

Engineering Specification

I-5 Columbia River Crossing – Steel Bridge Superstructure

Document: ENG-SPEC-2026-0147

Revision: B

Date: 09 July 2026

 **Originator:** AECOM / Jacobs Joint Venture

 **Discipline:** Structural Engineering

 **Status:** Issued for Construction

 **Classification:** Proprietary

1 Revision History

Rev.	Date	Author	Description	Approved
A	15 Mar 2026	R. Chen	Initial issue for internal review. Scope and material requirements established.	J. Torres
B	09 Jul 2026	R. Chen	Incorporated client review comments. Revised fatigue provisions per AASHTO 9th Ed. Updated verification matrix. Issued for construction.	J. Torres

2 Purpose

This Engineering Specification defines the technical requirements for the design, materials, fabrication, inspection, and erection of the steel plate-girder superstructure for the I-5 Columbia River Crossing (CRC) replacement bridge, Contract C-2026-0147. The document serves as the governing technical baseline against which all deliverables, shop drawings, test reports, and field inspections are verified.

3 Scope

The scope of this specification encompasses:

- Four continuous welded steel plate girders per span, spanning four segments of 45 m–60 m–60 m–45 m (total bridge length 210 m).
- Cross-frames, lateral bracing, stiffeners, bearing assemblies, and deck shear connectors.
- Structural steel conforming to ASTM A709 Grade 50W (weathering steel).
- Bolted field splices, shop-welded stiffeners, and high-strength bolted connections per RCSC Specification (2020).
- Quality assurance and non-destructive examination (NDE) protocols.

Excluded from this specification: substructure components (piers, abutments, foundations), concrete deck slab design (see ENG-SPEC-2026-0152), and temporary works.

4 Applicable Documents

The following codes, standards, and specifications form part of this document to the extent specified herein. The edition in effect at the date of contract award shall apply unless otherwise noted.

Ref. ID	Issuing Body	Title	Edition
I-5 Columbia River Crossing			1

AASHTO AASHTO	LRFD Bridge Design Specifications	9th Ed., 2020
AASHTO AASHTO	LRFD Bridge Construction Specifications	4th Ed., 2017
ASTM A36	Standard Specification for Structural Steel	2020
ASTM A325	High-Strength Bolts for Structural Joints	2020
ASTM E165	Standard Practice for Liquid Penetrant Test	2020
AWS D1.1	Bridge Welding Code	2020
RCSC RCSC	Specification for Structural Joints Using High-Strength Bolts	2020
AISC 360	Specification for Structural Steel Buildings	2016

5 Symbols & Abbreviations

Symbol	Definition
AASHTO	American Association of State Highway and Transportation Officials
AISC	American Institute of Steel Construction
ASTM	ASTM International (formerly American Society for Testing and Materials)
AWS	American Welding Society
CJP	Complete Joint Penetration (weld)
CRC	Columbia River Crossing
F_y	Specified minimum yield strength of steel (MPa)
F_u	Specified minimum tensile strength of steel (MPa)
HAZ	Heat-Affected Zone
HL-93	AASHTO notional design live-load model
MPT	Magnetic Particle Testing
NDE	Non-Destructive Examination
PJP	Partial Joint Penetration (weld)
RCSC	Research Council on Structural Connections
UT	Ultrasonic Testing
VT	Visual Testing

6 Technical Requirements

6.1 General Requirements

ID	Requirement Description	Verif.	Traceability
REQ-GEN-001	All structural steelwork shall be designed in accordance with AASHTO LRFD Bridge Design Specifications, 9th Edition.	A	AASHTO LRFD §1.1
REQ-GEN-002	Design service life of the superstructure shall be not less than 100 years for all primary load-carrying members.	A	Owner's RFP §2.3
REQ-GEN-003	The structure shall be classified as a Redundancy Level 1 (redundant) system per AASHTO LRFD §1.3.4.	A	AASHTO LRFD
REQ-GEN-004	All welders and welding operators shall be certified per AWS D1.5, Clause 5.	I+D	AWS D1.5
REQ-GEN-005	A project-specific Quality Assurance Plan (QAP) shall be submitted and approved prior to commencement of fabrication.	D	ENG-SPEC-2026-0147 §5

6.2 Structural Design Requirements

ID	Requirement Description	Verif.	Traceability
REQ-STR-001	Design live load shall be HL-93 in accordance with AASHTO LRFD §3.6.1.2. A live-load deflection limit of $L/800$ shall apply.	A+T	AASHTO LRFD
REQ-STR-002	Fatigue design shall comply with AASHTO LRFD §6.6.1 for Fatigue Category II (infinite life) for all welded details in tension zones.	A	AASHTO LRFD §6.6
REQ-STR-003	Seismic design shall conform to AASHTO Guide Specifications for LRFD Seismic Bridge Design, Seismic Design Category C, 1000-year return period.	A	AASHTO Seismic
REQ-STR-004	Cross-frame spacing shall not exceed 7.5 m centre-to-centre. End cross-frames shall be provided at all bearing locations.	A	REQ-STR-001
REQ-STR-005	All bolted field splices shall develop 100% of the lesser connected flange capacity in tension.	A+T	RCSC §5.1
REQ-STR-006	Web stiffeners shall be provided at all bearing and cross-frame locations. Intermediate transverse stiffeners shall satisfy AASHTO LRFD §6.10.11.1.	A	AASHTO LRFD
REQ-STR-007	Camber diagrams shall account for dead-load deflection, superimposed dead load, and 60% of live-load deflection, all computed at 20°C.	A+I	AASHTO LTS

6.3 Material Requirements

ID	Requirement Description	Verif.	Traceability
REQ-MAT-001	All primary structural steel (girders, cross-frames, stiffeners) shall be ASTM A709 Grade 50W with a Charpy V-notch toughness of 34 J at -18°C (Zone 2).	I+T	ASTM A709
REQ-MAT-002	High-strength bolts shall be ASTM A325 Type 1, heavy-hex structural bolts with mechanical galvanising per ASTM B695 Class 50.	I+T	ASTM A325
REQ-MAT-003	Welding consumables shall be matched to the base metal: E70T-1 or E71T-1 for flux-cored arc welding (FCAW) of Grade 50W steel.	I	AWS D1.5
REQ-MAT-004	Mill test reports (MTRs) shall be provided for each heat of steel and each lot of bolts, certifying chemical composition and mechanical properties.	I	ASTM A709 §9
REQ-MAT-005	Shear connector studs shall be ASTM A108 Grade 1015, 22 mm diameter $\times$ 150 mm long, with a minimum tensile strength of 415 MPa.	I+T	AWS D1.5

6.4 Fabrication Requirements

ID	Requirement Description	Verif.	Traceability
REQ-FAB-001	All flange-to-web welds shall be CJP groove welds with UT inspection of 100% of the weld length.	I+T	AWS D1.5 §6
REQ-FAB-002	Stiffener-to-web and stiffener-to-flange welds shall be PJP or fillet welds, minimum 8 mm leg size, with MPT inspection of 25% of weld length.	I+T	AWS D1.5
REQ-FAB-003	Bolted holes shall be sub-punched and reamed, or drilled full-size. Standard holes shall be 2 mm oversize relative to the nominal bolt diameter.	I	RCSC §3.2
REQ-FAB-004	Faying surfaces of all slip-critical bolted connections shall be blast-cleaned to Class B surface condition (slip coefficient $\mu = 0.50$).	I+T	RCSC §5.2

6.5 Erection Requirements

ID	Requirement Description	Verif.	Traceability
REQ-ERC-001	An erection engineering plan, including stability analysis for each stage of girder erection, shall be submitted 60 days prior to commencement of steel erection.	A+I	AASHTO LTS
REQ-ERC-002	Temporary bracing shall remain in place until all permanent cross-frames and lateral bracing in the affected bay are fully bolted.	I	REQ-ERC-001
REQ-ERC-003	Field-bolted connections shall be tensioned using the turn-of-nut method per RCSC §8.2. A minimum of 10% of bolts per connection shall be verified with a calibrated torque wrench.	I+T	RCSC §8

7 Verification Methods

Verification activities are classified per the following taxonomy:

Code	Description
A	Analysis — Verification by calculation, modelling, simulation, or engineering assessment. Includes finite-element analysis, section-capacity checks, and fatigue-life prediction.
I	Inspection — Verification by visual examination, measurement, or review of documentation. Includes mill-certificate review, dimensional checks, and weld-profile gauging.
D	Demonstration — Verification by witnessing an operational activity or procedural execution. Includes welder qualification tests, trial erection, and bolt-tensioning procedure demonstrations.
T	Test — Verification by quantitative measurement using calibrated instruments. Includes UT, MPT, radiographic testing, torque verification, and load testing.

8 Verification Cross-Reference Matrix

ID	Requirement Summary	A	I	D	T
REQ-GEN-001	Design per AASHTO LRFD 9th Ed.	✓			
REQ-GEN-002	100-year design service life	✓			
REQ-GEN-003	Redundancy Level 1 classification	✓			
REQ-GEN-004	Welder certification per AWS D1.5		✓	✓	
REQ-GEN-005	Quality Assurance Plan submission			✓	
REQ-STR-001	HL-93 live load, $L/800$ deflection	✓			✓
REQ-STR-002	Fatigue Category II (infinite life)	✓			
REQ-STR-003	Seismic Design Category C	✓			
REQ-STR-004	Cross-frame spacing ≤ 7.5 m	✓	✓		
REQ-STR-005	Flange splice $\geq 100\%$ capacity	✓			✓
REQ-STR-006	Web stiffener provisions	✓	✓		
REQ-STR-007	Camber diagram computation	✓	✓		
REQ-MAT-001	ASTM A709 Gr. 50W, CVN 34 J		✓		✓
REQ-MAT-002	ASTM A325 Type 1 bolts		✓		✓
REQ-MAT-003	Welding consumables E70T-1/E71T-1		✓		
REQ-MAT-004	Mill test reports for each heat		✓		
REQ-MAT-005	Shear connector stud properties		✓		✓
REQ-FAB-001	CJP welds – 100%				✓
REQ-FAB-002	UT Stiffener welds – MPT 25%				✓
REQ-FAB-003	Bolted-hole		✓		

Note: A = Analysis, I = Inspection, D = Demonstration, T = Test. ✓ indicates the primary verification method(s) assigned.

9 Appendices

Appendix A — Structural System Block Diagram

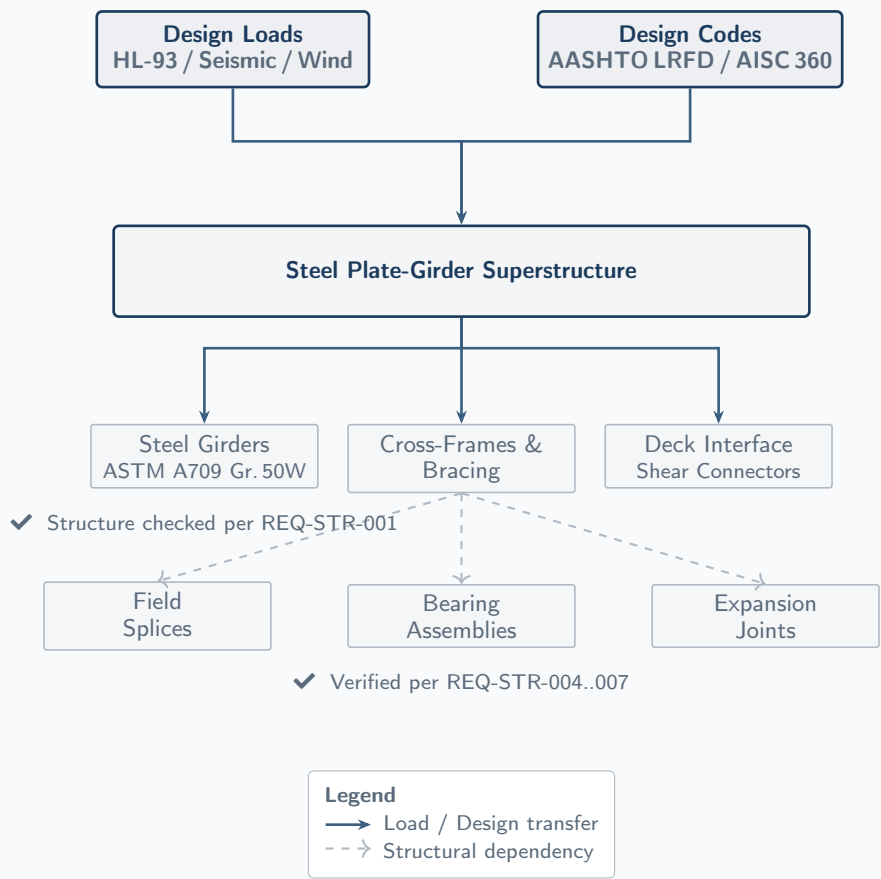


Figure 1: Structural system block diagram — load path and subsystem hierarchy for the I-5 CRC steel superstructure.