

DB Section 141.13 - Hydraulics

(a) Scope – This Section covers hydraulic analysis and design required for Bridges over waterways and culverts.

(b) Standards and References – Design-Builder shall perform hydraulic analyses, and design and construct bank protection and culverts in accordance with the requirements of this Section 141.13.

(1) Standards

- ODOT *Hydraulics Manual*
- ODOT *Hydraulics Manual* Volume 2, “Erosion and Sediment Control”, 1999
- ODOT *Highway Design Manual*
- Programmatic or individual environmental permit Performance Standards (as applicable to this project)
- Local Agency Design Standards (if applicable)
- The appropriate ODOT/APWA Oregon Standard Construction Drawings from the following site: <http://www.odot.state.or.us/tsroadway/std-dwg-02.htm>
- OAR 635-412 – Fish Passage
- **DB Standard Specifications**
- ASHTO LRFD Bridge Design Specification
- AASHTO LRFD Bridge Construction Specification

(2) References

- ODFW “Guidelines and Criteria for Stream-Road Crossings”
- FHWA Hydraulic Design Series (HDS)
- FHWA Hydraulic Engineering Circulars (HEC)
- ODOT Qualified Products List (QPL) at the following site:
<http://egov.oregon.gov/ODOT/HWY/CONSTRUCTION/QPL/Docs/QPL.pdf>
- ODOT *Non-Field Tested Materials Acceptance Guide*

(c) Requirements

(1) Bridges

a. Hydraulic Study - Design-Builder shall perform a hydraulic study and provide documentation as outlined in the ODOT *Hydraulics Manual*. At a minimum, the study shall include the following:

- Hydrologic analysis
- Hydraulic analysis to determine minimum low chord elevation and hydraulic opening

DB 141.13(c)(1)

- Scour analysis including the revetments
- Ice and debris passage analysis
- Fluvial analysis, as applicable (see below)

b. Fluvial Standard - Programmatic or individual environmental permits, as applicable to the Project, may require fluvial performance standards that surpass other hydraulic engineering design criteria. Refer to **DB General Provisions**, Section 141.51 – Environmental Compliance, for additional information. It does not take the place of a hydraulic design or analysis method.

c. Bank and Revetment Protection – Bank protection shall be designed in accordance with the ODOT *Hydraulics Manual* and, if under OTIA III programmatic permits, guidance from the OTIA III Statewide Bridge Delivery Program Environmental Performance Standard. In the case of conflicting requirements between ODOT Hydraulics Manual and the Environmental Performance Standard with regard to protection of the approach roadway fills (i.e. revetment protection), Design-Builder shall submit to Agency PM documentation explaining the basis of the conclusion of the Design-Builder as to which of the conflicting requirements applies. The documentation will be included in the Environmental Compliance Plan.

d. Hydraulic Design – Design-Builder shall prepare Design Documents which shall include at a minimum the following:

- Bank protection Plans
- Scour protection Plans
- Special Details
- **Design-Builder Specifications**
- Revetment Protection Plans

(2) Culverts

a. Hydraulic Study – Design-Builder shall perform a hydraulic study as outlined in the *ODOT Hydraulics Manual*. At a minimum, the study shall include the following:

- Hydrologic analysis
- Hydraulic analysis
- Fish passage requirements
- Ice and debris passage analysis
- Scour Analysis

b. Culvert Design – Design-Builder shall prepare Design Documents, which shall include at a minimum the following:

- Culvert Plan and profile
- Special details
- **Design-Builder Specifications**
- Bank and stream channel protection and habitat

c. Maintenance Accessibility – Design-Builder shall provide permanent access to culvert Structures for inspection and maintenance within the Project ROW. Maintenance access roads shall be designed in accordance with AASHTO *Guidelines for Geometric Design of Very Low-Volume Local Roads* for “Rural Minor Access Road” classification. Culvert Structure openings shall be sized to provide for maintenance access to clean out debris. Design-Builder shall coordinate the design with Agency regarding any specific maintenance concerns or design needs.

(3) Submittals

a. Definitive Design – At a minimum, Design-Builder shall include the following in its Definitive Design submittal:

- Draft Hydraulics Report
- Plan sheets including location of scour protection devices for piers, abutments, and approach roadways

b. Readiness-for-Construction – At a minimum, Design-Builder shall include the following in its Readiness-for-Construction submittal:

- Final Hydraulics Report (stamped and signed)
- Plan sheets
- Detail sheets
- Hydraulic Data Table
- **Design-Builder Specifications**

