

DB Section 141.22 - Drainage

(a) Scope - This Section covers the documentation, design, and construction of storm drainage systems to collect, convey, treat, store and discharge the stormwater runoff and surface water.

(b) Standards and References - Design-Builder shall design and construct drainage Structures and appurtenances and water quality/quantity facilities in accordance with the requirements of this Section 141.22.

(1) Standards

- ODOT *Hydraulics Manual*
- ODOT *Hydraulics Manual* Volume 2, "Erosion and Sediment Control"
- ODOT *Highway Design Manual*
- AASHTO *Roadside Design Guide*
- Programmatic or individual environmental permit performance Standards
- Local agency design Standards (if applicable)
- NOAA Fisheries "HCD Stormwater Online Guidance"
- The appropriate ODOT/APWA Oregon Standard Construction Drawings from the following site: <http://www.odot.state.or.us/tsroadway/std-dwg-02.htm>
- **DB Standard Specifications** (Parts 00200 through 03000 of the *Oregon Standard Specifications for Construction*)

(2) References

- Oregon DEQ NPDES Stormwater Regulations
- ODFW "Guidelines and Criteria For Stream-Road Crossings"
- FHWA Hydraulic Design Series (HDS)
- FHWA Hydraulic Engineering Circulars (HEC)
- AASHTO *Highway Drainage Guidelines*
- AASHTO "A Policy on Geometric Design of Highways and Streets" (Green Book), 5th Edition (2004)
- OSHA
- 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*, 2006
- PD-05 Water Quality Mitigation
- ODOT *Operation and Maintenance Manual for Water Quality Facility*

(c) Requirements

(1) General - Design-Builder shall evaluate all existing storm drainage and sewer systems, and if found to be inadequate, shall upgrade the systems to meet the Standards stipulated in this Section. Design-Builder shall adequately address functionality, durability, environmental impact, ease of maintenance, accessibility, safety and aesthetics in the design and construction of all drainage Structures, appurtenances and water quality/quantity facilities. Design-Builder shall prepare a Stormwater Technical Memorandum in accordance with the ODOT *Hydraulics Manual*.

(2) Hydrology - Peak flow rates and runoff volumes used for designing conveyance, treatment, and detention/retention facilities shall be calculated in accordance with methods described in the ODOT *Hydraulics Manual* and any Permitting or Local Agency Standards that may be applicable to this project.

(3) Roadway Pavement Drainage - Design-Builder shall evaluate the existing Roadway drainage system and identify drainage problems. In general, Roadside ditches or curbs shall be used to collect and convey stormwater runoff from Roadway Pavement. Design-Builder shall upgrade the existing Roadway storm drainage system to avoid concentrations of sheet flow across Roadways, including all superelevation transition points. Design-Builder shall use a two (2) percent minimum Roadway cross slope (excluding transitions), and wherever possible shall use a 0.5 percent minimum longitudinal grade for curbed Roadway sections. The absolute minimum grade is 0.3 percent. Design-Builder shall carefully review the potential for hydroplaning at locations where the longitudinal grade or cross slope is less than the minimum, or anywhere along the Roadway where there is a tendency for water to accumulate. Using the results, Design-Builder shall limit the maximum spread on curbed Roadways to Shoulder width plus two (2) feet encroachment into the outside Traffic Lane.

(4) Bridge Deck Drainage - Design-Builder shall provide a deck drainage system such that the spread limits due to the design storm as described in the ODOT *Hydraulics Manual* are not exceeded. The deck drainage system shall intercept stormwater flowing toward the Bridge prior to the approach slab. Design-Builder shall provide a proper deck drainage system to avoid erosion of embankments and corrosion of structural members, and to prevent deck drainage from discharging directly into a stream. Runoff shall be collected and conveyed to a stormwater treatment facility prior to discharge into a receiving body of water or existing storm drainage system.

(5) Storm Drainage System - Design-Builder shall evaluate the capacity of the existing storm sewer system, gather information about the past hydraulic performance, and identify drainage problem areas. Design-Builder shall use Manning's equation for hydraulic evaluation and design of common geometric channel shapes. Stormwater or surface water within the Project ROW or presently draining onto the Project Site shall be collected and conveyed to a storm drainage system designed in accordance with the requirements established herein. Design-Builder shall upgrade, clean or rehabilitate the existing storm drainage system to convey the design storm and meet the Standards set forth herein. Design-Builder shall design storm sewers to convey the Roadway runoff for the recurrence intervals described in the ODOT *Hydraulics Manual*. Storm sewers shall consider future planned improvements to the Highway and any planned local master drainage system in the Project area. If applicable, review any local agency

drainage master plan and coordinate the design with the local agency. Design-Builder shall submit draft and final Stormwater Reports, as described in the ODOT *Hydraulics Manual*.

a. Connections to Existing Systems - Design-Builder shall develop Plans and **Design-Builder Specifications** for connections to existing storm drainage systems, and shall ensure that the receiving system has sufficient capacity to convey the additional flow.

b. Stormwater Treatment Facility - Design-Builder shall coordinate with the proper Authorities to identify the appropriate stormwater facility for each Work Location, to determine the water quality and quantity requirements, and to provide the necessary treatment and detention. Design-Builder shall design water quality and quantity facilities, and develop Plans and **Design-Builder Specifications** in accordance with the ODOT *Hydraulics Manual* and any permitting or local agency Standards that may be applicable to the Project.

Design-Builder shall develop facility maintenance and performance monitoring procedures, and shall develop and submit to Agency an Agency "Operation and Maintenance Manual" for each stormwater treatment facility designed and constructed under the Contract.

c. Inlets - Design-Builder shall evaluate the performance of the existing inlets, and upgrade as necessary to meet the Standards listed in Subsection (b)(1) "Standards," above. Design-Builder shall provide inlets at low points on sag vertical curves, at upgrade of Bridge approaches, at superelevation transition points, at cut-to-fill transitions on Roadside ditches, at entrance/exit ramp gores and low points, and at areas where there is a possibility of accumulation of runoff under normal operation. Inlet capacity, spacing and type shall be based on the stipulated Standards.

d. Circular Culverts and Pipes - Design-Builder shall design culverts to have a capacity in accordance with the ODOT *Hydraulics Manual*. Design-Builder shall evaluate the performance of all culverts within the Project Site, including mainlines and approach roads, for hydraulic adequacy, structural integrity and outlet protection, and shall upgrade or rehabilitate existing pipes and culverts as necessary to meet the Standards listed in Subsection (b)(1) "Standards," above. Design-Builder shall base the selection of Material for pipes and culverts on the criteria specified in the ODOT *Hydraulics Manual*.

e. Roadside Ditches - Roadside ditches shall be designed to carry the runoff in accordance with the ODOT *Hydraulics Manual*. The water surface in ditches must not be higher than the bottom of the base Material to prevent saturation of the Roadbed. Channel location and geometric configuration shall comply with the AASHTO *Roadside Design Guide*. Design-Builder shall evaluate all the contributing flows to the existing ditches and provide improvements consistent with the requirements of this Section.

f. Outlet Protection - Design-Builder shall provide outlet protection at each concentrated discharge point to minimize scour and reduce the exit velocity/energy

at the outfall. Design-Builder shall design and construct the outlet protection such that the riparian habitat disturbances and other environmental impacts are minimized. Design-Builder shall locate any new outfalls so that the outlet elevation is above the Ordinary High Water Elevation of the receiving body of water. Design-Builder shall use energy dissipaters as appropriate.

(6) Temporary Erosion and Sediment Control - Design-Builder is responsible for the design, Plan preparation, construction, monitoring, maintenance and removal of all required temporary erosion and sediment-control measures. For each Work Location, Design-Builder shall develop an Erosion and Sediment Control Plan that complies with all erosion prevention and sediment-control requirements of Oregon DEQ, Agency, DSL, and other federal, State and local regulatory Authorities, and identifies and protects special areas, such as Wetlands, riparian habitat, existing watercourses, and other environmentally-sensitive areas. Design-Builder shall update the Erosion and Sediment Control Plan as needed to meet the changing conditions of the Project Site. Design-Builder shall install all erosion and sediment-control measures prior to beginning clearing activities, and shall maintain and upgrade the erosion and sediment-control measures until final stabilization of the site. Design-Builder shall keep and maintain records of all erosion-control monitoring and maintenance using the standard Agency form (referred to as Erosion Control Monitoring Reports herein). Design-Builder shall obtain all necessary construction NPDES Permits. For Permanent Erosion Control requirements, see **DB General Provisions**, Section 141.12 – Geotechnical.

(7) Submittals - Design-Builder shall submit the following to Agency PM for Review and Comment:

- **Drainage Plans** – at Definitive Design
- **Stormwater Technical Memorandum** – at Definitive Design
- **Draft Stormwater Report** – 30 Calendar Days following Definitive Design
- **Final Stormwater Report** – at Readiness-for-Construction
- **Pipe data sheet** – at Readiness-for-Construction
- **Drainage Plans** – at Readiness-for-Construction
- **Drainage profiles (as applicable)** – at Readiness-for-Construction
- **Drainage Details** – at Readiness-for-Construction
- **Design-Builder Specifications** – at Readiness-for-Construction
- **Stormwater Management Plan, if required by programmatic or individual environmental permits** – at least 30 Calendar Days prior to commencing clearing activities or construction of Project elements affecting the drainage system
- **Erosion and Sediment Control Plan** – at least 30 Calendar Days prior to commencing clearing activities or construction of Project elements affecting the drainage system
- **Erosion Control Monitoring Reports** – as requested by Agency and as part of the Project Records
- **Operation and Maintenance Manual** for each stormwater facility to Agency PM prior to Final Inspection