

TO: All Design Section Staff
FROM: Bijan Khaleghi
DATE: October 11, 2021
SUBJECT: New BDM Sections 3.16.8 and 15.3.6: Bridges Subjected to Tsunami Effects

This design memorandum introduces new sections for Bridge Design Manual (BDM) 3.16.8 and 15.3.6 for design of bridges subjected to tsunami inundation effects. The AASHTO LRFD Guide Specifications for Bridges Subject to Tsunami Effects (Tsunami Guide Specifications) is now available and shall be used for WSDOT new bridges within the coastal and Puget Sound region subject to tsunami inundation effects. The Tsunami Guide Specifications provide methods to evaluate the hazard posed by tsunami to a particular bridge, and to identify methodologies and details to mitigate that hazard in design.

Bridge tsunami design in accordance with the requirements of the Tsunami Guide Specifications shall be considered for all WSDOT bridges if the inundation at Mean High Water (MHW) is high enough to contact the bridge superstructure soffit based on the modeled inundation depth. Substructure design should consider loading applied through the superstructure and loads applied directly to the substructure. Both Scour and Geotechnical hazards due to tsunami inundation shall be investigated during final design.

The critical tsunami parameters including wave direction, velocity and depth, can be obtained from the Washington State Department of Natural Resources (DNR), at: [Tsunami Hazard Maps - WA](#) or Tsunami Inundation Database Interactive Web Portal at: [Tsunami Inundation Database Portal — The B. John Garrick Institute for the Risk Sciences \(ucla.edu\)](#).

The performance requirement for bridges subjected to tsunami effects is life safety no-collapse as defined in in BDM Chapter 4 for seismic performance requirement. Higher performance for post-tsunami serviceability may be considered on a case-by-case basis for recovery bridges as defined in BDM Chapter 4.

Simultaneous Consideration of Tsunami and Seismic, or Tsunami and Scour are not recommended tsunami design of conventional bridges.

Determination of whether the tsunami hazard applies shall be made at the bridge preliminary plan or conceptual plan stage using the above-mentioned tools and shall be noted in the Job File. Bridge preliminary plan or conceptual plan shall specify as possible the bridge soffit elevation and superstructure depth, and substructure/foundation type for tsunami hazard determination.

Where possible, all new bridges shall be designed so that the tsunami wave does not contact the superstructure. If this is not possible the bridge shall be designed to ensure that the bridge can resist the tsunami hazard loading as specified in the Tsunami Guide Specifications.

The provisions outlined in Section 7 of the Tsunami Guide Specifications for: reduction of tsunami loading, accommodation of forces, geometric proportioning, venting, and sacrificial elements could be with the approval of the Bridge Design Engineer regardless of the contracting method.

Background

The Tsunami Guide Specifications are intended for the design and construction of conventional bridges to resist the effects of tsunami waves. The conventional bridges are taken as those that:

- Have slab, beam, or box girder superstructures
- Are supported by pier and abutment substructures
- Are founded on shallow or deep foundations
- Have minimal changes in elevation along the bridge length
- Are straight in plan view (including skewed but not curved)

The tsunami design requirements for non-conventional bridges shall be considered on a case-by-case basis and consultation with the Bridge and Structures Office.

If you have any questions regarding this policy memorandum, please contact Nick Rodda at Nick.Rodda@wsdot.wa.gov (360) 705-7192 or Bijan Khaleghi Bijan.Khaleghi@wsdot.wa.gov at (360) 705-7181.

cc: TBD, Construction Office – 47354

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BDM Section 3.16.8: Bridges Subjected to Tsunami Effects

The Tsunami Guide Specifications are intended for the design and construction of conventional bridges to resist the effects of tsunami waves. The conventional bridges are taken as those that:

- Have slab, beam, or box girder superstructures
- Are supported by pier and abutment substructures
- Are founded on shallow or deep foundations
- Have minimal changes in elevation along the bridge length
- Are straight in plan view (including skewed but not curved)

The tsunami design requirements for non-conventional bridges shall be considered on a case-by-case basis and consultation with the Bridge and Structures Office.

Determination of whether the tsunami hazard applies shall be made at the bridge preliminary plan or conceptual plan stage using the above-mentioned tools and shall be noted in the Job File. Bridge preliminary plan or conceptual plan shall specify as possible the bridge soffit elevation and superstructure depth, and substructure/foundation type for tsunami hazard determination.

Where possible, all new bridges shall be designed so that the tsunami wave does not contact the superstructure. If this is not possible the bridge shall be designed to ensure that the bridge can resist the tsunami hazard loading as specified in the Tsunami Guide Specifications.

A bridge superstructure shall be considered for the tsunami hazard if the inundation at Mean High Water (MHW) is high enough to contact the bridge superstructure soffit based on the modeled inundation depth. Substructure design should consider loading applied through the superstructure and loads applied directly to the substructure. Both Scour and Geotechnical hazards due to tsunami inundation shall be investigated during final design.

The critical tsunami parameters including wave direction, velocity and depth, can be obtained from the Washington State Department of Natural Resources (DNR), at: [Tsunami Hazard Maps - WA](#) or Tsunami Inundation Database Interactive Web Portal at: [Tsunami Inundation Database Portal — The B. John Garrick Institute for the Risk Sciences \(ucla.edu\)](#).

The performance requirement for bridges subjected to tsunami effects is life safety no-collapse as defined in in BDM Chapter 4 for seismic performance requirement. Higher performance for post-tsunami serviceability may be considered on a case-by-case basis for recovery bridges as defined in BDM Chapter 4.

Simultaneous Consideration of Tsunami and Seismic, or Tsunami and Scour are not recommended tsunami design of conventional bridges.

The provisions outlined in Section 7 of the Tsunami Guide Specifications for: reduction of tsunami loading, accommodation of forces, geometric proportioning, venting, and sacrificial elements could be with the approval of the Bridge Design Engineer regardless of the contracting method.

BDM Section 15.3.6: Bridges Subjected to Tsunami Effects

Bridge tsunami design in accordance with the requirements of the Tsunami Guide Specifications and BDM Section 3.16.8 shall be required for all WSDOT bridges if the inundation at Mean High Water (MHW) is high enough to contact the bridge superstructure soffit based on the modeled inundation depth. Substructure design shall consider loading applied through the superstructure and loads applied directly to the substructure. Both Scour and Geotechnical hazards due to tsunami inundation shall be investigated during final design.

Simultaneous Consideration of Tsunami and Seismic, or Tsunami and Scour are not recommended tsunami design of conventional bridges.

The provisions outlined in Section 7 of the Tsunami Guide Specifications for: reduction of tsunami loading, accommodation of forces, geometric proportioning, venting, and sacrificial elements could be with the approval of the Bridge Design Engineer regardless of the contracting method.