

TO: All Design Section Staff
 FROM: Bijan Khaleghi
 DATE: January 8, 2017
 SUBJECT: AASHTO Guide Specifications for LRFD Seismic Bridge Design Amendments

This design memorandum requires all new bridges, bridge widenings, and retaining walls to be designed using USGS 2014 Seismic Hazard Maps with Seven Percent Probability of Exceedance in 75 yr (1000-yr Return Period) and the site coefficient listed below or site-specific procedure regardless of the delivery contracting methods.

This design memorandum applies to all projects with bridges, buried structures, and retaining walls that have not completed the preliminary plan process. This design memorandum applies to all Design-Build projects that have not issued an RFQ or for RFPs that are at 90% or less of completion stage.

The site coefficients for peak ground acceleration, F_{pga} , short-period range F_a , and for long-period range F_v , shall be taken as specified in the following Tables:

Table 1 Values of Site Coefficient, F_{pga} , for Peak Ground Acceleration

Site Class	Mapped Peak Ground Acceleration Coefficient (PGA)					
	PGA ≤ 0.10	PGA = 0.2	PGA = 0.3	PGA = 0.4	PGA = 0.5	PGA ≥ 0.6
A	0.8	0.8	0.8	0.8	0.8	0.8
B	0.9	0.9	0.9	0.9	0.9	0.9
C	1.3	1.2	1.2	1.2	1.2	1.2
D	1.6	1.4	1.3	1.2	1.1	1.1
E	2.4	1.9	1.6	1.4	1.2	1.1
F	*	*	*	*	*	*

Table 2 Values of Site Coefficient, F_a , for 0.2-sec Period Spectral Acceleration

Site Class	Mapped Spectral Acceleration Coefficient at Period 0.2 sec (S_s)					
	$S_s \leq 0.25$	$S_s = 0.50$	$S_s = 0.75$	$S_s = 1.00$	$S_s = 1.25$	$S_s \geq 1.50$
A	0.8	0.8	0.8	0.8	0.8	0.8
B	0.9	0.9	0.9	0.9	0.9	0.9
C	1.3	1.3	1.2	1.2	1.2	1.2

D	1.6	1.4	1.2	1.1	1.0	1.0
E	2.4	1.7	1.3	*	*	*
F	*	*	*	*	*	*

Table 3 Values of Site Coefficient, F_v , for 1.0-sec Period Spectral Acceleration

Site Class	Mapped Spectral Acceleration Coefficient at Period 1.0 sec (S_1)					
	$S_1 \leq 0.1$	$S_1 = 0.2$	$S_1 = 0.3$	$S_1 = 0.4$	$S_1 = 0.5$	$S_1 \geq 0.6$
A	0.8	0.8	0.8	0.8	0.8	0.8
B	0.8	0.8	0.8	0.8	0.8	0.8
C	1.5	1.5	1.5	1.5	1.5	1.4
D	2.4	2.2	2.0	1.9	1.8	1.7
E	4.2	3.3	2.8	2.4	2.2	2.0
F	*	*	*	*	*	*

* Site-specific response geotechnical investigation and dynamic site response analysis should be considered,

Note: Use straight line interpolation for intermediate values of PGA , S_s , and S_l .

To implement this design memo, the Bridge and Structures Office has developed ground motion software called *Spectra* to generate the design response spectrum using the general procedure described in the AASHTO Guide Specifications for LRFD Seismic Bridge Design. *Spectra* incorporate the USGS 2014 seismic hazard maps and the updated Site Coefficients. *Spectra* is a tool in the BridgeLink BEToolbox application. Download BridgeLink from the WSDOT web site at <http://www.wsdot.wa.gov/eesc/bridge/software> .

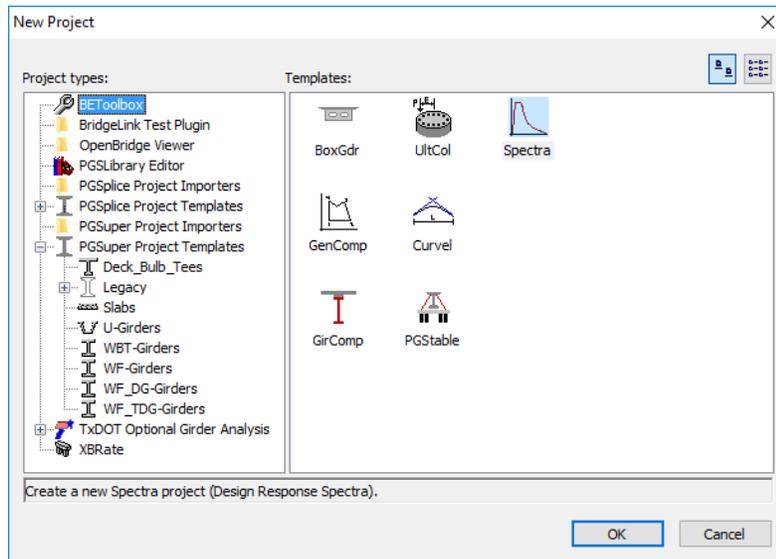
Background:

The current AASHTO seismic hazard maps are based on the 2002 U.S. Geological Survey (USGS) National Seismic Hazard Model (NSHM). In 2008 and 2014, the USGS updated its NSHM. Significant improvements include: (i) ground motion characterization from the Next Generation Attenuation (NGA) projects of the Pacific Earthquake Engineering Research Center (PEER; e.g., <http://peer.berkeley.edu/ngawest2/final-products/>); (ii) earthquake source characterizations from Version 3 of the Uniform California Earthquake Ruptures Forecast (UCERF3; <http://pubs.usgs.gov/of/2013/1165/>); and (iii) the Central and Eastern U.S. Seismic Source Characterization (CEUS-SSC; <http://www.ceus-ssc.com/>).

The current AASHTO site coefficients are based on the 2003 (and 2009) NEHRP Recommended Seismic Provisions for Building and Other Structures. In 2015, the Building Seismic Safety Council (BSSC) Provisions Update Committee (PUC) updated those site coefficients, based on research from the PEER NGA-West2 Project. The updated site coefficients have also been adopted for the 2016 edition American

Society of Civil Engineers (ASCE) 7 Standard. For the next edition of the NEHRP Recommended Seismic Provisions, the BSSC PUC is considering site coefficients that are directly based on hazard maps for different site classes.

The Spectra tool can be used to create design response spectrum. After downloading and installing, start BridgeLink, select File > New and select the Spectra tool to begin a new response spectrum project.



If you have any questions regarding this policy memorandum, please contact Chyuan-Shen Lee LeeCh@wsdot.wa.gov at 360-705-7441, Richard Brice BriceR@wsdot.wa.gov at 360-705-7174 or Bijan.Khaleghi@wsdot.wa.gov at 360-705-7181.

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