



Contract Number 008811	Contract Title I-405/SR167 Interchange Direct Connector Project	Federal Aid Number n/a
Change Order Number 01R2	Change Description Practical Design Workshop	Date Dec 2, 2016
Region Northwest Region	Project Engineer Gil McNabb <i>M.M.</i>	Phone Number 302-339-3459
Prime Contractor / Design-Builder Atkinson Construction		

- Ordered by Engineer under the terms of Section 1-04.4 of the Standard Specifications or the RFP
- Change proposed by Contractor / Design-Builder

Evolution & Description Of Change

The I-405/SR167 Direct Connector project contains Practical Design Workshop (PDW) RFP specifications per Section 1-04.3. The purpose of the PDW is to explore ideas that differ from the Work in the original Contract, identify cost reduction ideas, and other potential Contract changes while satisfying the Project's purpose and need. At this time, the project is one of two statewide design-build projects that is piloting RFP specifications allowing for up to a 30 day PDW prior to Notice to Proceed if the parties agree there is merit in proceeding with the PDW.

Changes identified through this PDW are Design-Builder Initiated Changes in accordance with Section 1-04.4(2). This change is executed by the State Construction Office per the Design-Build change order checklist.

The PDW for our team consisted of one full day workshop and two subsequent 2-hour meetings to come up with practical design ideas, and feasibility for moving them forward in the project. There were 32 ideas documented and categorized by the team during the PDW. Category 1 practical design ideas were intended to be included in this change order. Category 2 practical design ideas were deemed by the team as worthy to pursue for further development, and if successful, negotiated and included in future change orders. Category 3 ideas needed more information before further pursuing, and Category 4 ideas were determined as unfeasible for this project.

Five Category 1 practical design ideas are included with this change. Approved design deviations numbered 7,9, and 10 were approved as prerequisite to this change.

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Basis of Cost & Justification:

The PDW is a team partnering effort between WSDOT and the Design-Builder. Through negotiations, the total cost savings to the project are divided equally between WSDOT and the Design-Builder. Cost savings are derived from estimating the net reduction of in-place materials from Category 1 practical design ideas. Cost savings do not include considerations for associated Work that may be needed such as traffic control, erosion and sediment control, or risks to Design-Builder, overhead and profit, or markups. Costs and quantity takeoffs were initially proposed by the Design-Builder. WSDOT performed an independent cost estimate based on in-place material quantities broken out for each of the Category 1 practical design ideas. The quantities and costs were then discussed, verified, and negotiated with the Design-Builder.

This PDW change order has significant influences over the continuing development and scheduling of the project. The approach to cost savings estimating was chosen in the interest of expediting the PDW change near the beginning of the project, and mitigating disruptions in proceeding with overall project delivery.

Price: \$4,218,000 total savings to the project divided equally between the Design-Builder and WSDOT.
Total amount contract reduced by \$2,109,000.

Contract Time:

This Change Order does not impact Contract Time.

Prior Approvals:

This Change Order was approved by  Sharif Shaklawun, WSDOT Northwest Region Engineering Manager, on Dec. 2, 2016.

This Change Order was Approved by Denys Tak, HQ Assistant State Construction Engineer, on Dec. 1, 2016.

List Attachments:

- Change Order No. 01
- Attachment "A" Design-Build Change Order Checklist, dated August 9, 2013
- Attachment "B" Region Approval
- Attachment "C" HQ Approval - Attachment "D" WSDOT Independent Estimate

Distribution By:

- Project Office
- Copy of Change Records & Change Order w/Backup - Project Engineer
- Copy of ONLY Change Order - Prime Contractor / Design-Builder
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CONTRACT NO: 008811 FEDERAL AID NO:
 CONTRACT TITLE: DESIGN BUILD I-405, SR 167 INTERCHANGE DIRECT CONN
 CHANGE ORDER NO: 1 R2 PRACTICAL DESIGN WORKSHOP

PRIME CONTRACTOR: [REDACTED] GUY F. ATKINSON CONSTRUCTION, LLC.
 707 SOUTH GRADY WAY STE 500
 RENTON WA 98057-3224

Ordered by Engineer under the terms of Section 1-04.4 of the Standard Specifications

Change proposed by Contractor

ENDORSED BY: _____ CONTRACTOR 11-8-16 _____ DATE	SURETY CONSENT: _____ ATTORNEY IN FACT _____ DATE
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ORIGINAL CONTRACT AMOUNT: 115,899,599.00
 CURRENT CONTRACT AMOUNT: 115,922,321.00
 ESTIMATED NET CHANGE THIS ORDER: -2,109,000.00
 ESTIMATED CONTRACT TOTAL AFTER CHANGE: 113,813,321.00

Approval Required: Region Olympia Service Center Local Agency

<input checked="" type="checkbox"/> APPROVAL RECOMMENDED <input type="checkbox"/> EXECUTED PROJECT ENGINEER 12/5/16 _____ DATE	 EXECUTED STATE CONSTRUCTION ENGINEER 12/21/16 _____ DATE
<input checked="" type="checkbox"/> APPROVAL RECOMMENDED <input type="checkbox"/> EXECUTED REGIONAL ADMIN: BY: 12/5/16 _____ DATE	OTHER APPROVAL WHEN REQUIRED _____ SIGNATURE _____ DATE _____ REPRESENTING

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All work, materials, and measurements to be in accordance with the provisions of the Standard Specifications and Special Provisions for the type of construction involved.

This contract is revised as follows:

Any references to provisions of Division 1 of the Standard Specifications contained herein shall be deemed to refer to the appropriate provisions of the Request for Proposal (RFP) and other Contract Documents. Any references to Prime Contractor or Contractor contained herein shall be deemed to refer to the Design-Builder.

DESCRIPTION:

This change order incorporates practical design ideas facilitated through the Practical Design Workshop in accordance with RFP Chapter 1: General Provisions Section 1-04.3 and 1-04.4 to provide an equitable adjustment to the Design-Builder for the following Category 1 Practical Design Ideas (Cat 1 PDIs) as described in this change order:

PDI 1 Narrow NB Talbot Onramp

PDI 4 Delay SR 167 SB HOV

PDI 7 Shoulder Deviations SB I-405 over Talbot

PDI 12 Elimination of Talbot Ground Improvements

PDI 19 Treating SR167 North of DC as Ramps

Category 1 PDIs are contingent on receiving approval for required deviations described below:

PDI 1: Design Deviation 9 - HOV Shoulder Use and Narrow Ramp Lanes NB Talbot Entrance Ramp

PDI 7 & 12: Design Deviation 7 Lane and Shoulder Widths on I-405 over SR 515

PDI 19: Design Deviation 10 SR 167 Lane and Shoulder Widths

CONTRACT REQUIREMENTS:

The request for proposal (RFP) shall be modified as follows for each Category 1 PDI:

PDI 1 Narrow NB Talbot Onramp: Deviation 9 as defined in RFP 1-01.3(1) proposes deviations to WSDOT DM 1410.04(3)C for use of shoulder on freeway ramp for HOV, DM Exhibit 1360-6, dated July 2010, for reduction in travel way widths and shoulder widths.,

PDI 4 Delay SR 167 SB HOV: RFP Section 1-01.3(1) Defined Terms, Basic Configuration, on page 9 of 171 Line 21, after "Number/type/of ramps/overpasses/underpasses/interchanges", delete".", and add "except the SB SR 167 HOT lane which shall begin as an add lane from the new Direct Connector Ramp and not an Add lane South of I-405 as shown in the Conceptual Plans."

PDI 7 Shoulder Deviations SB I-405 over Talbot: Deviation 7 as defined in RFP Section 1-01.3(1) proposes deviations to WSDOT DM, Fig. 1140-5, dated July 2012, for maintaining lane widths and for reduction of shoulder widths, DM Figure 1240-2a dated July 2011 for traveled way width, and DM Exhibit 1260-3 dated July 2013 for horizontal stopping sight distance.

PDI 12 Elimination of Talbot Ground Improvements: RFP Section 2.13 revisions included with this change order shall be used.

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PDI 19 Treating SR167 North of DC as Ramps: Deviation 10 as defined in RFP Section 1-01.3(1) proposes deviations to WSDOT DM, Fig. 1140-6, dated July 2009 for Design Class P-1, for reduction of shoulder widths.

MEASUREMENT AND PAYMENT:

No specific unit of measure shall apply to these items. As mutually agreed for the Category 1 PDIs as described in this change order, WSDOT will adjust the contract amount for shared savings under the new lump sum items:

PDI 1 CO#1-Narrow NB Talbot Onramp in the amount of \$301,000

PDI 4 CO#1-Delay SR 167 SB HOV in the amount of \$1,161,000

PDI 7 CO#1-Shoulder Deviations S/b I-405 over Talbot in the amount of \$227,500

PDI 12 CO#1-Elimination of Talbot Ground Improvements in the amount of \$389,500

PDI 19 CO#1-Treating SR167 North of DC as Ramps in the amount of \$30,000

Existing Contract Bid Item No. 1 "Total for Design-Build Work (Under Revenue Rule 170)" shall be reduced by the amount of \$4,218,000.

Total amount contract reduced by \$2,109,000.

The Contractor shall assume all responsibility for design and construction of these Category 1 PDI changes.

TIME:

There shall be no change in Contract Time as a result of this change order.

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ITEM NO	GROUP NO	STD ITEM	ITEM DESCRIPTION	UNIT MEASURE	UNIT PRICE	EST QTY CHANGE	EST AMT CHANGE
0001	01		DESIGN BUILD WORK (RULE 170)	L.S.	5,245,083.00	0.00	-4,218,000.00
1003	01		PDI 1 - CO#1 NARROW NB TALBOT ONRAMP	L.S.	0.00	0.00	301,000.00
1004	02		PDI 4-CO#1 DELAY SR167 SB HOV	L.S.	0.00	0.00	1,161,000.00
1005	01		PDI7-CO#1-SHOULDER DEVIATIONS SB I-405 OV	L.S.	0.00	0.00	227,500.00
1006	01		PDI 12 -CO#1 ELIMINATION OF TALBOT GROUND	L.S.	0.00	0.00	389,500.00
1007	02		PDI-19 CO#1- TREATING SR167 NORTH OF DC A	L.S.	0.00	0.00	30,000.00

-2,109,000.00

1 **2.13 BRIDGES AND STRUCTURES**

2 **2.13.1 GENERAL**

3 The Design-Builder shall conduct all Work necessary to complete the bridges and
4 structures for the Project. Elements of Work shall include, but are not limited to, the
5 following:

- 6 • I-405/SR 167 Direct Connector Flyover Bridge.
- 7 • Additional lanes of capacity for Bridge No. 405/16 by one of the following two
8 options:
 - 9 ○ New bridge: replace Bridge No. 405/16 with a new bridge that shall be
10 Forward Compatible.
 - 11 ○ Separate bridges and seismic retrofit: design and construct a separate
12 bridge on each side of Bridge No. 405/16, and design and construct seismic
13 retrofit for the existing bridge. Develop and implement a monitoring
14 program. The separate bridges shall be Forward Compatible with the RTB
15 ETL Improvement Project. Existing Bridge No. 405/16 shall not be
16 widened.
- 17 • Fish passage barriers that are removed and replaced with a structure span
18 exceeding 20.0 feet (measured parallel to the roadway centerline alignment) shall
19 be designed and constructed in accordance with this Section, the BDM, and the
20 *AASHTO LRFD Bridge Design Specifications*.
- 21 • Permanent and temporary retaining walls, noise walls, barriers, moment slabs,
22 approach slabs, fish passable structures, pipes structures, sign structures, lighting
23 structures, and stormwater vaults.

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

27 **2.13.1.1 SEPARATE BRIDGES AND SEISMIC RETROFIT OF BRIDGE NO. 405/16**

28 If the Design-Builder elects to construct separate bridges on each side of the existing
29 Bridge No. 405/16, the new bridges shall be designed and constructed to “Do No Harm” to
30 the existing bridge in accordance with the policy of the BDM 4.3.1. Additionally, the
31 Design-Builder shall demonstrate that a collapse of the existing bridge will not cause
32 collapse of either of the new separate bridges.

33 The Design-Builder shall perform an above-footing seismic retrofit on the existing Bridge
34 No. 405/16 if it remains in service. The Work shall include the following:

- 35 • Design and construct a separate bridge on each side of the existing Bridge No.
36 405/16 for additional lane capacity and shoulder widths in the northbound and
37 southbound directions.
- 38 • Replace the existing rapid cure silicone sealant joint and concrete headers at all
39 bridge deck and abutment expansion joints for the full width of the bridge. Bridge
40 paving joint seals shall be in accordance with Standard Plan A-40.20.

- 1 • Remove the existing rock wall adjacent to Pier 3 and replace it with a retaining
2 wall and/or slope with adequate stabilization measures. The new wall and/or slope
3 shall be constructed between Pier 3 and the Pier 4 abutment. The final
4 configuration of the new wall and/or slope shall be designed and constructed such
5 that it does not decrease the overall stability of the existing Bridge No. 405/16. If a
6 new retaining wall is constructed, the retaining wall shall meet the requirements of
7 this Section, Section 2.6, and Section 2.15.

- 8 • For the above-footing retrofit work identified below, analyze the existing bridge to
9 determine the capacity to demand (C/D) ratios for the current and retrofitted
10 conditions. Items to be evaluated as are follows:
 - 11 • Column displacement capacities determined using pushover method of
12 analysis
 - 13 • Column shear capacity
 - 14 • Seismic restrainer load capacity
 - 15 • Transverse girder stop shear capacity at Piers 1 through 4
 - 16 • Longitudinal girder stop shear capacity at Piers 2 and 3
 - 17 • Seat extensions at Piers 1 through 4

- 18 • Design and construct above-footing retrofits identified below to meet or exceed a
19 C/D ratio of 1.0.
 - 20 • Provide column jackets on all existing bridge columns (9 at each
21 intermediate pier; 18 total).
 - 22 • Provide seismic restrainers across each intermediate pier for all existing
23 girders to remain.
 - 24 • Provide transverse girder stops at each abutment and intermediate pier for
25 all girders.
 - 26 • Provide longitudinal girder stops at each intermediate pier for all girders.
 - 27 • Provide seat extensions at all piers and cross beams for all existing girders
28 to remain.

29 **2.13.1.2 DESIGN AND CONSTRUCT FOR THE EFFECTS OF SKEW ON THE**
30 **STRUCTURE.MONITORING PROGRAM FOR EXISTING BRIDGE NO. 405/16**

31 The Design-Builder shall develop a monitoring program for the existing Bridge
32 No. 405/16. The monitoring program shall include at a minimum, the following elements:

- 33 • Pre- and post-construction condition surveys shall be performed on all spans of
34 Bridge No. 405/16. The surveys shall document visible cracks, defects, and any
35 unusual conditions in each span; shall provide a geometric baseline for bridge deck
36 and bridge pier location and elevation; and shall be used to determine what impacts
37 construction adjacent to existing Bridge No. 405/16 has imparted on the existing
38 spans and foundations. The pre-construction bridge surveys shall be performed
39 prior to any ground disturbance within the Project limits. Post-construction
40 surveys shall be performed within 10 Calendar Days of completion of each phase
41 of construction where the loads on the existing bridge foundations have been
42 changed.

- Survey monuments shall be installed on the existing spans and monitored routinely to detect any structure displacements during construction. Locations of these monuments (X, Y, and Z values) shall be checked twice per week during construction and the data shall be uploaded to an online database. At a minimum, monuments shall be located at each fog line at the centerline of each pier. Prior to any alert-level displacements being reached, successive monument location checks shall be separated by at least 3 Calendar Days. Access to the online database shall be provided to WSDOT during construction. The alert, maximum, and repair displacement values listed below define the thresholds for implementing additional monitoring requirements and to adjust construction practices as required.

The Design-Builder shall develop a corrective action plan describing specific actions to be taken if displacements exceed the alert, maximum, or repair levels for the existing bridge piers due to construction operations. This plan shall be submitted for Review and Comment and comments shall be addressed prior to any ground disturbance within the Project limits.

Displacement measurements shall be taken to a precision of at plus or minus 0.12 inch (0.01 foot). Baseline measurements shall also be taken to estimate the effects of temperature, traffic impacts, etc., on the displacement measurements. Damaged, missing, or non-functioning survey equipment or monuments shall be replaced and re-baselined immediately.

Displacement criteria for alert levels, action levels, and corrective action measures shall be determined by the Design-Builder in accordance with Section 2.6, but shall not exceed following:

Bridge No. 405/16 Displacement Criteria (inches)*			
Pier	Alert Level	Action Level	Corrective Action Level
1	0.5	1.0	1.5
2	1.0	1.5	1.7
3	1.0	1.5	1.7
4	0.5	1.0	1.5

* Vector resultant of X, Y, and Z values.

The Design-Builder shall perform remedial measures for each level as described below. Refer to Section 2.6 for additional monitoring criteria.

- Alert Level: The Design-Builder shall: notify the WSDOT Engineer in writing within 24 hours that the alert level has been measured by instrumentation; notify the WSDOT Engineer in writing within 24 hours of implementing a corrective action plan; report displacement measurements to the WSDOT Engineer until it is verified that movement has stopped; double the frequency of subsequent monitoring of the affected monument and monitor the adjacent monuments at the same frequency until movements have stabilized; and implement procedures to limit further movements and protect the affected facility.
- Action Level: The Design-Builder shall: notify the WSDOT Engineer in writing within 24 hours that the action level has been measured by instrumentation; increase monitoring frequency for all monuments on the bridge to three readings

1 daily, with a minimum of 6 hours between readings; and report results to the
2 WSDOT Engineer daily until it is verified that all movement has stopped.
3 WSDOT may suspend associated ground disturbing activities at that location and
4 require the Design-Builder to submit alternative proposals for minimizing further
5 movements. If Work is suspended, the Design-Builder shall obtain approval prior
6 to restarting ground disturbing activities at that location.

- 7 • Corrective Action Level: All construction activities associated with the bridge shall
8 be suspended immediately and the WSDOT Engineer shall be notified immediately
9 in writing. The Design-Builder shall submit a corrective action plan to the
10 WSDOT Engineer for Review and Comment. All comments shall be resolved
11 prior to resumption of construction activities associated with the bridge. Structural
12 repairs, if required by WSDOT, shall be designed and constructed by the Design-
13 Builder to restore the C/D ratios of the elements affected by the settlement to
14 values greater than 1.0.

15 **2.13.1.3 FORWARD COMPATIBILITY**

16 The new I-405/SR 167 Direct Connector Flyover Bridge shall be constructed so that it is
17 Forward Compatible.

18 If a new bridge is constructed to replace Bridge No. 405/16 or separate bridges are
19 constructed, the new bridge(s) shall be constructed so that they are Forward Compatible
20 with the Tukwila to Renton Improvement Project including providing clear span to
21 accommodate SR 515 Forward Compatibility improvements. Wing walls associated with
22 new bridge abutment ends are allowed to be modified with future widening with the
23 Tukwila to Renton Improvement Project. The bridge shall be constructed so that no bridge
24 widening or wing wall modifications are required for the RTB ETL Improvement Project.

25 All stormwater vaults shall be Forward Compatible with the Tukwila to Renton
26 Improvement Project. Refer to Section 2.14 for additional requirements.

27 All retaining walls shall be Forward Compatible with the RTB ETL Improvement Project,
28 unless specifically noted otherwise herein. The following retaining walls shall be
29 constructed so that they are also Forward Compatible with the Tukwila to Renton
30 Improvement Project:

- 31 • 2596L
- 32 • 2596R
- 33 • 248R
- 34 • 254R
- 35 • 257R
- 36 • 257L
- 37 • 287L

38 All noise walls shall be constructed so that they are Forward Compatible.

39 **2.13.2 MANDATORY STANDARDS**

40 The following is a list of Mandatory Standards that shall be followed for all design and
41 construction related to this Section. They are listed in hierarchical order, where the
42 Mandatory Standards listed higher in the list shall take precedence over those listed below

1 them. If a Mandatory Standard contains a reference to a portion of another document that
2 is not listed below and states that the referenced portion of the document shall be used,
3 then the referenced portion of the document shall also be considered to be a Mandatory
4 Standard with the same hierarchal precedence as the source publication. This is not a
5 comprehensive list; other applicable standards may be required to complete the design and
6 construction. If the Design-Builder becomes aware of any ambiguities or conflicts relating
7 in any way to the Mandatory Standards, the Design-Builder shall immediately notify the
8 WSDOT Engineer.

- 9 • Special Provisions (Appendix B).
- 10 • *Amendments to the Standard Specifications* (Appendix B).
- 11 • Standard Specifications (Appendix B).
- 12 • *WSDOT Bridge & Structures Office Design Memoranda* (Appendix D).
- 13 • *WSDOT Bridge Design Manual (LRFD)* (M23-50) (BDM) (Appendix D).
- 14 • *WSDOT Geotechnical Design Manual* (M 46-03) (GDM) (Appendix D).
- 15 • *AASHTO Guide Specifications for LRFD Seismic Bridge Design*.
- 16 • *FHWA Seismic Retrofitting Manual for Highway Structures: Part 1 - Bridges*.
- 17 • *AASHTO LRFD Bridge Design Specifications*.
- 18 • *FHWA Evaluating Scour at Bridges*, HEC-18.
- 19 • *AASHTO Manual for Bridge Evaluation*.
- 20 • *WSDOT Design Manual* (M22-01.11), July 2014 (Appendix D).
- 21 • *WSDOT Plans Preparation Manual* (M 22-31) (Appendix D).
- 22 • *WSDOT Construction Manual* (M 41-01) (Appendix D).
- 23 • *AASHTO LRFD Bridge Construction Specifications*.
- 24 • *AASHTO Guide Design Specifications for Bridge Temporary Works*.
- 25 • *WSDOT Materials Manual* (M 46-01) (Appendix D).
- 26 • Standard Plans (Appendix D).
- 27 • *WSDOT Qualified Products List* (QPL)
28 (<http://www.wsdot.wa.gov/Business/MaterialsLab/QPL.htm>).
- 29 • *AASHTO Standard Specifications for Structural Supports for Highway Signs,*
30 *Luminaires, and Traffic Signals*, 5th Edition, 2009.
- 31 • *AWS Structural Welding Code - Steel* (AWS D1.1/D1.1M).
- 32 • *AWS Structural Welding Code - Reinforcing Steel* (AWS D1.4/D1.4M).
- 33 • *AASHTO/AWS Bridge Welding Code* (AWS D1.5M/D1.5).
- 34 • *American Concrete Institute Code Requirements for Environmental Engineering*
35 *Concrete Structures* (ACI 350).
- 36 • *FHWA Technical Manual for Design and Construction of Road Tunnels – Civil*
37 *Elements* (publication FHWA-NHI-10-034).

1 **2.13.2.1 BDM RIGHTS AND RESPONSIBILITIES**

2 The following clarifies which rights and responsibilities discussed in the BDM, as
3 modified by *WSDOT Bridge & Structures Office Design Memoranda*, are applicable to the
4 Design-Builder:

- 5 • The Design-Builder shall complete all analyses, evaluations, load ratings, plans,
6 and specifications discussed in the BDM.
- 7 • All such analyses, evaluations, load ratings, plans, and specifications are subject to
8 Review and Comment by WSDOT.
- 9 • All references to WSDOT sections, offices, and engineers shall mean WSDOT.
- 10 • Where the BDM or *WSDOT Bridge & Structures Office Design Memoranda*
11 requires approval by the WSDOT Bridge Design Engineer, the Design Builder
12 shall be responsible for obtaining approval from the WSDOT Engineer prior to
13 proceeding with design. Work completed without the necessary approvals will not
14 be accepted.

15 **2.13.3 PERSONNEL REQUIREMENTS**

16 The Design-Builder shall provide a Structural Lead Engineer (SLE) to manage and review
17 all aspects of the structural Work completed for the Project. The Structural Lead Engineer
18 shall ensure that all design and construction of permanent Work is in conformance with the
19 RFP and Quality Management Plan (QMP), and shall be responsible for the quality of the
20 structural Work performed and for coordinating all structural design elements of the Project.

21 The SLE shall have a minimum of 10 years of experience in the design of bridges,
22 retaining walls, and other highway related structures. The SLE shall be responsible for all
23 bridge and structures design elements. This individual shall be a Professional Engineer
24 licensed under Title 18 RCW State of Washington in the branch of Civil and Structural
25 Engineering.

26 The Engineer of Record (EOR) for all structural engineering Design Documents for the
27 Project shall have a minimum of 10 years of experience in the design of bridges, retaining
28 walls, and other highway related structures. The EOR shall be a Professional Engineer
29 licensed under Title 18 RCW State of Washington in the branch of Civil and Structural
30 Engineering.

31 **2.13.4 DESIGN CRITERIA**

32 The Design-Builder shall design and construct the permanent bridges and structures to
33 achieve the required service life of 75 years. A minimum vertical clearance of 16.5 feet
34 shall be maintained over all roadways at all times during and after construction, with the
35 exception of existing structures having a vertical clearance less than 16.5 feet. For modified
36 existing structures, the minimum vertical clearance shall not be less than the existing
37 clearance. Railroad minimum vertical clearance shall be 23.5 feet.

38 **2.13.4.1 BRIDGE**

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

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1 The Extreme Event-I transient load factor for live load as specified in the *AASHTO LRFD*
2 *Bridge Design Specifications* shall be 0.5 for both the I-405 / SR 167 Direct Connector
3 Flyover Bridge and Bridge No. 405/16.

4 All new structural elements of the widened portion of the bridge shall be designed to HL-
5 93 live load.

6 The following bridge types are permitted for this Project:

- 7 • Prestressed concrete girders and slab girders.
- 8 • Spliced prestressed concrete girders.
- 9 • Steel plate girders.
- 10 • Steel box girders.
- 11 • Post-tensioned concrete box girders.

12 The Design-Builder shall not use rolled steel beams, deck bulb-tee girders (including thin
13 flange deck bulb-tee girders), Tri-beam sections, double tee girders, or precast voided slabs
14 for permanent structures. The Design-Builder shall not use masonry, timber, aluminum, or
15 lightweight concrete as materials for permanent bridge superstructures or substructures.

16 A minimum of three girders shall be used for steel plate girder and prestressed concrete
17 girder bridges to provide redundant load path structures.

18 Non-redundant, fracture critical pier caps or pier cross beams shall not be used.

19 Girders shall be designed to carry the weight of the fluid concrete deck as well as their own
20 weight without shoring.

21 Utilities and WSDOT-owned facilities (ITS conduit, etc.), except bridge drain pipes on the
22 I-405/SR 167 Direct Connector Flyover Bridge, shall be located between bridge girders.

23 **2.13.4.1.1 Seismic**

24 The seismic analyses and design for all new permanent bridges, foundations and retaining
25 walls shall be in accordance with the *AASHTO Guide Specifications for LRFD Seismic*
26 *Bridge Design*, as modified by the BDM, and the code-based response spectra and
27 coefficients applicable to this Project as defined in Section 2.6.

28 All structural elements for the new and existing bridges shall be designed for liquefaction
29 and shall satisfy the requirements of the BDM and the GDM.

30 **2.13.4.1.2 Bridge Load Ratings**

31 Load rating calculations shall be in accordance with the BDM. All new bridges, widened
32 bridges, rehabilitated bridges, culverts, and stormwater vaults that carry vehicular loads
33 and that are 20.0 feet or more in span length (measured parallel to roadway centerline)
34 shall be load rated.

35 **2.13.4.1.3 Precast Prestressed and Post-Tensioned Concrete Girders**

36 The Design-Builder shall provide continuity reinforcement at intermediate piers in the
37 bridge deck to resist negative moments due to live load and superimposed dead loads

38 Prestressed concrete girders shall be the same depth in all spans.

1 The Design-Builder shall bond match cast joints for segmental construction with an epoxy
2 bonding agent in accordance with the Standard Specifications. Dry cast joints shall not be
3 used.

4 **2.13.4.1.4 Steel Plate Girders and Steel Box Girders**

5 The main longitudinal load-carrying girders shall be cambered during fabrication. Heat
6 cambered rolled girders shall not be used except as secondary members or temporary
7 girders.

8 Steel superstructures shall have a cast-in-place reinforced concrete bridge deck designed to
9 be composite for live loads.

10 Pipe railing shall be provided along the girder webs for future maintenance and inspection
11 access, and shall be located and detailed in accordance with sheet 6.4-A9 of the BDM.

12 Drip plates shall be provided on the bottom flanges on the exterior side of the exterior steel
13 plate girders to direct water runoff away from bearings and bridge seats.

14 Galvanized Tension-Control bolts shall not be used.

15 All structural steel shall be painted in accordance with Section 6-07 of the Standard
16 Specifications.

17 **2.13.4.1.5 Bridge Inspection and Maintenance Access**

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

20 The Design-Builder shall design, detail, and construct all joints and bearings to be
21 replaceable.

22 New bridges and new features constructed on existing bridges, except for separate bridges
23 constructed on each side of Bridge No. 405/16, shall meet the access requirements
24 illustrated by Figure 2.3.11-1 of the BDM.

25 All box girder cells shall be accessible for interior inspection and maintenance during and
26 after construction. Access doors or access between cells/girders shall be provided at both
27 ends of the bridge. Exterior access doors shall be lockable, shall only swing into the box
28 girder, and shall be located at locations that do not impact traffic.

29 The Design-Builder shall paint the interior of steel box girders the color white (Federal
30 Standard 595, Color No. 17925).

31 The Design-Builder shall provide ventilation, fluorescent inspection lighting, and electrical
32 power inside box girders. Lighting fixtures, light switches and duplex receptacles shall be
33 located inside the box girders in a manner consistent with the *WSDOT Design Manual*.

34 The Design-Builder shall strip and remove all falsework and formwork from bridges,
35 including the interior of box girders.

36 The Design-Builder shall notify WSDOT 30 Calendar Days prior to any new bridge being
37 open to traffic, so that WSDOT can schedule an inventory inspection by the WSDOT
38 Bridge Preservation Office.

39 **2.13.4.1.6 Bridge Approach Slabs**

40 The Design-Builder shall provide a 25-foot minimum length (measured perpendicular to
41 the pavement seat) cast-in-place reinforced concrete bridge approach slab with approach

1 slab anchors at the ends of each new vehicular bridge. The bridge approach slab joints
2 with the pavement section shall be perpendicular to the travel lanes. Bridge approach slabs
3 shall extend the full width of the bridge deck and traffic barriers. Longitudinal joints in
4 new bridge approach slabs shall be placed at permanent lane lines.

5 **2.13.4.1.7 Bridge & Structure Foundations**

6 For bridge structures, the Design-Builder shall use spread footings, shafts, or cast-in-place
7 concrete piles for permanent structures.

8 The Design-Builder shall construct bridge abutments, wingwalls, and curtain walls with
9 cast-in-place reinforced concrete. Where structural earth walls adjoin bridge abutments or
10 curtain walls, the joint shall be a single vertical joint full height to the bottom of the traffic
11 barrier. Curtain walls at bridge abutment wall corners shall be cast-in-place walls integral
12 with the abutment walls and extending to the back of the footings. All girder seats at
13 abutments and pier caps shall be sloped to drain moisture accumulation.

14 The Design-Builder shall use wingwalls, curtain walls, and retaining walls as required by
15 slope geometry and under-bridge clearances. These walls shall prevent soil slopes from
16 spilling onto girders and bearings. For the separate bridge option for Bridge No. 405/16,
17 end slopes under bridge abutments shall be no steeper than 2:1 (horizontal to vertical);
18 unless a geotechnical investigation allows a steeper slope, in which case the end slopes
19 may be no steeper than 1.5:1.

20 Refer to Sections 2.6 and 2.15 for additional design criteria.

21 **2.13.4.1.8 Bridge Decks and Expansion Joints**

22 The Design-Builder shall design and construct all vehicular bridge decks using cast-in-
23 place reinforced concrete. Stay-in-place concrete deck panels for bridge decks may be
24 used in accordance with Section 5.7.3 of the BDM. On new vehicular bridges, bridge
25 decks shall include a Type 1 Protection System in accordance with the BDM. On widened
26 vehicular bridges, bridge decks shall include a Type 1 or Type 2 Protection System in
27 accordance with the BDM. Bituminous or bituminous-with-membrane overlays for
28 permanent bridge deck construction on new vehicular bridges shall not be used.

29 Stay-in-place metal deck forms shall not be used.

30 For widened structures the bridge deck shall be continuous between expansion joints and
31 the expansion joints shall match the location of the existing expansion joints. Refer to this
32 Section for additional requirements for bridge joint rehabilitation on widened structures.

33 All expansion joint seals shall be continuous the full width of the bridge. The Design-
34 Builder shall not use steel finger expansion joints on new bridges. All expansion joints
35 shall be watertight. Longitudinal expansion joints shall not be used on new bridges or
36 widened bridges. The maximum skew for expansion joints on new bridges shall be 30
37 degrees as measured perpendicular to the centerline of the bridge deck.

38 Longitudinal joints in overlays on existing bridges needed for construction staging shall be
39 placed along permanent lane lines.

40 **2.13.4.1.9 Slope Protection**

41 Slope protection shall reduce or eliminate the need for maintenance; lessen or eliminate
42 negative visual impacts associated with soil erosion, weed growth, trash accumulation, and
43 vandalism; and conform to the requirements described in Section 2.15.

1 Slope protection shall not be used at the I-405/SR 167 Direct Connector Flyover Bridge
2 and the Bridge No. 405/16 new bridge option.

3 For the Bridge No. 405/16 separate bridge option, concrete slope protection shall be
4 installed on the approach fills beneath the widened and modified portions at the Pier 1
5 abutment, and shall match the existing concrete slope protection. Alternatively, a retaining
6 wall meeting the requirements of this Section and Section 2.15 may be used together with
7 concrete slope protection.

8 **2.13.4.1.10 Bridge Barriers and Railings**

9 Refer to Section 2.11 for design criteria regarding barrier type and height. All bridge
10 barriers shall be 42-inches tall and shall use the design criteria for Test Level 4 (TL-4).
11 The railing standard plans may be modified by the Design-Builder to incorporate the
12 aesthetic requirements of Section 2.15, but shall not adversely affect the strength limit
13 state, extreme event limit state, service limit state, and safety requirements for the traffic
14 barriers and railings.

15 The Design-Builder shall not use precast concrete barriers for permanent applications on
16 bridges or bridge approach slabs. Permanent bridge barriers shall be cast-in-place
17 reinforced concrete.

18 The Design-Builder shall cast a minimum of two 2-inch diameter galvanized rigid steel
19 conduit pipes with junction box pairs (one for each conduit pipe) spaced at 180 feet
20 maximum into all new concrete bridge barriers for the full length of the barrier, including
21 barriers on bridge approach slabs and barriers on MSE walls that abut approach slabs or
22 bridges. Each conduit pipe shall terminate at separate Type 1 junction boxes within 15 feet
23 of the exit from a barrier. The Design-Builder shall provide and install conduit expansion
24 and/or deflection devices at all expansion joints, points where the conduit exits from the
25 barrier and any other location where movement is expected. Refer to Section 2.16 for
26 additional design criteria.

27 **2.13.4.2 AT-GRADE TRAFFIC BARRIERS**

28 At-grade traffic barriers shall be designed in accordance with the BDM and shall use the
29 design criteria for TL-4. Existing barriers that require modification shall be replaced by
30 removing the existing barrier to the next joint. Refer to Section 2.11 for additional design
31 criteria.

32 **2.13.4.3 RETAINING WALLS**

33 The Design-Builder shall design and construct permanent retaining walls for the Project in
34 accordance with the BDM and GDM. Retaining walls shall be of the following types:

- 35 • Proprietary structural earth walls in accordance with Section 6-13 of the Standard
36 Specifications.
- 37 • Standard permanent geosynthetic retaining walls in accordance with Sections D-
38 3.09-00, D-3.10-01, and D-3.11-02 of the Standard Plans and Section 6-14 of the
39 Standard Specifications.
- 40 • Standard reinforced concrete cantilevered retaining walls in accordance with
41 Sections D-10.10-01 through D-10.45-01 of the Standard Plans (as limited by
42 *WSDOT Bridge & Structures Office Design Memoranda*) and Section 6-11 of the
43 Standard Specifications.

- 1 • Soil nail walls in accordance with Section 6-15 of the Standard Specifications.
- 2 • Soldier pile walls in accordance with Sections 6-16 of the Standard Specifications.
- 3 • Soldier pile tieback walls in accordance with Sections 6-16 and 6-17 of the
- 4 Standard Specifications.

5 For geotechnical requirements, refer to Section 2.6. For aesthetic requirements, refer to

6 Section 2.15.

7 The Design-Builder shall calculate lateral earth pressures in accordance with Section 3.11

8 of the *AASHTO LRFD Bridge Design Specifications*, the BDM, the GDM, and all borings

9 performed for the Project. The Design-Builder shall modify the retaining walls in the

10 Standard Plans to meet seismic design criteria for the Project in accordance with

11 Section 2.6.

12 The Design-Builder may use the Standard Plan retaining wall as a basis for special design

13 retaining walls to meet the aesthetic requirements for the Project, in accordance with

14 Section 2.15. Aesthetic modifications shall not adversely affect the strength and safety

15 requirements of the retaining walls. Special design retaining walls shall be stamped and

16 signed by the Design-Builder.

17 Fall protection for maintenance shall be provided at the top of all retaining walls and

18 retaining wall terraces in accordance with Chapter 296-155 WAC.

19 The Design-Builder shall evaluate potential impacts to Utilities and WSDOT-owned

20 facilities (stormwater pipes, ITS conduit, etc.) crossing under proposed walls, and

21 incorporate mitigation measures to avoid conflicts and detrimental effects including, but

22 not limited to, settlement and surcharge loading.

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

24 as retaining walls.

25 Refer to Sections 2.6, 2.10, and 2.15 for additional design criteria.

26 **2.13.4.3.1 Temporary Retaining Walls**

27 Temporary retaining wall refers to any wall or portion of wall that retains earth adjacent to

28 public vehicular traffic and will not remain functional upon completion of the Project.

29 The Design-Builder may reuse structural components of temporary retaining walls as part

30 of permanent retaining wall systems, provided all of the structural support elements and

31 materials of the temporary retaining walls meet the requirements of the permanent structure

32 standards and are in undamaged, as-new condition. Timber piles will be allowed as

33 foundations for temporary retaining walls where allowed by the Project's permits.

34 Maintenance of temporary retaining walls shall be the Design-Builder's responsibility.

35 The Design-Builder may leave the buried portion of temporary retaining walls in place as

36 long as it does not conflict with permanent work, but shall remove them at least 2 feet

37 below finished grade and completely cover them with soil material. Timber components of

38 temporary retaining walls shall be removed in their entirety.

39 **2.13.4.4 DRAINAGE**

40 **2.13.4.4.1 Bridge Deck and Approach Drainage**

41 For new and separate bridge options for Bridge No. 405/16, no bridge drain inlets shall be

42 placed on the bridge to capture stormwater runoff. Runoff shall be captured at each end of

1 the bridge. Approach drains shall be placed to prevent stormwater from running from the
2 approach onto the structure. Bridge drain inlets, pipes, and downspouts shall not be
3 located on the bridge, unless noted otherwise. Storm drainage conveyance may be attached
4 to the bridge if it is located between girders and continuous from one abutment to the other
5 without inlets or downspouts.

6 All drainage conveyance shall be supported in accordance with the requirements for
7 utilities installed with new construction in Section 10 of the BDM.

8 For the I-405/SR 167 Direct Connector Flyover Bridge, bridge drain inlets, pipes, and
9 downspouts shall be placed to capture stormwater runoff on the bridge and shall meet the
10 following requirements:

- 11 • Downspout parts shall be accessible for maintenance and cleaning.
- 12 • Downspout elbows shall be 45 degrees or less.
- 13 • Drain pipe shall not be installed within the bridge substructure units or within the
14 box girder cells.
- 15 • Drain pipe shall be a minimum of 6 inches in diameter and shall be accessible for
16 maintenance.
- 17 • Drain pipes and downspouts shall be located to minimize disruption of the
18 aesthetic forms in Section 2.15.
- 19 • Pipes and downspouts shall be ductile iron pipe.

20 All exposed drainage conveyance attached to bridges shall be painted in accordance with
21 Section 6-07 of the Standard Specifications and Section 2.15.

22 See Section 2.14 for additional requirements.

23 **2.13.4.4.2 Culverts and Precast Concrete Arches**

24 Culvert and precast concrete arch design shall conform to *FHWA Technical Manual for*
25 *Design and Construction of Road Tunnels – Civil Elements*.

26 The Design-Builder shall not use corrugated steel or corrugated aluminum structures with a
27 span equal to or greater than 20.0 feet (measured parallel to roadway centerline). The
28 seismic design of buried structures with spans equal to or greater than 20.0 feet shall be in
29 accordance with Chapter 13, Seismic Considerations, of the *FHWA Technical Manual for*
30 *Design and Construction of Road Tunnels – Civil Elements*. Timber piles shall not be used
31 as foundations for culverts or precast concrete arches.

32 Refer to Section 2.14 and the *WSDOT Bridge & Structures Office Design Memoranda* for
33 additional requirements.

34 **2.13.4.4.3 Stormwater Vaults**

35 Stormwater vaults and open top vaults shall be watertight and shall conform to the
36 requirements for detention vaults in the BDM. Stormwater vaults shall not be located
37 under the roadway.

38 Refer to Section 2.14 for additional requirements.

1 **2.13.4.5 NOISE WALLS**

2 Noise walls shall be constructed of precast concrete or cast-in-place concrete. Gravity
3 block and reinforced concrete masonry noise walls shall not be used. The Design-Builder
4 may modify the noise wall plans shown in the Standard Plans as required to meet project-
5 specific criteria by providing special design analysis. A special design is required if a
6 Standard Plan is modified. The special design noise walls shall be stamped and signed by
7 the Design-Builder. The Design-Builder shall design noise walls for all structural service
8 limit state, strength limit state, extreme limit state, and safety requirements. Refer to
9 Section 2.6 for additional requirements.

10 If the Design-Builder chooses to reuse the existing Noise Wall East 5B wall panels for
11 construction of Noise Wall East 5, the following conditions shall apply:

- 12 • All existing wall panels and components used in the construction of Noise Wall
13 East 5 shall be finished, sealed, and painted in accordance with the applicable
14 Mandatory Standards for that Work.
- 15 • The Design-Builder assumes all risks and costs associated with the existing
16 condition, as-built materials and geometry, design, and repair of the noise wall
17 panels.
- 18 • Foundations for the noise wall shall be designed in accordance with the Mandatory
19 Standards.
- 20 • Existing noise wall panels have not been designed to account for the effects of
21 liquefaction; therefore, existing noise wall panels shall not be used where the
22 foundations will be constructed in liquefiable soils.
- 23 • The Design-Builder shall submit to WSDOT for Review and Comment an initial
24 conditions survey of the existing noise wall panels prior to construction activities
25 associated with their removal. The condition survey is required to confirm the as-
26 built conditions of the noise wall. The condition survey will also establish a
27 baseline to evaluate any repair or restoration required of the existing wall
28 components by the Design-Builder. The Design-Builder shall be responsible for
29 the repair or restoration of any additional damage to the existing wall components.
30 Any existing wall element damaged during the Work shall be either replaced or
31 restored to a condition equal to or better than the initial condition survey as
32 determined by the WSDOT Engineer. The conditions survey shall include:
33 marking of each panel with an identifying name; photographs of both sides of the
34 panel wall and pilasters; and documentation of the location of existing cracks,
35 spalling, and other damage.
- 36 • The precast concrete panels, wall caps, base plates, and noise wall doors and
37 frames of the existing Noise Wall East 5B may be reused given the following
38 requirements. No other elements shall be reused:
 - 39 ○ A special design is required for reused elements. The special design shall
40 be stamped and signed by the Design-Builder. The design shall be in
41 accordance with *AASHTO Guide Specifications for Structural Design of*
42 *Sound Barriers*, 1989, including 1992 and 2002 Interims.
 - 43 ○ Anchor bolts shall be new. The anchor bolts and their connections to the
44 base plates of the precast concrete panels shall be designed in accordance

- 1 with *AASHTO Guide Specifications for Structural Design of Sound*
2 *Barriers*, 1989, including 1992 and 2002 Interims.
- 3 ○ Design wind velocity shall be no less than 80 miles per hour, with wind
4 exposure B1.
 - 5 ○ Design peak ground seismic acceleration shall be no less than 0.44g.
 - 6 ○ The new locations of reused noise wall doors shall be in accordance with
7 the requirements specified in this Section and Section 2.11.
 - 8 ○ Existing noise wall panels shall not be reused if their reuse requires cutting
9 or altering the existing noise wall panel in any way.

10 Doors and vehicular access in noise walls shall be designed for the same wind loads as the
11 noise wall. The Design-Builder may use the Standard Plan noise walls as a basis for
12 special design noise walls to meet the aesthetic requirements for the Project in accordance
13 with Section 2.15. Aesthetic modifications shall not adversely affect the strength and
14 safety requirements of the Standard Plan noise walls.

15 The Design-Builder may use the Standard Plan noise walls as a basis for special design
16 noise walls to meet the seismic requirements for the Project in accordance with
17 Section 2.6. Structural modifications for seismic demand not covered by the Standard
18 Plans shall meet the strength and safety requirements of all noise wall design codes.

19 Grading at special design noise walls shall have a 3-foot wide level bench on both sides of
20 the noise wall.

21 The top of the noise walls shall be constructed to meet or exceed the top elevation of the
22 noise walls shown in the Conceptual Plans with vertical steps and horizontal runs
23 constructed in accordance with Section 2.15.

24 The Design-Builder shall provide noise wall doors in accordance with Section 2.11. Doors
25 shall be provided as specified in the Standard Plans, and locations shall be easily accessible
26 to both emergency vehicles and water supply service lines. Each access door shall have a
27 deadbolt lock capable of accepting a Best CX Series Core. The Design-Builder shall
28 furnish and install a spring-loaded construction core with each lock. WSDOT will furnish
29 the permanent Best CX Series Core for the Design-Builder to install at the end of the
30 Project. Fire hydrant signs shall be attached to all doors that provide access to fire
31 hydrants.

32 Final alignment tolerances shall be 0.5-inch within any 10-foot length of wall.

33 Refer to Section 2.8 for additional noise wall requirements.

34 **2.13.4.6 SIGN STRUCTURES, CCTV CAMERA STRUCTURES, TOLL GANTRIES, AND**
35 **OVERHEAD LIGHTING STRUCTURES**

36 Overhead sign structures include monotube sign structures, bridge mounted signs,
37 monotube sign structures mounted on bridges, TRS, VMS, Toll Gantries, and their
38 foundations.

39 Where overhead sign structures, closed circuit television (CCTV) camera structures, or
40 luminaires are mounted on bridges, the bridge structural elements shall be designed for the
41 loads from the overhead sign structures, CCTV camera structures, and luminaires mounted
42 on the bridge. Overhead lighting placed on the bridges shall be located at the bridge
43 supports. Refer to Section 2.19 for additional requirements regarding signs on bridge
44 structures.

1 The Design-Builder shall design retaining walls and foundations to account for the
2 placement of any major sign supports (such as cantilevered signs or sign bridges),
3 overhead lighting supports, or ITS facility supports on or behind the retaining walls.

4 Handholes in closed members shall have reinforcement around the holes. Structural bolted
5 splices or connections shall use ASTM A 325 high strength bolts. Non-metallic support
6 structures for signing, lighting, signals, CCTV cameras, or Toll Equipment shall not be
7 used for permanent installations. All fabricated structural components and hardware shall
8 be galvanized after fabrication in accordance with AASHTO M 111. All bolts and related
9 hardware shall be galvanized after fabrication per AASHTO M 232 except ASTM F 1554
10 GR 105 Anchor Rods shall be galvanized after fabrication per ASTM F 2329.

11 Overhead monotube sign structures shall be designed in accordance with the design limits
12 specified in Chapter 10 of the BDM. Span lengths and loadings are as shown in Chapter
13 10 of the BDM. Deviations from these designs shall be considered special designs and
14 shall be submitted to the WSDOT Engineer for Review and Comment. Special designs
15 shall be designed using *AASHTO Standard Specifications for Structural Supports for*
16 *Highway Signs, Luminaires, and Traffic Signals*, the BDM, and this Section.

17 Refer to Sections 2.15, 2.16, 2.18, 2.19, and 2.26 for additional requirements.

18 **2.13.4.6.1 Variable Message Signs (VMS)**

19 The Design-Builder shall furnish and install all VMS. The Design-Builder shall design
20 and construct all associated sign housings, sign mounting beams and brackets, maintenance
21 walkways, support structures, and foundations (including all necessary hardware) to install
22 VMS. VMS shall be installed on monotube sign bridge or balanced monotube cantilever
23 structures.

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

28 Prior to fabrication, the Design-Builder shall prepare and submit detailed structural design
29 calculations and plans for the VMS support structure to WSDOT for Review and
30 Comment. The VMS support structure and its foundation shall be designed by a Structural
31 Engineer licensed under Title 18 RCW.

32 **2.13.4.6.2 Toll Rate Signs (TRS)**

33 This Section has been intentionally omitted.

34 **2.13.4.6.3 Closed Circuit Television (CCTV)**

35 The analysis and design of CCTV camera support structures shall conform to the following
36 criteria:

- 37 • Basic wind speed of 90 mph shall be used in computing design wind pressure using
38 Equation 3-1 of the *AASHTO LRFD Bridge Design Specifications*.
- 39 • Pole deflection shall not exceed 0.7 inch in 30 mph wind or 1.4 inches in 70 mph
40 wind. The Design-Builder shall be responsible for selecting camera hardware
41 suitable for anticipated deflections.
- 42 • The design life and recurrence interval shall be as follows:

- 1 ○ Fifty years for CCTV camera support structures equal to or exceeding 50
- 2 feet in height.
- 3 ○ Twenty-five years for CCTV camera support structures less than 50 feet in
- 4 height.
- 5 ○ Fatigue design shall conform to Section 11 of the *AASHTO Standard*
- 6 *Specifications for Structural Supports for Highway Signs, Luminaires, and*
- 7 *Traffic Signals* using Fatigue Category III.

8 **2.13.4.6.4 Toll Gantries**

9 This Section has been intentionally omitted.

10 **2.13.5 CONSTRUCTION CRITERIA**

11 Construction equipment exceeding the legal load shall not be operated on structures

12 without WSDOT's written approval. Refer to Section 1-07 of the General Provisions for

13 additional requirements.

14 **2.13.6 BRIDGE MAINTENANCE REQUIREMENTS**

15 **2.13.6.1 BRIDGE JOINTS REHABILITATION**

16 The Design-Builder shall field measure all existing compression seal and strip seal

17 expansion joints requiring replacement. The existing expansion joint headers and

18 expansion joint materials shall be removed and reconstructed the entire width of the bridge

19 deck. The expansion joint header shall be removed to a depth of at least 1 inch below the

20 bottom reinforcing bar of the top mat of reinforcing steel in the bridge deck. The Design-

21 Builder shall make neat vertical saw cuts and maintain square edges at the boundaries of

22 the repair area. The saw cut depth shall not exceed $\frac{3}{4}$ inch or damage the steel reinforcing

23 bars, whichever is less. The width of expansion joint header removal shall be adjusted as

24 necessary to remove all existing patching materials. The expansion joint headers shall be

25 reconstructed with either elastomeric concrete or polyester concrete in widths matching or

26 greater than the existing headers and thickness. Where HMA approaches the joint header,

27 the HMA compacted depth shall be $\frac{1}{4}$ inch higher than the expansion joint header. The

28 joint shall be replaced with a compression seal, strip seal expansion joint, or rapid cure

29 silicone (RCS) joint system designed for the gap and motion range of the joint. Strip seals

30 and compression seals shall be replaced, in one continuous piece, for the entire width of the

31 bridge deck. Where HMA overlay is placed, the replacement HMA overlay shall not be

32 installed across the expansion joints; unless the movement rating is $\frac{1}{4}$ inch or less and

33 constructed in accordance with Detail 5 or 6 of Standard Plan A-40.20.

34 **2.13.7 SUBMITTALS**

35 **2.13.7.1 STRUCTURE DESIGN SUBMITTALS**

36 Project submittals shall include, but are not limited to, the required submittals in this

37 Section.

38 **2.13.7.1.1 Preliminary Design Submittal**

39 The Design-Builder shall submit bridge preliminary plan design drawings to WSDOT for

40 Review and Comment. The bridge preliminary plan design drawings shall be in

41 accordance with Chapter 2.7.2 of the BDM (Detailing the Preliminary Plan), documenting

42 information required in accordance with the Preliminary Plan Checklist included in the

1 BDM, and in accordance with Chapter 11 of the BDM (Detailing Practice) for all bridges
2 and structures. The preliminary plans shall show Forward Compatibility of the bridge.
3 The stamp and signature of the EOR will not be required.

4 **2.13.7.1.2 Final Design Submittal**

5 The Design-Builder shall submit to WSDOT for Review and Comment final design
6 drawings on WSDOT standard bridge sheets in accordance with the BDM Detailing
7 Practice. The Design-Builder shall submit final Technical Specifications, design
8 calculations, Forward Compatibility, and supporting reports for all bridges and structures.
9 The stamp and signature of the EOR will not be required.

10 **2.13.7.1.3 Released For Construction (RFC) Document Submittal**

11 The Design-Builder shall submit RFC documents to WSDOT for all structural Work
12 related to bridge and structures construction, including drawings, Technical Specifications,
13 design calculations, and supporting reports. The RFC Documents shall include the stamp
14 and signature of the EOR.

15 **2.13.7.1.4 Design Calculations**

16 The Design-Builder shall submit to WSDOT for Review and Comment complete sets of
17 legible calculations to support all structural engineering designs described in this Section.
18 Complete sets of calculations shall be included with the final design review and RFC
19 submittals.

20 All Released for Construction calculations shall include the stamp and signature of the
21 EOR.

22 The calculation sets shall include the following:

- 23 • Cover Sheet - The name of the Project, structure name, designer/checker names,
24 date (month, day, and year), and supervisor's name shall be listed. The stamp and
25 signature of the EOR shall also be included.
- 26 • Index Sheets - These shall include an index by subject with the corresponding
27 design calculation sheet numbers.
- 28 • Design Calculations - Design calculation sheets shall be numbered. The
29 calculations shall include design criteria; loadings; structural analysis; results;
30 member capacities; geotechnical calculations; horizontal and vertical settlement
31 calculations; deflection diagrams; long term creep diagrams for horizontal flexural
32 members; and all computer input and output data (reduced to an 8.5-inch by 11-
33 inch sheet size). In addition, electronic files of spreadsheets and computer
34 input/output files used to support the design calculations shall be submitted.

35 **2.13.7.2 WORKING DRAWINGS**

36 the Design-Builder shall submit Working Drawings to WSDOT for Review and Comment
37 in accordance with Section 2.28. Working Drawing submittals shall include, but not be
38 limited to, all steel elements, precast concrete elements, post-tensioning reinforcement,
39 bearings, expansion joints, railings, barriers, luminaires, drainage structures, reinforcing
40 steel bending diagrams, and piles/drilled shafts. The EOR shall review all Working
41 Drawings prior to submittal to WSDOT. The Working Drawings shall include, but not be
42 limited to, 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 • Reinforcing steel placement, fabrication, and bend details.
- 6 • Prestressing steel placement.
- 7 • Post-tensioning reinforcement tensioning procedure, stress calculations, and
- 8 elongations.
- 9 • Post-tensioning anchorage details.
- 10 • Fabrication-reaming, drilling, and assembly procedures.
- 11 • Wall penetrations.
- 12 • Erection procedures for steel elements.
- 13 • Handling and erection procedures for precast concrete elements, including
- 14 complete details of all temporary supports, bracing, and inserts placed for lifting,
- 15 assembly, and erection.
- 16 • Material specifications.

17 **2.13.7.2.1 Falsework, Forms, and other Temporary Structures**

18 The Design-Builder shall submit to WSDOT for Review and Comment Working Drawings
19 with supporting design calculations for falsework, forms, construction work bridges,
20 temporary retaining walls, temporary bridges, and other temporary structures.

21 The Design-Builder shall submit to WSDOT for Review and Comment procedures and
22 Working Drawings with supporting design calculations for critical construction processes.
23 Critical construction processes include, but are not limited to, bridge removal, bridge
24 approach demolition, and jacking pits.

25 All Working Drawing plans and calculations for the falsework, forms, construction work
26 bridges, temporary retaining walls, temporary bridges, other temporary structures,
27 demolition, erection, and installation shall bear the stamp and signature of a Professional
28 Civil or Structural Engineer licensed under Title 18 RCW.

29 **2.13.7.3 SHAFT INSTALLATION PLANS**

30 The shaft installation plans, and slurry and slurry-contacted spoils disposal plans shall be
31 submitted to WSDOT for Review and Comment.

32 **2.13.7.4 PLAN REVISIONS DURING CONSTRUCTION**

33 The Design-Builder shall incorporate calculations for revisions made during construction
34 into the design/check calculation file when construction is completed. Whenever new plan
35 sheets are required, the information in the title blocks of these sheets must be identical to
36 the title blocks of the contract they are for. Every revision shall be assigned a number.
37 The assigned number shall be located both at the location of the change on the sheet and in
38 the revision block of the plan sheet along with an explanation of the change. Refer to
39 Sections 2.12 and 2.28 for additional requirements.

1 **2.13.7.5 LOAD RATING REPORT**

2 The Design-Builder shall complete and submit a load rating report as described in
3 Section 13.4 of the BDM to WSDOT for Review and Comment at least 90 Calendar Days
4 before a new or widened bridge is opened to vehicular traffic.

5 The Design-Builder shall submit all electronic input and output files generated for the load
6 rating analysis on CDROM or DVD.

7 **2.13.7.6 END OF PROJECT SUBMITTALS**

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

11 **2.13.7.6.1 Plans**

12 The Design-Builder shall prepare As-Built Plans for bridges, retaining walls, sign
13 structures, lighting and signal structures, CIP barriers, and any buried structures with span
14 lengths equal to or greater than 20.0 feet (measured parallel to roadway centerline) on
15 WSDOT standard bridge sheets in accordance with the BDM Detailing Practice. Plans
16 shall be submitted on 11-inch by 17-inch white bond paper and as electronic CADD files in
17 accordance with Section 2.1.

18 **2.13.7.6.2 Calculations**

19 The Design-Builder shall revise all calculations as necessary for the design covered by the
20 scope of Work to accommodate field changes. The calculations shall include all the items
21 listed under “Design Calculations” previously specified in this Section.

22 **2.13.7.6.3 Bridge and Structures Archive**

23 In addition to the requirements in Section 2.12, the Design-Builder shall submit a separate,
24 additional set of the following for the Bridge and Structures Archives:

- 25 • End of Project Submittal Plans and Calculations;
- 26 • Load Rating Report;
- 27 • As-built Working Drawings for steel bridges, prestressed concrete girders,
28 bearings, expansion joints, and railings on structures or retaining walls;
- 29 • Geotechnical final documentation package (see Section 2.6); and
- 30 • All other structures related reports.

31
32

End of Section

DESIGN-BUILD CHANGE ORDER CHECKLIST

Cont. #: <u>008811</u>	Cont. Title: <u>405/SR167 Direct Connect</u>	Approval from State Construction Office Required
C.O. #: <u>01R1R2</u>	C.O. Title: <u>Practical Design Workshop</u>	
<input checked="" type="checkbox"/> Design-Builder initiated. <input checked="" type="checkbox"/> Agency initiated.		

I. Executed by the State Construction Office 1. Cost or credit equal to or exceeding \$200,000.*1 2. Change in the contract documents beyond the scope, intent or termini of the original contract.*2 3. Change in the condition of award. 4. Change in contract time greater than 30 working days.	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	X
5. Cost or credit greater than \$100,000 but less than \$200,000.*1 6. Change in contract time greater than 10 and less than or equal to 30 working days, must be related to changes implemented by change order.	<input type="checkbox"/> Yes <input type="checkbox"/> No	
III. Executed by the Project Engineer 7. Determination of impacts and/or overhead. 8. Design or construction work that does not comply with the Mandatory Standards. 9. A change to a Chapter 1 General Provision. 10. A change to a technical requirement in any of the following sections: Design Deviations, Geotechnical Design, Pavement, Project Documentation, Bridges and Structures, Control of Materials, MWBE Goals, QMP Requirements, or WSDOT Standard Specifications. 11. Determination of changed condition (Section 1-04.7 of the Request For Proposal). 12. Settlement of a claim (Section 1-09.11(2) of the Request For Proposal). 13. Repair of damage regarding "acts of God" or "acts of the public enemy or of government authorities (Section 1-07.13 of the Request For Proposal). 14. A "no-cost" change based upon a determination of "equal or better".	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Yes <input type="checkbox"/> No	X X X X X X X X

Approvals obtained:

Project Engineer: **(REQUIRED)** Chun-Ho Chen Date: 11/1/2016

Region: **(REQUIRED)** Gil McNabb Date: 11/1/2016

State Construction Office: Denys Tak Date: 12/1/2016

To be completed by the Project Engineer :

CO Reason(s) (See CCIS Source/Outcome) : AB,01,AP,RS

Change Order Prepared By: Duska Dietzway Date: 11/1/2016

Has change been entered as lesson learned? Yes No N/A

Has design documentation been updated? Yes No N/A

Is change approved by program management? Yes No N/A

To be completed by the Region :

Is the change eligible for Federal participation? Yes No N/A

Change Order Reviewed by: Nancy S. Swann Date: 12-14-16

C 8811
Change Order 01R2
Attachment "A"
Page 1 of 1

This form represents the minimum information required by the State Construction Office. *3

*1 Cost or Credit greater than \$200,000 on Federal Stewardship requires FHWA approval (see Construction Manual - Ch. 1-2.4C(3) and Ch. 1-3.4)
 *2 Per RCW 47.28.050, any change beyond \$7,500 that is beyond the original scope shall go through the competitive bidding process.
 *3 Changes that do not meet any of the itemized criteria above may be executed by the PE with Region approval.