

SECTION 1615 TSUNAMI LOADS

[W] 1615.1 General. The design and construction of Risk Category III and IV buildings and structures located in the Tsunami Design Zones (~~(defined in the Tsunami Design Geodatabase)~~) shall be in accordance with Chapter 6 of ASCE 7, except as modified by this code.

[W] 1615.2 Modifications to ASCE 7. The text of Chapter 6 of ASCE 7 shall be modified as indicated in this section.

[W] 1615.2.1 ASCE 7 Section 6.1.1. Modify the third paragraph ~~and its exception~~ in ASCE 7 Section 6.1.1 to read as follows:

The Tsunami Design Zone shall be determined using the ~~Washington State Department of Natural Resources pdfs~~ maps (abbreviation). The ~~(abbreviation) maps are available at [webpage]~~. For areas not covered by the extent of the ~~(abbreviation) maps~~, the Tsunami Design Zone shall be determined using the ASCE Tsunami Design Geodatabase of geocoded reference points shown in Fig. 6.1-1. The ASCE Tsunami Design Geodatabase of geocoded reference points of Runup and associated Inundation Limits of the Tsunami Design Zone is available at [\[http://asce7tsunami.online\]](http://asce7tsunami.online).

EXCEPTION: For coastal regions subject to tsunami inundation and not covered by ~~(abbreviation) maps~~ or Fig. 6.1-1, Tsunami Design Zone, inundation limits, and runup elevations shall be determined using the site-specific procedures of Section 6.7, or for Tsunami Risk Category II or III structures, determined in accordance with the procedures of Section 6.5.1.1 using Fig. 6.7-1.

[W] 1615.2.2 ASCE 7 Section 6.1.1. Add fifth paragraph and user note to ASCE 7 Section 6.1.1 to read as follows:

Whenever a Tsunami Design Zone or Fig. 6.1-1 is referenced in ASCE 7 Chapter 6, it shall include the ~~(abbreviation) maps~~, within the extent of those maps.

User Note: *Tsunami runup and inundation limit parameters can be obtained by contacting Washington State Department of Natural Resources.*

[W] 1615.2.3 ASCE 7 Section 6.2. Modify ASCE 7 Section 6.2 definitions as follows:

[option 1a] MAXIMUM CONSIDERED TSUNAMI: *A tsunami generated by a magnitude 9.0 Cascadia subduction zone earthquake along a splay fault (L1 scenario) or where the L1 scenario is not applicable, a probabilistic tsunami having a 2% probability of being exceeded in a 50-year period or a 2,475-year mean recurrence interval.*

Commented [jcs1]: Deleted reference to the geodatabase for consistency with revisions below.

Commented [jcs2]: Replace yellow-highlighted areas with the official name and abbreviation and delete square brackets except at "webpage." Text to be in italics, not bold.

Blue highlights in this section indicate text changes made after the 12/3 TAG meeting.

Commented [jcs3]: Added change to this exception after 12/3 TAG meeting. Do we need this exception? Is everything covered between the DNR and ASCE 7 maps? Should we delete the exception?

Commented [jcs4]: Sections 1615.2.2 through 1615.2.7 were added after the 12/3 TAG meeting.

Commented [jcs5]: Per Tim W. comment. Given other changes below, this may not be necessary, but can be kept as a catch-all in case a reference got missed by the search mechanism in Adobe Acrobat.

Commented [jcs6]: This is a method in ASCE 7 to provide commentary to point users in the right direction. See User Note in ASCE 7-16 Section 6.1.1 for an example.

Will there any other information they can get from the DNR geodatabase? (Potential subject of a future code change, but see also comments on Section 1615.2.5 and 1615.2.6 below.)

Commented [jcs7]: Option 1a says use the L1 scenario, or where L1 does not apply, go back to ASCE determination (2% in 50). Reference to M9 CSZ L1 scenario is lifted from Corina's presentation. (Note: should that be "moment magnitude?")

Option 1b says you can use either L1 or 2% in 50. This may be OK if 2% in 50 is more conservative than L1.

Option 2 uses FEMA P646 language, from Tim W.

Note that ASCE 7-16 Section 6.7.2 has a lower limit of moment magnitude 7 for non-subduction zone sources. That is, those that aren't capable of producing anything larger aren't counted as tsunamigenic sources.

[option 1b] MAXIMUM CONSIDERED TSUNAMI: *A tsunami generated by a magnitude 9.0 Cascadia subduction zone earthquake along a splay fault (L1 scenario) or where the L1 scenario is not applicable, a probabilistic tsunami having a 2% probability of being exceeded in a 50-year period or a 2,475-year mean recurrence interval.*

[option 2] MAXIMUM CONSIDERED TSUNAMI: *A design tsunami event based on a probabilistic assessment considering all possible tsunami sources, or a deterministic assessment considering the maximum tsunami that can reasonably be expected to affect a site.*

TSUNAMI DESIGN ZONE MAP: The *Washington State Department of Natural Resources pdfs maps (abbreviation)* designating the potential horizontal inundation limit of the Maximum Considered Tsunami, or outside of the extent of *(abbreviation) maps, the map given in Fig. 6.1-1.*

[W] 1615.2.4 ASCE 7 Section 6.5.1.1. Modify the first paragraph of ASCE 7 Section 6.5.1.1 to read as follows:

6.5.1.1. Runup Evaluation for Areas Where No Map Values Are Given. For Tsunami Risk Category II and III buildings and other structures where no mapped inundation limit is shown in *the Tsunami Design Zone Map*, the ratio of tsunami runup elevation above Mean High Water Level to Offshore Tsunami Amplitude, $R_{\overline{M}}$, shall be permitted to be determined using the surf similarity parameter ξ_{100} , according to Eqs. (6.5-2a, b, c, d, or e) and Fig. 6.5-1.

[W] 1615.2.5 ASCE 7 Section 6.7. Modify ASCE 7 Section 6.7 to read as follows:

When required by Section 6.5, the inundation depths and flow velocities shall be determined by site-specific inundation studies complying with the requirements of this section. Site-specific analyses shall use the ASCE Tsunami Design Geodatabase of geocoded reference points of Offshore Tsunami Amplitude and dominant waveform period shown in Fig. 6.7-1 as input to an inundation numerical model or shall use an integrated generation, propagation, and inundation model that replicates the given offshore tsunami waveform amplitude and period from the seismic sources given in Section 6.7.1. The ASCE Tsunami Design Geodatabase of geocoded reference points of Offshore 328-ft (100-m) depth, Tsunami Amplitude, H_T , and Predominant Period, T_{TSU} , of the Maximum Considered Tsunami is available at <http://asce7tsunami.online>.

[W] 1615.2.6 ASCE 7 Section 6.7.1. Modify the second paragraph of ASCE 7 Section 6.7.1 to read as follows:

The possibility of negative and positive leading amplitudes of the tsunami shall be considered, with the waveform given by Eq. (6.7-1) using the values of parameters given by the ASCE Tsunami Design Geodatabase of geocoded reference points shown in Fig. 6.7-1. For an inundation numerical model, the values given in Table 6.7-1 shall also be used to define at least two possible waveforms using the minimum and maximum prescribed values of a_2 . An integrated generation, propagation, and inundation model

Commented [jcs8]: Replace highlighted areas with the official name and abbreviation and delete square brackets except at "webpage." Text to be in italics, not bold.

Commented [jcs9]: ASCE 7 refers to their map here (Fig 6.1-1).

Commented [jcs10]: Cale A. raise this section as an issue, but I don't know if we need to fix it—or how, if we do. This says use the ASCE geodatabase or something that replicates the waveform amplitude and period from the source(s). Does the 2nd option cover use of the DNR information without making changes to the text?

If we need to fix it, does the DNR model have this information (amplitude & predominant waveform period)?

- If so, we can do the same as before and say use the DNR information, or the ASCE info if DNR doesn't cover it.
- If not, then ASCE is the only place for this information.

Maybe this is an issue that can wait until the DNR geodatabase is available?

Commented [jcs11]: Similar to 1615.2.5. Does DNR have this information? Should a User Note be added to tell users to get the information from DNR?

Commented [jcs12]: Does the DNR model qualify for this? If so, do we still need a specific reference to it?

that replicates the given offshore tsunami waveform amplitude and period from the seismic sources need not use the values given in Table 6.7-1.

[W] 1615.2.6 ASCE 7 Section 6.7.6.2. Modify ASCE 7 Section 6.7.6.2 to read as follows:

6.7.6.2 Seismic Subsidence before Tsunami Arrival. Where the seismic source is a local subduction event, the Maximum Considered Tsunami inundation shall be determined for an overall elevation subsidence value shown in Fig. 6.7-3(a) and 6.7-3(b) or shall be directly computed for the seismic source mechanism. The GIS digital map layers of subsidence are available in the ASCE Tsunami Design Geodatabase at <http://asce7tsunami.online>. The (abbreviation) maps include subsidence in the inundation.

Commented [jcs13]: Did I hear this correctly in the 12/3 TAG meeting?

If not, do we agree with the ASCE subsidence values? Or are there other subsidence maps available?