

TO: All Design Section Staff
FROM: Bijan Khaleghi
DATE: March 13, 2020
SUBJECT: BDM Section 15.8.3 - Buried Structures

This design memorandum specifies WSDOT's policy for Buried Structures. This memorandum replaces the Bridge Design Manual Section 15.8.3 in its entirety.

Bridge Design Manual Revisions:

15.8.3 Buried Structures

A. General Policy

Cast-in-place or precast reinforced concrete, and metal structural plate are authorized materials for Buried Structures as defined in [Section 8.3](#). If a Design-Builder intends to use alternate materials, other than reinforced concrete or metal structural plate, they shall submit an Alternative Technical Concept.

All Buried Structures shall be designed for a minimum service life of 75 years.

Span length for Buried Structures shall be as defined in [Section 8.3.1](#).

Buried Structures conveying vehicles, or pedestrians shall consider the applicability of safety systems such as, but not limited to, fire life-safety elements, ventilation, lighting, emergency egress, traffic control, and communications in accordance with [Section 8.3.8](#).

The Engineer of Record (EOR) for all structural engineering Design Documents for buried structures shall have a minimum 10 years of experience in the design of bridges and buried structures. The EOR shall be licensed in the State of Washington as a Professional Engineer with an endorsement in Civil Engineering.

B. General Design Requirements

The design of Buried Structures shall be in accordance with the requirements and guidance cited herein and in the current *AASHTO LRFD*, *AASHTO SEISMIC*, and the WSDOT [Geotechnical Design Manual M 46-03](#), and [Standard Specifications M 41-10](#), unless otherwise required in the project-specific criteria.

All Buried Structures with span lengths equal to or greater than 20 feet shall be

designed for seismic effects in accordance with [Section 8.3.3.E](#), and load rated in accordance with [Section 13](#). Seismic loading shall not apply for Buried Structures with spans less than 20.0 feet.

C. Application of Loads

Buried Structures shall be designed for force effects in accordance with *AASHTO LRFD*, Section 12.6.1.

The requirement of [Section 3.5](#) for inclusion of live load in the Extreme Event I Load Combination is applicable. The load factor γ_{EQ} as specified in *AASHTO LRFD*, Table 3.4.1-1 shall be taken equal to 0.50, regardless of location or congestion.

The effects of Live Load may be neglected for;

- [Single-Span Concrete Structures](#), when the depth of fill is greater than 8.0 feet and exceeds the span length.
- [Multiple-Span Concrete Structures](#), when the depth of fill exceeds the distance between inside faces of end walls.

Headwalls, wingwalls, and railings shall be designed for vehicular collision and pedestrian or worker fall protection forces where applicable in accordance with [Section 10.2](#) and [Section 10.5](#).

D. Scour

Buried Structures, Wingwalls, Headwalls, and Cutoff Walls and respective foundations shall be designed for the effects of scour as described in [Section 8.1.9](#).

E. Corrosion

Consideration shall be given to the degradation of Buried Structure materials resulting from corrosive conditions. For metal structural plate structures minimum corrosion rates and design service life analysis shall be in accordance with [Section 6.7.2](#).

F. Fall Protection

Fall protection shall be provided on headwalls and wingwalls in accordance with [Section 8.1.10.B](#) for exposed wall heights equal to or greater than 4.0 feet.

G. Deflection

Concrete structures with less than 2.0 feet of fill shall mitigate differential deflection between adjacent units in accordance with [Section 8.3.5.A.2](#). Structural connections involving welded ties are only permissible when the roadway above the structure has an annual daily traffic (ADT) less than 30,000.

H. Control of Cracking

Reinforcement provided in accordance with *AASHTO LRFD*, Section 5.6.7 shall

be based upon a Class 2 exposure condition.

I. Joints

Joints shall be designed to carry the applied horizontal and vertical forces resulting from, but not limited to, differential settlement between segments, live load deflection, and shear transfer. Joints shall be so formed that they can be assembled to transmit those forces, and provide joint tightness consistent with tolerances outlined in the Contract Documents. Each joint shall be sealed to prevent exfiltration or infiltration of soil fines and/or water.

J. Soil Cover

If soil cover is not provided, Buried Structures shall be designed for the direct application of vehicular loads, and an Approach Slab is required in accordance with [Section 10.6](#).

If you have any questions regarding this policy memorandum, please contact William Miller MilleWi@wsdot.wa.gov at (360) 705-7206, or Bijan Khaleghi Bijan.Khaleghi@wsdot.wa.gov at (360) 705-7181.

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