utilized for this Project shall be considered spare for future utility needs.

2.13.4.1.10 Bridge-Mounted Utilities

Existing Utilities shall be removed from the existing bridge and relocated in coordination with the type of replacement structures. Utility installation requirements on new and existing structures shall be in accordance with Section 2.10, *Utilities and Relocation Agreements*, and Section 15.10 of the WSDOT *Bridge Design Manual*.

2.13.4.1.11 Temporary Structures

Temporary structures refer to a temporary bridge, detour bridge, portion of a bridge, or buried structure that will not remain upon Physical Completion of the Project and shall accommodate vehicular and pedestrian traffic.

The Design-Builder shall design temporary structures in accordance with the WSDOT *Bridge Design Manual*, WSDOT Geotechnical Design Manual,

AASHTO LRFD Bridge Design Specifications, and AASHTO Guide Specifications for LRFD Seismic Bridge Design. Welding on all steel elements shall be in accordance with AWS D1.5. Components of temporary structures which will be incorporated into the permanent structures shall meet the requirements for the permanent structures. All temporary structures shall be designed for live load deflection less than or equal to L/800 as defined by AASHTO LRFD Bridge Design Specifications. Temporary structures with vehicular traffic shall be designed for minimum 75 percent of the HL-93 live load as defined in the AASHTO LRFD Bridge Design Specifications, except when there is no practical detour route available for freight, then 100 percent of the HL-93 live load shall be used.

The driving surface of the temporary detour structure shall be durable and skid resistant as defined in Section 10.13 of the WSDOT *Bridge Design Manual*. Temporary traffic barriers shall be in accordance with Section 1610 of the WSDOT *Design Manual* and the WSDOT *Bridge Design Manual*.

The Design-Builder may use new and salvaged structure members for the temporary structure, but it shall be the responsibility of the EOR to ensure all 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 structure members may be required in order to provide assurance that the appropriate requirements of material properties have been met. For salvaged steel materials where the grade of steel cannot be positively identified, the design stresses for the steel shall conform to Section 6-02.3(17)B3 of the Standard Specifications. Salvaged structure members include previously used members from other bridges or structures, members that have been fabricated but never installed in a structure, and members from a prefabricated structural system designed specifically for repeated temporary use. Concrete girder design sheets shall be provided indicating concrete strength, strand type and pattern, shear reinforcement, and other pertinent information. The Design-Builder shall provide supporting documentation for all selected temporary members to the WSDOT Engineer for Review and Comment.

All foundations of the temporary structures shall be located outside the horizontal limits of the Ordinary High Water for ***$$1$$*** and the bottom of foundations shall be located a minimum of 2 feet below scour estimated for the 2-year MRI water flows. Before Substantial Completion of the Project, the foundations for temporary structures shall be completely removed.

Prior to opening to traffic, all temporary detour structures shall be inspected by the Quality Assurance Inspector in the field for compliance with the Plans and specifications, and the SLE shall be advised of deviations. The Design-Builder shall be responsible for the maintenance and removal of all temporary structures. Temporary structures shall be removed in accordance with 2-02.3(2) of the Standard Specifications.

2.13.4.2 At-Grade Concrete Barrier

At-grade concrete barrier, except as otherwise described, shall be designed in accordance with the WSDOT *Design Manual* and shall use the design criteria reflected therein with a minimum of TL-3. Grade separations up to 10 inches may be designed to a minimum of TL-3 or employ a WSDOT standard plan. At-grade concrete barrier used for a structure or over a structure or buried structure shall be designed in accordance with the WSDOT *Bridge Design Manual* and shall use the design criteria reflected therein with a minimum of TL-4. Existing barriers that require modification shall be replaced by removing the existing barrier to the next joint.

2.13.4.3 Retaining Wall Design Criteria

The Design-Builder shall design and construct permanent retaining walls for the Project. Retaining walls shall be of the following types:

1. Proprietary structural earth walls in accordance with Section 6-13 of the Standard Specifications.
2. Standard permanent geosynthetic retaining walls in accordance with Standard Plans D-3.09, D-3.10, and D-3.11 and Section 6-14 of the Standard Specifications.
3. Standard reinforced concrete cantilevered retaining walls in accordance with Standard Plans D-10.10 through D-10.45, D-20.10-00 and Section 6-11 of the Standard Specifications.
4. Soil nail walls in accordance with Section 6-15 of the Standard Specifications.
5. Soldier pile walls in accordance with Sections 6-16 and 6-17 of the Standard Specifications.
6. Soldier pile tieback walls in accordance with Sections 6-16 and 6-17 of the Standard Specifications.
7. Secant pile and tangent pile walls in accordance with Section 6-19 of the Standard Specifications

The Design-Builder shall design walls in accordance with Section 2.06 *Geotechnical*, the *WSDOT Geotechnical Design Manual*, the *WSDOT Bridge Design Manual*, and the *AASHTO LRFD Bridge Design Specifications*. The Design-Builder may modify the Standard Plan retaining walls to meet Project requirements, such as seismic design criteria and aesthetic requirements per Section 2.15, *Roadside Restoration,* by providing special design analysis. Aesthetic modifications shall not adversely affect the strength and safety requirements of the retaining walls. Special design retaining walls shall be stamped and signed by the EOR.

The Design-Builder shall evaluate potential impacts to Utilities and WSDOT owned facilities (stormwater pipe, Intelligent Transportation System [ITS] conduit, etc.) crossing under proposed walls and incorporate mitigation measures

to avoid conflicts and detrimental effects including, but not limited to, settlement and surcharge loading.

Rock walls, gravity block walls, and gabion cribbing shall not be used for retaining earth or as retaining walls.

2.13.4.3.1 Temporary Retaining Walls

Temporary retaining wall refers to a wall or portion of wall that retains earth adjacent to public vehicular traffic and will not remain functional upon Physical Completion of the Project.

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 are in as-new condition and meet the requirements of the permanent structure standards. Timber piles will be allowed as foundations for temporary retaining walls where allowed by the Project's permits. Maintenance of temporary retaining walls shall be the Design-Builder's responsibility.

The Design-Builder shall remove all portions of temporary retaining walls before Substantial Completion of the Project.

2.13.4.4 Buried Structures Design Criteria

The Design-Builder shall use only cast-in-place or precast reinforced concrete, metal structural plate, or a composite arches system for buried structures.

Buried structures and associated approach slabs, footings, headwalls, wingwalls, Class 4000D concrete topping slab, connected barriers, rails, and fall protection shall be designed and constructed in accordance with the WSDOT *Geotechnical Design Manual*, WSDOT *Bridge Design Manual*, Standard Specifications, *AASHTO LRFD Bridge Design Specifications,* and the *AASHTO LRFD Bridge Construction Specifications*. The AASHTO operational classification load modifier for the buried structure shall be that for typical bridges unless noted otherwise.

Corrosion and abrasion shall be considered as specified in the WSDOT *Bridge Design Manual*.

No portion of the structure shall be placed within the Structure Free Zone (SFZ) as defined in Section 2.30, *Water Crossings*.

The Structural Clear Span of a buried structure shall be used to determine the buried structure class. When supporting a Roadway, the Structural Clear Span shall be the widest horizontal opening from interior face to interior face of the end walls measured parallel to the roadway centerline. When not supporting a Roadway, the Structural Clear Span shall be the widest horizontal opening from interior face to interior face of the end walls measured perpendicular to the buried structure centerline.

Structure Class	Structural Clear Span

Class 1	Less than 20.0 feet
Class 2	20.0 feet and greater

Class 2 buried structures shall include seismic design and ground failure mitigation in accordance with the *AASHTO LRFD Road Tunnel Design and Construction Guide Specifications.* Seismic analysis shall include the loading effects resulting from ground shaking and ground failure. This includes, at a minimum, design for the seismic effects of transient racking or ovaling deformations.

Seismic Design need not be considered for Class 1 buried structures.

All head walls and wingwalls shall meet the seismic design requirements in accordance with the WSDOT Bridge Design Manual, WSDOT Geotechnical Design Manual, and *AASHTO LRFD Bridge Design Specifications.*

All buried structures and associated headwalls and wingwalls shall be designed for scour from the design flood (100-year flood event) and the check flood (500-year flood event) in accordance with the WSDOT *Bridge Design Manual* and the *AASHTO LRFD Bridge Design Specifications* unless additional design criteria are documented in the Final Hydraulic Design report. Channel migration shall be considered.

Headwalls are structure elements that are end treatments connected to buried structures, including, at a minimum, parapets, slope collars, cutoff walls and inverts. Headwalls shall be reinforced concrete.

Wingwalls are retaining wall structure elements adjacent to or above a buried structure end or headwall. Portions of wingwalls below the 100 years mean recurrence interval water surface shall be reinforced concrete or have a reinforced concrete fascia.

When supporting a Roadway, the Fill Depth shall be defined as the total backfill and surfacing depth above the top of the buried structure. When not supporting a Roadway, the Fill Depth shall be defined as the total backfill above the top of the buried structure.

Structural Earth Wall wingwalls shall not use metallic ground reinforcement below the 100 year mean recurrence interval water surface unless the pH of the water in front of the wall and of the groundwater are within the range of 5.0 and 10.0, in accordance with WSDOT T 417 in the WSDOT *Materials Manual*.

All buried structures on this Project shall have an operational classification of Ordinary.

2.13.4.4.1 Concrete Structures

When the buried structure is located in a corrosive environment as defined in the WSDOT *Bridge Design Manual*, corrosion-resistant reinforcement defined in the WSDOT *Bridge Design Manual* shall be used. The minimum cover requirements

for direct exposure to salt water and coastal situations of the *AASHTO LRFD Bridge Design Specifications* shall apply.

When the Fill Depth of the buried structure is less than 2 feet at a point above the Structure, all reinforcement in the top slab shall be corrosion resistant as defined in the WSDOT *Bridge Design Manual* LRFD M 23-50. Reinforcement in the top slab need not be corrosion-resistant when a concrete deck meeting the requirements for a Type 4 Bridge Deck Protection System as defined in the WSDOT *Bridge Design Manual* is provided.

When the top of the buried structure is directly exposed to vehicular traffic, a concrete or HMA overlay or reinforced concrete deck shall be provided. For an HMA overlay, the minimum concrete cover from the top surface of the buried structure to the top mat of reinforcement shall be 2½ inches. For a concrete overlay or reinforced concrete deck, the minimum concrete cover from the top surface of the buried structure to the top mat of reinforcement shall be 2 inches. When the top of the buried structure is directly exposed to vehicular traffic, bridge approach slabs shall be provided.

All reinforcement in precast units shall be of the same type.

2.13.4.4.2 Metal Structural Plate Structures

Steel structural plate shall not be used in locations conforming to corrosive environments as defined in the WSDOT *Bridge Design Manual*. Galvanizing and zinc coatings shall not be used below the Hydraulic Design Flood Elevation, unless a reinforced concrete splash wall is provided in accordance with the WSDOT *Bridge Design Manual*.

Where the buried structure supports a Roadway and the minimum Fill Depth is less than 8 feet, the Contractor shall provide protection against Roadway de-icing salts and chlorides by one of the following methods:

1. Providing an impermeable geomembrane with welded seams in the backfill over the Structure that is sloped to drain water away from the Structure. The membrane shall be a minimum 30 mil thick polyvinyl chloride, ethylene interpolymer alloy, or polyurethane polymer, or a combination of these polymers.
2. Preventing roadway drainage from entering into the fill above the buried structure.
3. Providing additional metal plate thickness.

2.13.4.4.3 Composite Arch System

Composite arch systems, also referred to as Composite Arch Bridge System (CAS), shall not be used in locations of high energy streams, where the supporting arches could be vulnerable to impact damage from large rocks, wood or flood debris. Composite arch systems shall not be used in locations which are exposed to significant wildfire hazard.

Composite arch systems shall maintain a Fill Depth of at least 3 feet.

Composite arches systems shall consist of a two component Superstructure placed on reinforced concrete foundations. The superstructure shall consist of fiber-reinforced polymer (FPR) composite hollow tubes, external reinforcement/stay-in-place formwork filled with expansive self-consolidating concrete (ESCC), supporting custom pultruded corrugated FRP deck panels retaining the structural backfill. The arches shall be supported by concrete foundations (cast-in-place or precast in sections and made continuous), requiring a cast-in-place encasement of the arch ends for anchorage to the foundations.

The composted arch system shall be designed in accordance with the AASHTO LRFD Bridge Design Specifications, the AASHTO LRFD Guide Specifications for Design of Concrete-Filled FRP Tubes for Flexural and Axial Members, the ASCE Pre-Standard for LRFD of Pultruded FRP Structures, and other applicable specifications.

The composite arch system structural components shall be designed, fabricated and supplied by, or an independent contractor of:

$$$1$$$

2.13.4.4.4 Load Rating Report

For a Class 2 buried structure supporting a Roadway, the Contractor shall submit a load rating report in accordance with the WSDOT *Bridge Design Manual*, except in the following cases:

1. For a simple span (single barrel) buried structure, when the Structural Clear Span is less than or equal to 24 feet and the minimum Fill Depth is greater than 13 feet.
2. For a simple span (single barrel) buried structure, when the Structural Clear Span is greater than 24 feet and the minimum Fill Depth exceeds the Structural Clear Span.
3. For a multiple span (multiple barrel) buried structure, when the Fill Depth exceeds the Structural Clear Span.

2.13.4.5 Stormwater Vaults

New or modified stormwater vaults, vaults where the runoff volume is modified, and open top vaults shall be watertight and shall conform to the requirements for detention vaults in the WSDOT *Bridge Design Manual*. New stormwater vaults shall not be located in the roadway.

Stormwater vaults that may carry vehicular loads and that are 20 feet or more in span length (measured from inside face to inside face) shall be load rated in accordance with the WSDOT *Bridge Design Manual*.

Refer to Section 2.14, *Stormwater,* for additional design requirements.

2.13.4.6 Noise Wall Design Criteria

Noise walls shall be constructed of precast concrete, cast-in-place concrete, or reinforced concrete masonry. Gravity block noise walls shall not be used. The Design-Builder may modify the Noise Wall Plans shown in the Standard Plans as required to meet Project-specific criteria by providing special design analysis. The special design noise walls shall be stamped and signed by the EOR. The Design-Builder shall design noise walls for all structural service limit state, strength limit state, extreme limit state, and safety requirements.

The Design-Builder may use the Standard Plan noise walls as a basis for special design noise walls to meet the aesthetic requirements for the Project in accordance with Section 2.15, *Roadside Restoration*. Aesthetic modifications shall not adversely affect the strength and safety requirements of the Standard Plan noise walls.

The Design-Builder may use the Standard Plan noise walls as a basis for special design noise walls to meet the seismic requirements for the Project in accordance with Section 2.06, *Geotechnical*. Structural modifications for seismic demand not covered by the Standard Plans shall meet the strength and safety requirements of all noise wall design codes.

Grading at special design noise walls shall conform to the grading for Standard Plan noise walls.

The top of the noise walls shall be constructed to meet or exceed the top elevation of the noise walls shown in the Conceptual Plans with vertical steps and horizontal runs constructed in accordance with Section 6-12 of the Standard Specifications.

The Design-Builder shall provide fire hydrant access doors adjacent to fire hydrant locations. Doors shall be provided as specified in the Standard Plans and locations shall be easily accessible to both emergency vehicles and water supply service lines. Each access door shall have a deadbolt lock capable of accepting a Best CX Series Core. The Design-Builder shall furnish and install a spring-loaded construction core with each lock. WSDOT will furnish the permanent Best CX Series Core for the Design-Builder to install at the end of the Project. Fire hydrant signs shall be attached to all doors that provide access to fire hydrants.

Final alignment tolerances shall be 0.5 inches within a 10-foot length of wall.

2.13.4.7 Illumination, Intelligent Transportation System, Traffic Signal, and Overhead Sign Structures

Overhead sign structures include monotube sign structures, bridge mounted signs, monotube sign structures mounted on bridges, and their foundations. Overhead sign structures may support static signs, variable message signs (VMS), toll rate signs (TRS), or tolling equipment (toll gantries).

Where light standards, ITS closed-circuit television (CCTV) standards, traffic signal standards (including for ramp meter systems), or overhead sign structures

are mounted on bridges, the bridge structural elements shall be designed for the support reactions.

The Design-Builder shall design retaining walls and foundations to account for the placement of illumination, ITS, traffic signal (including ramp meter), or overhead sign structure supports on or behind the retaining walls.

Handholes in closed members shall have reinforcement around the holes. Structural bolted splices or connections shall use ASTM A 325 high strength bolts. All fabricated structural components and hardware shall be galvanized after fabrication in accordance with AASHTO M 111. All bolts and related hardware shall be galvanized after fabrication per AASHTO M 232 except ASTM F 1554 GR 105 Anchor Rods shall be galvanized after fabrication per ASTM F 2329.

Overhead monotube sign structures shall be designed in accordance with the design criteria specified in Chapter 10 of the WSDOT *Bridge Design Manual*. Overhead monotube sign structure designs (including foundations) shall be stamped and signed by the EOR. Span lengths and loadings are as shown in Chapter 10 of the WSDOT *Bridge Design Manual*. Deviations from these designs shall be considered special designs. Special designs shall be designed using *AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*, the WSDOT *Bridge Design Manual*, and this Section. The Design-Builder shall prepare and submit detailed structural design calculations and plans to the WSDOT Engineer for Review and Comment. Foundations for illumination, ITS, traffic signal, and overhead sign structures shall be designed in accordance with Section 2.06, *Geotechnical* and WSDOT *Bridge Design Manual.*

Non-metallic support structures for lighting, ITS, traffic signal, or Toll Equipment shall not be used for permanent installations.

2.13.4.7.1 Variable Message Signs

VMS shall be supported on monotube sign bridges or monotube balanced tee cantilever sign structures.

The Design-Builder shall furnish and install all VMS. The Design-Builder shall design and construct all associated VMS housings, VMS mounting beams and brackets, maintenance walkways, support structures, and foundations (including all necessary hardware) to install VMS.

The VMS housing structural framing, face covering, and mounting members shall be designed to withstand a wind velocity of 115 mph and shall otherwise comply with the requirements of the *AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

Prior to fabrication, the Design-Builder shall prepare and submit detailed structural design calculations and Plans for all associated VMS housings, VMS mounting beams and brackets, maintenance walkways, support structures, and foundations (including all necessary hardware) to WSDOT for Review and Comment.

2.13.4.7.2 Toll Rate Signs

TRS shall be installed on monotube sign bridge structures, unless noted otherwise. The Design-Builder shall furnish and install all TRS. The Design-Builder shall design and construct all associated sign housings, sign mounting beams and brackets, support structures, and foundations (including all necessary hardware) to install TRS.

The TRS on ***$$1$$*** shall be replaced with a new TRS of the same size. The Design-Builder shall analyze the existing cantilever sign structure to verify that it meets the required cubic (XYZ) and weight limitations as stated in the WSDOT *Bridge Design Manual* for cantilever sign structures. If the existing cantilever sign structure does not meet the requirements, the Design-Builder shall replace it with a monotube sign bridge.

The TRS housing structural framing, face covering, and mounting members shall be designed to withstand a wind velocity of 100 mph with a 30 percent gust factor and shall otherwise comply with the latest requirements of *LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals*.

Prior to fabrication, the Design-Builder shall prepare and submit detailed structural design calculations and Plans for all associated TRS housings, TRS mounting beams and brackets, maintenance walkways, support structures, and foundations (including all necessary hardware) to WSDOT for Review and Comment.

2.13.4.7.3 Closed-Circuit Television

Where pre-approved CCTV support structures are not used, the analysis and design of CCTV camera support structures shall comply with the requirements of the WSDOT *Bridge Design Manual*. Fatigue design shall conform to Section 11 of the *AASHTO LRFD Specifications for Structural Supports for Highway Signs, Luminaires, and Traffic Signals using* Fatigue Category III.

2.13.4.7.4 Toll Gantries

Toll Gantries shall use monotube sign structures as supports and shall not support other equipment other than tolling equipment. Toll Gantries shall be designed within the design criteria specified for monotube sign structures in accordance with the WSDOT *Bridge Design Manual*. Limits for span lengths and loadings shall be as shown in the Monotube Sign Structure Plans and notes in the WSDOT *Bridge Design Manual*. All proposed Toll Gantry plan sheets shall include details for the toll reader equipment cabinet and associated conduit, as well as vertical clearances over the center of each lane and shoulder.

Toll Gantry analysis and design shall conform to the following additional criteria:

1. Toll Equipment is assumed to have the following properties per tolled lane and per adjacent shoulder, including wiring, attachments, cameras, sensors, and other appurtenances:
    a) Weight 1,300 pounds

b) Surface area of 20 square feet

Limit the natural vibrational frequency of an element that supports the equipment support frame to less than 500 hertz.

2. Limit displacements of the structure when the wind speed is equal to 30 mph, so that:

a) Movement of a point along the structure shall not exceed 0.7 inches relative to the position of another point along the structure, and the maximum displacement of a point shall not exceed 0.7 inches.

b) Rotational displacement of a point shall not exceed 8 milliradians (0.47 degrees) relative to the rotational orientation of that point at rest, in all three rotational axes.

3. Limit displacements of the structure when the wind speed is equal to 70 mph, so that maximum movement of all points shall not exceed 1.4 inches.

4. See Section 2.26, *Toll Infrastructure* for additional requirements of Toll Gantries.

2.13.5 Construction Criteria

Construction equipment exceeding the legal load shall not be operated on structures without WSDOT's written approval. Refer to Section 1-07 of the *General Provisions* for additional requirements.

2.13.5.1 Structure Monitoring Program

All new and existing bridges, retaining walls, and other structures that have the potential to be damaged by the work shall be considered Sensitive Facilities. The Design-Builder shall identify all new and existing structures that are considered Sensitive Facilities based on the proposed Work and develop a monitoring program. Sensitive Facilities shall include at a minimum the following:

$$1$$.

The monitoring program shall be used to assess the stability and safety of the structure for public use by comparing baseline measurements to routine monitoring measurements after commencement of construction activities within the Project limits. The monitoring program shall include the following elements for a pre-construction condition survey and routine monitoring of the structure:

2.13.5.1.1 Pre-construction Condition Survey

There shall be two baseline Structure surveys. The first survey shall be performed at least 14 Calendar Days prior to commencement of construction activities (soil/rock removal, pile driving, structural Work, etc.) for the ***$$2$$***. The second survey shall be performed 24 hours prior to starting the construction activities in order to verify stability of the baseline measurements. Both surveys shall document visible cracks, defects, and unusual conditions. Baseline measurements shall include estimated effects due to temperature, traffic impacts,

etc. on the displacement measurements. The first survey shall include installation of survey targets on the structure to track permanent displacements. See Appendix S for recent WSDOT condition inspection documents for existing structures.

1. Bridge Surveys shall be performed on all spans and piers of the bridge and shall provide a geometric baseline for the bridge deck and the location and elevation of bridge piers. At a minimum, survey targets shall be located on each exterior column of interior piers, within 2 feet vertical distance below the top of each column, and within 2 feet vertical distance above the existing ground line or top of exposed footing.
2. Retaining Wall Surveys shall be performed at the wall ends and intervals no greater than 50 ft along the wall length. Survey targets shall be located within 2 ft of the top of wall.
3. ***$$3$$***

2.13.5.1.2 Routine Monitoring

Monitoring of the survey targets on the structure shall start within 24 hours after commencement of construction activities then continue at least each Calendar Day until the structure is no longer in service to the public, vehicular and pedestrian traffic is shifted to the temporary detour alignment, and construction activities adjacent to the structure that impact the stability are completed. Monitoring shall include surveying the target locations (x, y, and z values) a minimum of once per Calendar Day and uploading the survey data the same day to an online database. Access to the online database shall be provided to WSDOT up to Substantial Completion of the Project.

The trigger, maximum, and repair displacement values shown below define the threshold levels to implement additional monitoring requirements and adjust construction practices as required. The Design-Builder may adjust the threshold levels depending on the results of the Pre-construction Condition Survey. The Design-Builder shall notify the WSDOT Engineer of the selected threshold levels 24 hours prior to starting construction activities. Threshold levels are compared to the resultant combination of vertical and horizontal displacements of the survey targets. Displacement measurements shall be taken to a precision of 0.01 feet.

Threshold Levels for Permanent Displacements (feet)

Structure	Element	Trigger Level	Maximum Level	Repair Level
$$4$$	***$$5$$***	***$$6$$***	***$$7$$***	***$$8$$***

Damaged, missing, or non-functioning survey equipment or targets shall be replaced and re-baselined within 24 hours. The Design-Builder shall develop a Corrective Action Plan describing specific actions to be taken if permanent displacements exceed the threshold levels given above. This plan shall be submitted to the WSDOT Engineer for Review and Comment at least 14 Calendar Days prior to construction activities.

Structural damage to the structure caused by the Design-Builder's construction activities and creating safety concerns for public use on the structure, shall be repaired regardless of the measured displacement levels. The Design-Builder shall be responsible for all associated design and repair costs, and implementation of repairs to restore stability and safety to the structure for public use.

The monitoring program shall include the following elements:

1. ***$$9$$***

The Design-Builder shall perform remedial measures for each threshold level as described below:

1. Trigger Level: Notify the WSDOT Engineer the same Calendar Day that the trigger level has been exceeded. Report displacement measurements to the WSDOT Engineer until it is verified that movement has stopped. Increase frequency of future monitoring for each affected survey target to two readings daily with a minimum of 6 hours between readings, and also monitor the adjacent targets at the same frequency until movements have stabilized. Implement procedures to limit additional movement and protect the affected facility.
2. Maximum Level: Verify measurements and notify WSDOT immediately if the maximum level has been exceeded. Increase frequency of future monitoring for all survey targets to three readings daily with a minimum of 4 hours between readings. Report displacement measurements to the WSDOT Engineer until it is verified that movement has stopped. WSDOT may suspend associated ground disturbing activities and require the Design-Builder to submit alternative proposals for minimizing further movement. If Work is suspended, the Design-Builder shall obtain approval prior to restarting ground disturbing activities.
3. Repair Level: All construction activities affecting the structure shall be suspended immediately and WSDOT shall be notified immediately to assess the stability risk and safety of the structure for public use. The Design-Builder, SLE, and WSDOT Engineer shall determine the extent of temporary repairs required for the structure before construction activities are allowed to resume. Structural repairs shall be designed and constructed by the Design-Builder and SLE to restore stability and safety of the structure for public use.

2.13.6 Bridge Maintenance Requirements

2.13.6.1 Existing Bridge Expansion Joint Rehabilitation

The Design-Builder shall field measure all existing compression seal and strip seal expansion joints requiring replacement. The expansion joint headers and expansion joint materials of the existing bridge expansion joints shall be removed. The expansion joint headers shall be reconstructed with either elastomeric or polyester concrete, concrete class 4000 or concrete class 4000D (in widths matching the existing headers and thickness 0.25 inches less than the replacement

Hot Mix Asphalt (HMA) overlay), and the joint gland replaced with a compression seal, strip seal, or rapid-cure silicone expansion joint system designed for the gap and motion range of the joint. Strip seals and compression seals shall be removed and replaced with new seals, in one continuous piece, for the entire width of the new and existing bridge deck. New HMA overlay shall not be installed across the expansion joints. Transverse joint seals at the back of pavement seat and end of bridge approach slab shall be constructed in accordance with Standard Plan A-40.20. Transverse joint seals shall be located at the following locations: ***$$1$$***.

Bridge joint calculations shall be submitted to the WSDOT Engineer for Review and Comment.

2.13.6.2 Bridge Inspection and Maintenance Access

The Design-Builder shall design, detail, and construct all bridge superstructures, joints, and bearings to be accessible for WSDOT inspection and maintenance.

The Design-Builder shall design, detail, and construct all joints and bearings to be replaceable. 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, 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 on the Aspen Aerials website.

Pipe railing shall be provided along steel plate girder webs for future maintenance and inspection access and shall be located and detailed in accordance with sheet 6.4-A9 of the WSDOT *Bridge Design Manual*.

For box girders where permanent access is provided, access doors shall be provided at both ends of the bridge.

For steel box girders with permanent access, the Design-Builder shall paint the interior of steel box girders the color white (SAE AMS Standard 595, Color No. 17925) and shall provide LED 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*.

The Design-Builder shall notify WSDOT 30 Calendar Days prior to a new bridge or buried structure being open to traffic, so that WSDOT can schedule an inventory inspection by the WSDOT Bridge Preservation Office.

2.13.7 Submittals

2.13.7.1 Structure Design Submittals

Project submittals shall include, at a minimum, the required submittals in this Section.

2.13.7.1.1 Preliminary Design Submittal

The Design-Builder shall submit to WSDOT for Review and Comment preliminary design drawings on WSDOT standard sheets in accordance with the WSDOT *Bridge Design Manual* Preliminary Plan Checklist for all bridges and structures. The stamp of the EOR shall be applied in accordance with WAC 196-23-020.

2.13.7.1.2 Final Design Submittal

The Design-Builder shall submit to WSDOT for Review and Comment final design drawings on WSDOT standard sheets in accordance with the WSDOT *Bridge Design Manual*. The Design-Builder shall submit final Technical Specifications, design calculations, and supporting reports for all bridges and structures. The stamp of the EOR shall be applied in accordance with WAC 196-23-020.

2.13.7.1.3 Released for Construction Document Submittal

The Design-Builder shall submit Released for Construction (RFC) Documents to WSDOT for all structural Work related to bridge and structures construction, including drawings, Technical Specifications, design calculations, and supporting reports, along with verification that all written review comments for the Preliminary and Final Design Submittals have been resolved. The RFC Documents shall include the stamp and signature of the EOR in accordance with WAC 196-23-020.

2.13.7.1.4 Design Calculations

The Design-Builder shall submit to WSDOT for Review and Comment complete sets of legible calculations to support all structural engineering designs described in this Section. Complete sets of calculations shall be included with each Final and RFC design review Submittal.

All RFC calculations shall include the stamp and signature of the EOR in accordance with WAC 196-23-020.

All calculation sets shall include the following:

1. Cover Sheet - The name of the Project, structure name, designer/checker names, date (month, day, and year), and supervisor's name shall be listed. The stamp and signature of the EOR shall also be included.
2. Index Sheets - These shall include an index by subject with the corresponding design calculation sheet numbers.
3. Design Calculations - Design calculation sheets shall be numbered. The calculations 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 by 11-inch sheet size). In addition, all electronic files

of spreadsheets, computer models, analysis, design files of spreadsheets and computer input/output files used to support the design calculations shall be submitted.

2.13.7.2 Working Drawings

All Working Drawings shall be submitted as Type 2 Working Drawings in accordance with Section 1-05.3(5) unless otherwise noted.

2.13.7.2.1 Shop Drawings

The Design-Builder shall submit to WSDOT shop drawings for all steel elements, precast concrete elements, post-tensioning reinforcement, bearings, expansion joints, railings, barriers, luminaires, drainage structures, reinforcing steel, and piles/drilled shafts prior to implementing Work based on the shop drawings. The EOR shall review all shop drawings prior to Submittal to WSDOT. The Design-Builder shall submit the final approved shop drawings prior to Physical Completion as part of the As Built Plans in accordance with Section 2.13.7.5.1. The shop drawings shall include, at a minimum, the following information:

1. Size of member and fasteners
2. Length dimensions
3. Finish, such as galvanizing, anodizing, and painting.
4. Weld size and type and welding procedures
5. Strand or steel reinforcing bar placement
6. Post-tensioning reinforcement tensioning procedure, stress calculations, and elongations
7. Post-tensioning anchorage details
8. Fabrication-reaming, drilling, and assembly procedures
9. Wall penetrations
10. Erection procedures for steel elements
11. Handling and erection procedures for precast concrete elements, including complete details of all temporary supports, bracing, and inserts placed for lifting, assembly, and erection.
12. Material specifications

2.13.7.2.2 Falsework, Formwork, and other Temporary Structures

The Design-Builder shall submit to the WSDOT Engineer for Review and Comment Type 3 or Type 3E Working Drawings with supporting design calculations for falsework, formwork, construction work bridges, temporary retaining walls, temporary bridges, and other temporary structures.

The Design-Builder shall submit to WSDOT for Review and Comment procedures and Working Drawings with supporting design calculations for critical construction processes. Critical construction processes include, at a minimum, bridge removal, bridge approach demolition, and jacking pits.

All Final Design Plans and calculations for the falsework, formwork, construction work bridges, temporary retaining walls, temporary bridges, other temporary structures, demolition, erection, and installation shall bear the stamp and signature of a Professional Civil or Structural Engineer.

2.13.7.2.3 Shaft Construction Submittal

The Shaft Construction Submittals shall be submitted to the WSDOT Engineer for Review and Comment.

2.13.7.3 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. All revisions to design calculations and RFC plan sheets shall be stamped and signed by the EOR in accordance with WAC 196-23-020 prior to incorporating them into the Project. The SLE shall certify that all revisions to structural calculations and plan sheets are in conformance with the Contract requirements. Whenever new plan sheets are required as part of a Contract revision, the information in the title blocks of these sheets shall be identical to the title blocks of the Contract they are for. Every revision shall 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.

2.13.7.4 Load Rating Report

The Design-Builder shall complete and submit a load rating report as described in Section 15.12 of the WSDOT *Bridge Design Manual* to WSDOT for Review and Comment at least ***$$1$$*** Calendar Days before a structure is opened to vehicular traffic.

2.13.7.5 End of Project Submittals

All Design Documents overseen by the SLE shall be submitted prior to Physical Completion and shall bear the stamp and signature of the SLE except as otherwise required in this Section.

2.13.7.5.1 Plans

The Design-Builder shall prepare As Built Plans for bridges and structures on WSDOT standard sheets in accordance with the WSDOT *Bridge Design Manual*. Plans shall be submitted on 11 by 17-inch PDF and as electronic CADD files in accordance with Section 2.01, *General Information* and this Section. Final approved shop drawings for structures shall be included in the As Built Plans.

2.13.7.5.2 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.

2.13.7.6 Cost Reporting for Permanent Noise Barrier

The Design-Builder shall submit a report documenting the actual construction costs for all permanent noise barriers constructed as part of the Contract. The report shall be submitted no later than 60 Calendar Days after completion of all permanent noise barriers. For each noise barrier constructed, the report shall include the following information:

Barrier Description:

$$1$$

The report shall include final As Built Plans for the noise barriers, including plan, profile, and typical section views.

The cost reported shall include all expenditures for the Work directly associated with the construction of the noise barriers including, but not limited to, clearing, grading, temporary and permanent fencing, and landscaping required solely for the noise barrier construction, foundations, fabrication and installation, including all costs for Working Drawing preparation and review. For all Work described above, the cost reported shall include direct and indirect costs. Direct costs include, at a minimum, labor, equipment, materials, supervision, and field engineering. Indirect costs include, at a minimum, overhead, profit, bonds, taxes, and insurance.

2.13.7.7 Miscellaneous Submittals

At the request of the WSDOT Engineer, the Design-Builder shall deliver to the WSDOT Engineer Work-related submittals that do not fit in the previous categories but are prepared in accordance with this Section.

End of Section