

## CHAPTER 6. BRIDGES, SPECIAL CULVERTS, AND STRUCTURAL WALLS

### 6.1 Bridge Principal References

Except as specified below, City of SeaTac bridges, whether on public roads or on private roads, shall be designed and constructed to meet the minimum requirements set forth in the latest edition, including all interim addenda of AASHTO Load and Resistance Factor Design (LRFD) Bridge Design Specifications, WSDOT Bridge Design Manual, and in accordance with the most current requirements of WSDOT/APWA Standard Specifications. Bridge traffic barrier and approach railings shall be provided in accordance with those references and the WSDOT Bridge Design Manual and WSDOT/APWA Standard Plans. All new bridges, special culverts, and walls shall be designed to carry HL93 and other loads as defined in AASHTO LRFD, unless otherwise approved by the Director or designee. The work shall comply with current City of SeaTac critical area code requirements. Pedestrian bridges shall be designed in accordance with the most current AASHTO Guide Specifications for Design of Pedestrian Bridges.

### 6.2 Bridge Geometrics

- A. In general, the bridge shall comprise the full width and configuration of the road being served, (e.g. traveled way plus curb, sidewalks, walkway, bike lane and/or shoulder on one or both sides). Requirements of utilities shall be considered. Bridge roadway width shall be measured between curbs or between faces of bridge traffic barrier; whichever is less.
- B. On designated bike routes, combination bridge traffic barrier and bicycle railings shall be used. Where typical speed is 35 mph or higher and significant pedestrian and/or bike traffic can be expected, the Director or designee may require that the lanes for these other modes of traffic be separated from motor vehicle traffic by use of a bridge traffic barrier and further protected by a rail at the outer edge.
- C. Approach railings and transitions shall be made structurally continuous with bridge railings and shall meet AASHTO specifications as cited in Section 6.1 and details per WSDOT Standard Plans.
- D. Overhead vertical clearances for motor traffic on the traveled way or under overpasses shall be 16.5 feet minimum. Vertical clearance for bridges over railroad tracks shall comply with the minimum vertical clearance required by the WSDOT Design Manual and also may require negotiations with the railroad company concerning necessary clearances and bridge span. Vertical clearance of structures above a walkway or sidewalk shall be eight feet minimum and shall be 10 feet minimum on designated equestrian routes unless otherwise specified.

- E. Best available flood data, as defined in the Department of Development and Environmental Services Public Rule, Sensitive Areas: Flood Hazard Areas, shall be used to establish the 100-year water surface elevation in consultation with the Department of Natural Resources and Parks, Flood Hazard Reduction Services Section
- F. For stream crossing locations where the 100-year peak flow exceeds 100 cubic feet per second (cfs), the height of bridge clearance above rivers and streams shall be a minimum three feet above the 100-year water surface elevation unless otherwise required by the Director or designee based on an evaluation of conveyance factors as specified in subsection G of this section. For stream crossing locations where the 100-year peak flow is 100 cfs or less, there is no specific clearance requirement, but bridges must meet the standards in the King County Surface Water Design Manual.
- G. Evaluation of conveyance factors shall consider hydraulic capacity, bed aggradations, debris passage, safety margins, and bridges and levees, as specified in Section 4.3.3.1 of the Surface Water Design Manual.
- H. For bridge stream crossings, the most current FHWA HEC-18 shall be used for scour analysis.
- I. A minimum three feet of clearance between the low chord of the bridge and ground line shall be maintained along the entire bridge to facilitate future bridge inspection and maintenance access.

### **6.3 Bridge Design Criteria**

- A. Unless otherwise approved by the Director or designee, concrete approach slabs will be required for all new bridges and shall be constructed in accordance with WSDOT/APWA Standard Plans.
- B. Criteria under other recognized road and bridge project classifications, such as those of 3-R projects, set forth in WSDOT Local Agency Guidelines, may be applied under conditions deemed appropriate by the Director or designee.
- C. The construction, reconstruction or rehabilitation of bridges will necessitate submittal of the following items to the Director or designee:
  - 1. Design calculations
  - 2. Load rating analysis and report per WSDOT Bridge Design Manual requirements
  - 3. Hydraulic report
  - 4. Scour analysis
  - 5. Material certification of the major load bearing members
  - 6. Pile driving and drilled shaft construction records
  - 7. Plans of Record (As-built plans)

- D. The construction or reconstruction of bridges will necessitate the Director's or designee's approval of the following:
1. General bridge type, layout
  2. Foundation type
  3. Size and shape of the hydraulic opening
  4. Vertical clearance between the superstructure and the design water surface, including sensitive areas
  5. Location of piers and abutments
  6. Roadway cross section
  7. Bridge traffic barrier and approach guardrail type
  8. Aesthetic treatments
  9. Expansion joints (the design of bridge expansion joints shall consider the presence of bicycle traffic).

#### **6.4 Special Culverts**

All corrugated metal structures and reinforced concrete 3-sided and 4-sided box culverts shall be designed in accordance with the most current AASHTO LRFD Bridge Design Specifications.

#### **6.5 Structural Walls**

Structural retaining walls shall be designed in accordance with the most current AASHTO "Standard Specifications for Highway Bridges" and the most current WSDOT Bridge Design Manual.

Geosynthetics proposed for design of structural earth walls (SEW), geosynthetic retaining walls (GRW), reinforced slopes, and rock facing fill sections shall be listed in the most recent WSDOT Qualified Product List (QPL). The QPL shall be used for determination of ultimate and long-term geosynthetic strengths. Reinforcement lengths of geosynthetics shall meet the minimum embedment length of  $0.7H$  or 8.0 feet, whichever is greater. Backfill for the reinforced and retained zones of SEW, GRW, and reinforced slopes shall meet the current WSDOT Standard Specification 9-03.14(4) "Gravel Borrow for Structural Earth Wall".