



# INTERPRETATIONS & PROCEDURES

## DEVELOPMENT SERVICES DEPARTMENT

### BUILDING DIVISION

|                 |                                    |                      |              |
|-----------------|------------------------------------|----------------------|--------------|
| <b>CODE:</b>    | 2015 IBC & ASCE 7-10               | <b>INDEX NUMBER:</b> | IBC-2018-002 |
| <b>SECTION:</b> | ASCE 7-10 Section 21.2             | <b>ISSUE DATE:</b>   | 10/04/2018   |
| <b>SUBJECT:</b> | Seismic Basin Amplification Factor |                      |              |

#### BACKGROUND

The IBC adopts the 2010 edition of the American Society of Civil Engineers Standard 7, Minimum Design Loads for Buildings and Other Structures (ASCE 7-10) and its requirements for site-specific ground motion procedures. Per ASCE 7-10 Section 21.2, the site-specific "analysis shall incorporate current seismic interpretations, including uncertainties for models and parameter values for seismic sources and ground motions." Basin amplification factors due to the Seattle Basin are an important consideration in such analyses and are thus required by this policy. On March 22, 2018, the Seattle Department of Construction & Inspections (SDCI) held a joint workshop with the United States Geological Survey (USGS), "Incorporating results of the M9 project and other recent research to estimate Basin Effects in the design of Tall Buildings," to discuss current basin amplification research. The goal of the workshop was to obtain consensus within the design and geotechnical peer review community as to how the results of current research would be applied to Seattle area performance-based design projects. The participants at the workshop agreed that basin amplification factors for subduction sources are different than crustal sources. Workshop participants agreed on several recommendations, which the City of Bellevue is adopting by this policy. A detailed report of the workshop has been published by USGS: ([USGS Open-File Report 2018-1149](#))

#### POLICY

All building designs utilizing site-specific ground motion procedures shall incorporate basin effects in accordance with this policy. Basin amplification factors for site-specific procedures shall be in accordance with the following:

- The basin response shall be captured by multiplying the  $MCE_R$  spectrum from a site-specific PSHA by basin amplification factors in accordance with the USGS/SDCI 2013 workshop (USGS Open-File Report 2014-1 I-96). The basin amplification factors shall be calculated for each type of earthquake source and weighted by percent contribution of the source for each period. Basin amplification factors shall be applied to sites within the Seattle basin as defined by geology, gravity, and aeromagnetic data.
- Crustal sources - Use basin amplification factors from Campbell and Bozorgnia (2014), based on the  $Z_{2.5}$  from the Stephenson et al. (2017) velocity model.
- Intralab sources - Use observed Seattle basin amplification factors from local and regional earthquakes such as M6.8 2001 Nisqually and the M6.4 2004 Vancouver Island earthquakes ([USGS Open-File Report 2014-1196](#)).
- Subduction interface sources- Use the results of M9 Project basin amplification factors with a reference site of  $Z_{2.5} \approx 3$ km. This results in basin amplification factors that increase from 1.0 to 2.0 between periods of 0 to 2 seconds, and then remains constant at 2.0 at periods greater than 2 seconds.

These site-specific basin amplification ground motion procedures will be implemented starting December 1, 2018. The following projects are not required to implement the 2018 workshop results.

- Code-prescriptive projects with a complete building permit application in accordance with BCC Section 23.05.090.F prior to December 1, 2018 and projects utilizing a performance-based seismic design methodology with a peer review kick-off meeting prior to December 1, 2018. Previously approved analysis methods agreed to by the geotechnical peer reviewer may be used.

**Note: For questions concerning required permits, please visit or call Development Services (425-452-6800) between 8 a.m. and 4 p.m., Monday through Friday (Wednesday, 10 to 4).**

**SIGNATURE:**   
 Gregory H. Schrader, PE, SE, Building Official

**DATE:** 10/4/18