Procedures for Developing Multi-Period Response Spectra at Non-Conterminous United States Sites

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Procedures for Developing Multi-Period Response Spectra at Non-Conterminous United States Sites

Prepared by

APPLIED TECHNOLOGY COUNCIL
201 Redwood Shores Parkway, Suite 240
Redwood City, California 94065
www.ATCouncil.org

Prepared for

FEDERAL EMERGENCY MANAGEMENT AGENCY
Mai (Mike) Tong, Task Monitor
Robert D. Hanson, Technical Monitor
Washington, D.C.

CONSULTANTS

Charles A. Kircher
Kircher & Associates
Palo Alto, California

Sanaz Rezaeian
U.S. Geological Survey
Golden, Colorado

Nicolas Luco
U.S. Geological Survey
Golden, Colorado

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Notice

Cover photograph – High-rise steel frame building in Honolulu, Hawaii (photo courtesy of Martin & Chock, Inc.)

Preface

In 2017, under Federal Emergency Management Agency (FEMA) "Seismic Technical Guidance Development and Support" contract (HSFE60-17-D-0002), the Applied Technology Council (ATC) was awarded Task Order HSFE60-17-J-0034 entitled "Technical Monitoring of New and Existing Seismic Building Codes and Related Training Support" (ATC-136-1 Project). The purpose of this contract was to continue FEMA's support of the model codes and consensus standards development processes, and to support other code-related activities to ensure that seismic risk is adequately addressed at the state and local levels.

Under this contract, FEMA commissioned a study in support of proposals to incorporate multi-period response spectra (MPRS) in the 2020 edition of the *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures* (2020 *NEHRP Provisions*) and the American Society of Civil Engineers (ASCE) Standard, ASCE/SEI 7-22, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-22). Multi-period response spectra were being proposed in this cycle because late in the 2015 *NEHRP Provisions* cycle, it was discovered that the standard spectral shape was substantially understating spectral response in moderately long period structures located on soft soil sites (Site Class D or softer) where ground motion hazard is dominated by large magnitude events.

The primary objective of this study was to provide the technical basis and associated methods for the U.S. Geological Survey (USGS) to approximate multi-period response spectra using available short- and long-period ground motion parameters and the long-period transition period in regions for which seismic hazard analyses have not yet been updated to fully define parameters at all periods and site classes of interest. These include states and U.S. territories located outside of the conterminous United States (i.e., Alaska, Hawaii, Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa). A uniform definition of ground motion parameters across all U.S. regions was considered important for avoiding a situation in which different design methods would be required in regions with different definitions of ground motion parameters (i.e., MPRS ground motion parameters in the conterminous United States versus short- and long-period ground motion parameters in other U.S. regions).

This study develops methods for constructing MPRS at all periods and site classes of interest, assuming that only deterministic and probabilistic values of S_S and S_1, and approximated values of T_L from ASCE 7-16, are available for the site of interest. A comparison between derived MPRS and calculated MPRS at sites in the conterminous United States was used to validate the proposed methods and models. With this validation, these method and models can be used to derive multi-period response spectra using only the three currently available ground motion parameters S_S, S_1, and T_L for all non-conterminous United States regions of interest.

ATC is indebted to the author team of Charlie Kircher, Sanaz Rezaeian, and Nico Luco, who were responsible for the development of the methods, validation of results, and preparation of this report. A key aspect of the developmental process included vetting of methods and results by the Building Seismic Safety Council (BSSC) Provisions Update Committee (PUC), and members of the PUC are recognized for their contributions in the development of this report.

ATC also gratefully acknowledges Mike Tong (FEMA Task Monitor) and Robert Hanson (FEMA Technical Monitor) for their input and guidance in the preparation of this report, and Carrie J. Perna for ATC report production services.

Jon A. Heintz
ATC Executive Director

Executive Summary

This study complements proposals to the Provisions Update Committee of the Building Seismic Safety Council that would incorporate multi-period response spectra (MPRS) in the 2020 edition of the *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures* (2020 *NEHRP Provisions*) and related proposals to the ASCE 7-22 Seismic Subcommittee of the American Society of Civil Engineers for incorporation of MPRS in ASCE Standard, ASCE/SEI 7-22, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-22). Ultimately, the intent is that the proposed MPRS and related design requirements of ASCE 7-22 would be adopted, by reference, as part of the 2024 *International Building Code*.

The technical basis and associated methods herein enable the U.S. Geological Survey (USGS) to develop MPRS for sites in non-conterminous U.S. regions for which seismic hazard analyses have not yet been updated by the USGS to fully define all 22 periods and eight site classes of interest in the MPRS related proposals for the 2020 *NEHRP Provisions* and ASCE 7-22. These regions include Alaska, Hawaii, Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa.

The methods developed can be used to derive MPRS using only the three currently available ground motion parameters S_S, S_1, and T_L for all non-conterminous United States regions of interest. The methods include models that characterize generic shapes of Risk-Targeted Maximum Considered Earthquake (MCE_R) ground motions as a function of these three parameters. For deriving MPRS that represent probabilistic MCE_R ground motions, models are based on statistical analyses of large sample sets of probabilistic MCE_R response spectra for Western United States (WUS) and Cascadia sites in California, Oregon, Washington (including Puget Sound), Idaho, and Nevada. For deriving MPRS that represent deterministic MCE_R ground motions, models are based on sets of deterministic MCE_R response spectra calculated using WUS shallow crustal ground motion models for earthquake magnitudes and shaking levels typical of sites governed by deterministic MCE_R ground motions.

A comparison of derived MPRS with calculated MPRS (i.e., multi-period response spectra proposed for inclusion in the 2020 *NEHRP Provisions* and ASCE 7-22) for 34 example sites in the conterminous United States validates the proposed methods and models. These comparisons show that the methods and models are valid for deriving MPRS in tectonic regions that are similar to the WUS and Cascadia, including the regions of interest (Alaska, Hawaii, Guam and the Northern Mariana Islands, Puerto Rico and the United States Virgin Islands, and American Samoa), but would not be appropriate for deriving MPRS in regions that are tectonically similar to the conterminous Central and Eastern United States (CEUS).

Table of Contents

List of Figures

List of Tables

Chapter 1

Introduction

1.1 Purpose

The purpose of this study is to complement proposals to the Provisions Update Committee of the Building Seismic Safety Council that would incorporate multi-period response spectra (MPRS) in the 2020 edition of the *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures* (2020 NEHRP *Provisions*) and related proposals to the ASCE 7-22 Seismic Subcommittee of the American Society of Civil Engineers for incorporation of MPRS in the ASCE Standard, ASCE/SEI 7-22, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-22). Ultimately, the intent is that the proposed MPRS and related design requirements of ASCE 7-22 would be adopted, by reference, as part of the *2024 International Building Code* (2024 IBC).

The proposed changes to the 2020 *NEHRP Provisions* and ASCE 7-22 would collectively improve the accuracy of the frequency content of earthquake design ground motions and enhance the reliability of the seismic design parameters derived from these ground motions by defining earthquake design ground motions in terms of MPRS. Such changes would better use the available engineering seismological models that have, in general, advanced sufficiently to accurately define spectral response for different site conditions over a broad range of periods. The proposed changes would also eliminate the need for site-specific hazard analysis required in ASCE 7-16 (ASCE, 2016) for certain (soft soil) sites, requirements that were added to the 2015 *NEHRP Provisions* (FEMA, 2015), as an interim solution to deficiencies in the seismic design criteria discovered during the last seismic code development cycle (Kircher & Associates, 2015).

1.2 Objectives

The primary objective of this study is to provide the technical basis and associated methods for the U.S. Geological Survey (USGS) to approximate MPRS for the 2020 *NEHRP Provisions* and ASCE 7-22 from the ground motion parameters available in ASCE 7-16 (i.e., short- and long-period ground motion parameters and long-period transition period) for sites in U.S. regions for which seismic hazard analyses have not yet been updated by the USGS to fully define all periods and site classes of interest (i.e., Alaska,

Hawaii, Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa).

By reference, this report accompanies the subject MPRS proposals and, with proposal adoption, would be used by the USGS to develop MPRS for the aforementioned regions. It is intended that the 2020 *NEHRP Provisions* and ASCE 7-22 define and provide values of MPRS and associated ground motion parameters in a consistent manner for all U.S. regions, including the conterminous United States (i.e., the lower 48 states) and non-conterminous states and U.S. territories. In this sense, the MPRS methods of this study augment the site-specific ground motion procedures of Chapter 21 of the 2020 *NEHRP Provisions* and ASCE 7-22.

A uniform definition of ground motion parameters for all U.S. regions is important to the usability of the 2020 *NEHRP Provisions* and ASCE 7-22, which would otherwise require different design methods for regions with different definitions of ground motion parameters (i.e., MPRS as ground motion parameters for the conterminous United States versus the short- and long-period ground motion parameters for other U.S. regions).

1.3 Scope

Existing ground motion models (GMMs) have been used by the USGS to develop MPRS and related ground motion parameters at all periods and site classes of interest for sites in the conterminous Western United States (WUS), including the Pacific Northwest, and the Central and Eastern United States (CEUS). The scope of this study addresses development of MPRS and related ground motions for non-conterminous states, namely Alaska and Hawaii, and for U.S. territories, namely Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa, for which GMMs have not yet been updated by the USGS to develop MPRS at all periods and site classes of interest.

In general, only values of the short-period (0.2-second) MCE_R ground motion parameter, S_S, the 1-second MCE_R ground motion parameter, S_1, and the long-period transition period, T_L, are currently known at non-conterminous United States sites. Parameters S_S and S_1 characterize MCE_R ground motions for Site Class BC (reference) site conditions. This study develops methods for constructing MPRS at all periods and site classes of interest, assuming that only deterministic and probabilistic values of S_S and S_1, and approximated values of T_L from ASCE 7-16, are available for the site of interest. S_S and S_1 are defined by the deterministic and probabilistic MCE_R ground motions of Section 21.2 of ASCE 7-22. As such, values of S_S and S_1 represent response in the maximum (RotD100) direction; probabilistic values

of S_S and S_1 represent risk-targeted ground motions corresponding to 1 percent in 50-year collapse probability; and deterministic values of S_S and S_1 represent 84th percentile ground motions.

The models developed in this study allow the user to derive MPRS as a function of currently available parameters S_S, S_1 and T_L. They are meant to provide a better approximation of the response spectrum and a more accurate representation of frequency contents compared to the two-period design spectrum of the 2015 *NEHRP Provisions* and ASCE 7-16, and earlier versions of the provisions and standards (the two-period design spectrum is described in Chapter 2). Furthermore, these models are an interim solution for approximating MPRS until USGS updates of hazard models for these regions, using appropriate GMMs for all periods and site classes of interest, become available. Therefore, although various approaches to modeling exist, this study attempts to follow the simplest approach without introducing additional parameters other than the three mentioned above, and without introducing unnecessary model complexities, considering that MPRS will eventually be calculated directly from hazard at each period and site class of interest for all states and U.S. territories. Alternative modeling approaches are, however, discussed in Chapter 8 to improve the accuracy of the model in future studies, which could be useful in region-specific studies or in studies of regions outside of the United States or U.S. territories.

1.4 Report Organization

This report serves as: (1) a reference document in support of MPRS proposals for review by the Provisions Update Committee of the Building Seismic Safety Council and the ASCE 7-22 Seismic Subcommittee; and (2) a resource document for the development of MPRS by the USGS for non-conterminous United States sites. Accordingly, this report is both comprehensive in terms of supporting materials for MPRS proposals and technically rigorous in terms of the specific methods that will be used by the USGS to develop MPRS and related ground motion parameters for sites in Alaska, Hawaii, Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa.

Chapter 2 provides background on recent seismic code development work relevant to this study including recommendations in the Building Seismic Safety Council (BSSC) Project 17 Final Report, *Development of Next Generation of Seismic Design Value Maps for the 2020 NEHRP Provisions* (NIBS, 2019), a summary of the proposals to incorporate MPRS in the 2020 *NEHRP Provisions* and ASCE 7-22, and an overview of the 2018 update of the National Seismic Hazard Model (NSHM) by the USGS (Petersen et al.,

2020), which form the basis of MCE_R ground motions for the conterminous United States.

Collectively, Chapters 3, 4, and 5 provide the basis and methods for developing MPRS at sites of interest. Chapter 3 describes the general approach of the MPRS study and common methods for deriving either site-specific probabilistic or deterministic MPRS from values of parameters S_S, S_1, and T_L. Detailed descriptions of the basis and methods are provided in Chapter 4 for deriving probabilistic MPRS, and Chapter 5 for deriving deterministic MPRS.

Chapter 6 evaluates the reliability of the methods of Chapters 3, 4, and 5 by comparing MPRS derived from values of S_S, S_1, and T_L with those calculated by the USGS for 34 sites in the conterminous United States (i.e., WUS and CEUS sites where the 2018 NSHM fully defines response at all periods and site classes of interest), noting that the derived MPRS should be close to the calculated MPRS for WUS sites, but different for CEUS sites.

Chapter 7 provides examples of derived MPRS for six non-conterminous U.S. sites: Anchorage and Fairbanks, Alaska; Honolulu and Hilo, Hawaii; San Juan, Puerto Rico; and the Anderson Air Force Base (AFB), Guam.

Chapter 8 summarizes key results and provides recommendations for MPRS proposals for the 2020 *NEHRP Provisions* and ASCE 7-22.

MPRS are data intensive. A series of appendices contain tables and figures of MPRS and other data that could not be conveniently included in the main body of the report.

Chapter 2

Background

This chapter provides background on recent seismic code development work relevant to this study, including recommendations from the joint U.S. Geological Survey (USGS) and Building Seismic Safety Council (BSSC) Project 17, a summary of the proposals to incorporate multi-period response spectra (MPRS) in the 2020 *NEHRP Provisions* and ASCE 7-22, and an overview of the 2018 update of the USGS National Seismic Hazard Model (NSHM), which forms the basis of the MCE_R ground motions for the conterminous United States.

2.1 Relevant Seismic Code Development Work

During the closing months of the 2015 *NEHRP Provisions* cycle, a study was undertaken on behalf of the BSSC Provisions Update Committee (PUC) to investigate the compatibility of current site class coefficients, F_a and F_v, with the ground motion models (GMMs) used by the USGS to produce design maps (Kircher & Associates, 2015). In the course of this study, it was discovered that the standard three-domain spectral shape defined by the short-period spectral response acceleration parameter, S_{DS}, the 1-second spectral response acceleration parameter, S_{D1}, and long-period transition period, T_L, is not appropriate for soft soil sites (Site Class D or softer), in particular where ground motion hazard is dominated by large magnitude events. Specifically, on such sites, the standard spectral shape substantially understates spectral response for moderately long period structures.

The 2015 PUC initiated a proposal to move to specification of spectral acceleration values over a range of periods, abandoning the present three-domain format, as this would provide better definition of likely ground motion demands. However, this proposal was ultimately not adopted due to the complexity of implementing such a revision in the design procedure and time constraints. Instead, the 2015 PUC adopted a proposal prohibiting the general use of the three-parameter spectrum, and instead requiring site-specific hazard determination, for longer period structures on soft soil sites.

Subsequently, Project 17, a joint committee of BSSC volunteers and USGS representatives, was charged with formulating rules by which the next-generation seismic design value maps would be developed for consideration by the PUC in the 2020 *NEHRP Provisions*. This included reevaluating the

use of multi-period spectra as a replacement or supplement to the present three-domain (two-period) spectral definition, and consideration of how the basic design procedures embedded in ASCE 7-16 should be modified for compatibility with multi-period spectra. In its final report, *Development of Next Generation of Seismic Design Value Maps for the 2020 NEHRP Provisions* (NIBS, 2019), Project 17 developed (and unanimously approved) a comprehensive multi-period response spectra (MPRS) proposal, in four parts, for consideration by the 2020 PUC. The four parts separately address MPRS-related changes to Chapters 11, 20, 21, and 22, respectively, and form the basis of MPRS proposals for the 2020 *NEHRP Provisions* and related proposals for ASCE 7-22

2.2 Summary of MPRS Proposals for the 2020 *NEHRP Provisions*

As noted above, the MPRS proposals would primarily affect the seismic design criteria of Chapter 11, the site classification requirements of Chapter 20, the site-specific ground motion procedures of Chapter 21, and the seismic ground motion maps of Chapter 22. Certain sections of Chapter 12 (Seismic Design Requirements), Chapter 15 (Seismic Design Requirements for Nonbuilding Structures), and Chapter 18 (Seismic Design Requirements for Structures with Damping Systems), which use ground motion parameters that would no longer be defined (e.g., ground motion parameter S_1), would also be affected by the proposed changes. Key changes to Chapters 11, 20, 21, and 22 of the 2020 *NEHRP Provisions* (and ASCE 7-22) are described in the following sections.

2.2.1 Key Changes to the Seismic Design Criteria of Chapter 11

Proposed changes to seismic design criteria of Chapter 11 would incorporate values of seismic design parameters S_{MS} and S_{M1} (and S_{DS} and S_{D1}) derived from site-specific MPRS that include site amplification, spectrum shape, and other site (and source) effects. Users would obtain values of these and other ground motion data from a USGS web service for user-specific values of the location (i.e., latitude and longitude) and site conditions (i.e., site class) of the site of interest.

Values of seismic design parameters S_{MS} and S_{M1} (and S_{DS} and S_{D1}), provided by the USGS web service, preclude the need to define earthquake ground motions for "reference site" conditions (Site Class BC) and site amplification factors for determining earthquake ground motions for other site conditions. Accordingly, proposed changes to Chapter 11 would eliminate the tables of site coefficients, F_a and F_v, and replace values of "reference site" parameters,

S_S and S_1, with appropriate values of S_{DS} and S_{D1}, wherever S_S or S_1 appear in the requirements (e.g., to define Seismic Design Category).

The definition of seismic design parameters S_{DS} and S_{D1} (two-thirds of S_{MS} and S_{M1}) and their use in Chapter 12 and other chapters to define seismic loads for Equivalent Lateral Force (ELF) design, and other applications, would remain the same as that of ASCE 7-16 (and other prior editions of that standard). As a result, traditional methods familiar to and commonly used by engineering practitioners for building design would not change. Figure 2.2-1 is an annotated copy of the traditional two-period design spectrum proposed for the 2020 *NEHRP Provisions* (and ASCE 7-22) illustrating the relationship of seismic design parameters S_{DS} and S_{D1}, the underlying site-specific multi-period design spectrum, and the ELF seismic design coefficient, C_S.

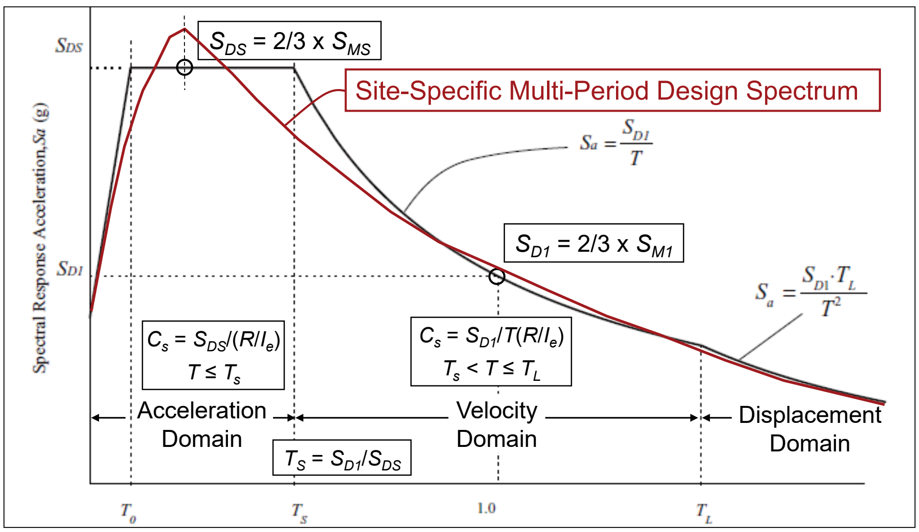


Figure 2.2-1 Annotated copy of the traditional two-period design spectrum proposed for the 2020 *NEHRP Provisions* (and ASCE 7-22); essentially the same as the design spectrum of ASCE 7-16.

As an alternative to the traditional two-period design spectrum, proposed changes to Chapter 11 would also incorporate site-specific MPRS in the definition of earthquake ground motions (e.g., the site-specific multi-period design spectrum also shown in Figure 2.2-1). Like parameters S_{MS} and S_{M1} (and S_{DS} and S_{D1}), users would obtain values of site-specific MPRS from a USGS web service for specific values of the location (i.e., latitude and longitude) and site conditions (i.e., site class) of the site of interest. Site-specific MPRS provide a more refined description of the frequency content of the ground motions that would be suitable for multi-mode response spectrum analysis and for developing ground motions for nonlinear response history analysis.

Proposed values of seismic design parameters S_{DS} and S_{D1} (and $S_{MS} = 1.5\ S_{DS}$ and $S_{M1} = 1.5\ S_{D1}$) would be developed by the USGS from the multi-period design spectrum for the site class of interest in accordance with the requirements of Section 21.4 of the 2020 *NEHRP Provisions* (and ASCE 7-22). Figure 2.2-2 illustrates the requirements of Section 21.4 for a hypothetical high seismicity site with soft soil Site Class DE site conditions (V_{S30} = 600 feet per second, fps). In this example, the value of S_{DS} is about 1.03 g (i.e., 0.9 × 1.14 g) and the value of S_{D1} is about 1.58 g (i.e., (3 s/1 s) × 0.53 g) with a corresponding transition period, T_S, of about 1.54 seconds. Because the site is soft, the transition period, T_S, is greater than 1.0 s. The calculated value of S_{D1} exceeds S_{DS}, and the design spectrum is truncated at the design short period spectral response acceleration. The frequency content of the design spectrum (i.e., two-thirds of the MCE$_R$ spectrum) of this example reflects the combined effects of site amplification and spectral shape, both of which contribute significantly to the long-period frequency content for this soft soil site.

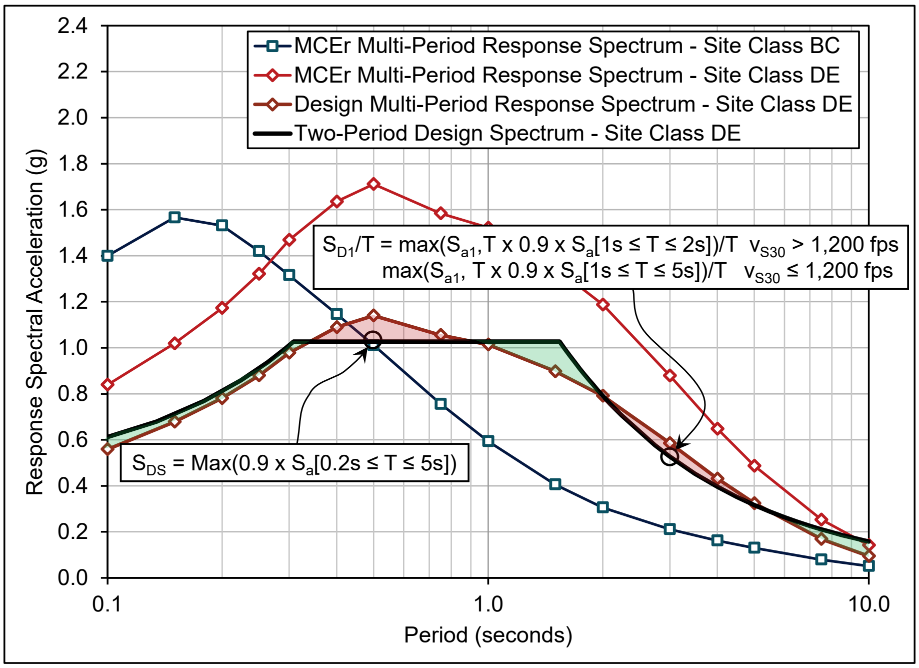


Figure 2.2-2 Example derivation of values of S_{DS} and S_{D1} from a multi-period site-specific design spectrum for a hypothetical high seismicity site with soft soil Site Class DE site conditions (V_{S30} = 600 fps).

Spectrum shape effects were not included in the site coefficients of ASCE 7-16*,* which necessitated requiring site-specific ground motion analysis for softer soil sites. The MPRS proposals would eliminate the need for such analyses, and proposed changes to Chapter 11 for site-specific analysis would revert back to those of ASCE 7-10 (e.g., site-specific analysis would

only be required for Site Class F sites with very poor soil conditions prone to potential failure under seismic loading).

Proposed changes to Chapter 11 would add three new site classes (Site Class BC, CD and DE) to more accurately define the frequency content of earthquake ground motions, of particular importance to accurate characterization of ground motions of softer sites at longer periods of response. New site classes, including revised ranges of V_{S30} values and related site classification criteria, are proposed as changes to Chapter 20. A new "Default" site condition is proposed as the more critical spectral response of Site Class C, CD, and D, for design where soil properties are not known in sufficient detail to reliably determine the site class.

2.2.2 Key Changes to the Site Classification Criteria of Chapter 20

Proposed changes to Chapter 20 would provide a more refined classification of site conditions, thereby improving the accuracy of site amplification and associated values of seismic design parameters at longer response periods. Table 2.2-1 describes the eight site classes proposed for Table 20.3-1 of ASCE 7-22; the upper-bound, lower-bound, and center values of shear wave velocity (V_{S30}) of each site class; and the rounded, center of range values of shear wave velocity used by the USGS to develop site-specific MPRS ground motions for Chapter 22.

Table 2.2-1 Site Classes and Associated Values of Shear Wave Velocity

Site Class		Shear Wave Velocity, V_{s30} (fps)			USGS[2] V_{s30} (mps)
Name	Description	Lower Bound[1]	Upper Bound[1]	Center	
A	Hard rock	5,000			2,000
B	Medium hard rock	3,000	5,000	3,536	1,080
BC	Soft rock	2,100	3,000	2,500	760
C	Very dense soil or hard clay	1,450	2,100	1,732	530
CD	Dense sand or very stiff clay	1,000	1,450	1,200	365
D	Medium dense sand or stiff clay	700	1,000	849	260
DE	Loose sand or medium stiff clay	500	700	600	185
E	Very loose sand or soft clay		500		150

1. Upper and lower bounds, as proposed for Table 20.3-1, ASCE 7-22.
2. Center of range (rounded) values used by USGS to develop MPRS.
[fps] feet per second, [mps] meters per second

The proposed changes would add to Table 20.3-1 of the 2020 *NEHRP Provisions* (and ASCE 7-22) three new site classes, Site Class BC (Soft Rock), Site Class CD (Dense Sand or Very Stiff Clay) and Site Class DE

(Loose Sand or Medium Stiff Clay), and the associated ranges of average shear wave velocity and other site classification criteria for these new site classes. The new site classes would be centered on existing site class boundaries (e.g., the center of Site Class BC is 2,500 fps; the center of Site Class CD is 1,200 fps; and the center of Site Class DE is 600 fps).

The proposed changes would also define a new "Default" site condition in terms of the maximum site amplification of Site Class C (Very Dense Soil or Hard Clay), Site Class CD (Dense Sand or Very Stiff Clay) or Site Class D (Medium Dense Sand or Stiff Clay). This is, in concept, consistent with ASCE 7-16*,* which effectively requires the more critical of Site Class C and D to be used for design where soil properties are not known in sufficient detail to determine the site class.

2.2.3 Key Changes to the Site-Specific Ground Motion Procedures of Chapter 21

Proposed changes to Chapter 21 would incorporate the MPRS available from the USGS web service into the site-specific requirements of Chapter 21 by: (1) permitting their use for design in lieu of those determined by a traditional site-specific ground motion analysis; and (2) requiring that site-specific ground motions not be less than those obtained from the USGS web service without peer review (i.e., to provide a lower-bound safety net for ground motions developed by a site-specific analysis).

Other proposed changes to Chapter 21 would eliminate the risk coefficient method for determining probabilistic (risk-targeted) MCE_R ground motions from uniform-hazard (2% probability of exceedance in 50-year) ground motions, revise the period-dependent factors required for conversion of geometric mean (RotD50) ground motions to maximum direction (RotD100) ground motions, and revise deterministic MCE_R ground motion requirements. Each of these proposed changes are consistent with the methods used by the USGS to develop updated values of seismic design parameters and MPRS provided by their web service (i.e., updated values of seismic ground motion maps proposed for Chapter 22).

The proposed elimination of the risk coefficient method would not affect the values of MPRS, which would be determined by iterative integration in accordance with the requirements of Section 21.2.1.2 (Method 2) of ASCE 7-16 that would remain the same in the 2020 *NEHRP Provisions* (and ASCE 7-22). The proposed revision of period-dependent factors used to convert geometric mean to maximum direction response would have a modest effect on the frequency content of the MPRS by factoring short-period (0.2-second, or less) response by 1.2, rather than 1.1, by factoring 1-second response by

1.25, rather than 1.3, and by factoring long-period (10-second) response by 1.3, rather than 1.5 at periods of 5 seconds or greater. The proposed factors are based on the analyses of Shahi & Baker (2013, 2014) and tend to increase short-period response and decrease long-period response from those required by ASCE 7-16 (see Resource Paper 4 of the 2015 *NEHRP Provisions*).

The proposed changes to deterministic MCE_R ground motion requirements include: (1) replacing "characteristic earthquakes" with "scenario earthquakes" as the definition of deterministic events, where scenario earthquake magnitudes would now be determined by deaggregation of the probabilistic spectral response acceleration at each period; (2) defining "active faults" in accordance with their hazard contributions from deaggregations; and (3) replacing the lower limit on the deterministic MCE_R spectrum (e.g., Figure 21.2-1 of ASCE 7-16) with a table of MPRS that define the lower limit deterministic MCE_R spectrum at all periods for the site class of interest.

The first proposed change was necessitated by the 2013 update of the Uniform California Earthquake Rupture Forecast, Version 3 (UCERF3) (Field et al., 2014), which essentially eliminated the concept of "characteristic earthquakes." The second proposed change introduces a definition of "active faults" that ensures that all faults contributing significantly to the probabilistic ground motions, and only those faults, are considered. These problems were investigated by Project 17, and the proposed changes reflect the recommendations from Project 17 to use probabilistically defined scenario earthquake ground motions constrained such that they comply with the fundamental 84^{th} percentile definition of the deterministic MCE_R spectrum (Section 21.2.2 of ASCE 7-16).

The proposed change to replace the lower limit on the deterministic MCE_R response spectrum with a table of MPRS was necessitated by the elimination of the site coefficients (F_a and F_v) and the desire to replace the two-domain spectrum of ASCE 7-16 with a more realistic multi-period characterization of the frequency content of lower limit ground motions. Figure 2.2-3 shows plots of the MPRS of proposed Table 21.2-1 of the 2020 *NEHRP Provisions* (and ASCE 7-22), illustrating the variation of the lower limit deterministic MCE_R response spectrum with site class.

The values of lower limit deterministic MPRS of proposed Table 21.2-1 are developed as part of this study, as described in Section 5.4. The proposed MPRS are based on an assumed magnitude 8.0 earthquake in the Western United States (WUS) at a distance of about 12 km from fault rupture. A magnitude 8.0 earthquake represents the approximate magnitude typically

found by deaggregation of site hazard for sites near major fault systems (e.g., San Andreas Fault in the San Francisco Bay Area). A 12 km distance from the site to fault rupture is the approximate distance at which a magnitude 8.0 earthquake generates 0.2-second response of 1.5 g and 1-second response of 0.6 g for Site Class BC site conditions. The proposed deterministic lower limit MPRS are anchored to these values of 0.2-second and 1-second response for consistency with the deterministic lower limit on the MCE_R response spectrum of ASCE 7-16 (i.e., Figure 21.2-1 of ASCE 7-16).

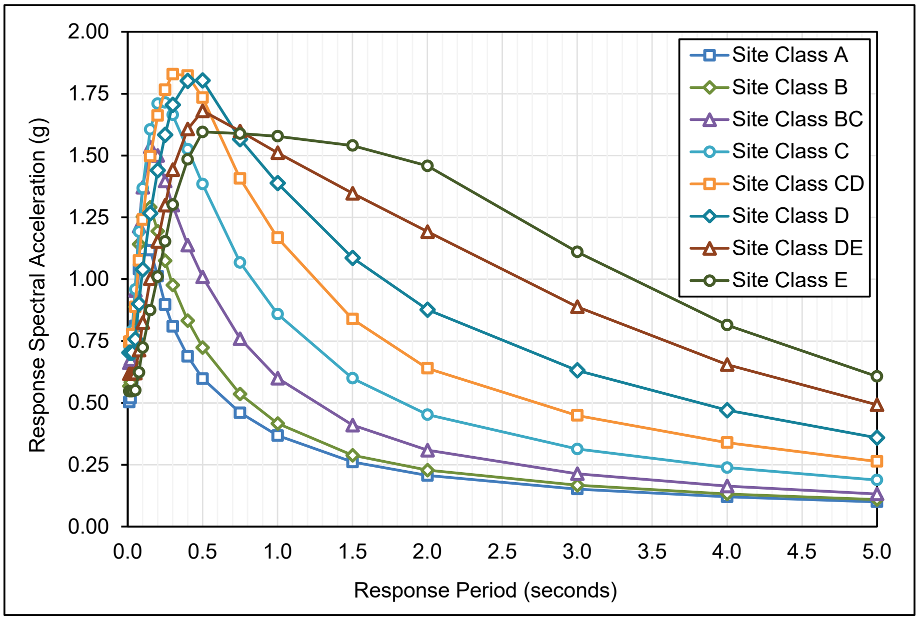


Figure 2.2-3 Plots of MPRS proposed for the lower limit deterministic MCE_R response spectra of Table 21.2-1 (up to 5.0 seconds) of the 2020 *NEHRP Provisions* and ASCE 7-22.

2.2.4 Key Changes to the Seismic Ground Motion Maps of Chapter 22

Proposed changes to Chapter 22 would: (1) replace figures of mapped values of obsolete parameters S_S, S_1, and PGA with figures of mapped values of parameters S_{MS}, S_{M1}, and PGA_M for Default site conditions; (2) reference a USGS web service for values of design parameters S_{MS}, S_{M1}, and PGA_M for any site condition of interest; and (3) delete figures of mapped values of the obsolete risk coefficients C_{RS} and C_{R1}.

All values of design parameters (and corresponding MPRS) would be obtained from the USGS web service for user-specific values of the site location (latitude and longitude) and site class (including Default site conditions). The proposed values are based on the 2018 update of the USGS NSHM, as described in Section 2.3.

Proposed MCE_R ground motions are developed from the USGS NSHM in accordance with the site-specific requirements of Chapter 21 of the 2020 *NEHRP Provisions* (and ASCE 7-22) for sites in the conterminous United States, and following the methods developed in this report for sites outside of the conterminous United States (i.e., sites in Alaska, Hawaii, Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa). For descriptions of the calculation of MCE_R ground motions from the USGS NSHM, see the commentaries of Chapters 21 (Section 21.2) and 22 of ASCE 7-22.

2.3 2018 Update of the National Seismic Hazard Model

The 2014 USGS NSHM was used to calculate ground motion parameters for the 2015 *NEHRP Provisions* and ASCE 7-16. The USGS updated this model in 2018-2019 (i.e., 2018 USGS NSHM). Whereas the 2014 USGS NSHM provided ground motion parameters at three spectral periods and one reference site class, the 2018 USGS NSHM provides ground motion parameters for all spectral periods and site classes needed to develop the MPRS. Details of the 2018 USGS NSHM are documented in Petersen et al., 2020. For states and U.S. territories outside of the conterminous United States, the 2018 USGS NSHM has not been updated with respect to the 2014 USGS NSHM. Modifications in the 2018 USGS NSHM for the conterminous United States are summarized as follows:

1. For the conterminous Central and Eastern United States (CEUS), the ground motion models incorporated into the 2018 USGS NSHM are from the NGA-East project of the Pacific Earthquake Engineering Research Center (PEER). This was a multi-year project funded by the U.S. Nuclear Regulatory Commission that gathered data applicable to the CEUS and developed models of median ground motions (PEER, 2015; Goulet et al., 2018), site effects (Stewart et al., 2017; 2020), and uncertainties (Al Atik, 2015; Goulet et al., 2017). The NGA-East ground motion models have made it possible to produce NSHM spectral response accelerations in the CEUS for periods from 0 (for peak ground acceleration) to 10 seconds and for Site Classes A through E. The CEUS ground motion models used for the 2014 USGS NSHM only included a relatively narrow range of periods and site classes.

2. In the Los Angeles, Seattle, San Francisco, and Salt Lake City regions, where published models are deemed applicable (from, respectively, Lee et al., 2014; Stephenson, 2007; Aagaard et al., 2008; and Magistrale et al., 2008), basin depths have been incorporated into the 2018 USGS NSHM. The depths are input to the ground motion models used for the

Western United States, although in the Seattle region, this entails modification of the models themselves. At sites where the basin depths are larger than a default that is estimated from site class (by each of the NGA-West2 ground motion models), ground motions are amplified. The amount of amplification increases with basin depth and depends on spectral response period and site class. At other sites where the depths are smaller, or outside of the four regions, the default basin depth is assumed, and ground motions are unaffected. In the 2014 USGS NSHM used for ASCE 7-16, the effects of deep basins were not included; only a relatively shallow default basin depth estimated for Site Class BC of the USGS NSHM was considered.

3. Outside of California (because the Uniform California Earthquake Rupture Forecast, UCERF3, has not been modified), the catalog of past earthquakes has been updated for the 2018 USGS NSHM. Seismicity catalogs are used to calculate spatially smoothed rates of occurrence of future earthquakes on unmodeled (or unknown) faults. In addition to appending earthquakes that occurred in 2013 through 2017, other updates have been made to the catalog and the smoothed earthquake rates; see Petersen et al. (2020).

4. For the Western United States, two of the ground motion models that were incorporated into the 2014 USGS NSHM have been excluded for the 2018 update. One of the two models cannot be used for softer site classes (Idriss, 2014), and the other cannot be used for spectral response periods longer that 3.0 seconds (Atkinson and Boore, 2003; 2008).

Chapter 3
Study Approach and Methods

This chapter describes the study approach and methods for developing probabilistic and deterministic maximum considered earthquake multi-period response spectra (MPRS) and MCE_R ground motions where only values of the ground motion parameters S_S, S_1, and T_L are known. Chapters 4 and 5 provide more in-depth descriptions of those methods specific to the development of probabilistic MPRS and deterministic MPRS, respectively.

3.1 General Approach and Methods

3.1.1 Definition of Multi-Period Response Spectra (MPRS)

For all sites, maximum considered earthquake multi-period response spectra (MPRS) are defined at 22 response periods (i.e., 0.0 s, 0.01 s, 0.02 s, 0.03 s, 0.05 s, 0.075 s, 0.1 s, 0.15 s, 0.2 s, 0.25 s, 0.3 s, 0.4 s, 0.5 s, 0.75 s, 1.0 s, 1.5 s, 2.0 s, 3.0 s, 4.0 s, 5.0 s, 7.5 s, and 10 s) for each of eight site classes (A, B, BC, C, CD, D, DE, and E). In all cases, MPRS are defined by 5-percent damped, maximum-direction, risk-targeted (as defined in ASCE 7-16) horizontal spectral response accelerations. The eight site classes and the associated values of shear-wave velocity, including those used by the U.S. Geological Survey (USGS) to develop MPRS, are provided in Chapter 2, Table 2.2-1.

The 22 response periods and eight site classes represent a matrix of 176 (22 × 8) values of MPRS, as illustrated by the example matrix in Table 3.1-1. The response spectrum of the site of interest would be selected from the MPRS matrix for the site class of interest, where site class is based on the site-specific value of shear-wave velocity, V_{S30}, or taken as the maximum of the MPRS of Site Classes C, CD, and D for Default site conditions.

The 176 (22 × 8) combinations of response period and site class define the same set of MPRS for all sites in the United States and U.S. territories, whether the site of interest is located in the conterminous Western United States (WUS) or Central and Eastern United States (CEUS) where spectral accelerations for all response periods and site classes are currently available, or located in regions outside the conterminous United States (i.e., Alaska, Hawaii, Guam, Puerto Rico, or American Samoa) where available spectral accelerations are more limited (e.g., only values of S_S and S_1 are available),

pending future USGS updates. The intent of this study (and related proposed changes for the 2020 *NEHRP Provisions* and ASCE 7-22) is that earthquake ground motions (i.e., as characterized by MPRS) be defined in a consistent manner for all U.S. and territorial sites, such that, for example, an engineer in Alaska or Hawaii would use the same type of seismic criteria and design methods as an engineer in California or South Carolina.

Table 3.1-1 Example Matrix of MPRS at 22 Response Periods and 8 Hypothetical Site Classes (and the Default Site Condition)

Period	5%-Damped Response Spectral Acceleration or PGA by Site Class (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.50	0.57	0.66	0.73	0.74	0.69	0.61	0.55	0.74
0.010	0.50	0.57	0.66	0.73	0.75	0.70	0.62	0.55	0.75
0.020	0.52	0.58	0.68	0.74	0.75	0.70	0.62	0.55	0.75
0.030	0.60	0.66	0.75	0.79	0.78	0.70	0.62	0.55	0.79
0.050	0.81	0.89	0.95	0.96	0.89	0.76	0.62	0.55	0.96
0.075	1.04	1.14	1.21	1.19	1.08	0.90	0.71	0.62	1.19
0.10	1.12	1.25	1.37	1.37	1.24	1.04	0.82	0.72	1.37
0.15	1.12	1.29	1.53	1.61	1.50	1.27	1.00	0.87	1.61
0.20	1.01	1.19	**1.50**	1.71	1.66	1.44	1.15	1.01	1.71
0.25	0.90	1.07	1.40	1.71	1.77	1.58	1.30	1.15	1.77
0.30	0.81	0.98	1.30	1.66	1.83	1.71	1.44	1.30	1.83
0.40	0.69	0.83	1.14	1.53	1.82	1.80	1.61	1.48	1.82
0.50	0.60	0.72	1.01	1.38	1.73	1.80	1.68	1.60	1.80
0.75	0.46	0.54	0.76	1.07	1.41	1.57	1.60	1.59	1.57
1.0	0.37	0.42	**0.60**	0.86	1.17	1.39	1.51	1.58	1.39
1.5	0.26	0.29	0.41	0.60	0.84	1.09	1.35	1.54	1.09
2.0	0.21	0.23	0.31	0.45	0.64	0.88	1.19	1.46	0.88
3.0	0.15	0.17	0.21	0.31	0.45	0.63	0.89	1.11	0.63
4.0	0.12	0.13	0.16	0.24	0.34	0.47	0.66	0.81	0.47
5.0	0.10	0.11	0.13	0.19	0.26	0.36	0.49	0.61	0.36
7.5	0.063	0.068	0.080	0.11	0.15	0.19	0.26	0.31	0.19
10	0.042	0.045	0.052	0.069	0.089	0.11	0.14	0.17	0.11

3.1.2 Key Hazard Parameters Influencing Spectral Shape

The crux of this study is estimation of the frequency content (shape of the MCE response spectrum) for all periods and all possible site conditions where only values of S_S, S_1, and T_L are known. The primary factors that influence the shape (frequency content) of earthquake ground motion response spectra are as follows:

1. Site conditions (as characterized by site class). Site-specific values of the site class, based on V_{S30}, are presumed to be known (i.e., determined by the design engineer or a geotechnical engineer for the site of interest), or a Default site condition is assumed.

2. Ground motion level (as characterized by site-specific values of S_S and S_1 in this study). Ground motion level influences the frequency content of

ground motions due to soil nonlinearity (i.e., amplitude-dependent response of soil), particularly at shorter periods and softer site conditions.

3. Earthquake magnitude. The earthquake magnitude(s) governing seismic hazard at the site of interest influences the relative strength of short-period and long-period ground motions (i.e., long-period ground motions are relatively stronger for sites governed by large magnitude earthquakes). The magnitudes governing short-period (0.2-second) and 1-second response for Site Class BC site conditions, which could be estimated from S_S and S_1 hazard deaggregations, are referred to as M_S and M_1 in this report. Where available, results of deaggregation could be used to determine M_S and M_1, although this study does not assume that this will be the case.

4. Spectral response ratio. In general, governing earthquake magnitude(s) are not known prior to performing probabilistic seismic hazard analysis and deaggregation of hazard, and the results of such analyses were generally not available at the time of this study (i.e., for the 2018 update of the USGS National Seismic Hazard Model). The effects of earthquake magnitude on the frequency content of probabilistic ground motions is implicitly taken into account in this study by defining probabilistic MPRS as a function of the spectral response ratio, $R_{S/1} = S_S/S_1$, and the mapped value of T_L (which is related to earthquake magnitude and an indicator of M_1, as shown in Figure 3.2-1). For development of deterministic MPRS, the governing earthquake magnitude is similarly inferred from the spectral response ratio, $R_{S/1} = S_S/S_1$. Although similar to T_L, $R_{S/1}$ is used as a proxy to represent the controlling magnitude at long periods, it also contains information about the relative amplitude of the ground motion at long compared to short periods. As will be discussed in Chapter 4, both parameters are used in the models of this report because they seem to control different features of the spectrum.

   Figure 3.1-1 shows example values of $R_{S/1}$ ratio (S_S/S_1) for a group of WUS sites where values of S_S and S_1 are obtained from probabilistic MCE_R ground motions plotted as a function of earthquake magnitude, where earthquake magnitude is obtained from deaggregation of 0.2-second and 1-second 2,475-year hazard for Site Class BC. The example WUS sites are the same as those used in Chapter 6 (see Chapter 6 for site names). Sites where the earthquake magnitudes governing 0.2-second and 1-second response are similar (i.e., $M_S \approx M_1$) show a consistent trend in the values of $R_{S/1}$, decreasing as earthquake magnitude increases. The outlier sites in this figure, such as Sacramento (SAC) and

sites in the Pacific Northwest, Seattle (SEA), Tacoma (TAC), Everett (EWA), and Portland (POR) have 0.2-second and 1-second response usually controlled by significantly different earthquake magnitudes (i.e., $M_S \neq M_1$). Figure 3.1-1 also shows the underlying trend in example values of $R_{S/1}$ with earthquake magnitude determined from representative deterministic MCE$_R$ ground motions where values of 0.2-second and 1-second response are governed by the same source and earthquake magnitude, i.e., $M_S = M_1$ (see also Section 5.2).

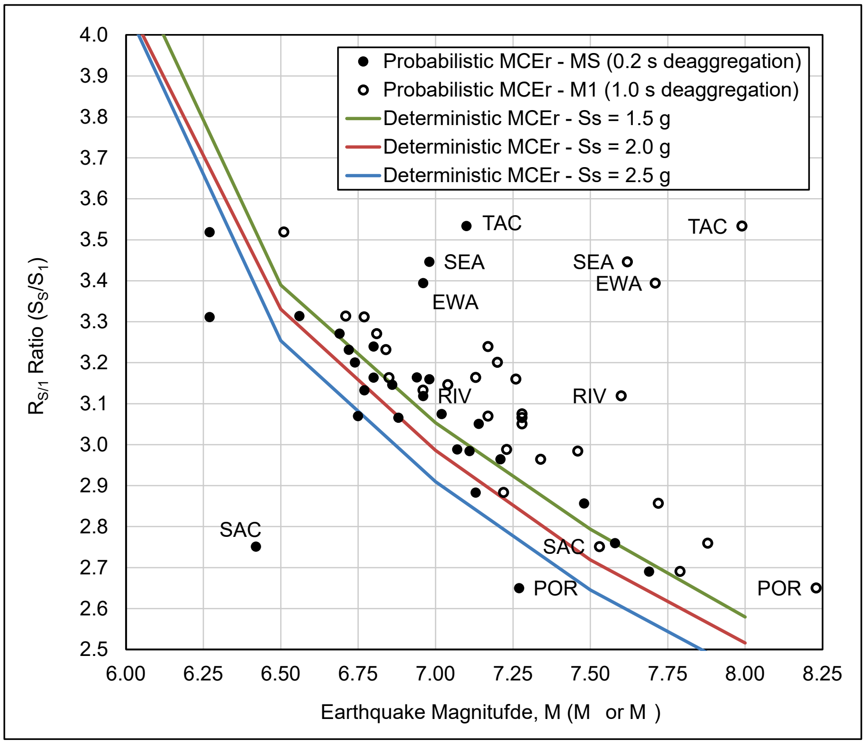


Figure 3.1-1 Values of the $R_{S/1}$ ratio (S_S/S_1) plotted as a function of earthquake magnitude obtained from deaggregation, where values of S_S and S_1 are obtained from probabilistic MCE$_R$ ground motions for example WUS sites, and underlying trends in the values $R_{S/1}$ with earthquake magnitude, as determined from representative deterministic MCE$_R$ ground motions.

Other site and source parameters influence the frequency content of earthquake ground motions, including earthquake mechanism (e.g., shallow crustal events, deep subduction zone events, stable continental events), fault type (e.g., strike-slip, reverse, normal), directivity, and basin effects, which, in general, are less influential. In addition, information from deaggregation of site hazard (e.g., values of ε_0) are generally not available from USGS at all response periods and site classes of interest.

3.1.3 Frequency Content of MPRS Derived from WUS Crustal and Subduction Earthquake Ground Motion Models

In this study, the frequency content (shape of the MCE_R response spectrum) of MPRS is based primarily on the spectral shape of WUS shallow crustal earthquakes in active tectonic regions for typical or default values of source and site parameters (e.g., a strike-slip mechanism is assumed for development of deterministic MPRS and V_{S30}-based default values of basin depth terms are used for development of both deterministic and probabilistic MPRS). The frequency content of MPRS is also influenced by subduction earthquakes in the Pacific Northwest region.

The frequency content of MPRS at sites where only values of S_S, S_1, and T_L are known is assumed to be the same as that of the ground motion models (GMMs), hazard curves, and methods used by the USGS to develop the MPRS proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 for sites in the WUS (governed by shallow crustal and subduction earthquakes). Conceptually, characterizing the frequency content of MPRS of non-WUS sites using MPRS of WUS sites is consistent with the traditional approach of characterizing site effects for all WUS and non-WUS sites with the same set of site amplification factors (e.g., F_a and F_v of ASCE 7-16) that were developed primarily from WUS ground motions.

Furthermore, the shallow crustal and subduction GMMs are more appropriate for use in the U.S. regions under consideration in this report, as opposed to, for example, GMMs for the CEUS. Previous USGS hazard models for Alaska and Puerto Rico have used both crustal and subduction GMMs, and preliminary analysis of recent Hawaii earthquake recordings show that they are consistent with the Next Generation Attenuation (NGA) crustal earthquake GMMs. None of the non-conterminous United States and U.S. territories under consideration in this report are considered to be stable continental regions; therefore, the use of CEUS GMMs would not be appropriate in the modeling as they will result in MPRS with very different frequency contents (see CEUS examples of Chapter 6). Therefore, until new region-specific GMMs are developed and implemented by the USGS for each of the non-conterminous United States and U.S. territories under consideration in this report, WUS GMMs are used to capture the frequency content of MPRS.

The MPRS proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 are based on the 2018 update of the USGS National Seismic Hazard Model (NSHM). For WUS sites governed by shallow crustal earthquakes, the following four, equally weighted, NGA-West2 GMMs are used in the calculation of hazard curves in the 2018 USGS NSHM update:

1. Abrahamson, Silva, and Kamai, 2014 (ASK14),
2. Boore, Stewart, Seyhan, and Atkinson, 2014 (BSSA14),
3. Campbell and Bozorgnia, 2014 (CB14), and
4. Chiou and Youngs, 2014 (CY14).

For WUS sites in the Pacific Northwest region, subduction earthquakes are also considered, which are characterized by the following three, equally weighted, subduction GMMs in the 2018 USGS NSHM update:

1. Abrahamson et al., 2016 (BC Hydro12), for both interface and intraslab earthquakes,
2. Atkinson and Macias, 2009 (AM09), only for interface earthquakes, and
3. Zhao et al., 2006 (Zhao06), for both interface and intraslab earthquakes.

These three GMMs were slightly modified in the 2018 USGS NSHM update by adding deep basin amplifications based on the CB14 model to better estimate long period ground motions in the Pacific Northwest region. Their non-amplified versions are used in this report to represent default basin values.

The above mentioned WUS GMMs describe the median ground motions in terms of RotD50, which is a measure of the median horizontal ground motion intensity. In contrast, MCE_R ground motions are defined by ASCE 7-16 in terms of maximum-direction response (i.e., RotD100). The USGS NSHM provides hazard curves and typically describes ground motions in terms of uniform hazard (e.g., 2 percent in 50-year exceedance probability), whereas MCE_R ground motions are defined by ASCE 7-16 in terms of uniform risk (i.e., 1 percent in 50-year collapse probability). In this study (and USGS development of proposed MPRS for the 2020 *NEHRP Provisions* and ASCE 7-22), probabilistic and deterministic MPRS are calculated in accordance with the site-specific requirements of Section 21.2 of ASCE 7-16, including changes proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 (e.g., Section 21.2.1 requirements for determining maximum-direction 1% in 50-year risk-targeted probabilistic MCE ground motions from site-specific hazard curves).

Proposed changes for the 2020 *NEHRP Provisions* and ASCE 7-22 include an update of the specified values of the factors required for calculating maximum direction from median response. Proposed values of these factors are 1.2 for periods less than or equal to 0.2 s, 1.25 for a period of 1.0 s, and 1.3 for periods greater than or equal to 10 s, with straight line interpolation between these periods. Values of these factors are based on Shahi and Baker

(2013, 2014), as recommended in Resource Paper 4 of the 2015 *NEHRP Provisions*.

It may be noted that the frequency content (shape) of MPRS is also influenced by: (1) the period-dependent values of the lognormal standard deviation parameter of the GMMs; (2) the period-dependent factors used to convert median to maximum-direction response; and (3) the period-dependent conversion of 2 percent in 50-year uniform hazard to 1 percent in 50-year uniform risk. These are either an inherent property of the ground motion models or a site-specific requirement of Section 21.2 of ASCE 7-16 (including proposed changes to Section 21.2 for the 2020 *NEHRP Provisions* and ASCE 7-22).

3.2 Response Spectrum Shape Parameters (RSSPs)

To describe generic shapes of MPRS, this study defines response spectrum shape parameters (RSSPs) as the set of MPRS normalized by the response at 0.2-seconds for Site Class BC (i.e., S_S), as illustrated in the example matrix of Table 3.2-1 (from Appendix C, Table C-1).

In the table, the short-period range parameters T_{amax} and $S_{a,amax}$, and long-period range parameters T_{vmax} and $S_{a,vmax}$, are described in Section 3.3.2. For documentation and computational purposes, values of RSSPs are defined with three decimal place precision (i.e., 0.001 g). This normalization by the S_S amplitude allows the study to better isolate and observe the effects of frequency content on the shape of the response spectrum at each site condition.

RSSPs are developed in this study to characterize the frequency content of probabilistic and deterministic MPRS as a function of: (1) site class (as illustrated in Table 3.2-1); (2) the level of ground motion (as defined by values of S_S and S_1); and (3) earthquake magnitude (as inferred from the spectral response ratio, $R_{S/1} = S_S/S_1$, and T_L for probabilistic MPRS). That is, multiple sets of deterministic RSSPs (15 sets) and probabilistic RSSPs (41 sets), like the one shown in Table 3.2-1, are used to characterize the frequency content of deterministic and probabilistic MPRS for different ground motion levels and earthquake magnitudes.

Table 3.2-1 Example Matrix of RSSPs at 22 Response Periods and 8 Hypothetical Site Classes (and the Default Site Condition) and Corresponding Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.334	0.377	0.439	0.484	0.494	0.462	0.405	0.365	0.494
0.01	0.336	0.379	0.441	0.487	0.498	0.469	0.412	0.365	0.498
0.02	0.346	0.389	0.450	0.493	0.499	0.469	0.412	0.365	0.499
0.03	0.397	0.442	0.500	0.528	0.519	0.469	0.412	0.365	0.528
0.05	0.541	0.592	0.636	0.639	0.592	0.505	0.413	0.368	0.639
0.08	0.693	0.761	0.809	0.795	0.717	0.600	0.475	0.416	0.795
0.10	0.746	0.835	0.914	0.912	0.827	0.693	0.550	0.482	0.912
0.15	0.745	0.861	1.023	1.071	0.998	0.844	0.668	0.583	1.071
0.20	0.675	0.796	**1.000**	1.140	1.108	0.960	0.769	0.674	1.140
0.25	0.596	0.714	0.927	1.143	1.177	1.056	0.866	0.768	1.177
0.30	0.537	0.647	0.859	1.107	1.219	1.137	0.962	0.867	1.219
0.40	0.455	0.550	0.748	1.010	1.211	1.201	1.071	0.990	1.211
0.50	0.394	0.477	0.661	0.913	1.149	1.202	1.121	1.064	1.202
0.75	0.301	0.351	0.494	0.700	0.927	1.037	1.058	1.051	1.037
1.0	0.240	0.272	0.388	0.561	0.767	0.914	0.995	1.039	0.914
1.5	0.169	0.187	0.265	0.389	0.548	0.710	0.881	1.007	0.710
2.0	0.133	0.147	0.200	0.292	0.417	0.571	0.776	0.949	0.571
3.0	0.098	0.108	0.138	0.203	0.291	0.408	0.574	0.717	0.408
4.0	0.078	0.085	0.106	0.154	0.219	0.304	0.423	0.526	0.304
5.0	0.065	0.071	0.085	0.122	0.170	0.232	0.318	0.392	0.232
7.5	0.041	0.044	0.052	0.071	0.096	0.125	0.166	0.201	0.125
10	0.027	0.029	0.034	0.044	0.057	0.073	0.093	0.110	0.073
$S_{a,amax}$ (g)	0.675	0.796	1.000	1.143	1.219	1.202	1.121	1.064	1.219
T_{amax} (s)	0.20	0.20	0.20	0.25	0.30	0.50	0.50	0.50	0.30
$S_{a,vmax}$ (g)	0.133	0.147	0.388	0.292	0.219	0.408	0.574	0.717	0.408
T_{vmax} (s)	2.00	2.00	1.00	2.00	4.00	3.00	3.00	3.00	3.00

3.2.1 Census Tract-Based Data

As a first step in the development of RSSPs, census tract-based MPRS are developed for 9,897 sites in California, Oregon, Washington, Idaho, and Nevada. The 9,897 sites in five Western states were selected to provide MPRS that: (1) represent a broad range of ground motion levels for each T_L region of interest; and (2) provide a large statistical sample of ground motions for each ground motion level and T_L combination.

The 9,897 sites are located at the centroids of the denser census tracts of the five Western states, representing about 90 percent of the population (living in less than 6 percent of the land area) in those states. For reference, there are a little more than 1,000 buildings in a census tract on average, so roughly a total of 10 million buildings are located in the 9,897 census tracts. These buildings account for over 85 percent of the seismic risk (annualized dollar loss) in the conterminous United States (Jaiswal et al., 2015). Appendix A

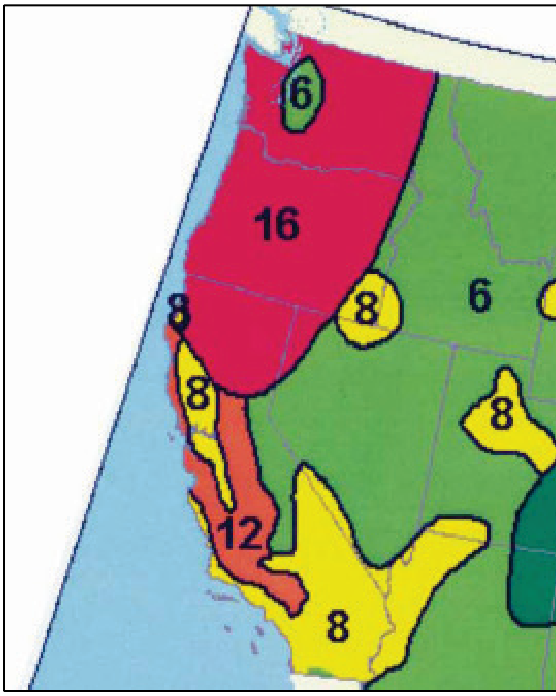
provides a more complete description of the development of census tract-based data for the five Western states.

For each census tract location, this study first determines if the seismic hazard is governed probabilistically or deterministically, based on 2015 *NEHRP Provisions* data for both S_S and S_1 responses. Of the total 9,897 census tract sites, 7,392 sites are controlled by probabilistic ground motions and 1,998 sites are controlled by deterministic ground motions at both short-period (S_S) and 1-second (S_1). For the "probabilistic" census tracts, MPRS are developed from an early version of the 2018 USGS NSHM hazard curves and are normalized by S_S to obtain the RSSPs for each census tract. For the "deterministic" tracts, MPRS are calculated for scenario earthquakes (of different magnitudes and fault distances) and normalized by S_S to obtain representative RSSPs. These RSSP data are then used to recommend generic shapes of response spectra for each site class as a function of ground motion level (i.e., S_S and S_1), the spectral response ratio ($R_{S/1}$), and T_L (for probabilistic MPRS). Although the format is the same, different approaches are used to determine probabilistic RSSPs and deterministic RSSPs, as summarized in the following sections and described in more detail in Chapters 4 and 5, respectively.

3.2.2 Development of Probabilistic RSSPs

For this study, representative probabilistic MPRS are calculated for the 7,392 of the census tract sites for which the hazard is governed by probabilistic MCE_R ground motions at both short-period and 1-second response, according to the 2015 *NEHRP Provisions*. Probabilistic MPRS are calculated in accordance with the site-specific requirements of Section 21.2.1 (including changes proposed for the 2020 *NEHRP Provisions* and ASCE 7-22), using an early version of the 2018 update of the USGS NSHM. Generic probabilistic RSSPs are then developed by statistical evaluation of the resulting RSSPs of the 7,392 census tract sites. The census tract-based RSSPs are grouped to represent: (1) five different T_L regions; (2) five different ground motion levels, determined by probabilistic S_S ranges; and (3) five different ranges of the spectral response ratio, determined by probabilistic $R_{S/1} = S_S/S_1$ values. The "probabilistic" values of S_S and S_1 are the 0.2-second and 1-second response, respectively, of probabilistic MPRS for Site Class BC. All possible combinations of T_L, S_S, and $R_{S/1}$ result in 125 possible groups; however, many of these combinations are unlikely (as discussed below and in Chapter 4), resulting in a total of 41 (T_L, S_S, $R_{S/1}$) groups for which generic RSSPs are provided in Chapter 4 and Appendix B.

The five Western states used in this study provide a broad range of ground motion levels for the five T_L regions of interest: (1) T_L = 16 s; (2) T_L = 12 s; (3) T_L = 8 s; (4) T_L = 6 s outside of Puget Sound region; and (5) T_L = 6 s inside the Puget Sound region. The MPRS for T_L = 6 s show different frequency content inside and outside of the Puget Sound region due to the presence of subduction zone earthquakes within the region. Figure 3.2-1 is a map of the WUS showing the five T_L regions of interest, and includes a table showing the approximate relationship between T_L (T_C) and the earthquake magnitude governing long-period response. Figure 3.2-1 is taken from a 2006 study (Crouse et al., 2006) which forms the basis of the T_L maps in ASCE 7-16. In Figure 3.2-1, the "corner" period, T_C, approximates the long-period transition period, T_L, of ASCE 7-16. A more precise version of this figure, including latitudes and longitudes, is provided in Figure 22-14 of ASCE 7-16.



Magnitude (M) Range	Corner Period, T_c (seconds)
6.0 - 6.5	4
6.5 - 7.0	6
7.0 - 7.5	8
7.5 - 8.0	12
8.0 - 8.5	16
8.5 - 9.0+	20

Figure 3.2-1 Map of the WUS showing T_L regions in California, Oregon, Washington, Idaho, and Nevada, and table relating magnitude, M, to the corner period, T_c (from Crouse et al., 2006).

Table 3.2-2 shows the number of sites, out of the total 7,392 probabilistically governed census tract sites, in various (S_S, S_1) bins, collectively for all T_L regions. In this table, the bins are defined by discrete values of S_S that vary from 0.25g to 2.5g in increments of 0.25g and by discrete values of S_1 that vary from 0.1g to 1.0g in increments of 0.1g. This table shows that the selected census tract sites provide a broad range of ground motion levels. It also shows a large number of census tracts for each of the five S_S groups.

The spectral acceleration headings for each bin in this table represent the centers of the bins and are only used in sorting of the sites (i.e., they do not represent the actual sample mean values of the data in a bin; this information is provided in Chapter 4).

Table 3.2-2 Number of Sets of WUS Probabilistic RSSPs for all T_L Regions, Binned by Values of S_S and S_1 and Grouped by Very Low, Low, Moderate, High, and Very High Ground Motion Levels

	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
S_1	0.25	0.50	0.75	1.00	1.25	1.5	1.75	2.00	2.25	2.50
0.1	278	122	0	0	0	0	0	0	0	0
0.2	0	868	376	0	0	0	0	0	0	0
0.3	0	0	390	457	14	0	0	0	0	0
0.4	0	0	107	495	498	467	0	0	0	0
0.5	0	0	0	25	17	764	348	0	0	0
0.6	0	0	0	0	0	9	457	778	0	0
0.7	0	0	0	0	0	15	12	217	581	0
0.8	0	0	0	0	0	0	6	0	18	59
0.9	0	0	0	0	0	0	0	0	2	12
1	0	0	0	0	0	0	0	0	0	0

Many (S_S, S_1) bins in Table 3.2-2 are empty (or poorly populated), indicating unlikely combinations of S_S and S_1. Even for those bins with statistically large populations, developing a probabilistic set of RSSPs for each (S_S, S_1) bin would be an unwarranted complexity. Rather, for each T_L region, probabilistic RSSPs are developed from groups of bins representing (1) "very low," "low," "moderate," "high," or "very high" ground motion levels, determined by probabilistic S_S values, and (2) different ranges of the spectral response ratio, determined by probabilistic $R_{S/1} = S_S/S_1$ values as described below.

Each of the five ground motion level groups (i.e., very low, low, moderate, high, or very high) is defined by a range of S_S values that varies slightly depending on the T_L region of interest. This range is determined statistically using the data from bins forming a group. The breakdown of Table 3.2-2 by T_L region and the specific S_S ranges used to define each of the five ground motion levels are given in Chapter 4.

The $R_{S/1}$ ranges for the five groups of spectral response ratios (i.e., $3.2 \leq R_{S/1}$, $2.9 \leq R_{S/1} < 3.2$, $2.7 \leq R_{S/1} < 2.9$, $2.5 \leq R_{S/1} < 2.7$, and $R_{S/1} < 2.5$) are defined to roughly correspond to a magnitude range of M6.5 or less, M6.5 to M7.0, M7.0 to M7.5, M7.5 to M8.0, and M8.0 or above. Table 3.2-3 shows the theoretical values (i.e., values based on bin centers as reported in the table

headings, not based on sample data) of $R_{S/1}$ for each near-diagonal bin, illustrating the five groups by the five different colors of the bins. Note that all diagonal bins have an $R_{S/1}$ of 2.5, roughly corresponding to a magnitude M7.5 earthquake. The off-diagonal bins below the diagonals have a lower spectral response ratio, indicating larger magnitude events (usually observed in the T_L = 16 s region. The off-diagonal bins above the diagonals have larger spectral response ratios (varying with the level of ground motion), indicating smaller magnitude earthquakes.

Table 3.2-3 Theoretical Values of $R_{S/1}$, Based on the Center of Each S_S and S_1 Bin, Shaded in a Different Color for Each of the Five Ranges of Spectral Response Ratio: 3.2 ≤ $R_{S/1}$ (Purple), 2.9 ≤ $R_{S/1}$ < 3.2 (Orange), 2.7 ≤ $R_{S/1}$ < 2.9 (Green), 2.5 ≤ $R_{S/1}$ < 2.7 (Yellow), and $R_{S/1}$ < 2.5 (Blue)

	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
S_1	0.25	0.50	0.75	1.00	1.25	1.5	1.75	2.00	2.25	2.50
0.1	2.50	5.00								
0.2	1.25	2.50	3.75							
0.3		1.67	2.50	3.33	4.17					
0.4			1.88	2.50	3.13	3.75				
0.5				2.00	2.50	3.00	3.5			
0.6					2.08	2.50	2.92	3.33		
0.7						2.14	2.50	2.86	3.21	3.57
0.8							2.19	2.50	2.81	3.13
0.9								2.22	2.50	2.78
1									2.25	2.50

3.2.3 Development of Deterministic RSSPs

In contrast to the "statistical" approach of the probabilistic RSSPs, deterministic RSSPs are developed from "scenario" earthquake ground motions typical of WUS deterministic MCE_R ground motions. Deterministic RSSPs are developed from deterministic MPRS of 15 combinations of: (1) three response levels, defined by paired values of the parameters S_S and S_1 (i.e., S_S = 1.5g and S_1 = 0.6g, S_S = 2.0g and S_1 = 0.8g, and S_S = 2.5g and S_1 = 1.0g); and (2) five earthquake magnitudes (i.e., M6.0, M6.5, M7.0, M7.5, and M8.0). The "deterministic" values of S_S and S_1 are the 0.2-second response and 1-second response, respectively, of deterministic MPRS of Site Class BC. For this study, representative deterministic MPRS are calculated in accordance with the site-specific requirements of Section 21.2.2 (including changes proposed for the 2020 *NEHRP Provisions* and ASCE 7-22), using the 2018 update of the USGS NSHM.

Table 3.2-4 shows the number of WUS deterministically governed census tract sites in each (S_S, S_1) bin for all T_L regions (which may be compared with the number of binned sets of WUS probabilistic RSSPs in Table 3.2-2). Sites for which the hazard is governed by deterministic MCE_R ground motions are found only in T_L = 8 s and 12 s regions of coastal California (e.g., there are no deterministic sites in the Pacific Northwest).

As shown in Table 3.2-4, the three ground motion levels (i.e., S_S = 1.5g and S_1 = 0.6g, S_S = 2.0g and S_1 = 0.8g, and S_S = 2.5g and S_1 = 1.0g) represent the range of possible deterministic MPRS ground motions. These ranges are sufficiently refined to limit differences in deterministic RSSP shape to about plus/minus 5 percent for all site conditions. The five discrete earthquake magnitudes (M6.0, M6.5, M7.0, M7.5, and M8.0) represent the range of earthquake magnitudes that could govern deterministic MCE_R ground motions. Interpolation of MPRS shapes between discrete magnitudes is used to eliminate potential bias in MPRS shape that can occur at very long periods.

Table 3.2-4 Number of WUS Deterministically Governed Census Tracts of All T_L Regions (T_L = 8 s and T_L =12 s), Binned by Values of S_S and S_1

	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
S_1	0.25	0.50	0.75	1.00	1.25	1.5	1.75	2.00	2.25	2.50
0.1	0	0	0	0	0	0	0	0	0	0
0.2	0	0	0	0	0	0	0	0	0	0
0.3	0	0	0	0	0	0	0	0	0	0
0.4	0	0	0	0	0	0	0	0	0	0
0.5	0	0	0	0	0	0	0	0	0	0
0.6	0	0	0	0	0	443	324	171	27	3
0.7	0	0	0	0	0	0	22	203	163	28
0.8	0	0	0	0	0	0	0	23	194	160
0.9	0	0	0	0	0	0	0	0	13	172
1	0	0	0	0	0	0	0	0	2	50

3.3 Development of Probabilistic and Deterministic MPRS

This section describes the process for developing probabilistic and deterministic MPRS using the sets of probabilistic and deterministic RSSPs (described in Section 3.2) given values of S_S, S_1, and T_L for the site of interest. The process is the same whether calculating probabilistic or deterministic MPRS, although "probabilistic" values of S_S and S_1 would be used for development of probabilistic MPRS, and "deterministic" values of

S_S and S_1 would be used for development of deterministic MPRS. The process has the following four basic steps:

- Step 1 – Select representative sets of short-period and long-period RSSPs.
- Step 2 – Determine short-period and long-period response domains.
- Step 3 – Calculate (by scaling RSSPs) short-period and long-period MPRS.
- Step 4 – Calculate mid-period MPRS (by blending short-period and long-period response).

3.3.1 Selection of Short-Period and Long-Period RSSPs

Ideally, site-specific MPRS are based on the "short-period" RSSPs that best describe short-period response and the "long-period" RSSPs that best describe long-period response, which may be different, to account for differences in the frequency content of short-period and long-period responses. In general, this is not possible since identifying different short-period and long-period deterministic RSSPs would require knowledge of the magnitudes, M_S and M_1, governing short-period and 1-second response (e.g., as might be determined from deaggregation of site hazard).

Accordingly, the same set of RSSPs deemed to best represent the site-specific values of S_S, the spectral response ratio $R_{S/1} = S_S/S_1$, and T_L is selected to describe the frequency content at both short and long periods of response of probabilistic MPRS. Similarly, the same set of RSSPs deemed to best represent the site-specific values of S_S and $R_{S/1} = S_S/S_1$ is selected to describe the frequency content at both short and long periods of response of deterministic MPRS. Where different values of magnitude, M_S and M_1, are known from deaggregation, the "short-period" deterministic RSSPs would be selected considering the magnitude M_S and the "long-period" deterministic RSSPs would be selected considering the magnitude M_1 and the ground motion level. If needed, the earthquake magnitude can be approximated from $R_{S/1}$ ratio, using Figure 3.1-1.

3.3.2 Determination of Short-Period and Long-Period Response Domains

For a given site class, the short-period RSSPs govern the frequency content of ground motions at periods from 0.00 s to the period of maximum acceleration response ($S_{a,amax}$), T_{amax}, and the long-period RSSPs govern the frequency content of ground motions from the period of maximum velocity response ($S_{a,vmax}$) up to 10 s, T_{vmax}. The value of T_{amax} is determined from the

short-period RSSPs and the value of T_{vmax} is determined from the long-period RSSPs, subject to certain constraints as described below.

In general, periods T_{amax} and T_{vmax} are related to site class, earthquake magnitude, and the ground motion level. These periods are intentionally constrained to comply with the requirements of Section 21.4 of ASCE 7-16 for determining site-specific values of S_{DS} and S_{D1}. That is, these periods are constrained such that: (1) T_{amax} cannot be less than 0.2 s, nor greater than 0.5 s (all site classes, except Site Class BC); (2) T_{vmax} cannot be less than 1 s, nor greater than 2 s for stiffer site classes (i.e., Site Classes A, B, and C); and (3) T_{vmax} cannot be less than 1 s, nor greater than 5 s, for softer site classes (i.e., Site Classes CD, D, DE, and E). Site Class CD is included with the softer site classes, although it includes values of $V_{S30} > 1,200$ fps (i.e., the "stiffer site" shear wave criterion of Section 21.4). Additionally, for Site Class BC, the value of T_{amax} is taken as 0.2 s and the value of T_{vmax} is taken as 1.0 s, for consistency with the response periods of parameters S_S and S_1. Example values of the periods T_{amax} and T_{vmax} are shown in Table 3.2-1.

3.3.3 Calculation of Short-Period and Long-Period MPRS

The "short-period" MPRS, $S_{a,T(short)}$, are calculated by uniform scaling of the short-period RSSPs by the site-specific value of S_S (i.e., as defined by 0.2-second response of Site Class BC), and the "long-period" MPRS, $S_{a,T(long)}$, are calculated by uniform scaling of the long-period RSSPs as required to match the site-specific value of S_1 (i.e., as defined by 1-second response of Site Class BC).

3.3.4 Calculation of Mid-Period MPRS

For a given site class, the short-period MPRS govern response at periods from 0.00 s to the period T_{amax}, and the long-period MPRS govern response from the period T_{vmax} to 10 s. Response at mid-periods (i.e., from period T_{amax} to period T_{vmax}) is calculated by the blending of short-period MPRS and long-period MPRS, using a period-dependent weighting scheme. The blended portions of the MPRS are more heavily influenced by the short-period MPRS at periods closer to T_{amax}, and more heavily influenced by the long-period MPRS at periods near T_{vmax}. In all cases, the blended portions of the MPRS are constrained such that, at these mid-periods, response does not exceed either $S_{a,amax}$ (i.e., maximum spectral response acceleration of the short-period MPRS) or the product of (T_{vmax}/T) and $S_{a,vmax}$ (i.e., spectral response acceleration of the long-period MPRS at the period T_{vmax} of maximum velocity response).

Period-dependent values of the weighting factor, W_T, and blended values of MPRS, $S_{a,T}$, are given by the following equations:

$$W_T = \frac{\ln\left(T / T_{a\,max}\right)}{\ln\left(T_{v\,max} / T_{a\,max}\right)} \tag{3.3-1}$$

$$S_{a,T} = min\begin{Bmatrix} \left(1 - W_T\right) S_{a,T(short)} + \left(W_T\right) S_{a,T(long)} \\ S_{a,a\,max} \\ \left(T_{v\,max} / T\right) S_{a,v\,max} \end{Bmatrix} \tag{3.3-2}$$

$$T_{amax} \leq T \leq T_{vmax}$$

where:

$S_{a,T(short)}$ = spectral response acceleration at period T from the short-period response spectrum of the site class of interest,

$S_{a,T(long)}$ = spectral response acceleration at period T from the long-period response spectrum of the site class of interest,

$S_{a,amax}$ = spectral response acceleration at period T_{amax} from the short-period response spectrum of the site class of interest,

$S_{a,vmax}$ = spectral response acceleration at period T_{vmax} from the long-period response spectrum of the site class of interest,

T_{amax} = period of maximum response of the short-period response spectrum, $S_{a,T(short)}$, for the site class of interest, subject to the period constraints 0.2 s $\leq T_{amax} \leq$ 0.5 s for all site classes except Site Class BC, and T_{amax} = 0.2 s for Site Class BC, and

T_{vmax} = period of maximum velocity response (i.e., maximum value of $T \times S_{a,T(long)}$) for the site class of interest, subject to the period constraints 1.0 s $\leq T_{vmax} \leq$ 2.0 s for Site Classes A, B, C, 1.0 s $\leq T_{vmax} \leq$ 5.0 s for Site Classes CD, D, DE, and E, and T_{vmax} = 1.0 s for Site Class BC.

3.4 Development of Site-Specific MCE$_R$ Ground Motions

MCE$_R$ ground motions are developed from the probabilistic and deterministic MPRS of Section 3.3 in accordance with Section 21.2 (including changes proposed for the 2020 *NEHRP Provisions* and ASCE 7-22). Specifically, as required by Section 21.2.2, deterministic MCE$_R$ ground motions are taken as the greater of: (1) the deterministic MPRS of Section 3.3; and (2) the deterministic lower limit MPRS of proposed Table 21.2-1 at each response period for the site class of interest. As required by Section 21.2.3, site-specific MCE$_R$ ground motions are taken as the lesser of: (1) the probabilistic MPRS of Section 3.3; and (2) the set of deterministic MCE$_R$ ground motions at each response period for the site class of interest.

Chapter 4

Development of Probabilistic Multi-Period Response Spectra

This chapter describes the study approach and methods for developing probabilistic maximum considered earthquake multi-period response spectra (i.e., probabilistic MPRS) where only values of the ground motion parameters S_S (0.2-second ground motion), $R_{S/1} = S_S/S_1$ (spectral response ratio, where S_1 is the 1-second ground motion), and T_L (long-period transition period) are known. Although the ground motion level, S_S, primarily controls the short-period shape (i.e., frequency content) of the spectrum, the two parameters, $R_{S/1}$ and T_L, primarily control the long-period shape of the spectrum.

For development of probabilistic MPRS, parameters S_S and S_1 represent the probabilistic values of the 5-percent damped, maximum-direction, risk-targeted horizontal spectral response accelerations for Site Class BC, which are calculated in accordance with the proposed requirements of Section 21.2.1 of the 2020 *NEHRP Provisions* and ASCE 7-22. When probabilistic MPRS are developed, S_S and S_1 values from previous versions of the *NEHRP Provisions* are used. These values of S_S and S_1 are calculated by the products of the risk coefficients (i.e., C_{RS} and C_{R1}) and uniform hazard ground motion parameters (i.e., S_{SUH} and S_{1UH}) from previous versions of the *NEHRP Provisions* after they have been adjusted for the proposed maximum-direction factors of the 2020 *NEHRP Provisions* and ASCE 7-22.

As explained in Chapter 3, earthquake magnitude can strongly influence the shape (i.e., frequency content) of the MCE_R response spectrum. However, probabilistic seismic hazard analysis accounts for all possible magnitude earthquakes affecting a site of interest, making it difficult to determine the magnitude of the event(s) that contribute(s) most to the hazard at a given location without deaggregation. As a result, in this chapter, T_L is also used in addition to the spectral response ratio to approximate the earthquake magnitude governing the long-period response. T_L for a given site can be estimated from the mapped values in Chapter 3, Figure 3.2-1.

This chapter concludes with an example illustrating the procedures, deriving probabilistic MPRS for a site in Irvine, California (assuming only S_S, $R_{S/1}$ =

S_S/S_1, and T_L are known for this site), and validates the results by comparison with site-specific probabilistic MPRS proposed for the 2020 *NEHRP Provisions* and ASCE 7-22.

4.1 Approach and Methods

4.1.1 Overview

Chapter 3 describes the general approach and methods for developing MPRS, where MPRS are defined at 22 response periods (from 0.0 s to 10 s) and eight site classes (see Chapter 2, Table 2.2-1). An example set of MPRS, consisting of 176 (22 × 8) values, is shown in Chapter 3, Table 3.1-1. As described in Section 3.1.2, the primary factors that influence the shape (i.e., frequency content) of MPRS are: (1) site conditions; (2) ground motion level; and (3) earthquake magnitude (or spectral response ratio as a surrogate). The site conditions are characterized by the shear-wave velocity of the site, V_{S30}, as defined in Table 2.2-1. The ground motion level in this chapter is characterized by the probabilistic values of S_S and $R_{S/1}$, while the earthquake magnitude is characterized by T_L and is also implicitly taken into account through $R_{S/1}$ (see Figure 3.1-1, for the relationship between $R_{S/1}$ and earthquake magnitude).

To develop generic shapes of MPRS, Section 3.2 defined response spectrum shape parameters (RSSPs) as a set of MPRS each normalized by its S_S value (i.e., 0.2-second value of MPRS for Site Class BC). This normalization isolates the shape of MPRS and is illustrated in the example RSSP matrix of Table 3.2-1.

Generic shapes of RSSPs are developed based on statistical analysis of data from thousands of census tract sites in five states located in the conterminous western United States (WUS) (see Section 3.2.1 and Appendix A for more information on census tract sites). Of the 9,910 census tract sites, the 7,392 for which the hazard was governed by probabilistic S_S and S_1 according to the 2015 *NEHRP Provisions* are used in this chapter. Probabilistic seismic hazard analysis is then performed at each of these "probabilistic" census tract locations to develop site-specific hazard curves. Then, MPRS and RSSPs are developed for each location in accordance with the proposed requirements of Section 21.2.1 of the 2020 *NEHRP Provisions* and ASCE 7-22, which includes calculation of risk-targeted ground motions and application of maximum-direction factors.

Once site-specific, census-tract based RSSPs are developed, they are sorted into the (S_S, S_1) bins shown in Table 3.2-2 for each T_L region of interest: 10×10×5=500 total bins, many of which are empty due to unlikely

combinations of S_S and S_1. Finally, statistical evaluation is performed and generic probabilistic RSSPs are developed by grouping of RSSP bins to represent: (1) five different T_L regions (see Figure 3.2-1):

(1) T_L = 16 s,
(2) T_L = 12 s,
(3) T_L = 8 s,
(4) T_L = 6 s outside of the Puget Sound region, and
(5) T_L = 6 s inside the Puget Sound region;

(2) five different ground motion level groups based on S_S (the S_S range for each level is determined statistically and is different for each T_L region):

(1) S1 = Very Low S_S Level,
(2) S2 = Low S_S Level,
(3) S3 = Moderate S_S Level,
(4) S4 = High S_S Level, and
(5) S5 = Very High S_S Level; and

(3) five different ranges of spectral response ratios, $R_{S/1}$ (see Table 3.2-3):

(1) R1: $3.2 \leq R_{S/1}$ (purple),
(2) R2: $2.9 \leq R_{S/1} < 3.2$ (orange),
(3) R3: $2.7 \leq R_{S/1} < 2.9$ (green),
(4) R4: $2.5 \leq R_{S/1} < 2.7$ (yellow), and
(5) R5: $R_{S/1} < 2.5$ (blue).

All possible combinations of T_L, S_S, and $R_{S/1}$ groups result in 5×5×5=125 possible groups; however, only 41 groups are not empty. The corresponding 41 generic probabilistic RSSPs are developed in this chapter and provided in Appendix B.

For any site of interest, if the three input parameters T_L, S_S, and $R_{S/1}$ are known, a generic set of probabilistic RSSPs can be selected and scaled to develop a site-specific MPRS according to the procedures described in Section 3.3, as illustrated in an example later in this chapter.

4.1.2 Development of Site-Specific Probabilistic Hazard Curves

Probabilistic seismic hazard analysis is performed at each of the 7,392 probabilistic census tract sites to develop site-specific hazard curves, using an early version of the 2018 USGS National Seismic Hazard Model (NSHM). As such, the resulting RSSPs developed in this chapter are consistent with the MPRS proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, which are also based on the 2018 USGS NSHM. Minor

differences, considered inconsequential for development of generic RSSPs, exist for sites with very deep basin depth effects, and for sites with very hard rock site conditions, as explained below.

Deep basin effects can significantly influence the response spectrum at longer periods (i.e., periods greater than about 2 s), especially for softer soil conditions. In the 2018 update of the USGS NSHM, amplifications due to very deep basins are taken into account in four regions where local basin models are available to estimate basin depths (i.e., Los Angeles, San Francisco Bay Area, Seattle, and Salt Lake City). Since this chapter aims to develop "generic" RSSPs that can be applied to any region, basin depth terms are taken as their V_{S30}-based default values provided by the NGA-West2 GMMs for all locations.

The site-specific hazard curves are calculated at each period for eight site classes. For site classes other than Site Classes A and E (which are relatively rare site conditions in the WUS), the value of V_{S30} is taken as the geometric center of the range of shear-wave velocities defining the site class of interest, as summarized in Table 2.2-1. For hard rock sites, the hazard curves in this chapter are calculated for a V_{S30} of 1,500 mps (which is the reported applicability limit of NGA-West2 GMMs), because they were calculated using an early version of the 2018 USGS NSHM for which 2,000 mps hazard curves were not available (but the results are expected to be close to the V_{S30} of 2,000 mps). The V_{S30} of Site Class E is taken as 150 mps, same as in Table 2.2-1, which is outside the applicability limit of two of the NGA-West2 GMMs (180 mps). The assumption is that all GMMs extrapolate reasonably to 150 mps, but site-specific analysis may be required to confirm this assumption at such soft site conditions.

4.1.3 Development of Site-Specific Probabilistic MPRS and RSSPs

After the probabilistic hazard curves are calculated at each of the 7,392 probabilistic census tract sites, for each of the 22 spectral periods and eight site classes, the 1% in 50-year risk-targeted probabilistic ground motions are calculated by convolving the hazard curves with a fragility function in accordance with the site-specific requirements of Section 21.2 (including changes proposed for the 2020 *NEHRP Provisions* and ASCE 7-22), which include an update to the maximum-direction factors.

The GMMs used in the 2018 USGS NSHM estimate median ground motions. Maximum-direction ground motions are then calculated by scaling the results with period-dependent factors that are based on Shahi and Baker (2013; 2014) and proposed for the 2020 *NEHRP Provisions* and ASCE 7-22. These

new maximum-direction factors are 1.2 at periods less than or equal to 0.2 s (previously 1.1), 1.25 at 1 s (previously 1.3), and 1.3 at periods greater than or equal to 10 s, with straight line interpolation between these periods. The maximum-direction factors are shown in Chapter 5, Table 5.1-1 for all 22 periods of interest.

The above procedure (i.e., risk-targeted calculations and application of maximum-direction factors) results in 7,392 sets of site-specific probabilistic MPRS, with a similar format to what is shown in Table 3.1-1. These MPRS are then normalized by their S_S values (i.e., values at 0.2-second period for Site Class BC) to result in 7,392 sets of site-specific probabilistic RSSPs, with a format similar to what is shown in Table 3.2-1. These site-specific probabilistic RSSPs are grouped and statistically analyzed to form 41 generic RSSPs as functions of T_L, S_S, and $R_{S/1}$, as described below and provided in Appendix B.

4.2 Probabilistic RSSPs for (T_L, S_S, $R_{S/1}$) Bins

The 7,392 site-specific probabilistic RSSPs developed in the previous section are representative of RSSPs for sites where hazard is governed probabilistically, and they provide a broad range of ground motion levels for several T_L regions of interest. To develop "generic" sets of RSSPs, the site-specific RSSPs are first binned for each T_L region using 10 values of S_S that vary from 0.25g to 2.50g, in increments of 0.25g, and 10 values of S_1 that vary from 0.1g to 1.0g, in increments of 0.1g, resulting in a total of 100 (S_S, S_1) bins for a given T_L region (see Table 3.2-2). Table 3.2-2 shows the number of probabilistic census tract sites in each bin, collectively for all T_L regions. For example, in this table, the S_S = 1.0g, S_1 = 0.4g bin contains 495 probabilistic census tract sites with probabilistic 0.875g < $S_S \leq$ 1.125g and probabilistic 0.35g < $S_1 \leq$ 0.45g, where S_S and S_1 values are taken from the 2015 *NEHRP Provisions*.

Tables 4.2-1 to 4.2-5 show the breakdown of these data (i.e., number of probabilistic census tract sites) for each T_L region. Later, in the development of generic RSSPs for (S_S, $R_{S/1}$) groups, the number of sites in each bin are used to calculate weighted averages of RSSPs. The MPRS for T_L = 6 s show different frequency content inside and outside of the Puget Sound region due to the presence of subduction zone earthquakes within this region. Therefore, the census tract sites with T_L = 6 s are divided into two separate groups. The first group consists of sites in two states, Idaho and Nevada (Table 4.2-4). The second group consists of sites in Washington (Table 4.2-5). This separation allows for investigation of possible differences in the frequency content at long periods due to subduction zone events.

The numerical values of spectral acceleration headings for each S_S level (i.e., group) in Tables 4.2-1 to 4.2-5 are different for each T_L region. They are calculated by averaging the S_S values from the site-specific MPRS based on the 2018 USGS NSHM (see Section 4.1.3) in each bin, and then weighting them based on the number of sites in that bin. The averaged S_S values for each bin, i.e., sample means, are given below in Tables 4.2-6 to 4.2-10. In these tables, each S_1 bin is indicated by the range of the corresponding sample S_1 values from the same site-specific MPRS data.

Table 4.2-1 Number of Probabilistic Census Tract Sites for T_L=16 s Region, Binned by Values of S_S and S_1 (g), Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)

S_1	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
	0.397		0.924		1.483		1.934		2.663	
[0,0.15]	111	34	0	0	0	0	0	0	0	0
[0.15,0.25]	0	112	0	0	0	0	0	0	0	0
[0.25,0.35]	0	0	105	62	0	0	0	0	0	0
[0.35,0.45]	0	0	107	469	51	0	0	0	0	0
[0.45,0.55]	0	0	0	25	10	54	7	0	0	0
[0.55,0.65]	0	0	0	0	0	5	15	0	0	0
[0.65,0.75]	0	0	0	0	0	15	12	0	0	0
[0.75,0.85]	0	0	0	0	0	0	6	0	0	0
[0.85,0.95]	0	0	0	0	0	0	0	0	2	0
≥ 0.95	0	0	0	0	0	0	0	0	0	0

Table 4.2-2 Number of Probabilistic Census Tract Sites for T_L=12 s Region, Binned by Values of S_S and S_1 (g), Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)

	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
S_1	0.585		0.806		1.422		1.945		2.384	
[0,0.15]	0	0	0	0	0	0	0	0	0	0
[0.15,0.25]	0	437	234	0	0	0	0	0	0	0
[0.25,0.35]	0	0	189	92	0	0	0	0	0	0
[0.35,0.45]	0	0	0	0	34	0	0	0	0	0
[0.45,0.55]	0	0	0	0	7	43	4	0	0	0
[0.55,0.65]	0	0	0	0	0	4	28	19	0	0
[0.65,0.75]	0	0	0	0	0	0	0	14	14	0
[0.75,0.85]	0	0	0	0	0	0	0	0	2	2
[0.85,0.95]	0	0	0	0	0	0	0	0	0	12*
≥ 0.95	0	0	0	0	0	0	0	0	0	0

Table 4.2-3 Number of Probabilistic Census Tract Sites for T_L=8 s Region, Binned by Values of S_S and S_1 (g), Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: green, R4: Yellow, R5: Blue)

	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
S_1	0.397		0.924		1.483		1.934		2.663	
[0,0.15]	4	0	0	0	0	0	0	0	0	0
[0.15,0.25]	0	0	0	0	0	0	0	0	0	0
[0.25,0.35]	0	0	96	301	14	0	0	0	0	0
[0.35,0.45]	0	0	0	23	283	142	0	0	0	0
[0.45,0.55]	0	0	0	0	0	393	222	0	0	0
[0.55,0.65]	0	0	0	0	0	0	399	731	0	0
[0.65,0.75]	0	0	0	0	0	0	0	197	551	0
[0.75,0.85]	0	0	0	0	0	0	0	0	14	57
[0.85,0.95]	0	0	0	0	0	0	0	0		12*
≥ 0.95	0	0	0	0	0	0	0	0	0	0

Table 4.2-4 Number of Probabilistic Census Tract Sites for T_L=6 s Outside of Puget Sound Region, Binned by Values of S_S and S_1 (g), Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)

S_1	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
	0.440		0.667		1.643		2.004		2.379	
[0,0.15]	160	88	0	0	0	0	0	0	0	0
[0.15,0.25]	0	319	142	0	0	0	0	0	0	0
[0.25,0.35]	0	0	0	2	0	0	0	0	0	0
[0.35,0.45]	0	0	0	0	2	4	0	0	0	0
[0.45,0.55]	0	0	0	0	0	32	31	0	0	0
[0.55,0.65]	0	0	0	0	0	0	15	28	0	0
[0.65,0.75]	0	0	0	0	0	0	0	6	16	0
[0.75,0.85]	0	0	0	0	0	0	0	0	2	0
[0.85,0.95]	0	0	0	0	0	0	0	0	0	0
≥ 0.95	0	0	0	0	0	0	0	0	0	0

Table 4.2-5 Number of Probabilistic Census Tract Sites for T_L=6 s Inside of Puget Sound Region, Binned by Values of S_S and S_1 (g), Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)

S_1	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
	0.334		1.146		1.479		1.777			
[0,0.15]	3	0	0	0	0	0	0	0	0	0
[0.15,0.25]	0	0	0	0	0	0	0	0	0	0
[0.25,0.35]	0	0	0	0	0	0	0	0	0	0
[0.35,0.45]	0	0	0	3	128	321	0	0	0	0
[0.45,0.55]	0	0	0	0	0	242	84	0	0	0
[0.55,0.65]	0	0	0	0	0	0	0	0	0	0
[0.65,0.75]	0	0	0	0	0	0	0	0	0	0
[0.75,0.85]	0	0	0	0	0	0	0	0	0	0
[0.85,0.95]	0	0	0	0	0	0	0	0	0	0
≥ 0.95	0	0	0	0	0	0	0	0	0	0

Table 4.2-6 **Average S_S (g) Values in Each (S_S, S_1) Bin for T_L=16 s Region, Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)**

	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
S_1	0.397		0.924		1.483		1.934		2.663	
[0,0.15]	0.322	0.404								
[0.15,0.25]		0.469								
[0.25,0.35]			0.801	0.994						
[0.35,0.45]			0.851	0.949	1.263					
[0.45,0.55]				1.102	1.399	1.604	1.811			
[0.55,0.65]						1.663	1.892			
[0.65,0.75]						1.789	1.955			
[0.75,0.85]							2.139			
[0.85,0.95]									2.663	
≥ 0.95										

Table 4.2-7 **Average S_S (g) Values in Each (S_S, S_1) Bin for T_L=12 s Region, Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)**

	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
S_1	0.585		0.806		1.422		1.945		2.384	
[0,0.15]										
[0.15,0.25]		0.585	0.694							
[0.25,0.35]			0.810	1.085						
[0.35,0.45]					1.274					
[0.45,0.55]					1.404	1.524	1.775			
[0.55,0.65]						1.623	1.838	2.059		
[0.65,0.75]								2.051	2.266	
[0.75,0.85]									2.355	2.533
[0.85,0.95]										2.503*
≥ 0.95										

* See page 4-14 for explanation of this cell.

Table 4.2-8 **Average S_S (g) Values in Each (S_S, S_1) Bin for T_L=8 s Region, Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)**

	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
S_1	0.355		0.999		1.468		1.973		2.313	
[0,0.15]	0.355									
[0.15,0.25]										
[0.25,0.35]			0.886	1.024	1.155					
[0.35,0.45]				1.136	1.314	1.466				
[0.45,0.55]						1.591	1.749			
[0.55,0.65]							1.868	2.049		
[0.65,0.75]								2.155	2.282	
[0.75,0.85]									2.389	2.601
[0.85,0.95]										2.503*
≥ 0.95										

* See page 4-14 for explanation of this cell.

Table 4.2-9 **Average S_S (g) Values in Each (S_S, S_1) Bin for T_L=6 s Outside of Puget Sound Region, Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)**

	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
S_1	0.440		0.667		1.643		2.004		2.379	
[0,0.15]	0.303	0.420								
[0.15,0.25]		0.514	0.664							
[0.25,0.35]				0.894						
[0.35,0.45]					1.351	1.521				
[0.45,0.55]						1.676	1.823			
[0.55,0.65]							1.982	2.171		
[0.65,0.75]								2.219	2.366	
[0.75,0.85]									2.484	
[0.85,0.95]										
≥ 0.95										

Table 4.2-10 Average S_S (g) Values in Each (S_S, S_1) Bin for T_L=6 s Inside of Puget Sound Region, Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)

	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
S_1	**0.334**		**1.146**		**1.479**		**1.777**			
[0,0.15]	0.334									
[0.15,0.25]										
[0.25,0.35]										
[0.35,0.45]				1.146	1.334	1.467				
[0.45,0.55]						1.573	1.777			
[0.55,0.65]										
[0.65,0.75]										
[0.75,0.85]										
[0.85,0.95]										
≥ 0.95										

In the above tables, the shaded color of each nonempty bin indicates the $R_{S/1}$ range of the resulting averaged RSSPs for that bin. The five $R_{S/1}$ groups were first introduced in Table 3.2-3, where their theoretical values were reported based on center values of each (S_S, S_1) bin. It was shown that there is a "diagonal" pattern to the grouped values of spectral response ratio, which is also correlated with earthquake magnitude. The center of sample data, however, does not always match the theoretical center values shown in Table 3.2-3. Therefore, to assign more accurate center values to the generic RSSPs, the mean $R_{S/1}$ of sample data for each bin is calculated and reported in Tables 4.2.11 to 4.2-15. These means are used to determine the shaded colors of each bin in all tables in this chapter.

As a complement to S_S, $R_{S/1}$ is a more informative parameter than S_1, because it not only contains information on S_1, but it is also correlated with the governing earthquake magnitude. As previously mentioned in Chapter 3, the five ranges of $R_{S/1}$ are defined to roughly correspond to a magnitude range of M6.5 or less, M6.5 to M7.0, M7.0 to M7.5, M7.5 to M8.0, and M8.0 or above (see Figure 3.1-1). Figure 3.1-1 shows this correlation for a group of 34 cities (including the 29 WUS example sites used in Chapter 6). The outlier sites in this figure, such as Sacramento, are usually controlled by more than one magnitude event.

Table 4.2-11 Sample Mean $R_{S/1}$ Values in Each (S_S, S_1) bin for T_L=16 s Region, Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)

S_1	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
	0.397		0.924		1.483		1.934		2.663	
[0,0.15]	3.44	3.35								
[0.15,0.25]		3.03								
[0.25,0.35]			2.63	3.14						
[0.35,0.45]			2.26	2.59	3.19					
[0.45,0.55]				2.30	2.98	3.28	3.38			
[0.55,0.65]						2.43	3.11			
[0.65,0.75]						2.36	2.57			
[0.75,0.85]							2.44			
[0.85,0.95]									2.56	
≥ 0.95										

Table 4.2-12 Sample Mean $R_{S/1}$ Values in Each (S_S, S_1) bin for T_L=12 s Region, Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)

S_1	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
	0.585		0.806		1.422		1.945		2.384	
[0,0.15]										
[0.15,0.25]		2.69	2.95							
[0.25,0.35]			3.04	3.21						
[0.35,0.45]					3.03					
[0.45,0.55]					2.98	3.04	3.31			
[0.55,0.65]						2.81	3.07	3.28		
[0.65,0.75]								2.99	3.21	
[0.75,0.85]									2.93	2.97
[0.85,0.95]										2.70*
≥ 0.95										

* See page 4-14 for explanation of this cell.

Table 4.2-13 Sample Mean $R_{S/1}$ Values in Each (S_S, S_1) Bin for T_L=8 s Region, Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)

S_1	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
	0.355		0.999		1.468		1.973		2.313	
[0,0.15]	2.25									
[0.15,0.25]										
[0.25,0.35]			3.16	3.17	3.30					
[0.35,0.45]				3.11	3.22	3.24				
[0.45,0.55]						3.21	3.21			
[0.55,0.65]							3.12	3.18		
[0.65,0.75]								3.14	3.14	
[0.75,0.85]									2.92	3.12
[0.85,0.95]										2.70*
≥ 0.95										

* See page 4-14 for explanation of this cell.

Table 4.2-14 Sample Mean $R_{S/1}$ Values in Each (S_S, S_1) Bin for T_L=6 s Outside of Puget Sound Region, Grouped by Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)

S_1	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
	0.440		0.667		1.643		2.004		2.379	
[0,0.15]	3.25	3.10								
[0.15,0.25]		3.21	3.43							
[0.25,0.35]				3.28						
[0.35,0.45]					3.12	3.28				
[0.45,0.55]						3.26	3.28			
[0.55,0.65]							3.24	3.23		
[0.65,0.75]								3.10	3.16	
[0.75,0.85]									3.08	
[0.85,0.95]										
≥ 0.95										

Table 4.2-15 Sample Mean $R_{S/1}$ Values in Each (S_S, S_1) Bin for T_L=6 s Inside of Puget Sound Region, Grouped By Five Ground Motion Levels (S1, S2, S3, S4, S5), and Shaded in a Different Color for Each of the Five Ranges of the Spectral Response Ratios (R1: Purple, R2: Orange, R3: Green, R4: Yellow, R5: Blue)

S_1	Very Low S_S Level (S1)		Low S_S Level (S2)		Moderate S_S Level (S3)		High S_S Level (S4)		Very High S_S Level (S5)	
	0.334		1.146		1.479		1.777			
[0,0.15]	3.32									
[0.15,0.25]										
[0.25,0.35]										
[0.35,0.45]				3.42	3.49	3.49				
[0.45,0.55]						3.44	3.45			
[0.55,0.65]										
[0.65,0.75]										
[0.75,0.85]										
[0.85,0.95]										
≥ 0.95										

Upon closer examination of the 12 census tract sites of bin (S5, R4), i.e., very high S_S level and $2.5 \leq R_{S/1} < 2.7$ (yellow), for T_L = 8 s (see Tables 4.2-3, 4.2-8, and 4.2-13), these sites are recategorized as T_L = 12 s and are listed instead in Tables 4.2-2, 4.2-7, and 4.2-12, with an average S_S value of 2.503g, and a mean $R_{S/1}$ of 2.70, which is shaded yellow because its value prior to rounding is 2.698. This bin is indicated by an asterisk in the above-mentioned tables. The 12 sites in this bin are representatives of sites in Riverside and San Bernardino in California, which are thought to be miscategorized in the simplified map of Figure 3.2-1 to have a T_L = 8 s, corresponding to a magnitude event between 7.0 and 7.5. Deaggregation of hazard at the two sites shows that the controlling magnitude is in fact larger, corresponding to a T_L = 12 s. More information on these sites is provided in Chapter 6.

4.2.1 Influence of Site Conditions on Frequency Content

The frequency content (i.e., shape) of the MCE_R response spectrum is strongly influenced by site conditions, which are characterized by site classes in this study. This influence is illustrated in Figures 4.2-1 to 4.2-5, where three plots in each figure from top to bottom represent the three Site Classes BC, CD and DE (i.e., harder to softer site conditions from top to bottom in each figure). Each of these figures corresponds to a specific T_L region, and the plots show the averaged representative RSSPs in each (S_S, $R_{S/1}$) bin for that T_L region.

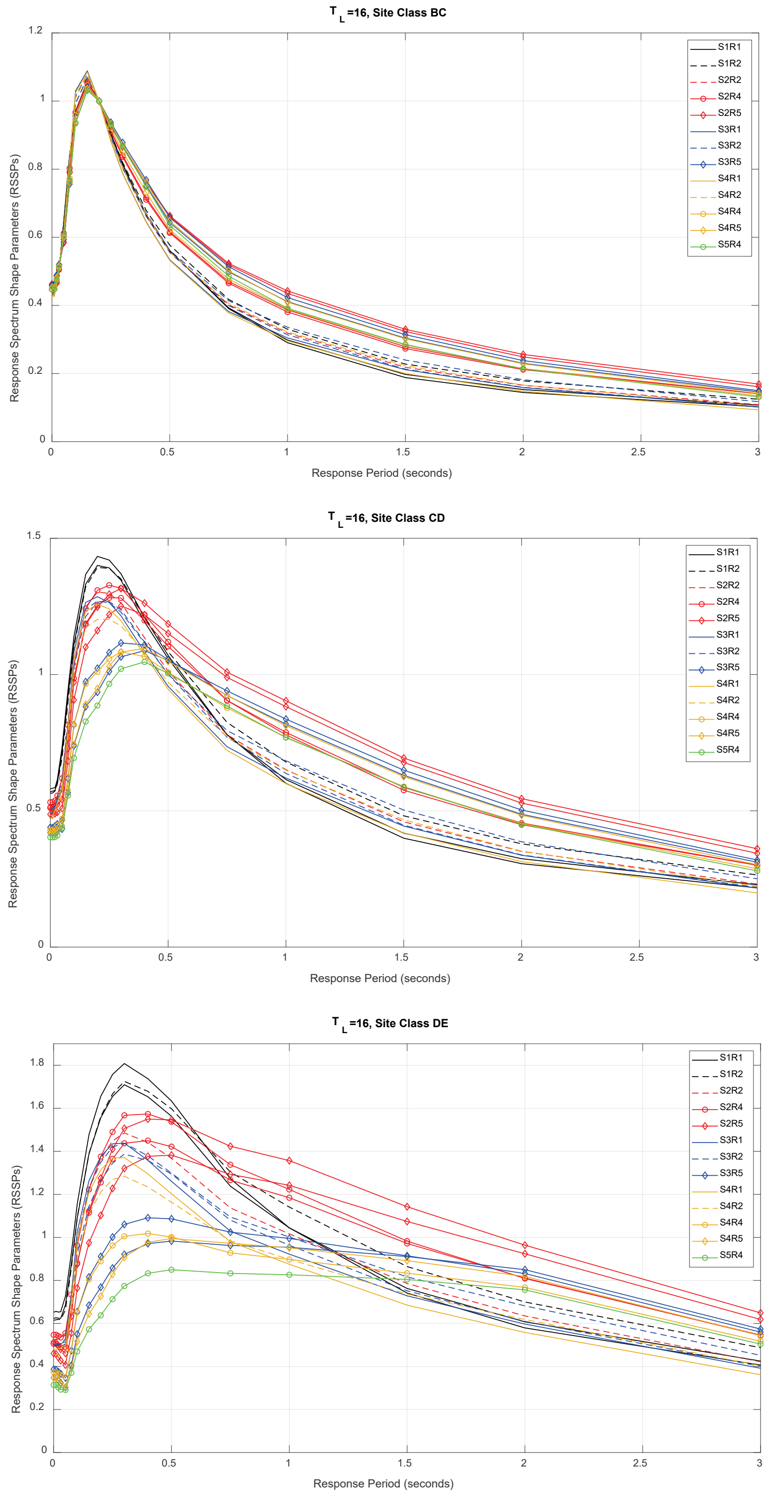


Figure 4.2-1 Plots of RSSPs for each (S_S, $R_{S/1}$) bin for T_L = 16 s; Site Class BC (top), Site Class CD (middle), and Site Class DE (bottom).

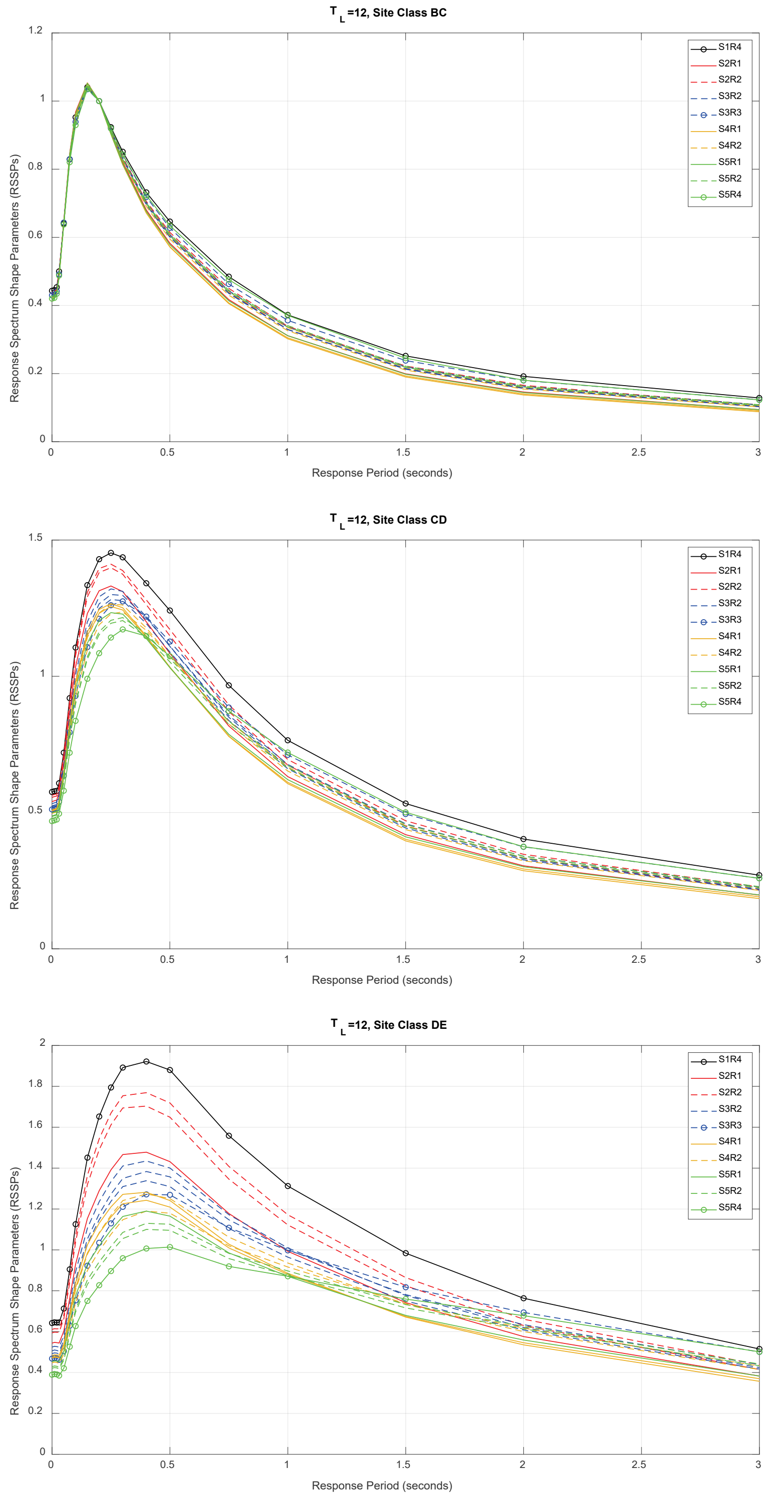


Figure 4.2-2 Plots of RSSPs for each (S_S, $R_{S/1}$) bin for T_L = 12 s; Site Class BC (top), Site Class CD (middle), and Site Class DE (bottom).

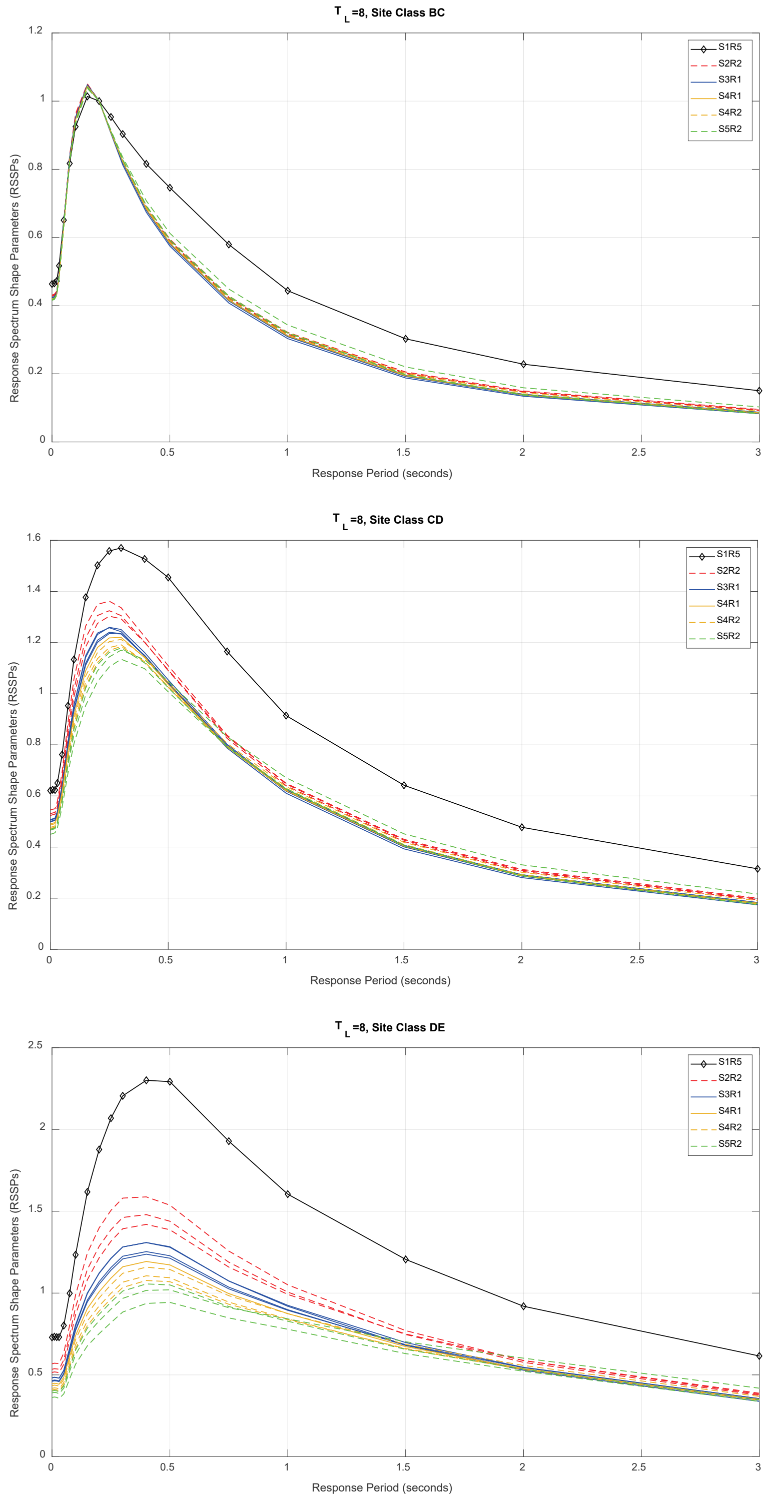


Figure 4.2-3 Plots of RSSPs for each (S_S, $R_{S/1}$) bin for T_L = 8 s; Site Class BC (top), Site Class CD (middle), and Site Class DE (bottom).

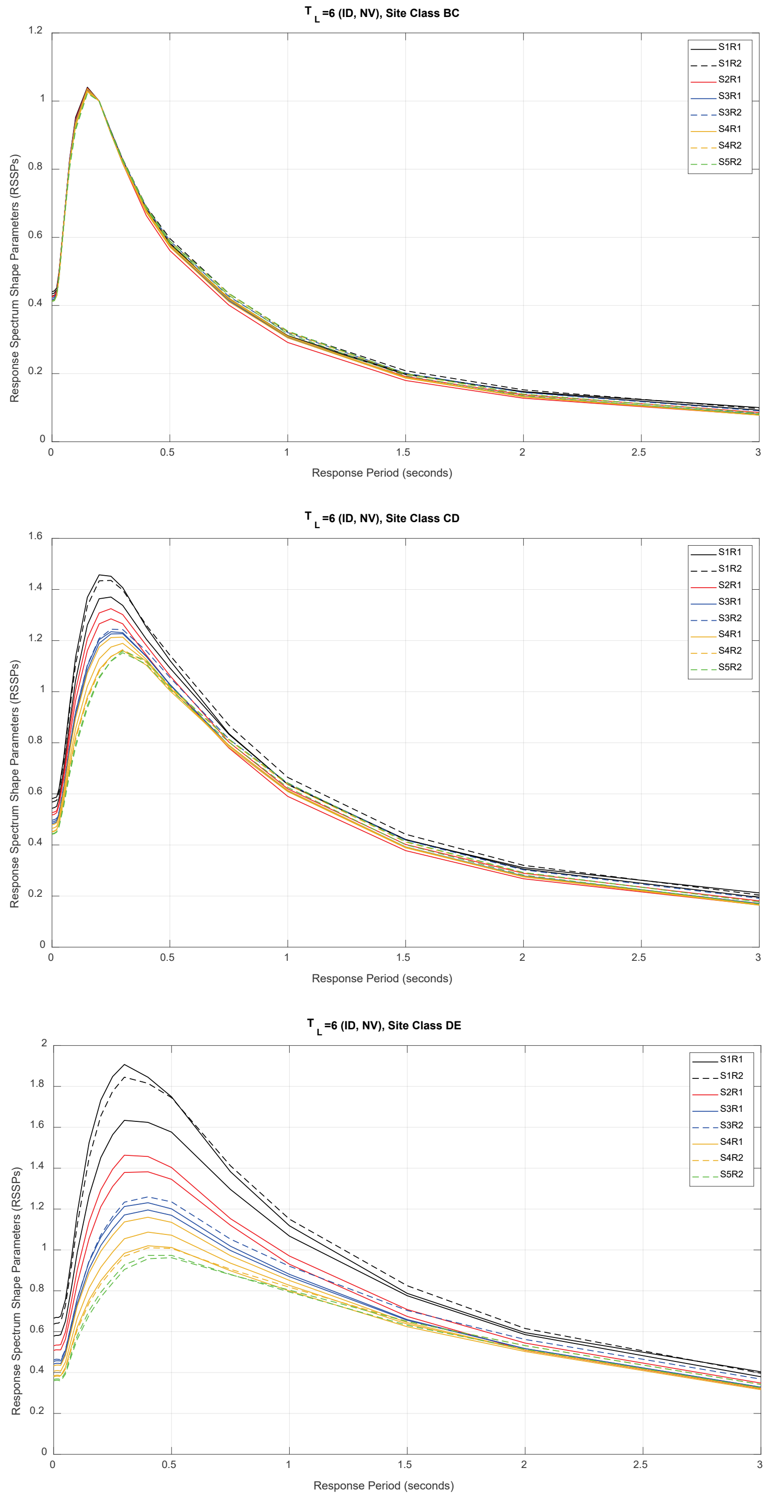


Figure 4.2-4 Plots of RSSPs for each (S_S, $R_{S/1}$) bin for T_L = 6 s outside Puget Sound region (i.e., Idaho and Nevada sites); Site Class BC (top), Site Class CD (middle), and Site Class DE (bottom).

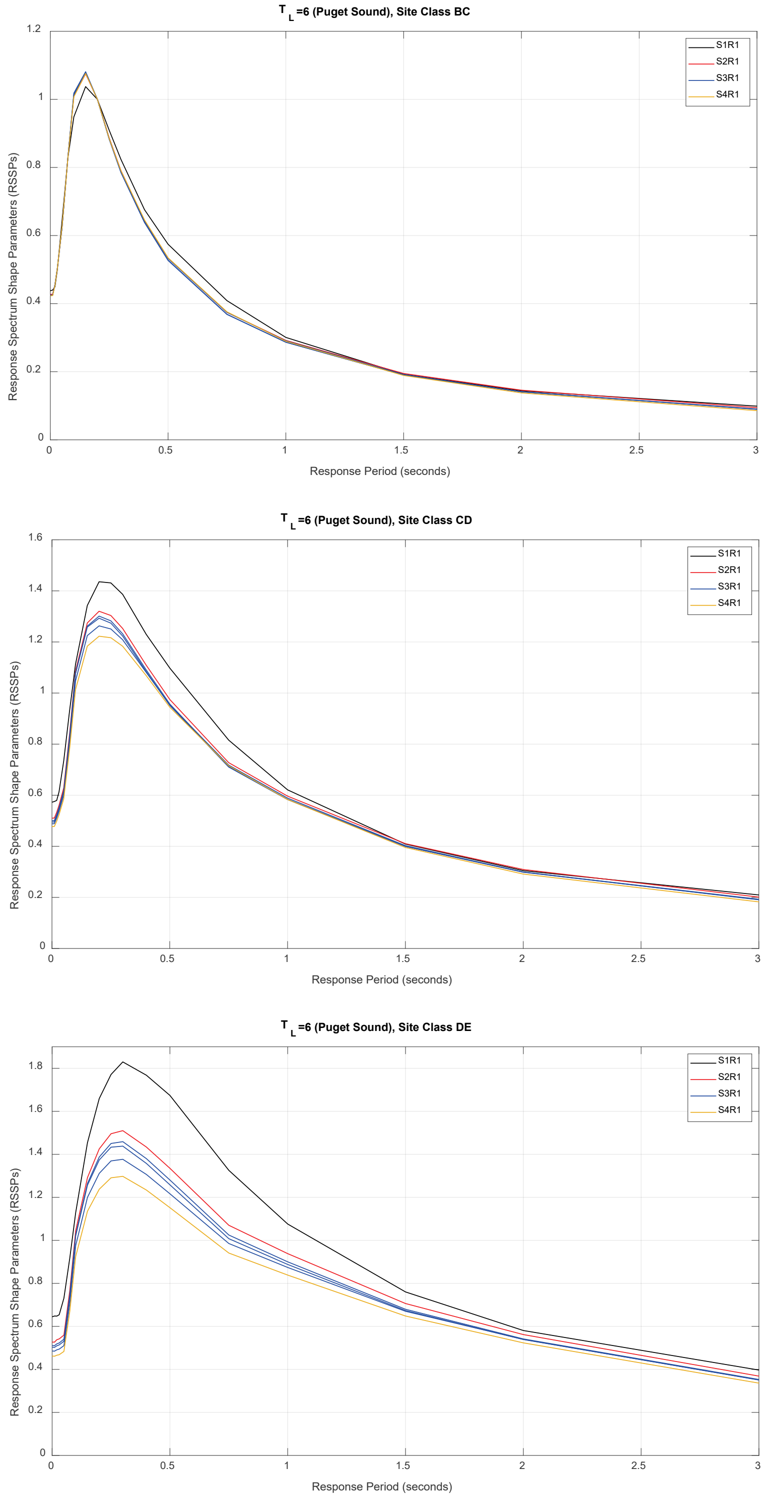


Figure 4.2-5 Plots of RSSPs for each (S_S, $R_{S/1}$) bin for T_L = 6 s inside Puget Sound region; Site Class BC (top), Site Class CD (middle), and Site Class DE (bottom).

Observe that the softer the site gets (see Site Class DE and compare it to Site Class BC), the more variation in the shape of the spectrum there is with respect to the standard three-domain spectral shape of the design spectrum used in ASCE 7-16 and earlier versions. As discussed in Chapter 2, the standard shape has been approximately representative of the shape of the spectrum for a reference Site Class BC (see top plot in each figure). In general, as the site gets softer, the peak of the spectrum increases and shifts to longer periods (note that the vertical scale is different in these plots to better show the shape of the spectrum in each plot). Also, as the site gets softer, the spectrum does not "drop off" with period as fast as it does for Site Class BC, resulting in smaller $R_{S/1}$ (see plots from about 0.5 s to 2 s periods, and compare BC to DE). Furthermore, as the site gets softer, the variation in the shape of spectra becomes more dependent on the level of ground motion and spectral response ratios (see legends), as discussed below.

4.2.2 Influence of Ground Motion Level, Ss, and Spectral Response Ratio, $R_{S/1}$, on Frequency Content

In Figures 4.2-1 to 4.2-5, the legend specifies the ground motion level (S1, S2, S3, S4, and S5; defined in Section 4.1.1) and spectral response ratio range (R1, R2, R3, R4, and R5; defined in Section 4.1.1) for each bin of the specified T_L region. RSSPs corresponding to the same ground motion level are colored the same, while RSSPs corresponding to the same spectral response ratio range have the same "line type," (e.g., solid, dashed). In many instances, more than one bin represents the same S_S and $R_{S/1}$ group. For example, see Figure 4.2-3 for the T_L = 8 s region, where three bins for S2R2 group (red dashed lines), correspond to the three orange-colored bins in Table 4.2-3 under the "Low (S2)" ground motion level, consisting of 96, 301, and 23 census tract sites.

In general, the ground motion level, S_S, primarily controls the short-period shape of the spectrum. For example, see the Figure 4.2-2 plot for Site Class DE around 0.5 s period, where the distinction between S_S levels (i.e., colors) is more obvious, with black RSSPs on the top (S1), then red (S2), then blue (S3), then yellow (S4), and green RSSPs on the bottom (S5). On the other hand, the spectral response ratio, $R_{S/1}$, primarily controls the long-period shape of the spectrum. For example, in the same Figure 4.2-2 for Site Class DE, around 2 to 3 s periods, the RSSPs are sorted by the line type; the lines with circle markers (R4 and R3) being on the top, the dashed lines (R2) being in the middle, and the solid lines (R1) being at the bottom.

4.2.3 Influence of the Long-Period Transition Period, T_L, on Frequency Content

As previously discussed, the long-period transition period, T_L, is also used in this chapter as a surrogate for the earthquake magnitude governing long-period response. In Figures 4.2-1 to 4.2-5, the influence of this parameter on the shape of the spectrum can be seen. This influence is stronger for softer site conditions (see Site Class DE and the variation of RSSPs from one figure to another). Observe how the RSSPs cross each other around mid-range periods (about 1 to 1.5 s) in Figure 4.2-1 for larger T_L = 16 s (i.e., larger magnitude events) compared to the RSSPs of Figure 4.2-4 for smaller T_L = 6 s (i.e., smaller magnitude events), which seem to be scaling up and down without crossing.

4.3 Generic Probabilistic RSSPs

As previously mentioned, many (S_S, S_1) bins are empty or poorly populated (grey colors in Tables 4.2-1 to 4.2-5), indicating unlikely combination of S_S and S_1, which, consequently, means that many (S_S, $R_{S/1}$) bins are also empty (i.e., few shaded colors out of the possible five are available for a given S_S level in Tables 4.2-1 to 4.2-5). Even for those bins with statistically large populations, developing a probabilistic set of RSSPs for each bin is an unwarranted complexity. Rather, for each of the five T_L regions, sets of generic probabilistic RSSPs are developed by combining RSSPs from similar bins, i.e., into the five S_S groups (S1, S2, S3, S4, and S5) and the five $R_{S/1}$ groups (R1, R2, R3, R4, and R5) introduced earlier in Section 4.1.1.

The generic RSSPs are calculated by taking the weighted average of the RSSPs in nonempty bins for each (S_S, $R_{S/1}$) group. The weights are proportional to the number of sites in each bin, reported in Tables 4.2-1 to 4.2-5. Although there are 125 possible combinations of T_L, S_S, and $R_{S/1}$ groups, only 41 are nonempty, representing likely combinations. These 41 sets of generic probabilistic RSSPs are provided in Appendix B.

As an example, Figure 4.3-1 shows how the generic set of RSSPs (bottom plot of the figure) for T_L = 12 s and Site Class DE are developed from RSSPs of individual bins (top plot of the figure), for various ground motion levels and spectral response ratio groups. For example, note that the two dashed red lines for the S2R2 group (see legend), i.e., "Low" S_S level and $2.9 \leq R_{S/1} < 3.2$, are combined into one line. Likewise, the three dashed blue lines for S3R2 group, i.e., "Moderate" S_S level and $2.9 \leq R_{S/1} < 3.2$, are also combined into one line. Figure 4.3-2 shows the same plots but with the horizontal axis in logarithmic scale, which better shows the spectra at shorter periods.

As an example of a generic set of RSSPs, Table 4.3-1 shows the resulting generic probabilistic RSSPs for T_L = 12 s, S2 ground motion level ("Low" S_S level), and R2 spectral response ratio group ($2.9 \leq R_{S/1} < 3.2$). The column with the heading DE corresponds to the dashed red line of Figures 4.3-1 and 4.3-2 (bottom plots).

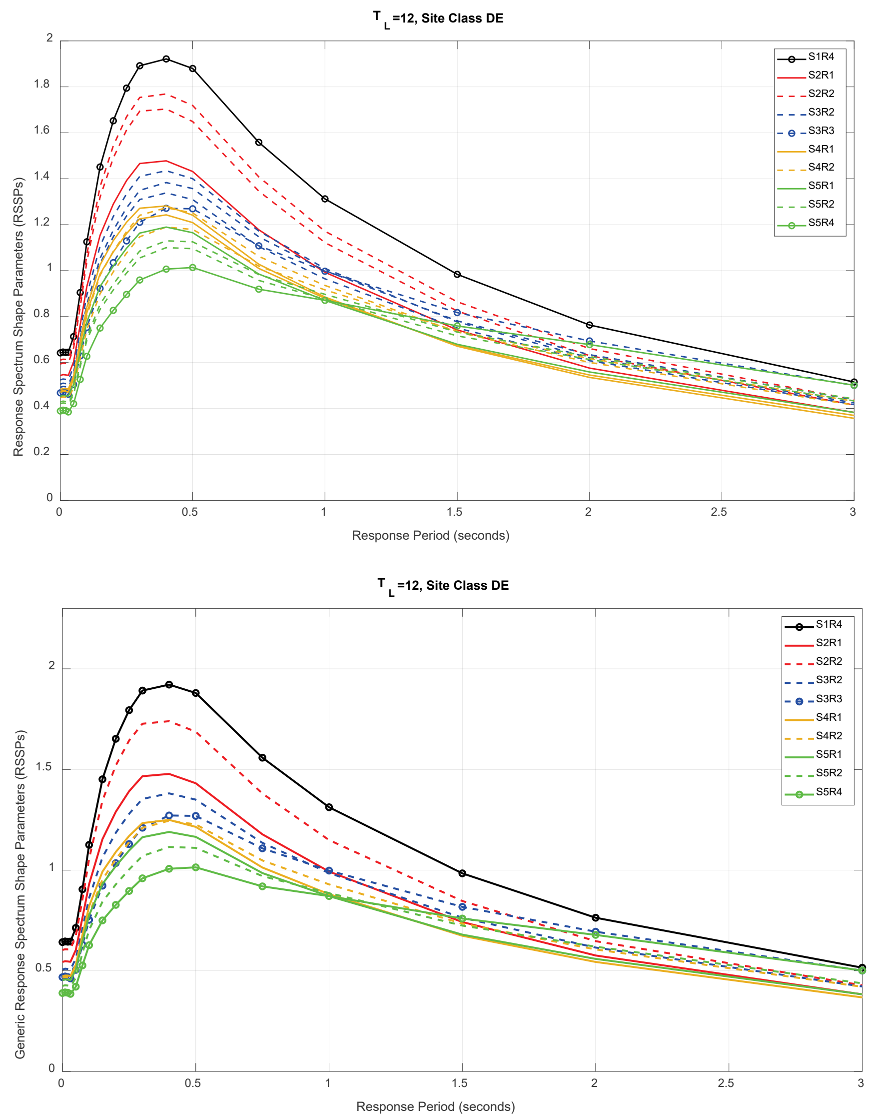
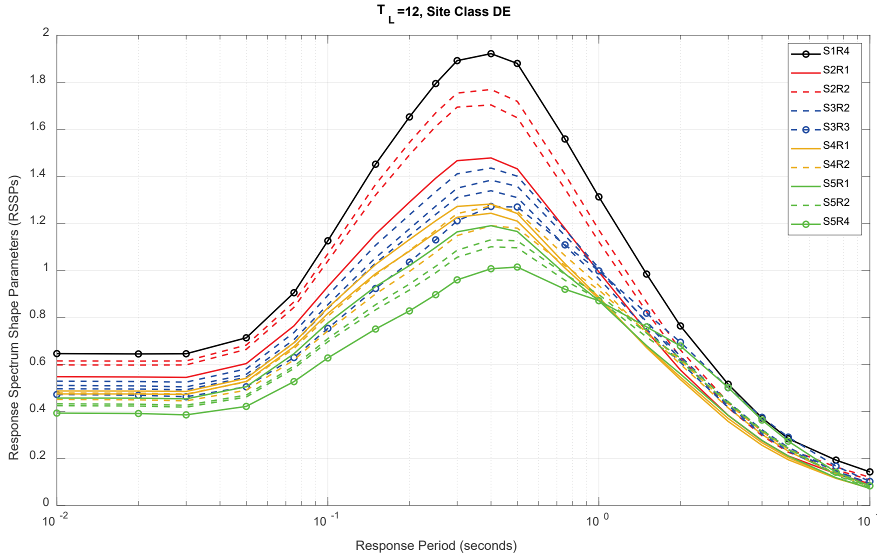


Figure 4.3-1 Plots of RSSPs (linear horizontal axes) for T_L = 12 s and Site Class DE, for individual (S_S, $R_{S/1}$) bins (top), and for weighted averages of bins within (S_S, $R_{S/1}$) groups (bottom).



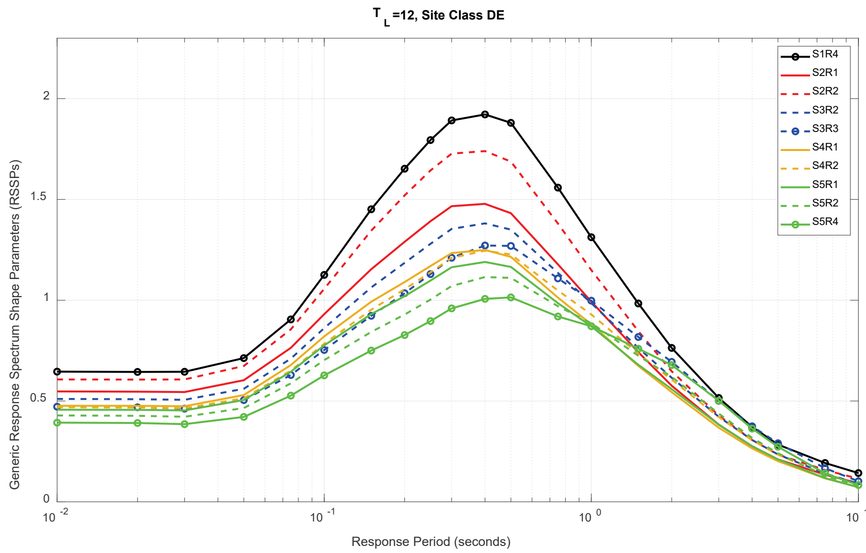


Figure 4.3-2 Plots of RSSPs (logarithmic horizontal axes) for and Site Class DE, for individual (S_S, $R_{S/1}$) bins (top), and for weighted averages of bins within (S_S, $R_{S/1}$) groups (bottom).

Table 4.3-1 Sample Generic RSSPs for T_L = 12 s, S2 Ground Motion Level, R2 Spectral Response Ratio Group, i.e., Table B16 in Appendix B. Column DE Corresponds to the Red Dashed Line in the Bottom Plots of Figures 4.2-7 and 4.2-8

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.331	0.372	0.437	0.502	0.560	0.590	0.603	0.615	0.590
0.01	0.333	0.374	0.439	0.504	0.563	0.593	0.607	0.619	0.593
0.02	0.343	0.384	0.447	0.510	0.565	0.594	0.606	0.614	0.594
0.03	0.397	0.437	0.496	0.550	0.594	0.610	0.607	0.607	0.610
0.05	0.549	0.591	0.644	0.686	0.708	0.700	0.674	0.662	0.708
0.08	0.707	0.766	0.838	0.887	0.906	0.888	0.855	0.844	0.906
0.10	0.766	0.850	0.961	1.042	1.083	1.079	1.056	1.055	1.083
0.15	0.759	0.867	1.048	1.198	1.301	1.338	1.345	1.358	1.338
0.20	0.677	0.788	**1.000**	1.221	1.389	1.476	1.520	1.555	1.476
0.25	0.591	0.698	0.915	1.177	1.406	1.548	1.644	1.712	1.548
0.30	0.524	0.623	0.834	1.106	1.382	1.574	1.727	1.837	1.574
0.40	0.427	0.513	0.703	0.963	1.273	1.517	1.740	1.896	1.517
0.50	0.362	0.438	0.610	0.853	1.161	1.431	1.688	1.878	1.431
0.75	0.271	0.316	0.445	0.633	0.884	1.126	1.380	1.595	1.126
1.0	0.211	0.235	0.335	0.483	0.686	0.901	1.149	1.360	0.901
1.5	0.146	0.156	0.218	0.319	0.462	0.629	0.846	1.041	0.629
2.0	0.116	0.123	0.162	0.236	0.340	0.469	0.647	0.815	0.469
3.0	0.082	0.087	0.106	0.154	0.222	0.307	0.428	0.544	0.307
4.0	0.063	0.067	0.080	0.115	0.163	0.223	0.307	0.387	0.223
5.0	0.053	0.056	0.065	0.092	0.129	0.173	0.234	0.293	0.173
7.5	0.042	0.044	0.050	0.068	0.092	0.120	0.158	0.196	0.120
10	0.035	0.036	0.041	0.054	0.071	0.090	0.115	0.140	0.090

4.4 Procedure for Developing Site-Specific Probabilistic MPRS

This section describes the procedure for selecting, scaling, and combining the generic RSSPs of Appendix B to develop a set of site-specific probabilistic MPRS for given values of T_L, S_S, and S_1. Again, each set of probabilistic MPRS describe the maximum-direction, risk-targeted, 5%-damped spectral response accelerations at 22 response periods (from 0.0 s to 10 s) for each of eight site classes (i.e., Site Classes A, B, BC, C, CD, D, DE, and E).

The process for developing site-specific MPRS is described in Section 3.3. It is essentially the same for deterministic MPRS and probabilistic MPRS once the appropriate set(s) of RSSPs is(are) selected (e.g., from Appendix B for development of probabilistic MPRS). The three site-specific parameters T_L, S_S, and $R_{S/1} = S_S/S_1$ are the required "input" parameters for selecting sets of probabilistic RSSPs, as described below.

4.4.1 Probabilistic Input Parameters

Probabilistic input parameters S_S and $R_{S/1} = S_S/S_1$ are defined by 0.2-second response, and its ratio to 1-second response for Site Class BC, respectively, from probabilistic MCE_R ground motions of the site of interest. The

parameter values used in this chapter to develop generic probabilistic RSSPs are calculated in accordance with the proposed requirements of the 2020 *NEHRP Provisions* and ASCE 7-22. When probabilistic MPRS are developed using S_S and S_1 values from previous versions of the *NEHRP Provisions*, they are calculated as the products of the risk coefficients (i.e., C_{RS} and C_{R1}), and uniform hazard ground motion parameters (i.e., S_{SUH} and S_{1UH}) after they have been adjusted for the proposed maximum-direction factors of the 2020 *NEHRP Provisions* and ASCE 7-22 (i.e., factor of 1.2 at the 0.2 s response instead of the previous 1.1, and factor of 1.25 at 1 s response instead of the previous 1.3).

The long-period transition input parameter, T_L, is used as a surrogate to approximate the earthquake magnitude that contributes most to the hazard at long periods at a given location. It can be estimated from the mapped values in Figure 3.2-1, which is also available for all other states and U.S. territories in the 2015 *NEHRP Provisions* and ASCE 7-16.

4.4.2 Selection of Probabilistic RSSPs

For a given site of interest, the values of parameters T_L, S_S, and $R_{S/1}$ must first be determined. Then, one of the 41 generic sets of probabilistic RSSPs provided in Appendix B is selected for developing both "short-period" and "long-period" MPRS. Each of the generic RSSP tables in Appendix B follow a naming convention and are labeled as "GTL#S#R#," where "G" stands for "group" and each # character is an identifier for one of the five groups defined in Section 4.1.1, corresponding to the appropriate values of T_L, S_S, and $R_{S/1}$, respectively.

T_L can take on one of five values, consisting of: 16 s, 12 s, 8 s, and 6 s (one for inside or outside of the Puget Sound region). If the T_L estimate for a site is not one of these five values, the RSSP table with the closest T_L value (closest controlling magnitude event, see Figure 3.2-1) is to be selected. For example, if T_L = 4 s, use the table for T_L = 6 s. If T_L = 20 s, use the table for T_L = 16 s. If T_L = 6 s in a region outside of the Puget Sound (or where subduction earthquakes are not dominating the hazard), use the tables for T_L = 6 s outside of the Puget Sound (i.e., developed from Idaho and Nevada data), otherwise use the tables for T_L = 6 s inside of the Puget Sound (i.e., from Washington data).

The ground motion level, S_S, can be one of the following levels: S1 (very low), S2 (low), S3 (moderate), S4 (high), or S5 (very high). The range of S_S that specifies each level varies slightly depending on the T_L region of the site, because it is calculated using the sample data in each group. Once the value

of S_S is determined, the level can be determined from Table 4.4-1. These numbers are consistent with center values for each level reported in Tables 4.2-6 to 4.2-10.

Table 4.4-1 Definition of S_S (g) Range for the Five Ground Motion Levels and Each T_L Region, Based on the Statistics of Sample Data Reported in Tables 4.2-6 to 4.2-10

	T_L = 16 s	T_L = 12 s	T_L = 8 s	T_L = 6 s (WA)	T_L = 6 s (ID, NV)
S1:	≤ 0.660	≤ 0.696	≤ 0.677	≤ 0.740	≤ 0.553
S2:	(0.660,1.203]	(0.696,1.114]	(0.677,1.233]	(0.740,1.313]	(0.553,1.155]
S3:	(1.203,1.708]	(1.114,1.684]	(1.233,1.720]	(1.313,1.628]	(1.155,1.825]
S4:	(1.708,2.298]	(1.684,2.165]	(1.720,2.143]	> 1.628	(1.825,2.193]
S5:	> 2.298	> 2.165	> 2.143		> 2.193

Once the appropriate T_L and S_S groups are determined, the $R_{S/1}$ value is used to determine which of the five spectral response ratio groups (R1, R2, R3, R4, and R5) is appropriate. The five groups are defined in Section 4.1.1; however, there are several missing $R_{S/1}$ groups for a given (T_L, S_S) combination among the final 41 generic RSSPs. For instances where the selected $R_{S/1}$ group is missing for the T_L and S_S groups of interest, the closest $R_{S/1}$ group within that (T_L, S_S) group is to be selected. Examples of selecting appropriate sets of generic RSSPs are provided for a site in Irvine, California in Section 4.5, and for six non-conterminous U.S. sites in Chapter 7.

4.4.3 Calculation of Probabilistic MPRS

Site-specific probabilistic MPRS are calculated by first calculating a set of "short-period" and a set of "long-period" probabilistic MPRS, as described in Section 3.3.3, and then by combining these two sets of MPRS, as described in Section 3.3.4. It should be noted that this is the same process that is used to calculate deterministic MPRS (described in Chapter 5).

4.5 Example Set of Probabilistic MPRS for Irvine, California

This section provides an example of "derived" probabilistic MPRS for a site in Irvine, California, calculated using the procedures of Sections 3.3 and 4.4, assuming only values of parameters T_L, S_S, and S_1 are known. The resulting set of derived probabilistic MPRS is compared with the set of probabilistic MPRS calculated in accordance with the site-specific procedures of Section 21.2.1 of the 2020 *NEHRP Provisions* and ASCE 7-22. The intent of this comparison (and additional comparisons in Chapter 6) is to show that

probabilistic MPRS derived from values of T_L, S_S, and S_1 can accurately reflect the frequency content of probabilistic MCE_R ground motions for all response periods and site classes.

4.5.1 Irvine Site

The Irvine Site (latitude: 33.65°, longitude: -117.80°) is located in Southern California in the proximity of several major faults, as shown in Figure 4.5-1. This site was selected because the ground motions are governed probabilistically at almost all response periods and site classes of interest. The long-period transition period, T_L, is 8 s (see Figure 3.2-1). The site-specific probabilistic value of the parameter S_S is 1.430g and the site-specific probabilistic value of the parameter S_1 is 0.455g, resulting in the ratio $R_{S/1}$ = 1.430/0.455 = 3.14 for this site. These values are obtained from the probabilistic MPRS of Appendix D for the Irvine Site (i.e., Table D.1-5 of Appendix D).

Figure 4.5-1 Map of Southern California, showing the location of the Irvine Site and its proximity to major faults.

The deaggregation of hazard for this site shows that the hazard at shorter periods, e.g., 0.2 s, is mainly controlled by smaller magnitude events (mean magnitude 7.25 for Site Class BC) at smaller distances (about 10 km), while the hazard at longer periods, e.g., 1 s, is mainly controlled by slightly larger magnitude events (mean magnitude 7.29) at slightly larger distances (about 20 km). These magnitudes are not used in deriving the probabilistic MPRS; they are only provided here to gain a better understanding of the hazard at the site. In the next section, values of S_S, $R_{S/1}$, and T_L are used directly to derive the probabilistic MPRS.

4.5.2 Derived Probabilistic MPRS

In this example, T_L = 8 s suggests a governing magnitude of about 7.0 to 7.5 (see Figure 3.2-1). The ground motion level S_S = 1.430g suggests a "moderate" S3 ground motion level for this T_L region (see Table 4.4-1), and the spectral response ratio $R_{S/1}$ = 3.14 falls under the R2 category, which suggests a governing magnitude of roughly 6.5 to 7.0 (see Section 4.1.1). These rough estimates of controlling magnitude based on T_L and $R_{S/1}$ parameters are not too different from the deaggregation results for this site.

Following the guidelines in Section 4.4.2 for selection of the appropriate set of generic RSSPs, the input parameters (i.e., T_L = 8 s, S3 moderate ground motion level, and R2 spectral response ratio group) suggest that the appropriate generic set of RSSPs for this site is "GTL8S3R2." However, spectral response ratio group R2 does not exist for TL8S3 among the 41 sets of generic RSSPs; therefore, the closest available $R_{S/1}$ group is R1, and "GTL8S3R1," which corresponds to Table B-26 from Appendix B, is selected for this site. This generic set of RSSPs is shown below in Table 4.5-1.

Table 4.5-1 The Generic Set of RSSPs Used for the Irvine Site, Corresponding to T_L = 8 s, S3 Ground Motion Level, and R1 Spectral Response Ratio Group (i.e., GTL8S3R1, Table B-26 in Appendix B)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.324	0.363	0.423	0.473	0.502	0.495	0.469	0.456	0.502
0.01	0.326	0.365	0.426	0.476	0.505	0.498	0.472	0.460	0.505
0.02	0.338	0.377	0.436	0.483	0.508	0.499	0.471	0.455	0.508
0.03	0.396	0.434	0.488	0.522	0.533	0.510	0.467	0.445	0.533
0.05	0.562	0.603	0.641	0.653	0.632	0.579	0.514	0.483	0.653
0.08	0.727	0.785	0.833	0.839	0.798	0.725	0.648	0.615	0.839
0.10	0.780	0.863	0.951	0.977	0.941	0.865	0.785	0.753	0.977
0.15	0.769	0.876	1.047	1.130	1.124	1.053	0.967	0.932	1.130
0.20	0.682	0.792	**1.000**	1.172	1.214	1.162	1.081	1.048	1.214
0.25	0.592	0.695	0.907	1.138	1.245	1.229	1.168	1.147	1.245
0.30	0.521	0.615	0.821	1.065	1.240	1.267	1.238	1.235	1.267
0.40	0.421	0.498	0.682	0.921	1.153	1.241	1.266	1.289	1.241
0.50	0.352	0.418	0.582	0.805	1.047	1.177	1.240	1.290	1.177
0.75	0.256	0.294	0.416	0.588	0.797	0.942	1.045	1.131	0.942
1.0	0.195	0.217	0.311	0.447	0.623	0.772	0.906	1.012	0.772
1.5	0.128	0.137	0.194	0.284	0.405	0.535	0.688	0.817	0.535
2.0	0.098	0.104	0.139	0.202	0.291	0.398	0.543	0.677	0.398
3.0	0.067	0.071	0.087	0.126	0.182	0.253	0.353	0.447	0.253
4.0	0.050	0.053	0.062	0.090	0.128	0.176	0.243	0.306	0.176
5.0	0.042	0.043	0.049	0.070	0.098	0.132	0.179	0.223	0.132
7.5	0.030	0.030	0.033	0.045	0.060	0.079	0.104	0.127	0.079
10	0.022	0.022	0.024	0.032	0.042	0.053	0.068	0.081	0.053

This table is developed based on data from 832 probabilistic census tract sites, using four bins from Table 4.2-3 that contain the 14+283+142+393 = 832 sites. The value of $R_{S/1}$ for this set of RSSPs is 1.000/0.311 = 3.22, which is very close to the $R_{S/1}$ value of the Irvine Site (i.e., 3.14). Therefore, very good estimates are expected for the long period content of the derived MPRS.

The short-period and long-period MPRS are constructed according to Section 3.3, by scaling the selected set of RSSPs to match the probabilistic S_S and S_1 values of the site (see Tables 4.5-2 and 4.5-3). Values of T_{amax} and T_{vmax}, for determination of short-period and long-period response domains, are calculated and shown in Table 4.5-4. Finally, the short-period and long-period MPRS are combined using the procedures outlined in Section 3.3.4. The period-dependent values of the weighting factor, W_T, are shown in Table 4.5-5 for mid-period MPRS and the final derived probabilistic MPRS is shown in Table 4.5-6.

Table 4.5-2 Short-Period MPRS for Irvine Site, Scaled to Match S_S = 1.430 g

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.463	0.519	0.605	0.677	0.718	0.708	0.670	0.652	0.718
0.01	0.466	0.522	0.609	0.681	0.722	0.713	0.675	0.658	0.722
0.02	0.483	0.539	0.624	0.691	0.726	0.714	0.673	0.650	0.726
0.03	0.567	0.621	0.699	0.747	0.763	0.729	0.668	0.636	0.763
0.05	0.804	0.862	0.916	0.934	0.904	0.828	0.736	0.691	0.934
0.08	1.039	1.123	1.192	1.201	1.142	1.037	0.927	0.879	1.201
0.10	1.115	1.234	1.360	1.398	1.346	1.238	1.122	1.077	1.398
0.15	1.100	1.252	1.498	1.616	1.608	1.507	1.384	1.334	1.616
0.20	0.976	1.132	**1.430**	1.676	1.736	1.663	1.546	1.499	1.736
0.25	0.847	0.994	1.298	1.627	1.781	1.758	1.671	1.641	1.781
0.30	0.746	0.879	1.174	1.524	1.774	1.812	1.770	1.767	1.812
0.40	0.602	0.713	0.975	1.317	1.650	1.775	1.810	1.844	1.775
0.50	0.504	0.597	0.833	1.151	1.497	1.684	1.773	1.846	1.684
0.75	0.366	0.420	0.594	0.841	1.140	1.348	1.494	1.618	1.348
1.0	0.280	0.311	0.444	0.640	0.891	1.104	1.296	1.447	1.104
1.5	0.183	0.197	0.278	0.406	0.580	0.766	0.984	1.169	0.766
2.0	0.141	0.149	0.199	0.289	0.416	0.569	0.777	0.968	0.569
3.0	0.096	0.101	0.124	0.181	0.261	0.362	0.505	0.639	0.362
4.0	0.072	0.076	0.089	0.129	0.184	0.252	0.348	0.437	0.252
5.0	0.060	0.062	0.070	0.099	0.139	0.189	0.257	0.319	0.189
7.5	0.042	0.043	0.047	0.064	0.086	0.113	0.149	0.182	0.113
10	0.031	0.032	0.034	0.045	0.059	0.076	0.097	0.116	0.076

Table 4.5-3 Long-Period MPRS for Irvine Site, Scaled to Match S_1 = 0.455 g

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.474	0.531	0.620	0.693	0.735	0.725	0.686	0.668	0.735
0.01	0.477	0.535	0.623	0.697	0.739	0.730	0.692	0.674	0.739
0.02	0.494	0.552	0.639	0.707	0.744	0.731	0.689	0.666	0.744
0.03	0.580	0.636	0.715	0.765	0.781	0.746	0.684	0.651	0.781
0.05	0.823	0.882	0.938	0.956	0.925	0.847	0.753	0.708	0.956
0.08	1.064	1.150	1.221	1.229	1.169	1.062	0.949	0.900	1.229
0.10	1.142	1.264	1.392	1.431	1.378	1.267	1.149	1.102	1.431
0.15	1.126	1.282	1.533	1.655	1.646	1.543	1.417	1.365	1.655
0.20	0.999	1.159	1.464	1.716	1.777	1.702	1.582	1.535	1.777
0.25	0.867	1.018	1.329	1.666	1.823	1.799	1.710	1.680	1.823
0.30	0.763	0.900	1.202	1.560	1.816	1.855	1.813	1.809	1.855
0.40	0.617	0.730	0.998	1.348	1.689	1.818	1.853	1.888	1.818
0.50	0.516	0.612	0.852	1.178	1.533	1.724	1.815	1.890	1.724
0.75	0.375	0.430	0.609	0.861	1.168	1.380	1.530	1.657	1.380
1.0	0.286	0.318	**0.455**	0.655	0.912	1.130	1.327	1.482	1.130
1.5	0.188	0.201	0.285	0.415	0.594	0.784	1.008	1.197	0.784
2.0	0.144	0.153	0.204	0.296	0.426	0.583	0.795	0.991	0.583
3.0	0.098	0.103	0.127	0.185	0.267	0.370	0.517	0.655	0.370
4.0	0.074	0.077	0.091	0.132	0.188	0.258	0.356	0.447	0.258
5.0	0.061	0.063	0.072	0.102	0.143	0.193	0.263	0.326	0.193
7.5	0.043	0.044	0.048	0.065	0.089	0.116	0.153	0.186	0.116
10	0.032	0.033	0.035	0.046	0.061	0.078	0.099	0.119	0.078

Table 4.5-4 Values of Period T_{amax} for Short-Period MPRS and Values of Period T_{vmax} for Long-Period MPRS

Period	Periods T_{amax} and T_{vmax} by Site Class							
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**
T_{amax}	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.50
T_{vmax}	2.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00

Table 4.5-5 Period-Dependent Values of the Weighting Factor, W_T

Period	Weight Factors							
T (s)	A	B	BC	C	CD	D	DE	E
0.01								
0.02								
0.03								
0.05								
0.08								
0.10								
0.15								
0.20	0.000	0.000	0.000	0.000				
0.25	0.097	0.139	0.139	0.139	0.000			
0.30	0.176	0.252	0.252	0.252	0.132	0.000		
0.40	0.301	0.431	0.431	0.431	0.339	0.179	0.000	
0.50	0.398	0.569	0.569	0.569	0.500	0.317	0.139	0.000
0.75	0.574	0.821	0.821	0.821	0.792	0.569	0.391	0.292
1.0	0.699	1.000	1.000	1.000	1.000	0.748	0.569	0.500
1.5	0.875					1.000	0.821	0.792
2.0	1.000						1.000	1.000
3.0								
4.0								
5.0								
7.5								
10								

Table 4.5-6 Derived Probabilistic MPRS for the Irvine site, Matching (S_S, S_1)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.463	0.519	0.605	0.677	0.718	0.708	0.670	0.652	0.718
0.01	0.466	0.522	0.609	0.681	0.722	0.713	0.675	0.658	0.722
0.02	0.483	0.539	0.624	0.691	0.726	0.714	0.673	0.650	0.726
0.03	0.567	0.621	0.699	0.747	0.763	0.729	0.668	0.636	0.763
0.05	0.804	0.862	0.916	0.934	0.904	0.828	0.736	0.691	0.934
0.08	1.039	1.123	1.192	1.201	1.142	1.037	0.927	0.879	1.201
0.10	1.115	1.234	1.360	1.398	1.346	1.238	1.122	1.077	1.398
0.15	1.100	1.252	1.498	1.616	1.608	1.507	1.384	1.334	1.616
0.20	0.976	1.132	**1.430**	1.676	1.736	1.663	1.546	1.499	1.736
0.25	0.849	0.997	1.302	1.633	1.781	1.758	1.671	1.641	1.781
0.30	0.749	0.884	1.181	1.533	1.779	1.812	1.770	1.767	1.812
0.40	0.607	0.720	0.985	1.330	1.663	1.783	1.810	1.844	1.783
0.50	0.509	0.605	0.844	1.167	1.515	1.696	1.779	1.846	1.696
0.75	0.371	0.428	0.606	0.857	1.162	1.366	1.508	1.630	1.366
1.0	0.284	0.318	**0.455**	0.655	0.912	1.123	1.313	1.465	1.123
1.5	0.187	0.201	0.285	0.415	0.594	0.784	1.004	1.191	0.784
2.0	0.144	0.153	0.204	0.296	0.426	0.583	0.795	0.991	0.583
3.0	0.098	0.103	0.127	0.185	0.267	0.370	0.517	0.655	0.370
4.0	0.074	0.077	0.091	0.132	0.188	0.258	0.356	0.447	0.258
5.0	0.061	0.063	0.072	0.102	0.143	0.193	0.263	0.326	0.193
7.5	0.043	0.044	0.048	0.065	0.089	0.116	0.153	0.186	0.116
10	0.032	0.033	0.035	0.046	0.061	0.078	0.099	0.119	0.078

4.5.3 Comparison of Probabilistic MPRS

The derived set of probabilistic MPRS for the Irvine Site is compared with the set of probabilistic MPRS calculated in accordance with the proposed "site-specific" procedures of the 2020 *NEHRP Provisions* and ASCE 7-22. The second set, denoted hereafter as ASCE 7-22 values, is provided in Table 4.5-7, and represents the "true" values of the MPRS, used here to determine the accuracy and reliability of values derived in the previous section for the Irvine Site. Note that the S_S and S_1 values used in the previous section come directly from these "true" values of MPRS at 0.2 s and 1 s periods for Site Class BC. The percent differences between the derived and "true" values of the probabilistic MPRS are shown in Table 4.5-8. In this table, a positive value represents an overestimation, while a negative value represents an underestimation of the "true" values. For all periods and site classes, the differences are small, within about 5% of the "true" values.

Table 4.5-7 ASCE 7-22 Probabilistic MPRS for the Irvine Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.449	0.516	0.603	0.678	0.726	0.725	0.697	0.683	0.726
0.01	0.452	0.519	0.606	0.682	0.730	0.729	0.703	0.689	0.730
0.02	0.468	0.535	0.621	0.691	0.734	0.731	0.700	0.682	0.734
0.03	0.550	0.615	0.694	0.747	0.771	0.748	0.696	0.669	0.771
0.05	0.783	0.852	0.910	0.936	0.918	0.853	0.771	0.731	0.936
0.08	1.009	1.112	1.187	1.207	1.166	1.076	0.975	0.935	1.207
0.10	1.079	1.226	1.357	1.409	1.379	1.288	1.188	1.149	1.409
0.15	1.073	1.255	1.497	1.625	1.643	1.568	1.465	1.423	1.643
0.20	0.953	1.137	**1.430**	1.679	1.766	1.725	1.632	1.595	1.766
0.25	0.830	1.005	1.303	1.627	1.805	1.818	1.761	1.744	1.818
0.30	0.730	0.894	1.183	1.525	1.794	1.867	1.861	1.875	1.867
0.40	0.587	0.724	0.983	1.318	1.663	1.821	1.893	1.947	1.821
0.50	0.491	0.608	0.841	1.152	1.508	1.720	1.843	1.939	1.720
0.75	0.358	0.431	0.603	0.842	1.144	1.368	1.539	1.682	1.368
1.0	0.277	0.323	**0.455**	0.642	0.892	1.115	1.325	1.490	1.115
1.5	0.185	0.207	0.288	0.411	0.585	0.776	1.003	1.194	0.776
2.0	0.143	0.158	0.208	0.294	0.421	0.576	0.788	0.981	0.576
3.0	0.099	0.108	0.131	0.185	0.265	0.368	0.514	0.650	0.368
4.0	0.075	0.081	0.095	0.133	0.188	0.259	0.357	0.448	0.259
5.0	0.062	0.067	0.075	0.103	0.144	0.195	0.265	0.329	0.195
7.5	0.045	0.047	0.051	0.067	0.091	0.119	0.157	0.191	0.119
10	0.034	0.035	0.037	0.048	0.063	0.080	0.103	0.122	0.080

Table 4.5-8 Percent Differences Between Derived and "True" Values of Probabilistic MPRS for the Irvine Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	3.1	0.5	0.4	-0.1	-1.1	-2.3	-3.8	-4.5	-1.1
0.01	3.1	0.5	0.4	-0.1	-1.1	-2.3	-3.9	-4.5	-1.1
0.02	3.2	0.7	0.5	-0.1	-1.1	-2.3	-3.8	-4.6	-1.1
0.03	3.1	0.9	0.6	0.0	-1.1	-2.5	-4.0	-4.9	-1.1
0.05	2.7	1.2	0.7	-0.2	-1.5	-3.0	-4.6	-5.4	-0.2
0.08	3.0	1.0	0.4	-0.6	-2.0	-3.6	-4.9	-6.0	-0.6
0.10	3.3	0.7	0.2	-0.8	-2.3	-3.9	-5.5	-6.3	-0.8
0.15	2.5	-0.2	0.0	-0.6	-2.1	-3.9	-5.5	-6.3	-1.6
0.20	2.4	-0.4	0.0	-0.2	-1.7	-3.6	-5.3	-6.0	-1.7
0.25	2.3	-0.7	-0.1	0.3	-1.4	-3.3	-5.1	-5.9	-2.0
0.30	2.5	-1.0	-0.2	0.5	-0.8	-3.0	-4.9	-5.8	-3.0
0.40	3.4	-0.6	0.2	1.0	0.0	-2.1	-4.3	-5.3	-2.1
0.50	3.6	-0.5	0.4	1.3	0.5	-1.4	-3.5	-4.8	-1.4
0.75	3.6	-0.6	0.5	1.8	1.5	-0.1	-2.0	-3.1	-0.1
1.0	2.5	-1.6	0.0	2.0	2.2	0.7	-0.8	-1.7	0.7
1.5	1.5	-2.9	-1.3	1.1	1.5	1.1	0.1	-0.3	1.1
2.0	0.6	-3.5	-2.0	0.5	1.2	1.1	1.0	1.0	1.1
3.0	-0.6	-4.4	-3.3	-0.3	0.5	0.5	0.5	0.6	0.5
4.0	-1.5	-5.0	-4.2	-1.0	-0.2	-0.2	-0.2	-0.1	-0.2
5.0	-1.8	-4.8	-4.1	-1.4	-0.7	-0.8	-0.9	-0.7	-0.8
7.5	-3.6	-5.6	-5.4	-3.1	-2.5	-2.6	-2.6	-2.5	-2.6
10	-4.0	-5.8	-5.5	-3.5	-3.0	-3.1	-3.1	-3.0	-3.1

In the figures below, comparisons of probabilistic MCE_R response spectra are made for three hypothetical site conditions: Site Classes BC, CD, and DE. These comparisons illustrate the differences in probabilistic MCE_R ground motions for different site conditions. Figures 4.5-2, 4.5-3, and 4.5-4 are plots of MCE_R response spectra comparing derived values (from Table 4.5-6) and ASCE 7-22 values (from Table 4.5-7) of probabilistic MPRS for each of these three hypothetical site classes, respectively. In these figures, the ASCE 7-22 deterministic MPRS (with lower limits, see Chapter 5) are also plotted to show that the probabilistic values govern at almost all periods and site classes for this site, except for a few mid-range periods (2.0 to 4.0 s for Site Class CD, and 1.0 to 12.0 s for Site Class DE) where the deterministic and probabilistic values are not that different.

Figures 4.5-5, 4.5-6, and 4.5-7 are plots of the same MCE_R response spectra using a different horizontal axis that better shows the long-period response. For all periods and site classes, these figures show that the probabilistic MPRS derived from only the values of T_L, S_S, and S_1 are very close to their actual "true" values for all periods and site classes of interest (i.e., the red and green lines are almost on top of each other in all figures).

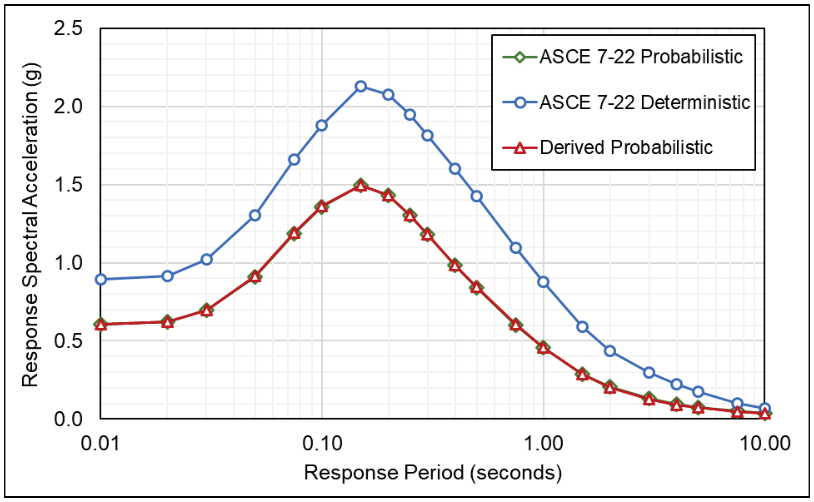


Figure 4.5-2 MCE$_R$ Response Spectra, Irvine Site, Site Class BC.

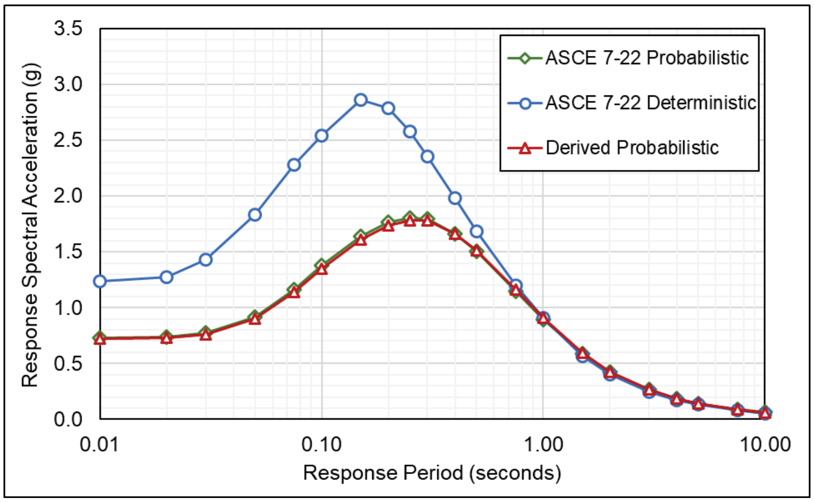


Figure 4.5-3 MCE$_R$ Response Spectra, Irvine Site, Site Class CD.

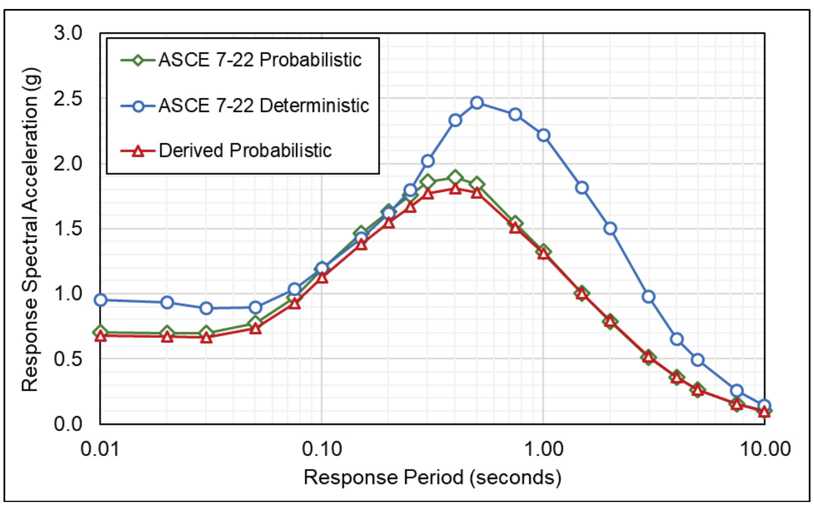


Figure 4.5-4 MCE$_R$ Response Spectra, Irvine Site, Site Class DE.

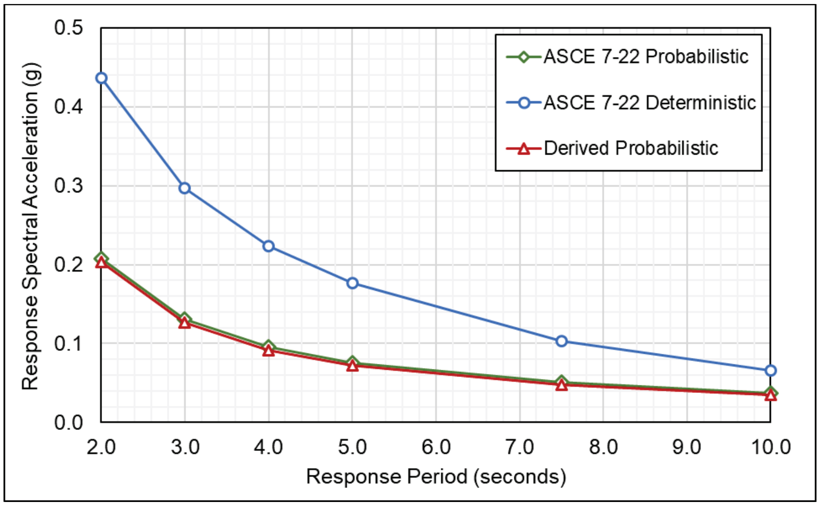


Figure 4.5-5 MCE$_R$ Response Spectra, Irvine Site, Site Class BC.

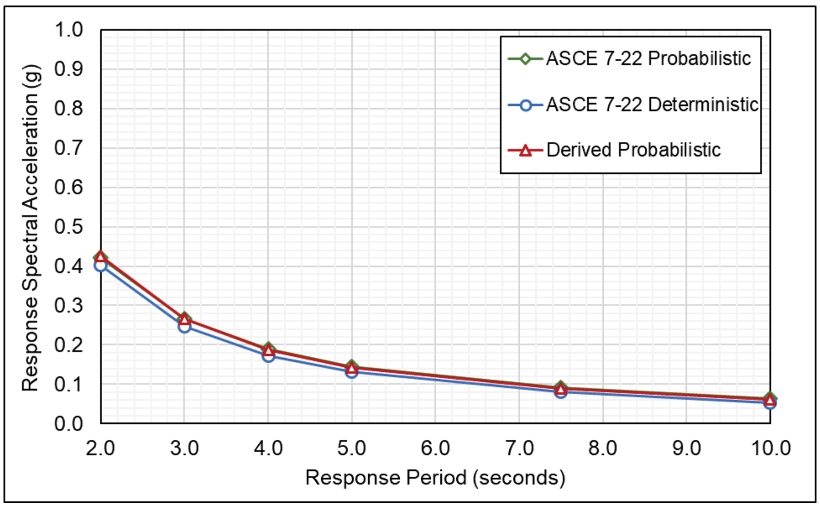


Figure 4.5-6 MCE$_R$ Response Spectra, Irvine Site, Site Class CD.

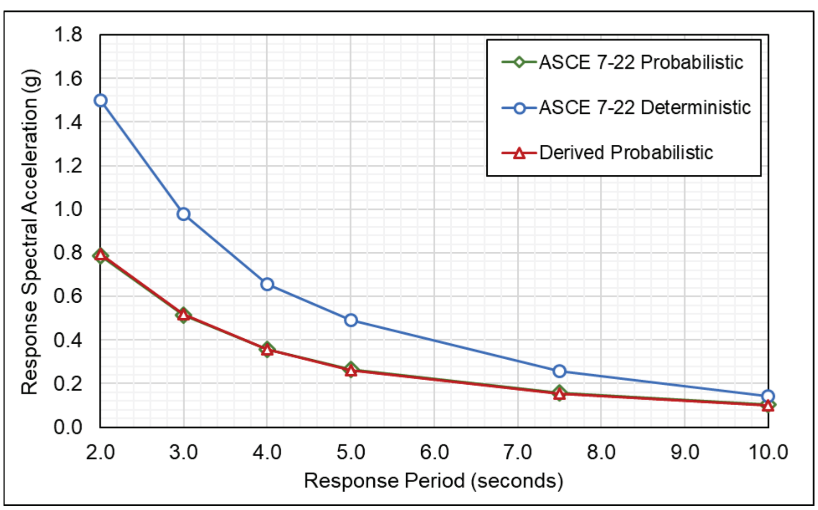


Figure 4.5-7 MCE$_R$ Response Spectra, Irvine Site, Site Class DE.

Chapter 5
Development of Deterministic Multi-Period Response Spectra

This chapter defines 15 sets of generic deterministic response spectrum shape parameters (RSSPs) that characterize the generic frequency content of deterministic MCE_R multi-period response spectra (MPRS). It describes procedures that may be used to derive site-specific deterministic MPRS from these RSSPs where only values of the ground motion parameters S_S and S_1 are known. It provides an example illustrating the procedures, deriving deterministic MPRS for a site in San Mateo, California (assuming only S_S and S_1 are known for this site), and validates the results by comparison with site-specific deterministic MPRS proposed for the 2020 *NEHRP Provisions* and ASCE 7-22. Finally, it utilizes these procedures to develop the set of MPRS defining lower limit deterministic MCE_R response proposed for Table 21.2-1 of the 2020 *NEHRP Provisions* and ASCE 7-22.

In this chapter, the parameters S_S and S_1 designate 0.2-second and 1-second response of deterministic MCE_R ground motions for Site Class BC, calculated in accordance with the requirements of Section 21.2.2 of the 2020 *NEHRP Provisions* and ASCE 7-22. As such, these parameters represent MCE_R ground motions at sites in regions of high seismicity where the deterministic S_S and S_1 are: (1) greater than or equal to those of the lower limit deterministic MCE_R response spectrum (e.g., S_S = 1.5g and S_1 = 0.6g); and (2) less than the probabilistic MCE_R values of S_S and S_1 (e.g., values of S_S and S_1 of Chapter 4).

5.1 Approach and Methods

5.1.1 Overview

As discussed in Chapter 3, the primary factors that influence the shape (frequency content) of earthquake ground motion response spectra are: (1) site conditions; (2) ground motion level; and (3) earthquake magnitude. Here, deterministic RSSPs characterizing the generic shapes of deterministic MPRS are developed for 15 sets of ground motions. The 15 sets are combinations of three response levels each defined by paired values of the parameters S_S and S_1 (i.e., S_S = 1.5g and S_1 = 0.6g, S_S = 2.0g and S_1 = 0.8g, and S_S = 2.5g and S_1 = 1.0g) and five earthquake magnitudes (i.e., M6.0,

M6.5, M7.0, M7.5, and M8.0). Each set of RSSPs describes 5%-damped spectral response acceleration at 22 response periods (from 0.0 s to 10 s) for each of eight site classes (i.e., Site Classes A, B, BC, C, CD, D, DE, and E).

The three discrete ground motion levels are selected to correspond approximately to the grouping of probabilistic RSSPs (see Chapter 4), excluding groups with ground motions below the lower limit on deterministic MCE_R ground motions (e.g., $S_S < 1.5g$, $S_1 < 0.6g$). The five discrete earthquake magnitudes (M6.0, M6.5, M7.0, M7.5, and M8.0) are selected to represent the range of earthquake magnitudes that typically govern deterministic MCE_R ground motions. Where the magnitude of interest does not match one of the discrete magnitudes, interpolation of RSSPs is used to eliminate potential bias in the frequency content (e.g., at long periods).

Each set of deterministic RSSPs is determined from a set of deterministic multi-period MCE_R response spectra collectively normalized to 1.0g at 0.2-second response for Site Class BC (i.e., $S_S = 1.0g$). The set of deterministic MCE_R response spectra represents ground motions for one of the 15 combinations of ground motion level and earthquake magnitude.

5.1.2 NGA-West2 Spreadsheet Calculation of MCE_R Ground Motion Response Spectra

In this chapter, deterministic MCE_R ground motion response spectra are calculated at each period of interest using a version of the PEER NGA-West2 spreadsheet (Seyhan, 2014) modified to expedite: (1) preprocessing of input parameters; (2) postprocessing of response spectra; and (3) development of deterministic MPRS. The NGA-West2 spreadsheet calculates median and 84th percentile RotD50 response, and postprocessing includes factoring RotD50 response to obtain RotD100 (maximum direction) response, as required by Section 21.2 of the 2020 *NEHRP Provisions* and ASCE 7-22. Factors used to convert RotD50 to RotD100 response are based on Shahi and Baker (2013; 2014), as discussed in Section 3.1.3 of this report.

The NGA-West2 spreadsheet provides options for selecting and weighting ground motion models (GMMs) and specifying values of various source and site parameters. Spreadsheet calculations for this chapter are made using: (1) values of source and site parameters deemed to best represent typical conterminous Western United States (WUS) ground motions, as described in Section 5.1.3; and (2) the same set of four equally weighted GMMs as those underlying the 2018 update of the USGS NSHM for WUS (shallow crustal) sites, as discussed Section 5.1.4.

5.1.3 Values of Source and Site Parameters

Source and site parameters of the NGA-West2 GMMs include earthquake magnitude, distance from the site to fault rupture (e.g., R_x), fault mechanism (e.g., strike slip, reverse, or normal), top of rupture depth (Z_{TOR}), fault width (W), dip angle (δ), site shear wave velocity (V_{S30}), and basin depth terms (e.g., $Z_{1.0}$ and $Z_{2.5}$). With the exception of earthquake magnitude and shear wave velocity, values of each of the parameters of the GMMs must be either assumed, based on typical source and site conditions, or derived from the values of other parameters (e.g., the fault distance, R_x, is back-figured for a given magnitude to achieve the target value of S_S or S_1).

In all cases, the fault mechanism is assumed to be strike-slip, with values of dip angle $\delta = 90°$, width $W = 13$ km, and top of rupture depth $Z_{TOR} = 0.3$ km, and fault properties typical of shallow crustal sources in the WUS. Spectral shape is relatively insensitive to these assumptions. Basin depth terms are taken as equal to the V_{S30}-based default values provided with the NGA-West2 GMMs (i.e., the values of basin depth terms estimated from site class shear wave velocity). Basin depth terms can significantly influence response at longer periods (i.e., periods greater than about 1 s).

For site classes other than Site Class A and E, the value of site class shear wave velocity is taken as the geometric center of the range of shear wave velocities of the site class of interest, as summarized in Table 2.2-1. The center value of Site Class A is taken as 5,000 fps, roughly equal to 1,500 mps. The USGS also calculated Site Class A in the WUS with a V_{S30} of 1,500 mps; harder rocks are uncommon in this region. The center of Site Class E is taken as 500 fps (roughly 150 mps), based approximately on the limits of applicability of the NGA-West2 GMMs. Site Class A and Site Class E are relatively rare site conditions in the WUS.

5.1.4 Average 84th Percentile Response of NGA-West2 GMMs

In this chapter, deterministic MCE_R response spectra are calculated as the average of the 84th percentile RotD50 response of four NGA-West2 GMMs (i.e., ASK14, BSSA14, CB14, and CY14) factored to represent RotD100 (maximum direction) response, consistent with Section 21.2 of the 2020 *NEHRP Provisions* and ASCE 7-22.

Both the values of the lognormal standard deviation parameter (LnStdDev) of the GMMs, relating 84th percentile to median response, and the factors relating RotD100 to RotD50 response, are period dependent, and significantly influence the frequency content of the deterministic MCE_R ground motions. For example, Table 5.1-1 provides period-dependent values

of the following: (A) the ratio of RotD100 (maximum direction) to RotD50 response; (B) the ratio of 84th percentile to median response ($e^{LnStdDev}$); and (C) the total factor (A × B) relating 84th percentile RotD100 to median RotD50 response for Site Classes BC, CD, and DE, respectively. The LnStdDev values of the four NGA-West2 GMMs are mildly magnitude and fault distance dependent; in this example, they are based on a magnitude 8.0 earthquake at R_x = 12.5 km. Figure 5.1-1 shows trends of the total factor as a function of period. The takeaway from the factors of Table 5.1-1 and plots of Figure 5.1-1 is that the ratio of 84th percentile RotD100 (maximum direction) to median RotD50 varies significantly with period and site class.

Table 5.1-1 Example Values of Factors Relating 84th Percentile RotD100 (Maximum Direction) Response to Median RotD50 (Geomean) Response for Site Classes BC, CD, and DE

Period T (s)	(A) Ratio of Max to Geomean	84th Percentile Response (M8.0 at 12.5 km)						Total Factor (C = A x B)		
		LnStdDev			(B) exp(LnStdDev)					
		BC	CD	DE	BC	CD	DE	BC	CD	DE
0.000	1.200	0.60	0.55	0.47	1.81	1.74	1.60	2.18	2.09	1.93
0.010	1.200	0.60	0.56	0.47	1.82	1.74	1.61	2.18	2.09	1.93
0.020	1.200	0.60	0.56	0.48	1.82	1.74	1.62	2.18	2.09	1.94
0.030	1.200	0.61	0.56	0.49	1.84	1.75	1.62	2.21	2.10	1.95
0.050	1.200	0.63	0.57	0.50	1.88	1.78	1.65	2.25	2.13	1.98
0.075	1.200	0.65	0.59	0.51	1.91	1.80	1.67	2.29	2.16	2.00
0.10	1.200	0.66	0.59	0.51	1.93	1.80	1.67	2.31	2.16	2.00
0.15	1.200	0.65	0.57	0.49	1.92	1.78	1.63	2.30	2.13	1.95
0.20	1.200	0.64	0.57	0.47	1.91	1.78	1.60	2.29	2.13	1.92
0.25	1.203	0.64	0.58	0.47	1.90	1.79	1.60	2.28	2.16	1.92
0.30	1.206	0.65	0.60	0.48	1.91	1.83	1.62	2.30	2.21	1.96
0.40	1.213	0.66	0.63	0.51	1.93	1.88	1.67	2.34	2.28	2.03
0.50	1.219	0.67	0.65	0.54	1.95	1.92	1.72	2.38	2.34	2.09
0.75	1.234	0.70	0.69	0.59	2.01	1.99	1.80	2.48	2.45	2.23
1.0	1.250	0.71	0.70	0.63	2.03	2.01	1.89	2.54	2.52	2.36
1.5	1.253	0.71	0.71	0.67	2.04	2.03	1.96	2.55	2.54	2.45
2.0	1.256	0.71	0.71	0.70	2.04	2.03	2.01	2.56	2.55	2.52
3.0	1.261	0.71	0.71	0.71	2.04	2.04	2.03	2.57	2.57	2.57
4.0	1.267	0.70	0.70	0.70	2.02	2.02	2.02	2.55	2.55	2.55
5.0	1.272	0.70	0.70	0.70	2.02	2.02	2.02	2.57	2.57	2.57
7.5	1.286	0.70	0.70	0.70	2.01	2.01	2.01	2.59	2.59	2.59
10.0	1.300	0.69	0.69	0.69	1.99	1.99	1.99	2.58	2.58	2.58

The period-dependent and site class-dependent variations of the term $e^{LnStdDev}$ reflect the composite ground motion variability of NGA-West2 GMMs. Composite variability is calculated by the NGA-West2 spreadsheet, at each period for the site class of interest, as the weighted average of 84th percentile response divided by the weighted average of median response, where 84th percentile response is calculated individually for each GMM based on the ground motion variability of the individual GMM. Although also equally weighted, the four NGA-West2 GMMs are embedded in the 2018 USGS NSHM in a more complex representation of probabilistic hazard. As such,

proposed deterministic MCE_R ground motions derived by the USGS from probabilistic MCE_R ground motions (i.e., probabilistic MCE_R ground motions adjusted to represent 84th percentile response, as described in Section 2.2.3) will be somewhat different from those based on the average 84th percentile response of the four equally weighted GMMs.

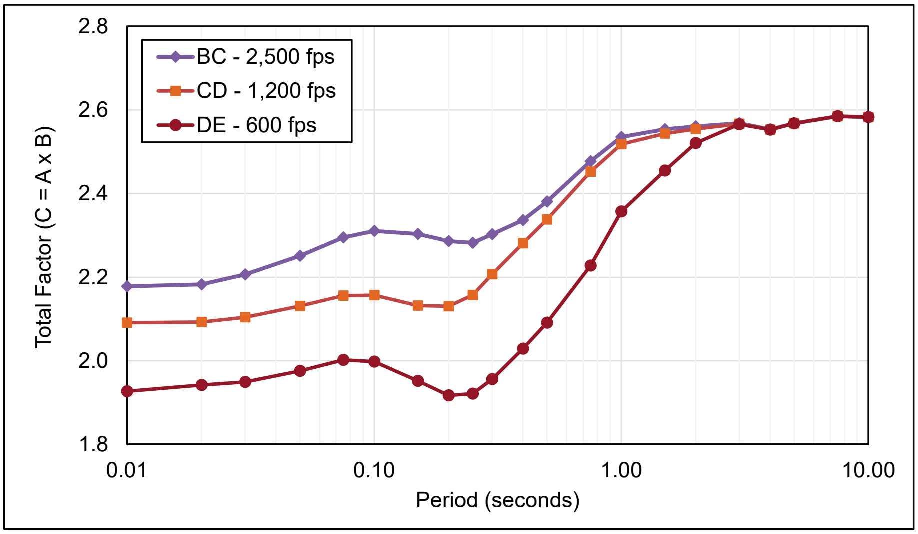


Figure 5.1-1 Plots of example values of the total factor (C = A × B) relating 84th percentile RotD100 response to median RotD50 response for Site Classes BC, CD, and DE.

5.2 Generic Deterministic RSSPs

Sets of generic deterministic response spectrum shape parameters (RSSPs) are calculated for each of the five earthquake magnitudes (M6.0, M6.5, M7.0, M7.5, and M8.0) as a weighted combination of scenario earthquakes that generate the ground motion level of interest. Ground motion levels are categorized by three paired values of the parameters, S_S and S_1 (i.e., $S_S = 1.5$g and $S_1 = 0.6$g, $S_S = 2.0$g and $S_1 = 0.8$g, and $S_S = 2.5$g and $S_1 = 1.0$g), that represent independent target values of 0.2-second response and 1-second response for Site Class BC.

In general, the earthquake magnitude and fault distance (R_x) required to match the "target" value of S_S will not also match the target value of S_1 (and vice versa). For example, a magnitude 8.0 earthquake at 13.0 km generates values of $S_S = 1.5$g (target value) and $S_1 = 0.581$g, where the latter is somewhat less than the target value of $S_1 = 0.6$g. A magnitude 8.0 event at 12.3 km generates values of $S_1 = 0.6$g (target value) and $S_S = 1.545$g, where the latter is somewhat greater than the target value of $S_S = 1.5$g. Each set of deterministic RSSPs is the weighted average of the RSSPs of the two target sets (i.e., one set based on the target value of S_S and the other based on the target value of S_1). The weighting factor is judgmentally assigned

considering the likelihood of fault distance. The weighted average of the two target RSSPs is intended to characterize the typical frequency content of the ground motion level of interest. For each of the five earthquake magnitudes, Table 5.2-1 summarizes the fault distances and weighting factors of the scenario earthquakes used to develop the 15 sets of deterministic RSSPs. Fault distances of 0.0 km indicate that the target value of 84th percentile ground motions cannot be achieved for the given magnitude.

Table 5.2-1 Summary of Fault Distance (R_x) and Weighting Factors of Scenario Earthquakes Used to Generate Deterministic RSSPs

Target	Scenario Earthquake Fault Distance, R_x (km)				
S_S and S_1 Levels	M8.0	M7.5	M7.0	M6.5	M6.0
S_S = 1.5 g	13.0	10.6	8.8	6.9	4.7
S_1 = 0.6 g	12.3	8.8	6.2	3.7	0.0
S_S/S_1 Weight	50/50	50/50	50/50	75/25	100/0
S_S = 2.0 g	7.3	6.0	5.0	3.7	1.6
S_1 = 0.8 g	7.2	4.9	2.8	0.0	0.0
S_S/S_1 Weight	50/50	50/50	75/25	100/0	100/0
S_S = 2.5 g	3.3	2.6	2.0	0.5	0.0
S_1 = 1.0 g	3.7	1.7	0.0	0.0	0.0
S_S/S_1 Weight	50/50	75/25	100/0	100/0	100/0

Each set of deterministic RSSPs is normalized to S_S = 1.0g (i.e., each cell of the RSSP matrix is normalized by the same value such that the 0.2-second response for Site Class BC is 1.0g). Deterministic RSSPs are also conditioned (slightly) at very short periods to decrease monotonically as they converge to 0.0-second response (e.g., average 84th percentile response of the GMMs is greater at 0.01 s (100 Hz) than at 0.03 s (33 Hz) for softer site conditions).

Figure 5.2-1 shows example plots of deterministic RSSPs at periods up to 3.0 s for the S_S = 1.5g and S_1 = 0.6g ground motion level, by earthquake magnitude for Site Classes BC, CD, and DE. For comparison, Figures 5.2-2 and 5.2-3 show the same type of example plots of deterministic RSSPs for the S_S = 2.0g and S_1 = 0.8g and S_S = 2.5g and S_1 = 1.0g ground motion levels, respectively. Numerical values of the deterministic RSSPs are provided in Appendix C for each of the 15 combinations of the three ground motion levels and the five earthquake magnitudes. Values given in the tables of Appendix C are shown with three decimal place precision to permit interpolation and tracing of values; the RSSPs should not be considered to have that level of accuracy.

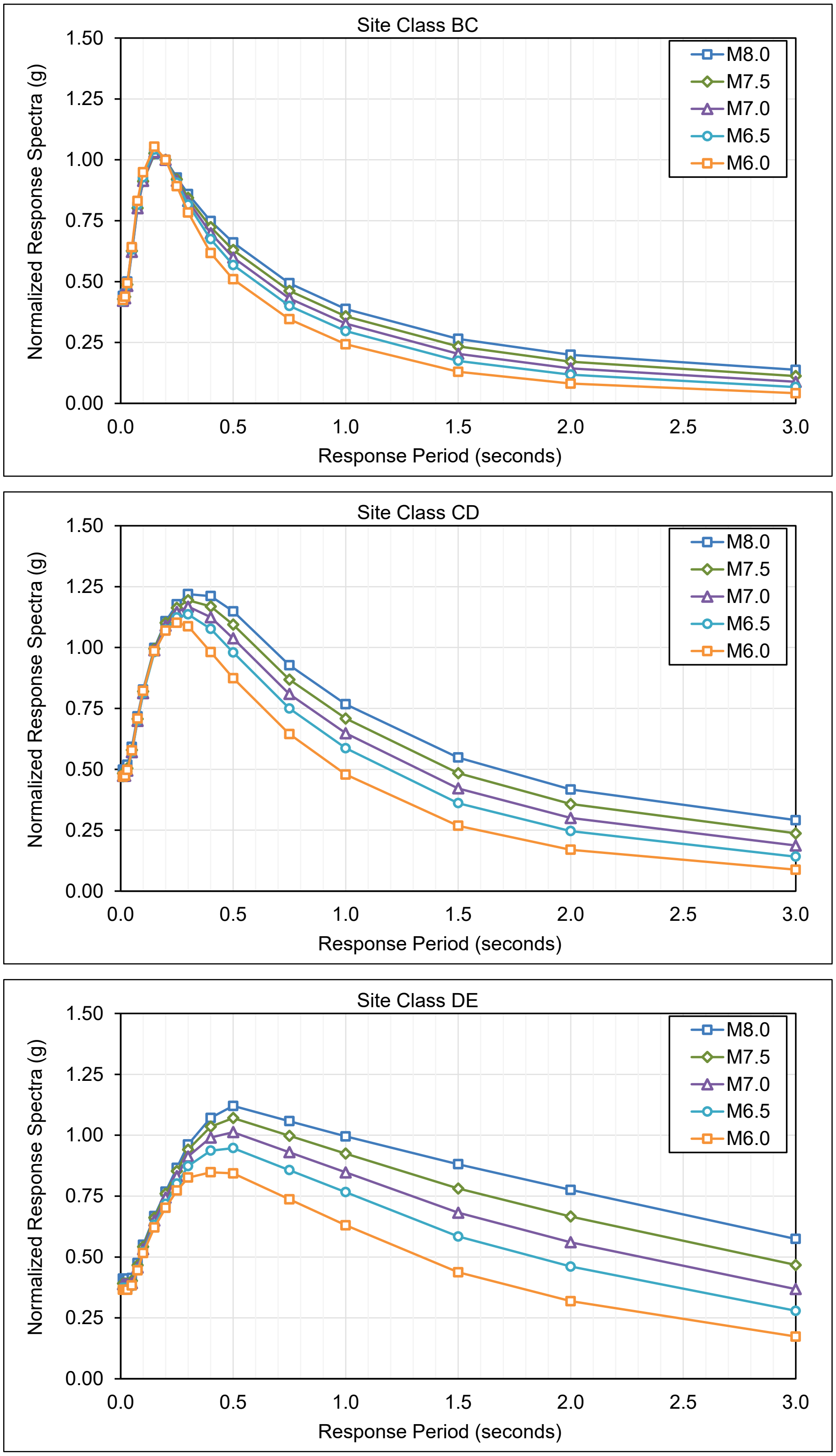


Figure 5.2-1 Plots of RSSPs for M6.0, M6.5, M.7.0, M7.5, and M8.0; ground motion level S_S = 1.5g and S_1 = 0.6g; and Site Class BC (top), CD (middle), and DE (bottom).

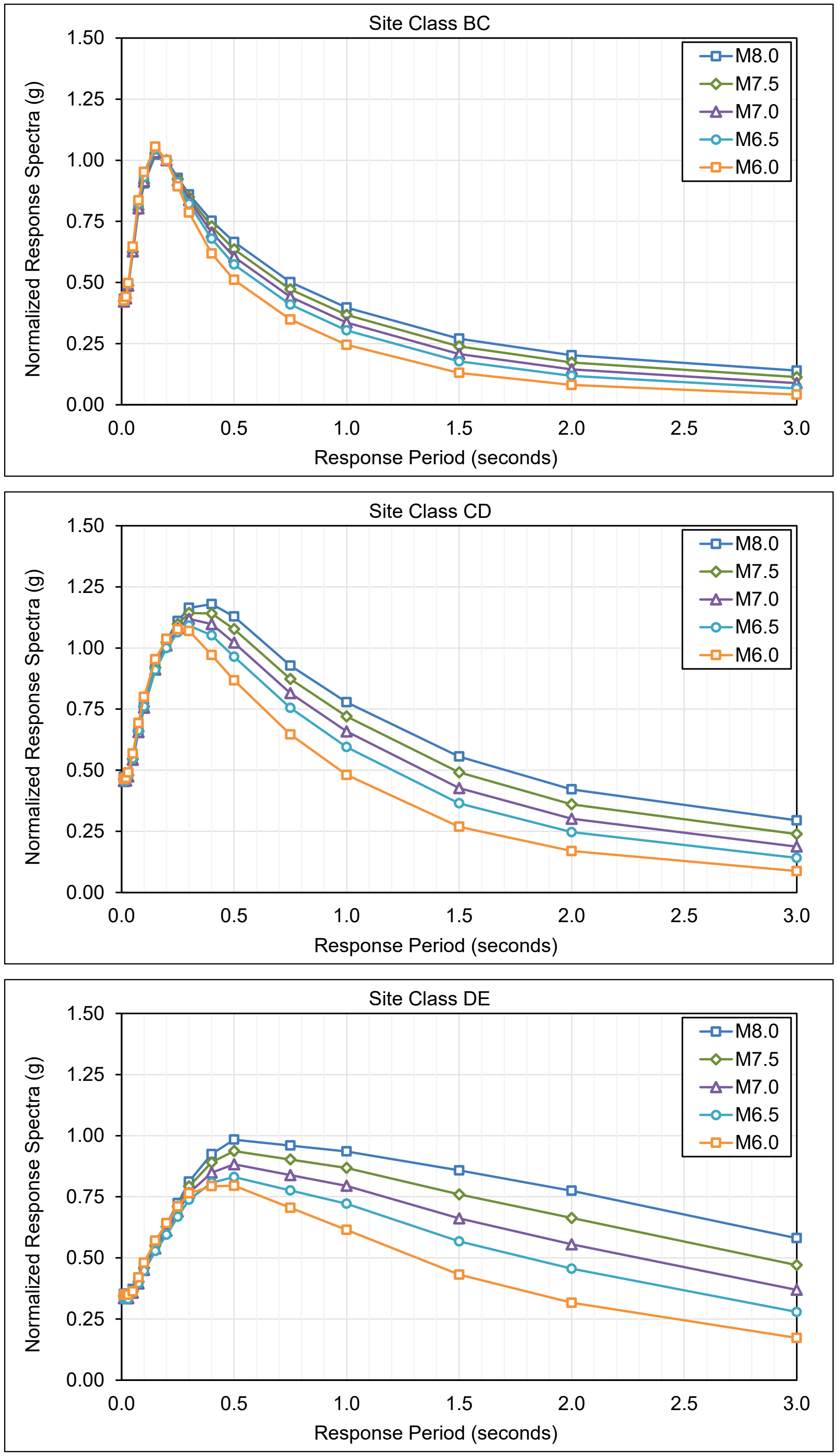


Figure 5.2-2 Plots of RSSPs for M6.0, M6.5, M.7.0, M7.5, and M8.0; ground motion level S_S = 2.0g and S_1 = 0.8g; and Site Class BC (top), CD (middle), and DE (bottom).

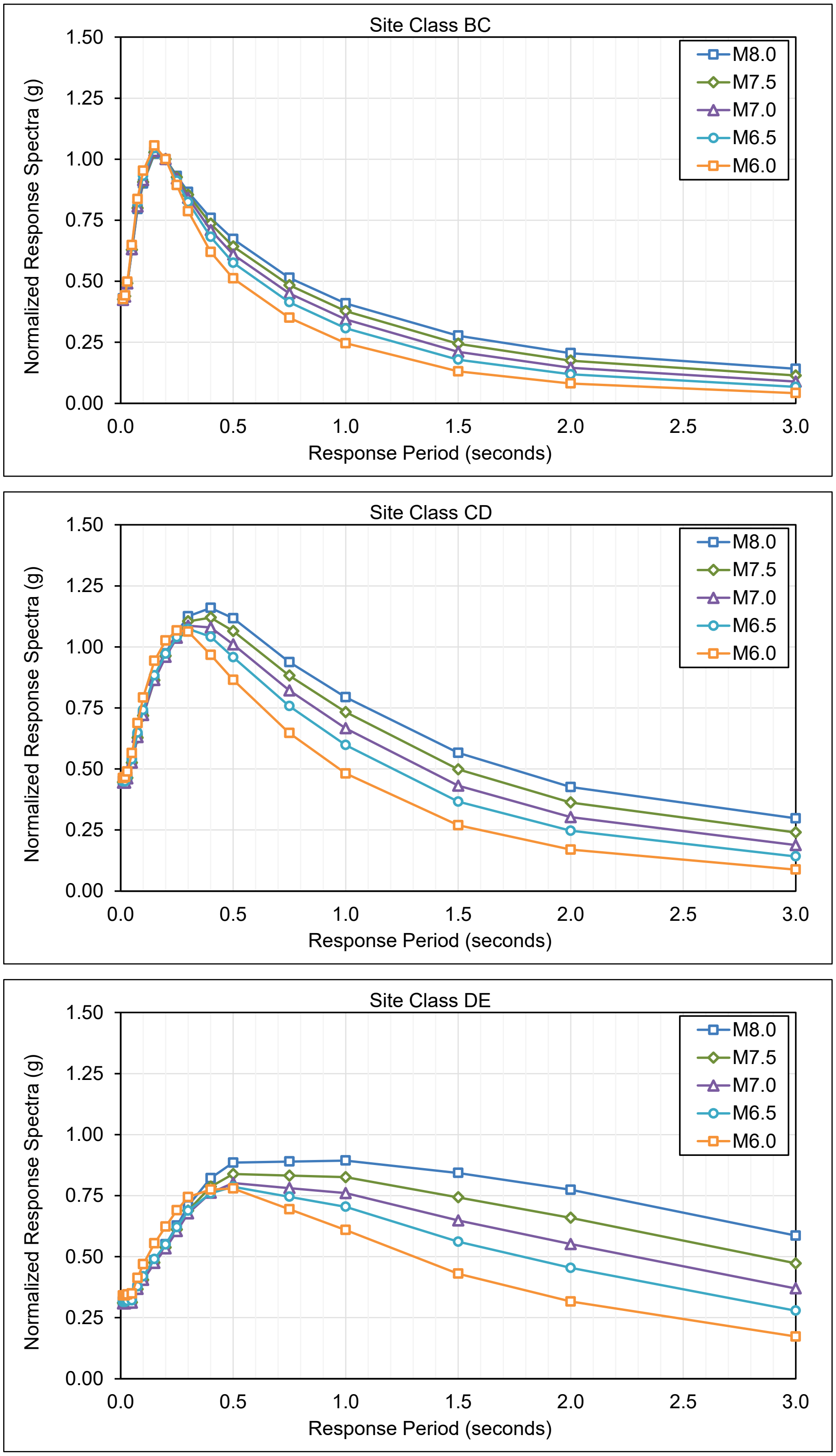


Figure 5.2-3 Plots of RSSPs for M6.0, M6.5, M.7.0, M7.5, and M8.0; ground motion level S_S = 2.5g and S_1 = 1.0g; and Site Class BC (top), CD (middle), and DE (bottom).

Each of the 15 sets of deterministic RSSPs has a different magnitude-dependent value of the $R_{S/1}$ ratio as shown by plots of $R_{S/1}$ as a function of earthquake magnitude in Figure 5.2-4 for each of three ground motion levels. For example, in Figure 5.2-4, the normalized value of 1-second response of the M8.0 set of RSSPs is about 0.4 for Site Class BC, corresponding to a ratio of $R_{S/1}$ = 1.0/0.4 = 2.5; in contrast, the normalized value of 1-second response of the M6.0 set of RSSPs is about 0.25, corresponding to a ratio of $R_{S/1}$ = 1.0/0.25 = 4.0. The magnitude-dependent value of the $R_{S/1}$ ratio is an indicator of the magnitude governing site-specific ground motions, which is important where only the values of parameters S_S and S_1 are known. Values of the $R_{S/1}$ ratio plotted in Figure 5.2-4 are given in Table 5.2-2.

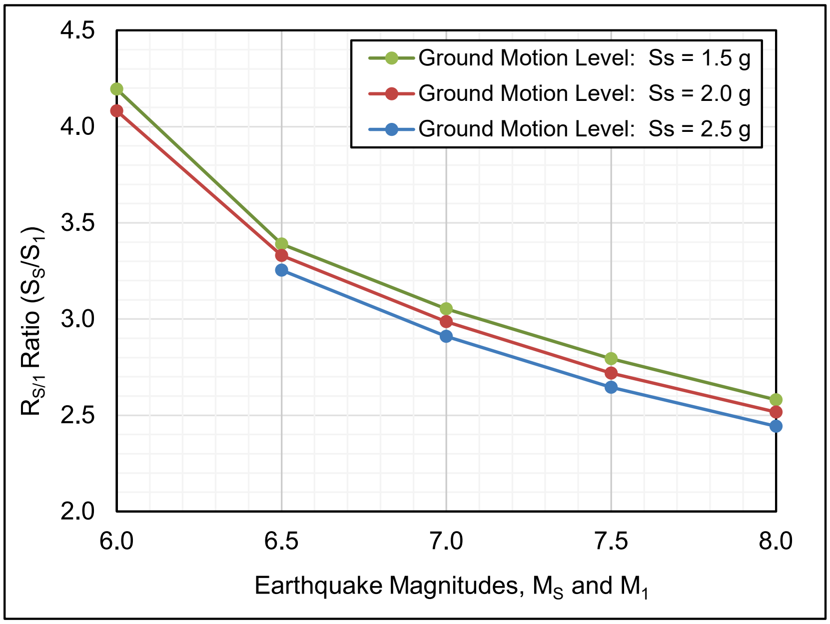
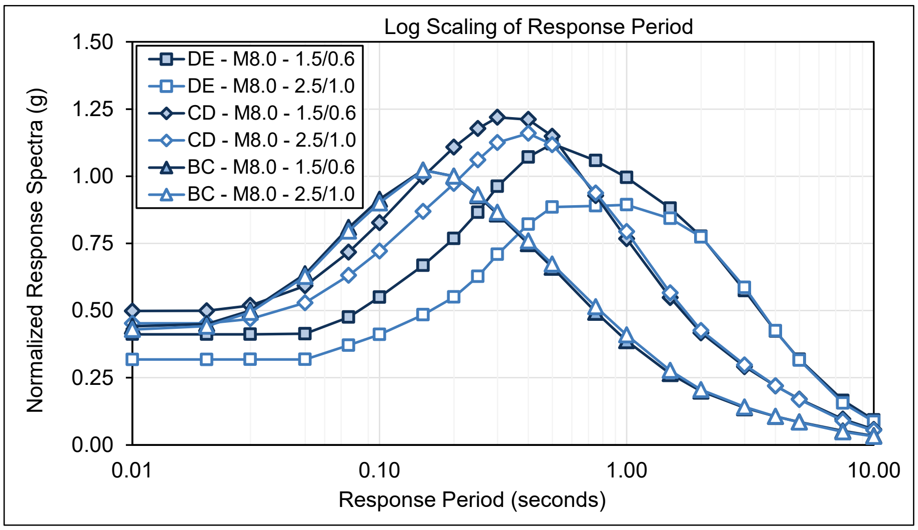


Figure 5.2-4 Relationship of the $R_{S/1}$ ratio and earthquake magnitudes M_S and M_1 for sites where 0.2-second and 1-second deterministic MCE_R ground motions are governed by the same earthquake source and magnitude (i.e., $M_S = M_1$).

Table 5.2-2 Values of the $R_{S/1}$ Ratio as a Function of Earthquake Magnitude (i.e., $M_S = M_1$) Shown in Figure 5.2-4

Ground Motion Level	Earthquake Magnitude ($M_S = M_1$)				
	M6.0	M6.5	M7.0	M7.5	M8.0
S_S = 1.5 g	4.19	3.39	3.05	2.79	2.58
S_S = 2.0 g	4.08	3.33	2.99	2.72	2.52
S_S = 2.5 g	4.07	3.25	2.91	2.65	2.44

Figure 5.2-5 compares example deterministic RSSPs for magnitude 8.0 ground motions, Sites Classes BC, CD, and DE, and two ground motion levels: S_S = 1.5g and S_1 = 0.6g, and S_S = 2.5g and S_1 = 1.0g. Since the RSSPs are normalized (i.e., to S_S = 1.0g), the plots provide a relative measure of the frequency content of the ground motions. The plots show that the frequency content of stiffer sites (e.g., Site Class BC) is insensitive to the ground motion level, while softer sites (e.g., Site Class DE) are significantly influenced by the ground motion level (i.e., stronger shaking reduces response at shorter periods).



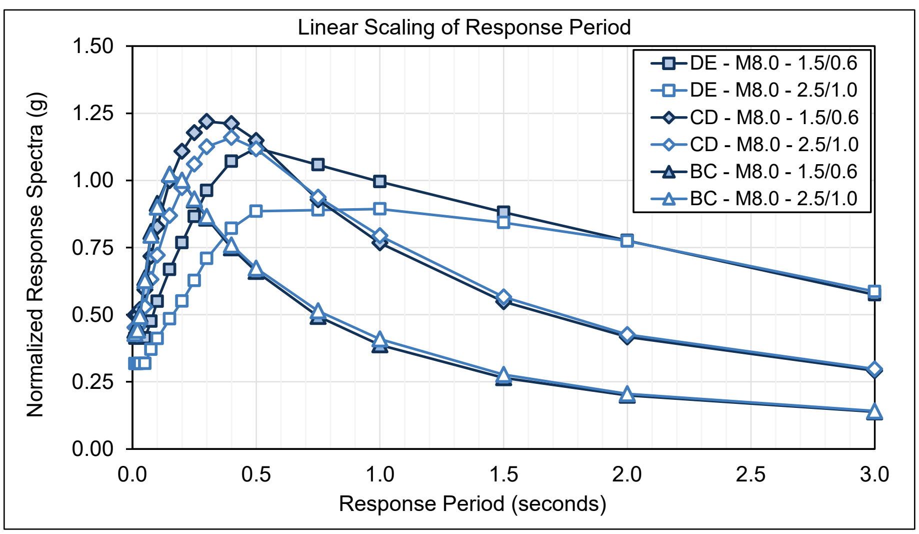


Figure 5.2-5 Plots comparing deterministic RSSPs for M8.0; Site Classes BC, CD, and DE; and ground motion levels S_S = 1.5g and S_1 = 0.6g, and S_S = 2.5g and S_1 = 1.0g. The two sets of plots show the same RSSPs as a function of log scaling (top) and linear scaling (bottom) of response period.

5.3 Procedure for Developing Site-Specific Deterministic MPRS

This section describes the procedure for selecting, scaling, and combining the generic RSSPs of the previous section to develop a set of site-specific deterministic MPRS for the pair of deterministic values of parameters S_S and S_1 for the site of interest. Again, each set of deterministic MPRS describe the 84^{th} percentile, 5%-damped spectral response acceleration at 22 response periods (from 0.0 s to 10 s) for each of eight site classes (i.e., Site Classes A, B, BC, C, CD, D, DE, and E).

The process for developing site-specific MPRS is described in Section 3.3 and is essentially the same for deterministic MPRS and probabilistic MPRS once the appropriate set(s) of RSSPs is(are) selected (e.g., from Appendix C for development of deterministic MPRS). The four site-specific parameters, S_S and M_S, and S_1 and M_1, are the required "input" parameters for selecting sets of deterministic RSSPs, as described in Section 5.3.1.

5.3.1 Deterministic Input Parameters

Deterministic input parameters S_S and S_1 are defined by 0.2-second and 1.0-second response, respectively, of the deterministic MCE_R ground motions of the site of interest, assuming Site Class BC site conditions. As proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Section 21.2.2 defines deterministic MCE_R ground motions in terms of the largest 84^{th} percentile response of scenario earthquakes, as determined by deaggregation of site hazard (see Section 2.2.3 of this report).

In general, the magnitude of the scenario earthquake governing the value of S_S (i.e., M_S) will be different from that governing the value of S_1 (i.e., M_1). It is assumed that these two earthquake magnitudes are known or can be determined (e.g., from deaggregation of site hazard). Where deaggregation is not performed, earthquake magnitudes M_S and M_1 can be estimated from the ratio $R_{S/1} = S_S/S_1$, using the curves shown in Figure 5.2-4 and the values of the $R_{S/1}$ ratio given in Table 5.2-2. There, the values of S_S and S_1 are implicitly assumed to be governed by the same earthquake source and magnitude (i.e., $M_S = M_1$).

5.3.2 Selection and Interpolation of Short-Period and Long-Period RSSPs

To account for differences in the shape (frequency content) of short-period and long-period response, site-specific MPRS are based on the generic set(s) of RSSPs that best describe short-period response, and on the generic set(s) of RSSPs that best define long-period response. The generic "short-period"

RSSPs are selected considering the magnitude M_S and the ground motion level (i.e., values of S_S and S_1), and the generic sets of "long-period" RSSPs are selected considering the value of M_1 and the ground motion level.

The level of ground motion is selected based on the product of values of the S_S and S_1 parameters, as follows:

1. S_S = 1.5g Ground Motion Level: If the product, $S_S \times S_1 \leq 1.2\text{g}^2$ (based on 2.0g × 0.6g), then select sets of RSSPs developed for the S_S = 1.5g and S_1 = 0.6g ground motion level (i.e., RSSPs given in Tables C-1 through C-5 of Appendix C).
2. S_S = 2.0g Ground Motion Level: If the product, $1.2 < S_S \times S_1 \leq 2.0\text{g}^2$ (based on 2.0g × 0.6g and 2.5g × 0.8g), then select sets of RSSPs developed for the S_S = 2.0g and S_1 = 0.8g ground motion level (i.e., RSSPs given in Tables C-6 through C-10 of Appendix C).
3. S_S = 2.5g Ground Motion Level: If the product, $2.0\text{g}^2 < S_S \times S_1$ (based on 2.5g × 0.8g), then select sets of RSSPs developed for the S_S = 2.5g and S_1 = 1.0g ground motion level (i.e., RSSPs given in Tables C-11 through C-15 of Appendix C).

In general, values of M_S and M_1 will fall between the five discrete values of magnitude (M6.0, M6.5, M7.0, M7.5, and M8.0) used to develop the deterministic RSSPs of Appendix C. In such cases, the set of RSSPs of the magnitude of interest (e.g., M7.8) is calculated by linear interpolation between the sets of RSSPs of Appendix C for the next larger and smaller discrete values of magnitude (e.g., M8.0 and M7.5). The deterministic RSSPs for magnitude M8.0 ground motions are used for sites where values of M_S and M_1 are greater than M8.0, and the deterministic RSSPs for magnitude M6.0 ground motions are used for sites where values of M_S and M_1 are less than M6.0.

5.3.3 Calculation of Deterministic MPRS

Site-specific deterministic MPRS are calculated by first calculating a set of "short-period" deterministic MPRS and a set of "long-period" deterministic MPRS, as described in Section 3.3.3, and then by combining these two sets of MPRS, as described in Section 3.3.4. It should be noted that this is the same process as that used to calculate probabilistic MPRS (Chapter 4).

5.4 Example Set of Deterministic MPRS for San Mateo, California

This section provides an example of "derived" deterministic MPRS for a site in San Mateo, California, calculated using the procedures of Sections 3.3 and 5.3, hypothetically assuming that only values of parameters S_S and S_1 are known. The resulting set of derived deterministic MPRS is compared with sets of deterministic MPRS calculated in accordance with the "scenario earthquake" definition proposed for the deterministic MCE_R ground motions of Section 21.2.2 of the 2020 *NEHRP Provisions* and ASCE 7-22. The intent of these comparisons is to show that deterministic MPRS derived from values of S_S and S_1 can accurately reflect the frequency content of deterministic MCE_R ground motions for all response periods and site classes.

5.4.1 San Mateo Site

The San Mateo Site (latitude: 37.55°, longitude: -122.30°) is located in California, on the San Francisco Bay peninsula near the intersection of Highways 101 and 92, as shown in Figure 5.4-1. The site is approximately 6.3 km to the closest point on the Peninsula segment of the San Andreas Fault, which dominates site hazard at all response periods and site conditions. The site-specific deterministic values of the parameters S_S and S_1 are 2.077g and 0.875g, respectively, and the corresponding value of the ratio $R_{S/1}$ is 2.077/0.875 = 2.37. The values of these parameters are obtained from the deterministic MPRS of Appendix D for the San Mateo Site (i.e., Table D.2-17 of Appendix D).

Figure 5.4-1 Map of the San Francisco Bay peninsula, showing the location of the San Mateo Site and its proximity to the San Andreas Fault.

5.4.2 *Derived Deterministic MPRS*

This example has the benefit of deaggregation results, which may not always be the case. Results of deaggregation show that a magnitude 7.82 earthquake (at R = 6.3 km) governs 0.2-second response for Site Class BC (i.e., M_S = 7.82), and that a slightly larger magnitude 7.85 earthquake (also at R = 6.3 km) governs 1-second response for Site Class BC (i.e., M_1 = 7.85). Where deaggregation results are not available, the governing magnitudes may be estimated from Figure 5.2-4 for the value of $R_{S/1}$ of interest. For the San Mateo Site, $R_{S/1}$ = 2.37 and Figure 5.2-4 suggest a M8.0+ earthquake for the S_S = 2.0g and S_1 = 0.8g ground motion level (i.e., Figure 5.2-4 only defines magnitudes up to M8.0). Thus, values of $M_S = M_1$ = 8.0 would be used to derive deterministic MPRS.

Deterministic MPRS are constructed for site-specific values of S_S = 2.077g and S_1 = 0.875g, and M_S = 7.82 and M_1 = 7.85 (which are essentially the same magnitude), following the procedures of Sections 3.3 and 5.3, as described in the following steps.

Step 1. Selection (and Interpolation) of RSSPs:

1. The S_S = 2.0g and S_1 = 0.8g ground motion level governs the selection of RSSPs based on the product, $S_S \times S_1 = 2.077 \times 0.875 = 1.82g^2$ (see Section 5.3.2).
2. Two sets of short-period RSSPs are selected for bounding magnitudes of 8.0 (Table C-6) and 7.5 (Table C-7), based on M_S = 7.82 (and the S_S = 2.0g and S_1 = 0.8g ground motion level).
3. The same two sets of long-period RSSPs are selected for bounding magnitudes of 8.0 (Table C-6) and 7.5 (Table C-7), based on M_1 = 7.85 (and the S_S = 2.0g and S_1 = 0.8g ground motion level).

   The set of short-period RSSPs for M_S = 7.82 are calculated by linear interpolation of the two bounding-magnitude sets of short-period RSSPs (Table C-6 and Table C-7). Likewise, the set of long-period RSSPs for M_1 = 7.85 are calculated by linear interpolation of the two bounding-magnitude sets of long-period RSSPs (Table C-6 and Table C-7), which in this example, is essentially the same as the set of short-period RSSPs.

Step 2. Determination of Control Periods T_{amax}, and T_{vmax}: Values of period T_{amax} are determined from the set of short-period RSSPs, and values of period T_{vmax} are determined from the set of long-period RSSPs, in accordance with definitions of these periods given with Equations 3.3-1 and 3.3-2. Table 5.4-1 summarizes the values of periods T_{amax} and T_{vmax} for this example, which are the same as those given in Tables C-6 and C-7 for most site classes.

Table 5.4-1 Values of Period T_{amax} for Short-Period RSSPs (M_S = M7.82) and Values of Period T_{vmax} for Long-Period RSSPs (M_1 = M7.85)

Period (s)	Periods T_{amax} and T_{vmax} by Site Class								
	A	B	BC	C	CD	D	DE	E	Default
T_{amax}	0.20	0.20	0.20	0.25	0.40	0.50	0.50	0.50	0.40
T_{vmax}	2.00	2.00	1.00	1.50	3.00	3.00	3.00	3.00	3.00

Step 3. Calculation (Scaling) of Short-Period and Long Period RSSPs: The set of short-period RSSPs are scaled uniformly by the site-specific value of S_S = 2.077g. Scaled short-period RSSPs define site-specific deterministic MPRS from 0.0 s to period T_{amax}. The set of long-period RSSPs are scaled by a factor that sets the 1-second response of Site Class BC to be equal to the site-specific value of S_1 = 0.875g. Scaled long-period RSSPs define site-specific deterministic MPRS from period T_{vmax} to 10 s.

Step 4. Calculation of Mid-Period Response by Blending of Short-Period and Long-Period MPRS: The set of short-period MPRS and the set of long-period MPRS are "blended" at mid-periods (defined by the range of periods from T_{amax} to T_{vmax}) in accordance with Equations 3.3-1 and 3.3-2. Blended mid-period MPRS define site-specific deterministic MPRS from period T_{amax} to period T_{vmax}.

In this example, deterministic MPRS are derived for all site classes, as would be calculated by the USGS to provide MCE_R ground motions for an arbitrary, user-specified value of site class. Site-specific ground motions would be those based on actual site conditions where such are known, or on Default site conditions where soil properties are not known in sufficient detail to determine the site class. Table E.2-17 of Appendix E provides values of deterministic MPRS for the San Mateo Site derived from the site-specific values of S_S = 2.077g and S_1 = 0.875g, as described in the above steps.

Note: Appendix E provides derived sets of probabilistic MPRS in Section E.1, derived sets of deterministic MPRS in Section E.2 (without the lower limit), and sets of MPRS representing MCE_R ground motions (i.e., lesser of derived probabilistic MPRS and derived deterministic MPRS with the lower limit) in Section E.3, for each of 34 example sites in the conterminous United States (i.e., the same example sites as those of the commentary to Chapter 22 of ASCE 7-16).

5.4.3 Comparison of Deterministic MPRS

The derived set of deterministic MPRS for the San Mateo Site (Table E.2-17) is compared with two versions of deterministic MPRS calculated in

accordance with the “scenario earthquake” definition of deterministic MCE_R ground motions proposed for Section 21.2.2 of the 2020 *NEHRP Provisions* and ASCE 7-22:

1. “Scenario” deterministic MPRS based on a magnitude 7.9 earthquake on the San Andreas Fault at a distance of R = 6.3 km, and
2. “Epsilon-adjusted” deterministic MPRS developed by the USGS from the probabilistic MPRS for the San Mateo Site.

The first set of “scenario earthquake” deterministic MPRS represent 84th percentile maximum-direction MCE_R ground motions calculated using the NGA-West2 spreadsheet (see Section 5.1.2) for representative values of magnitude 7.9 and fault distance R = 6.3 km determined by deaggregation of site hazard (of the 2018 USGS NSHM). Deaggregation magnitudes vary from about 7.80 at very short periods to about 7.95 at very long periods, and are relatively insensitive to site class. Fault distance (R = 6.3 km) is insensitive to both response period and site class. The set of scenario deterministic MPRS are provided in Table 5.4-2.

The second set of “scenario earthquake” deterministic MPRS also represent 84th percentile maximum-direction ground motions, but are calculated by adjusting values of probabilistic MPRS for the San Mateo Site based on the values of epsilon determined by deaggregation of site hazard (of the 2018 USGS NSHM), as described in Section 2.2.3. In concept, values of epsilon-adjusted deterministic MPRS should be the same as those of the scenario deterministic MPRS; essentially, they just use different approaches to calculate 84th percentile deterministic MCE_R ground motions. The set of probabilistic MPRS of the San Mateo Site are provided in Table D.1-17 and the set of epsilon-adjusted deterministic MPRS are provided in Table D.2-17.

Note: Appendix D provides sets of probabilistic MPRS in Section D.1, sets of deterministic (epsilon-adjusted) MPRS in Section D.2, and sets of MPRS representing MCE_R ground motions (i.e., lesser of probabilistic and deterministic MPRS) in Section D.3, for each of 34 example sites in the conterminous United States calculated in accordance with the proposed changes to the 2020 *NEHRP Provisions* and ASCE 7-22.

Table 5.4-2 "Scenario" Deterministic MPRS for the San Mateo Site Based on a M7.9 "Scenario Earthquake" at R = 6.3 km

Period	5%-Damped Response Spectral Acceleration by Site Class (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.000	0.67	0.77	0.89	0.97	0.96	0.86	0.72	0.65	0.97
0.010	0.67	0.77	0.90	0.97	0.96	0.87	0.73	0.65	0.97
0.020	0.70	0.80	0.92	0.99	0.98	0.88	0.74	0.65	0.99
0.030	0.81	0.91	1.03	1.06	1.01	0.87	0.70	0.62	1.06
0.050	1.12	1.23	1.31	1.28	1.14	0.93	0.72	0.63	1.28
0.075	1.43	1.59	1.66	1.59	1.37	1.10	0.83	0.71	1.59
0.10	1.53	1.75	1.88	1.82	1.58	1.26	0.95	0.81	1.82
0.15	1.52	1.80	2.13	2.15	1.91	1.52	1.14	0.96	2.15
0.20	1.36	1.66	2.08	2.31	2.13	1.73	1.30	1.10	2.31
0.25	1.19	1.49	1.93	2.34	2.29	1.93	1.47	1.26	2.34
0.30	1.07	1.35	1.79	2.28	2.40	2.10	1.65	1.43	2.40
0.40	0.90	1.15	1.56	2.09	2.44	2.27	1.88	1.66	2.44
0.50	0.78	0.99	1.38	1.89	2.33	2.31	2.00	1.82	2.33
0.75	0.60	0.74	1.04	1.46	1.91	2.05	1.92	1.83	2.05
1.0	0.48	0.57	0.82	1.18	1.60	1.84	1.91	1.93	1.84
1.5	0.33	0.39	0.55	0.81	1.13	1.44	1.74	1.96	1.44
2.0	0.26	0.30	0.41	0.60	0.85	1.16	1.57	1.91	1.16
3.0	0.187	0.22	0.28	0.41	0.59	0.83	1.16	1.46	0.83
4.0	0.146	0.170	0.211	0.31	0.44	0.61	0.84	1.05	0.61
5.0	0.120	0.139	0.168	0.24	0.33	0.46	0.63	0.77	0.46
7.5	0.073	0.083	0.097	0.133	0.179	0.24	0.31	0.38	0.24
10	0.049	0.055	0.063	0.083	0.107	0.136	0.173	0.206	0.136

In the figures below, comparisons of deterministic MCE_R response spectra are made for three hypothetical site conditions for the San Mateo Site: Site Classes BC, CD, and DE. These comparisons illustrate potential differences in deterministic MCE_R ground motions for different site classes. Figures 5.4-2, 5.4-3, and 5.4-4 are plots of, respectively, MCE_R response spectra comparing derived deterministic response (from Table E.2-17), scenario (M7.9 at 6.3 km) deterministic response (from Table 5.4-2), and epsilon-adjusted (ε-adjusted) deterministic response (from Table D.2-17), for each of these three hypothetical site classes. For reference, each of these figures also includes the probabilistic MCE_R response spectrum (from Table D.1-17), which governs MCE_R ground motions at very long periods at the San Mateo Site, and the lower limit deterministic MCE_R response spectrum (from Table 5.5-2), which does not govern MCE_R ground motions at any period or site class for this site. Figures 5.4-5, 5.4-6, and 5.4-7 are plots of the same MCE_R response spectra using a different horizontal axis that better shows the long-period response.

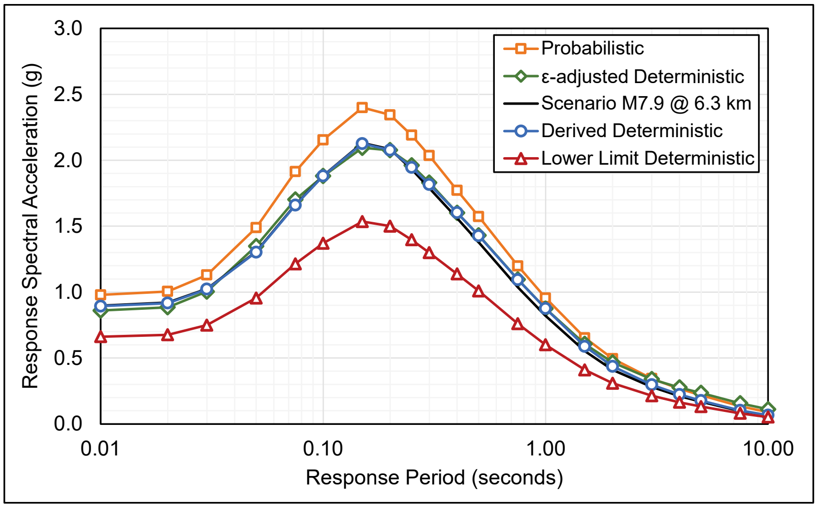


Figure 5.4-2 MCE$_R$ Response Spectra, San Mateo Site, Site Class BC.

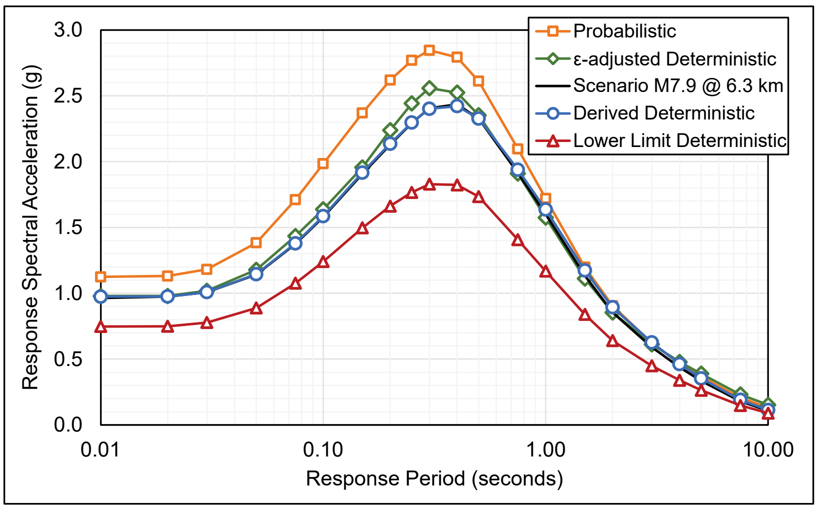


Figure 5.4-3 MCE$_R$ Response Spectra, San Mateo Site, Site Class CD.

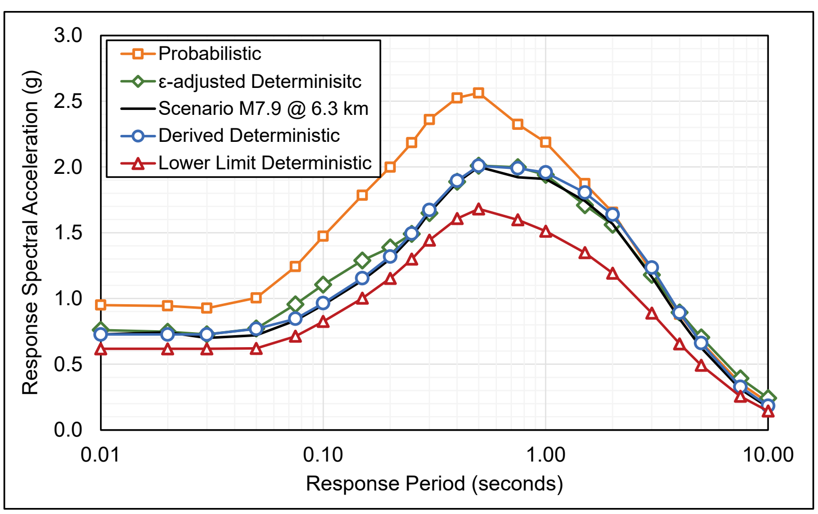


Figure 5.4-4 MCE$_R$ Response Spectra, San Mateo Site, Site Class DE.

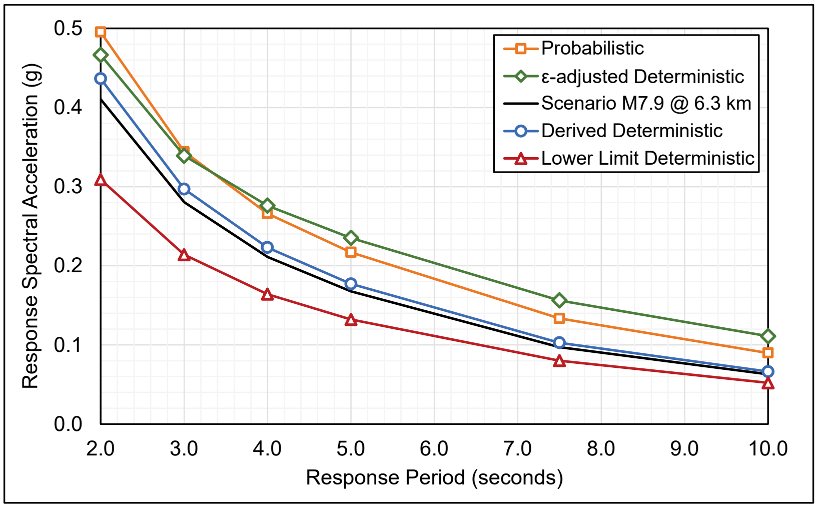


Figure 5.4-5 MCE$_R$ Response Spectra, San Mateo Site, Site Class BC.

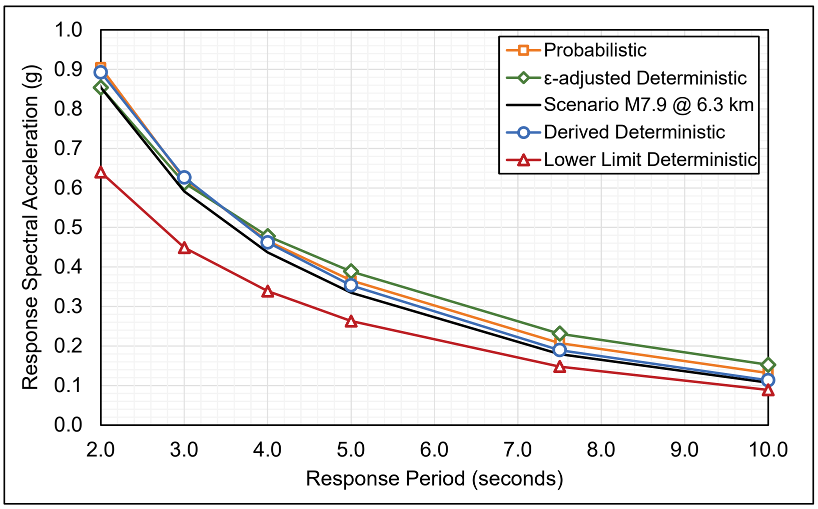


Figure 5.4-6 MCE$_R$ Response Spectra, San Mateo Site, Site Class CD.

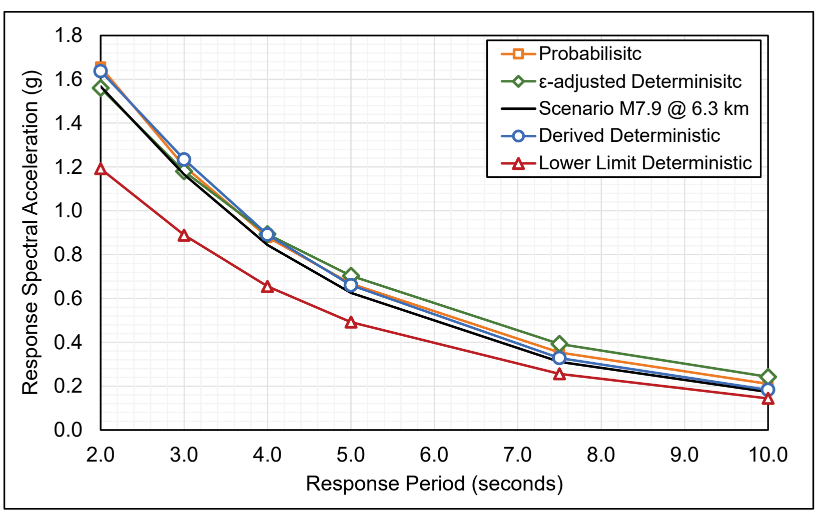


Figure 5.4-7 MCE$_R$ Response Spectra, San Mateo Site, Site Class DE.

As shown in Figures 5.4-5, 5.4-6, and 5.4-7, at periods beyond about 3.0 s, epsilon-adjusted deterministic MCE_R response exceeds that of the probabilistic MCE_R response spectrum, indicating that probabilistic ground motions are slightly less conservative than 84th percentile ground motions at very long periods (i.e., the values of epsilon from deaggregation are less than 1.0 at these periods).

The following observations may be made from the comparison of deterministic MCE_R response spectra:

1. Derived deterministic MCE_R response spectra closely match (or slightly exceed) the scenario (M7.9 at 6.3 km) deterministic response spectrum at all response periods and for all three site classes, demonstrating that site-specific deterministic MCE_R response for the San Mateo Site can be accurately derived from the site-specific values of deterministic parameters S_S and S_1 using the RSSPs of Appendix C and methods of Sections 3.3 and 5.3.
2. Derived deterministic MCE_R response spectra closely match epsilon-adjusted deterministic response spectra at most response periods and for most site classes, noting significant differences (i.e., greater than 20 percent) at certain short periods for soft sites and at very long periods for all site classes.

5.5 Deterministic Lower Limit MCE_R Response Spectra

5.5.1 Background

As required by Section 21.2 of the 2020 *NEHRP Provisions* and ASCE 7-22, and prior editions of these documents, deterministic MCE_R ground motions govern design at sites where they are less than the probabilistic MCE_R ground motions, which typically occurs at sites of high seismicity located relatively close to an active fault (e.g., sites in coastal California near an active fault). The deterministic lower limit MCE_R response spectrum establishes a lower bound on deterministic MCE_R ground motions below which probabilistic MCE_R ground motions govern design at the site of interest (e.g., most sites in the CEUS). Where the deterministic lower limit MCE_R response spectrum is greater than deterministic MCE_R ground motions (i.e., without the lower limit) and less than probabilistic MCE_R ground motions, the deterministic lower limit MCE_R response spectrum governs design at the site of interest (e.g., sites in California 10 to 20 km from an active fault capable of large magnitude earthquakes, such as the San Andreas Fault).

Section 21.2.2 of ASCE 7-16 defines a lower bound limit on the site-specific deterministic MCE_R spectrum using the two-period response spectrum shape. That spectrum, shown in Figure 21.2-1 of ASCE 7-16, is scaled to $1.5F_a$ at short periods (i.e., domain of constant acceleration), to $0.6F_v/T$ at periods greater than $T_s = 0.4F_a/F_v$ (i.e., domain of constant velocity), and to $0.6F_vT_L/T^2$ at periods greater than T_L (i.e., domain of constant displacement). At periods less than $0.08F_v/F_a$, spectral acceleration decreases uniformly to $0.6F_a$ at $T = 0.0$ s.

The shape of the deterministic lower limit MCE_R spectrum is identical to that of the Design response spectrum (Figure 11.4-1 of ASCE 7-16), with the exception that special values of F_a and F_v are required in Section 21.2.2 of ASCE 7-16 for Site Class D (i.e., $F_a = 1.0$ and $F_v = 2.5$) and for Site Classes E and F (i.e., $F_a = 1.0$ and $F_v = 4.0$). The special values of F_v required by Section 21.2.2 for Site Classes D, E, and F are intended to incorporate both site amplification and spectral shape effects. The simple shape of the two-period response spectrum is problematic since it can overstate spectral acceleration (e.g., at the intersection of the domains of constant acceleration and velocity), and has been replaced in Supplement 1 to ASCE 7-16 with a more realistic, but non-standard, shape based on scaling of the site-specific calculation of the deterministic MCE_R spectrum. As such, there is no longer an absolute definition of the deterministic lower limit MCE_R response spectrum, as there was with the crude, but consistent, two-period lower limit spectrum of Figure 21.2-1 of ASCE 7-16.

5.5.2 Approach

The methods of Sections 3.3 and 5.3 are implemented to develop a set of lower limit deterministic MPRS that: (1) are consistent with the definition of the lower limit in ASCE 7-16; (2) have a smooth, multi-period shape (avoiding problems with prior two-period spectrum shape); and (3) provide an unambiguous, standard definition of sites governed by probabilistic MCE_R ground motions (i.e., deterministic MCE_R ground motions need not be calculated for sites where probabilistic MCE_R ground motions are less than the lower limit on deterministic MCE_R ground motions). Consistent with other MPRS, deterministic lower limit MPRS describe 84th percentile, maximum-direction, 5%-damped spectral response acceleration at 22 response periods (from 0.00 s to 10 s) for each of the eight site classes (i.e., Site Classes A, B, BC, C, CD, D, DE, and E) and the Default site class.

Two alternative sets of deterministic lower limit MPRS are developed for: (1) values of $S_S = 1.5$ (i.e., $1.5F_a$) and $S_1 = 0.6$ (i.e., $0.6F_v/T$) assuming $M_S = M_1 = 8.0$; and (2) values of $S_S = 1.5$ and $S_1 = 0.6$ assuming $M_S = M_1 = 7.0$.

The two alternatives represent the most literal interpretations of the definition of the lower limit criteria of Figure 21.2-1 of ASCE 7-16 for two bounding values of earthquake magnitude. They provide options for defining lower limit deterministic MPRS that ostensibly comply with the requirements of Section 21.2.2 of ASCE 7-16.

Bounding values of magnitude are based on the results of deaggregation of the ground motion hazard (of the 2018 USGS NSHM) for the 34 example sites in the conterminous United States. Table 5.5-1 summarizes deaggregation results listing the governing magnitudes and faults at the 13 sites where short-period (0.2 second) and/or long-period (3.0-second) response is governed by deterministic MCE_R ground motions for assumed Site Class BC site conditions. In general, the values of governing magnitude are relatively stable and do not vary with site class. Values of governing magnitude can vary significantly by response period where the fault governing deterministic MCE_R ground motions is different for short-period and long-period response (e.g., San Jose Site). Where different, the value of the governing magnitude at long periods is considered more critical to the development of the lower limit deterministic MPRS, since it influences long-period response that tends to be more significant in the calculation of site-specific ground motions. For the seven sites (all in the San Francisco Bay Area of Northern California) where MCE_R response spectra are governed by deterministic MCE_R ground motions at long periods, the values of the governing magnitude are about M7.9 – M8.0 for the three sites governed by the San Andreas Fault, and about M6.9 – M7.3 for the four sites governed by the Hayward, Concord, Rodgers Creek-Healdsburg, and Contra Costa Faults.

Table 5.5-1 **Summary of Ground Motion Hazard De-Aggregation Results: Earthquake Magnitudes and Faults Governing Short-Period (0.2-second) and/or Long-Period (3.0-second) Deterministic MCE_R Response, for Each of the 13 of 34 Sites in the Conterminous United States Where Deterministic MCE_R Ground Motions are Less than Probabilistic MCE_R Ground Motions for Assumed Site Class BC Site Conditions (Shading Indicates Sites Where Probabilistic MCE_R Ground Motions Exceed Deterministic MCE_R Ground Motions at Long Periods)**

Site Location (City Name)	Short-Period (0.2-s) Response		Long-Period (3.0-s) Response	
	Magnitude	Fault Name	Magnitude	Fault Name
WUS - Southern California Sites (3 of 11)				
Northridge	7.48	Compton	7.70	Northridge Hills
Riverside	8.04	San Jacinto	8.06	San Jacinto
San Bernardino	8.00	San Jacinto	8.04	San Jacinto
WUS - Northern California Sites (8 of 10)				
Concord	6.64	Concord	6.87	Concord
Oakland	7.13	Hayward	7.28	Hayward
San Francisco	7.85	San Andreas	7.92	San Andreas
San Jose	6.97	Hayward	7.99	San Andreas
San Mateo	7.82	San Andreas	7.90	San Andreas
Santa Cruz	6.79	Reliz	7.65	San Gregorio
Santa Rosa	7.20	Rodgers Creek - Healdsburg	7.30	Rodgers Creek - Healdsburg
Vallejo	6.66	Franklin	7.05	Contra Costa
WUS - Pacific Northwest Sites (1 of 4)				
Tacoma, WA	9.05	Cascadia Interface	8.99	Cascadia Interface
CEUS - Intermountain Sites (1 of 4)				
Reno, NV	6.82	Mount Rose	6.85	Mount Rose

5.5.3 Lower Limit Deterministic MPRS

Tables 5.5-2 and 5.5-3 provide numerical values of the MPRS for the two alternatives of lower limit deterministic MCE_R ground motions, and Figures 5.5-1 and 5.5-2 are plots of the MPRS for these two alternatives. Values given in these tables are shown with three decimal place precision to permit tracing of values; MPRS should not be considered to have this level of accuracy. In both tables, 0.2-second response is 1.5g and 1.0-second response is 0.6g, consistent with the target values of S_S and S_1.

Table 5.5-2 Lower Limit Deterministic MPRS (Alternative 1, $M_S = M_1 = 8.0$)

Period T (s)	5%-Damped Response Spectral Acceleration or PGA by Site Class (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.010	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.020	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.030	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.050	0.811	0.888	0.955	0.958	0.888	0.758	0.620	0.551	0.958
0.075	1.040	1.142	1.214	1.193	1.076	0.900	0.713	0.624	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.825	0.724	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.002	0.875	1.606
0.20	1.012	1.194	**1.500**	1.710	1.662	1.440	1.153	1.010	1.710
0.25	0.897	1.075	1.397	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.810	0.976	1.299	1.665	1.829	1.705	1.443	1.301	1.829
0.40	0.689	0.833	1.138	1.525	1.823	1.802	1.607	1.484	1.823
0.50	0.598	0.724	1.009	1.385	1.734	1.803	1.681	1.596	1.803
0.75	0.460	0.536	0.760	1.067	1.407	1.566	1.598	1.589	1.566
1.0	0.368	0.417	**0.600**	0.859	1.168	1.388	1.512	1.578	1.388
1.5	0.261	0.288	0.410	0.600	0.839	1.086	1.348	1.540	1.086
2.0	0.207	0.228	0.309	0.452	0.640	0.877	1.192	1.458	0.877
3.0	0.152	0.167	0.214	0.314	0.449	0.632	0.889	1.111	0.632
4.0	0.120	0.132	0.164	0.238	0.339	0.471	0.655	0.815	0.471
5.0	0.100	0.109	0.132	0.188	0.263	0.359	0.492	0.607	0.359
7.5	0.063	0.068	0.080	0.110	0.148	0.194	0.256	0.311	0.194
10	0.042	0.045	0.052	0.069	0.089	0.113	0.144	0.170	0.113

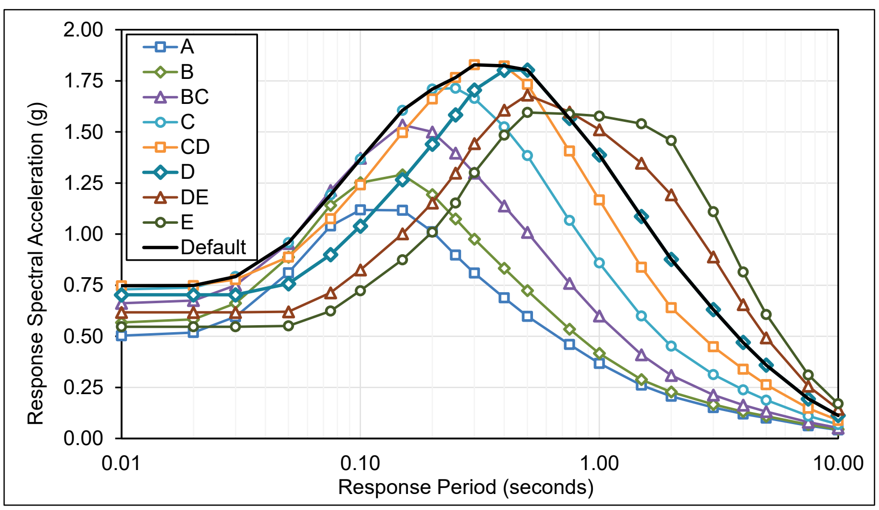


Figure 5.5-1 Plot of lower limit deterministic MPRS (Alternative 1).

Table 5.5-3 Lower Limit Deterministic MPRS (Alternative 2, $M_S = M_1 = 7.0$)

Period	5%-Damped Response Spectral Acceleration or PGA by Site Class (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.000	0.478	0.540	0.628	0.689	0.699	0.651	0.567	0.513	0.699
0.010	0.481	0.543	0.631	0.693	0.709	0.666	0.581	0.513	0.709
0.020	0.498	0.560	0.648	0.705	0.711	0.666	0.581	0.513	0.711
0.030	0.577	0.641	0.724	0.760	0.741	0.667	0.581	0.513	0.760
0.050	0.797	0.872	0.933	0.930	0.856	0.725	0.589	0.521	0.930
0.075	1.036	1.137	1.202	1.172	1.048	0.870	0.685	0.597	1.172
0.10	1.125	1.259	1.371	1.355	1.219	1.012	0.797	0.697	1.355
0.15	1.129	1.305	1.547	1.605	1.482	1.242	0.975	0.848	1.605
0.20	1.012	1.194	**1.500**	1.697	1.635	1.404	1.116	0.974	1.697
0.25	0.909	1.088	1.412	1.697	1.719	1.531	1.248	1.104	1.719
0.30	0.822	0.991	1.316	1.691	1.752	1.625	1.369	1.232	1.752
0.40	0.698	0.844	1.149	1.550	1.752	1.668	1.486	1.373	1.752
0.50	0.603	0.730	1.012	1.399	1.703	1.668	1.519	1.444	1.703
0.75	0.466	0.542	0.764	1.083	1.418	1.475	1.485	1.444	1.475
1.0	0.372	0.421	**0.600**	0.869	1.188	1.306	1.412	1.444	1.306
1.5	0.239	0.263	0.373	0.548	0.773	0.970	1.202	1.333	0.970
2.0	0.176	0.194	0.263	0.386	0.550	0.754	1.027	1.207	0.754
3.0	0.115	0.127	0.162	0.238	0.342	0.480	0.675	0.844	0.480
4.0	0.082	0.090	0.112	0.162	0.231	0.320	0.446	0.555	0.320
5.0	0.063	0.069	0.083	0.118	0.165	0.225	0.308	0.380	0.225
7.5	0.033	0.036	0.043	0.058	0.078	0.103	0.136	0.165	0.103
10	0.021	0.023	0.026	0.035	0.045	0.057	0.072	0.086	0.057

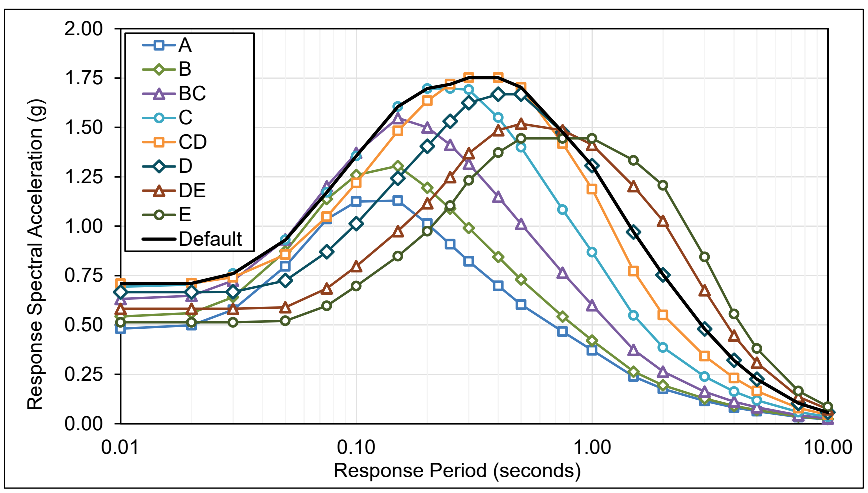


Figure 5.5-2 Plot of lower limit deterministic MPRS (Alternative 2).

The values of the MPRS are similar for the two alternatives, except at long periods where response values of Alternative 2 (Table 5.5-3) are significantly less than those of Alternative 1 (Table 5.5-2), due to the smaller value of earthquake magnitude (i.e., M7.0).

Figure 5.5-3 compares lower limit MPRS for Site Classes C, D, and E from Alternative 1 with the two-period lower limit deterministic MCE response

spectra of ASCE 7-16 (Figure 21.2-1), and Figure 5.5-4 compares the sets of response spectra for Alternative 2. In these figures, the two-period response spectra of ASCE 7-16 are based on values of the parameter F_v = 2.5 for Site Class D, and F_v = 4.0 for Site Class E, that are intended to include both site amplification and spectrum shape effects at longer periods.

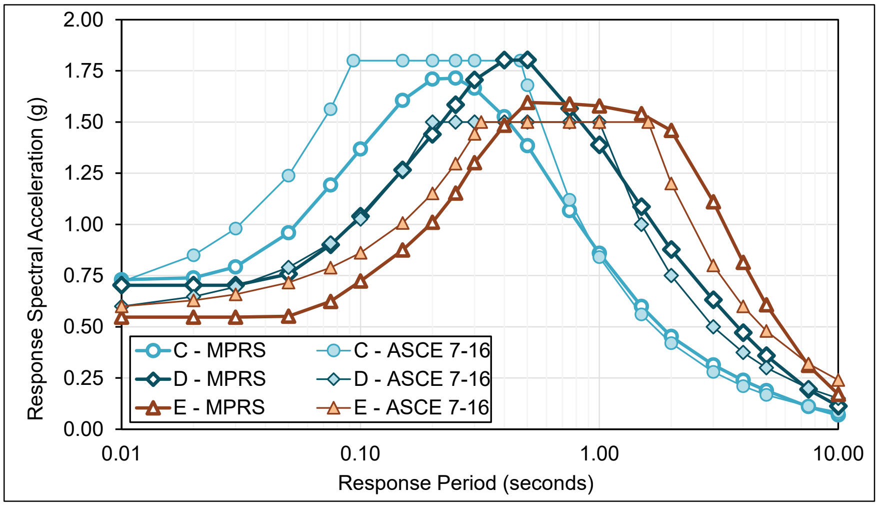


Figure 5.5-3 Comparison of lower limit deterministic MCE_R response spectra of ASCE 7-16 and MPRS (Alternative 1) for Site Classes C, D, and E.

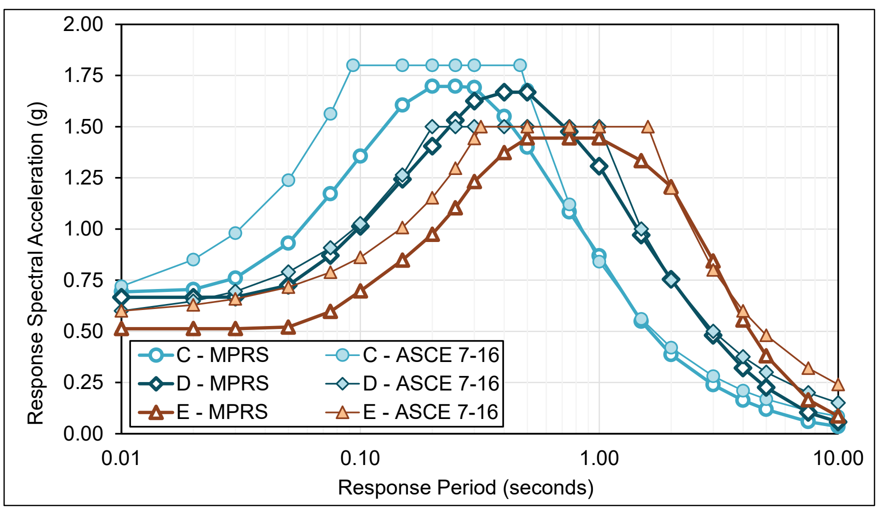


Figure 5.5-4 Comparison of lower limit deterministic MCE_R response spectra of ASCE 7-16 and MPRS (Alternative 2) for Site Classes C, D, and E.

Comparison of the lower limit deterministic MPRS of Alternative 1 with the corresponding lower limit spectra of ASCE 7-16 in Figure 5.5-3 shows smoothing of the two-period spectra of ASCE 7-16 and a general reduction of the lower limit spectra for Site Class C. Where greater than that of ASCE 7-16, the MPRS of Alternative 1 indicate longer response periods at which

the lower limit deterministic MCE_R spectra of ASCE 7-16 are not conservative (e.g., sites governed by magnitude 8.0 earthquakes). The MPRS of Alternative 1 would be appropriate for determining the lower limit deterministic MCE_R response spectrum at sites in the San Francisco Bay Area relatively close to the San Andreas fault (e.g., San Francisco, San Jose, and San Mateo sites), where the hazard is governed by approximately M8.0 earthquakes. The MPRS of Alternative 2 would be appropriate for determining lower limit deterministic MCE_R response spectra at sites relatively close to smaller magnitude faults (e.g., Concord, Oakland, and Vallejo sites), where the hazard is governed by approximately M7.0 earthquakes.

Chapter 6
Validation of Derived Multi-Period Response Spectra

This chapter evaluates the reliability of the methods of this study by comparing sets of multi-period response spectra (MPRS) derived from values of S_S, S_1, and T_L (referred to herein as "Derived MPRS") with the "true" sets of MPRS calculated for all periods and site classes of interest. The "true" sets of MPRS and the parameters S_S, S_1, and T_L used to calculate the Derived MPRS are from an early version of MPRS proposed for the 2020 *NERHP Provisions* and ASCE 7-22 (referred to herein as "Proposed MPRS"). What is referred to herein as Proposed MPRS is provisional and subject to change, as the proposed values of MCE_R ground motions will be finalized by the USGS; however, "proposed" MPRS are just examples of "true" MPRS calculated at all periods and site classes of interest, and the validation exercises in this chapter will still hold regardless of future updates because they show that the models presented in this report are capable of closely estimating any "true" MPRS by matching to its S_S, S_1, and T_L values. In this chapter, comparisons are made in terms of the similarity of the frequency content of Derived MPRS and Proposed MPRS (i.e., do sets of Derived MPRS and Proposed MPRS have the same shape?), and in terms of the similarity of the associated values of the seismic design parameters S_{MS} and S_{M1} (e.g., would the same value of base shear be used for equivalent lateral force design?).

Comparisons of Derived MPRS and Proposed MPRS are made for 34 sites in the conterminous United States where sets of ground motion models (GMMs) fully define response at all periods and site classes of interest (i.e., for both the Western United States (WUS), and Central and Eastern United States (CEUS). The 34 sites used in these comparisons are the same as those used in the commentaries of the *NEHRP Provisions* and ASCE 7 that provide example values of MCE_R ground motions. Specific locations of each of the 34 sites, and other information, may be found in the commentary to Chapter 22 of the 2015 *NEHRP Provisions* and ASCE 7-16.

For the WUS sites governed only by active crustal earthquakes (e.g., WUS sites in Southern and Northern California), Derived MPRS are expected to compare very well with Proposed MPRS because they are both developed

based on the same set of GMMs (i.e., NGA-West2). There will be slight differences because, for some locations, deep basin effects are included in Proposed MPRS (see Petersen et al., 2020, for details), whereas the models for Derived MPRS were intentionally developed based on default basin depths to be representative of generic shapes. It is not desirable to account for local basin effects when deriving MPRS for a general site in the United States and U.S. territories with unknown basin conditions.

For WUS sites in the Pacific Northwest and the Intermountain West regions, where Proposed MPRS are also influenced by other GMMs (i.e., GMMs for subduction earthquakes and GMMs for CEUS sources), the comparisons are not expected to be as good. Note that some subduction GMMs are used in the development of derived probabilistic MPRS (i.e., in regions where T_L = 16 s in the Pacific Northwest), but not in the development of deterministic MPRS, so comparisons are relatively better in those locations. However, some additional differences are expected for some locations near the Seattle basin due to the inclusion of deep basin amplifications in Proposed MPRS (see Petersen et al., 2020, for details) because the models for Derived MPRS were developed based on default basin depths. Again, it is not desirable to account for local basin effects when deriving MPRS for a general site in the United States and U.S. territories with unknown basin conditions.

Finally, for CEUS sites, where Proposed MPRS are based on an entirely different set of GMMs (i.e., NGA-East), poor comparisons are expected. The CEUS examples are provided in this chapter to illustrate the differences between WUS and CEUS ground motion models and the resulting design parameters. The comparisons for the CEUS locations could be improved if a separate set of response spectrum shape parameters (RSSPs) were developed based on CEUS GMMs. However, as previously mentioned, because the states and U.S. territories under consideration in this report are not in stable continental regions (i.e., similar tectonic settings as the CEUS), developing an alternative set of RSSPs based on CEUS GMMs is not within the scope of this report.

6.1 Calculation of MPRS at 34 WUS and CEUS Sites

6.1.1 Proposed MPRS and Parameters S_{MS} and S_{M1}

For each of the 34 sites, the USGS has developed sets of Proposed MPRS of: (1) probabilistic MCE_R ground motions; (2) deterministic MCE_R ground motions; and (3) combined (lesser of probabilistic and deterministic after applying the deterministic lower limit) MCE_R ground motions. These sets of

Proposed MPRS are calculated in accordance with proposed requirements of the 2020 *NEHRP Provisions* and ASCE 7-22 using the ground motions of the 2018 USGS NSHM. As previously mentioned, these Proposed MPRS values are provisional and subject to change, as they will be finalized by the USGS for adoption by the 2020 *NEHRP Provisions* and ASCE 7-22, but such updates will not change the conclusions of this validation effort.

Table 6.1-1 Summary of the Values of the MCE$_R$ Ground Motion Parameter S_{MS} of Proposed MPRS for Each of Eight Hypothetical Site Classes and the Default Site Condition for 34 Conterminous U.S. Sites (Appendix D)

Site		5%-Damped Response Spectral Acceleration (g) by Site Class								
City (State)	Sym.	A	B	BC	C	CD	D	DE	E	Default
WUS - Southern California Sites										
Los Angeles	LA	1.32	1.57	1.98	2.27	2.35	2.25	1.93	1.66	2.35
Century City	CC	1.43	1.70	2.13	2.43	2.52	2.39	2.02	1.70	2.52
Northridge	NR	1.32	1.47	1.86	2.18	2.26	2.07	1.77	1.55	2.26
Long Beach	LB	1.15	1.37	1.73	1.99	2.09	2.03	1.96	1.76	2.09
Irvine	IRV	0.86	1.02	1.29	1.51	1.62	1.68	1.70	1.74	1.68
Riverside	RIV	0.91	1.07	1.35	1.54	1.67	1.64	1.51	1.44	1.67
San Bernardino	SBO	1.77	1.99	2.51	2.91	2.97	2.69	2.13	1.78	2.97
San Luis Obispo	SLO	0.73	0.87	1.10	1.30	1.40	1.44	1.47	1.51	1.44
San Diego	SD	1.04	1.24	1.56	1.77	1.78	1.68	1.57	1.56	1.78
Santa Barbara	SBA	1.48	1.77	2.21	2.44	2.51	2.35	2.13	1.77	2.51
Ventura	VEN	1.40	1.68	2.10	2.39	2.50	2.39	2.23	1.83	2.50
WUS - Northern California Sites										
Oakland	OAK	1.29	1.45	1.85	2.16	2.21	2.02	1.67	1.44	2.21
Concord	CON	1.68	1.94	2.45	2.84	2.79	2.42	1.90	1.60	2.84
Monterey	MON	0.90	1.07	1.35	1.59	1.71	1.75	1.77	1.68	1.75
Sacramento	SAC	0.39	0.46	0.59	0.72	0.85	0.97	1.10	1.22	0.97
San Francisco	SF	1.01	1.12	1.42	1.67	1.80	1.74	1.54	1.44	1.80
San Mateo	SM	1.33	1.48	1.87	2.20	2.30	2.14	1.81	1.57	2.30
San Jose	SJ	0.91	1.07	1.35	1.54	1.65	1.62	1.51	1.44	1.65
Santa Cruz	SC	1.01	1.18	1.48	1.71	1.78	1.82	1.51	1.44	1.82
Vallejo	VAL	1.42	1.65	2.08	2.39	2.43	2.18	1.80	1.54	2.43
Santa Rosa	SR	1.71	1.96	2.47	2.91	2.95	2.61	2.08	1.73	2.95
WUS - Pacific Northwest Sites										
Seattle WA	SEA	1.05	1.38	1.68	1.93	2.11	2.10	1.92	1.98	2.11
Tacoma WA	TAC	0.89	1.07	1.35	1.54	1.65	1.62	1.57	1.74	1.65
Everett WA	EWA	0.82	1.05	1.29	1.49	1.62	1.70	1.56	1.47	1.70
Portland OR	POR	0.53	0.69	0.85	1.00	1.09	1.17	1.22	1.35	1.17
Intermountain Sites										
Salt Lake City UT	SLC	1.02	1.24	1.57	1.77	1.81	1.68	1.50	1.43	1.81
Boise ID	BID	0.19	0.23	0.30	0.37	0.43	0.49	0.56	0.61	0.49
Reno NV	RNV	0.91	1.08	1.38	1.64	1.74	1.64	1.51	1.44	1.74
Las Vegas NV	LNV	0.41	0.50	0.63	0.74	0.79	0.82	0.83	0.87	0.82
CEUS Sites										
Saint Louis MO	STL	0.49	0.49	0.57	0.63	0.68	0.67	0.61	0.61	0.68
Memphis TN	MEM	0.93	1.03	1.17	1.24	1.24	1.12	0.94	0.91	1.24
Charleston NC	CHS	1.28	1.28	1.45	1.47	1.38	1.15	0.91	0.91	1.47
Chicago IL	CHI	0.12	0.12	0.14	0.16	0.18	0.20	0.19	0.19	0.20
New York NY	NY	0.21	0.21	0.24	0.27	0.30	0.30	0.28	0.28	0.30

Tables and plots of Proposed MPRS are provided in Appendix D for each of the 34 sites. Tables 6.1-1 and 6.1-2 summarize values of MCE_R ground motion parameters S_{MS} and S_{M1}, respectively, of Proposed MPRS for each of the 34 sites and for eight hypothetical site classes (i.e., Site Class A, B, BC, C, CD, D, DE, and E), as well as the Default site condition.

Table 6.1-2 Summary of the Values of the MCE_R Ground Motion Parameter S_{M1} of Proposed MPRS for Each of Eight Hypothetical Site Classes and the Default Site Condition for 34 Conterminous U.S. Sites (Appendix D)

Site		5%-Damped Response Spectral Acceleration (g) by Site Class								
City (State)	Sym.	A	B	BC	C	CD	D	DE	E	Default
WUS - Southern California Sites										
Los Angeles	LA	0.54	0.60	0.79	1.04	1.38	1.65	2.11	2.62	1.65
Century City	CC	0.63	0.70	0.92	1.22	1.59	1.84	2.39	2.88	1.84
Northridge	NR	0.54	0.59	0.77	1.02	1.36	1.64	2.09	2.60	1.64
Long Beach	LB	0.55	0.58	0.75	1.00	1.31	1.57	2.14	2.63	1.57
Irvine	IRV	0.28	0.32	0.45	0.64	0.89	1.12	1.42	1.77	1.12
Riverside	RIV	0.35	0.40	0.58	0.83	1.15	1.44	2.01	2.55	1.44
San Bernardino	SBO	0.65	0.74	1.06	1.52	2.07	2.83	3.93	4.99	2.83
San Luis Obispo	SLO	0.24	0.28	0.40	0.57	0.80	1.00	1.30	1.64	1.00
San Diego	SD	0.32	0.37	0.52	0.75	1.03	1.23	1.50	1.87	1.23
Santa Barbara	SBA	0.50	0.62	0.86	1.21	1.63	1.89	2.46	2.93	1.89
Ventura	VEN	0.68	0.76	1.01	1.35	1.76	2.11	2.84	3.47	2.11
WUS - Northern California Sites										
Oakland	OAK	0.61	0.60	0.78	1.04	1.41	1.71	2.40	3.02	1.71
Concord	CON	0.67	0.73	0.97	1.30	1.68	1.93	2.48	3.03	1.93
Monterey	MON	0.30	0.34	0.49	0.70	0.98	1.21	1.62	2.05	1.21
Sacramento	SAC	0.15	0.17	0.24	0.34	0.49	0.65	0.88	1.13	0.65
San Francisco	SF	0.39	0.42	0.60	0.86	1.30	1.75	2.40	3.02	1.75
San Mateo	SM	0.71	0.71	0.87	1.16	1.68	2.30	3.18	4.06	2.30
San Jose	SJ	0.59	0.55	0.60	0.86	1.22	1.71	2.40	3.00	1.71
Santa Cruz	SC	0.37	0.41	0.59	0.85	1.18	1.47	2.05	2.60	1.47
Vallejo	VAL	0.67	0.67	0.89	1.19	1.55	1.78	2.44	3.04	1.78
Santa Rosa	SR	0.86	0.88	1.16	1.55	2.01	2.39	3.30	4.17	2.39
WUS - Pacific Northwest Sites										
Seattle WA	SEA	0.36	0.52	0.71	0.96	1.30	1.66	2.21	2.63	1.66
Tacoma WA	TAC	0.26	0.37	0.49	0.66	0.89	1.11	1.49	1.98	1.11
Everett WA	EWA	0.27	0.37	0.49	0.66	0.89	1.10	1.47	1.81	1.10
Portland OR	POR	0.16	0.25	0.36	0.53	0.75	1.00	1.35	1.81	1.00
Intermountain Sites										
Salt Lake City UT	SLC	0.43	0.48	0.64	0.84	1.10	1.28	1.61	2.01	1.28
Boise ID	BID	0.06	0.07	0.10	0.14	0.21	0.28	0.36	0.44	0.28
Reno NV	RNV	0.32	0.38	0.54	0.77	1.07	1.32	1.64	2.06	1.32
Las Vegas NV	LNV	0.12	0.14	0.20	0.28	0.40	0.51	0.62	0.77	0.51
CEUS Sites										
Saint Louis MO	STL	0.18	0.18	0.18	0.23	0.32	0.38	0.36	0.36	0.38
Memphis TN	MEM	0.34	0.35	0.35	0.45	0.62	0.72	0.66	0.66	0.72
Charleston NC	CHS	0.37	0.37	0.38	0.49	0.67	0.76	0.67	0.67	0.76
Chicago IL	CHI	0.07	0.07	0.08	0.10	0.13	0.15	0.15	0.15	0.15
New York NY	NY	0.05	0.05	0.05	0.06	0.09	0.11	0.10	0.10	0.11

6.1.2 Derived MPRS and Parameters S_{MS} and S_{M1}

For each of the 34 sites, this study develops sets of Derived MPRS of: (1) probabilistic MCE_R ground motions; (2) deterministic MCE_R ground motions; and (3) combined (lesser of probabilistic and deterministic after applying the deterministic lower limit) MCE_R ground motions. Sets of Derived MPRS of probabilistic MCE_R ground motions are calculated in accordance with the methods of Chapters 3 and 4; sets of Derived MPRS of deterministic MCE_R ground motions are calculated in accordance with the methods of Chapters 3 and 5. Tables and plots of Derived MPRS are provided in Appendix E for each of the 34 sites.

Probabilistic MPRS are derived from the set of probabilistic RSSPs of Appendix B that corresponds to the site-specific values of T_L, S_S, and $R_{S/1} = S_S/S_1$. The values of the parameters S_S and S_1 used to derive the probabilistic MPRS are the 0.2-second and 1.0-second response values, respectively, of the corresponding set of probabilistic Proposed MPRS (of Appendix D), for Site Class BC. Deterministic MPRS are derived from the set(s) of deterministic RSSPs of Appendix C that corresponds to the site-specific values of S_S, M_S, S_1, and M_1. The values of the parameters S_S and S_1 used to derive deterministic MPRS are the 0.2-second and 1.0-second response values, respectively, of the corresponding set of deterministic Proposed MPRS (of Appendix D), for Site Class BC.

Table 6.1-3 summarizes the values of the "probabilistic" parameters T_L, S_S, and $R_{S/1} = S_S/S_1$ used to derive sets of probabilistic MPRS, as well as the values of the "deterministic" parameters S_S, M_S, S_1, and M_1 used to derive sets of deterministic MPRS for each of the 34 conterminous U.S. sites. As shown in this table, the probabilistic values of the parameter S_S, which are based on the probabilistic (risk-targeted) methods proposed for Section 21.2.1 of the 2020 *NERHP Provisions* and ASCE 7-22, are different at all sites from those of the deterministic (scenario-based) methods proposed for Section 21.2.2. Where the probabilistic value of the parameter S_S is less than the deterministic value of S_S, the probabilistic MPRS govern 0.2-second MCE_R ground motions for Site Class BC. At most WUS sites, ASCE 7-22 (and derived) MPRS are governed by probabilistic MCE_R for some periods and site classes and by deterministic MCE_R ground motions for others. In general, ASCE 7-22 (and derived) MPRS of WUS sites in Northern California are more likely to be governed by deterministic MCE_R ground motions than those of WUS sites in Southern California.

To better understand these examples, Table 6.1-3 also provides the magnitudes (labeled as M_S and M_1) and associated values of epsilon

Table 6.1-3 Summary of the Values of: (1) the Parameters T_L, S_S, and $R_{S/1}$ = S_S/S_1 Used to Derive Sets of Probabilistic MPRS; (2) Values of the Parameters S_S, M_S, S_1, and M_1 Used to Derive Sets of Deterministic MPRS; and (3) Values of Governing Magnitudes and Epsilons Obtained from Hazard Deaggregation, for 34 Conterminous U.S. Sites. Yellow (Green) Shading Indicates Values of Epsilon Less (Greater) than 1.0

Site		Probabilisitc			Deterministic			from Deaggregation			
City (State)	Sym.	T_L (s)	S_S (g)	$R_{S/1}$	S_S (g)	S_1 (g)	$M_S(M_1)$	M_S	$\varepsilon_{0,0.2s}$	M_1	$\varepsilon_{0,1.0s}$
WUS - Southern California Sites											
Los Angeles	LA	8	2.20	2.79	2.61	0.91	7.1	7.3	0.72	7.2	0.76
Century City	CC	8	2.37	2.58	2.73	1.06	7.7	7.4	0.76	7.3	0.77
Northridge	NR	8	2.21	2.86	2.06	0.79	7.8	7.5	1.12	7.7	0.95
Long Beach	LB	8	1.92	2.54	2.75	1.12	8.0	7.3	0.40	7.4	0.34
Irvine	IRV	8	1.43	3.14	2.79	0.91	6.8	7.3	-0.11	7.3	-0.15
Riverside	RIV	12	1.79	3.12	1.42	0.52	7.7	8.0	1.39	8.0	1.16
San Bernardino	SBO	12	2.93	2.76	2.78	1.12	7.9	8.0	1.08	8.0	0.91
San Luis Obispo	SLO	8	1.22	3.07	1.97	0.63	6.8	6.8	0.21	6.9	0.23
San Diego	SD	8	1.74	3.31	2.18	0.69	6.7	6.5	0.62	6.6	0.55
Santa Barbara	SBA	8	2.46	2.84	3.17	1.17	7.4	7.7	0.58	7.7	0.50
Ventura	VEN	8	2.34	2.32	3.05	1.39	8.0	7.5	0.56	7.5	0.47
WUS - Northern California Sites											
Oakland	OAK	8	2.53	2.72	2.05	0.78	7.7	7.1	1.35	7.2	1.29
Concord	CON	8	2.93	2.79	2.72	0.97	7.2	6.6	1.12	6.7	1.14
Monterey	MON	12	1.50	3.07	2.24	0.72	6.8	6.9	0.33	6.9	0.36
Sacramento	SAC	12	0.65	2.75	0.51	0.18	7.4	6.9	1.41	7.1	1.45
San Francisco	SF	12	1.98	2.82	1.57	0.59	7.8	7.9	1.38	7.9	1.28
San Mateo	SM	12	2.34	2.45	2.08	0.87	7.9	7.8	1.20	7.9	1.15
San Jose	SJ	12	2.36	2.58	1.41	0.59	8.0	7.0	1.87	7.9	1.74
Santa Cruz	SC	12	1.76	2.98	1.64	0.62	7.9	6.7	1.12	6.9	0.91
Vallejo	VAL	8	2.37	2.56	2.31	0.89	7.6	7.2	1.04	7.3	1.06
Santa Rosa	SR	8	2.83	2.39	2.75	1.16	8.0	6.8	1.05	7.2	1.03
WUS - Pacific Northwest Sites											
Seattle WA	SEA	6	1.86	2.64	2.12	0.89	8.0	6.9	0.78	6.9	0.62
Tacoma WA	TAC	6	1.58	3.22	1.23	0.51	8.0	9.0	1.42	9.0	0.92
Everett WA	EWA	6	1.43	2.92	1.81	0.67	7.5	7.0	0.61	7.1	0.49
Portland OR	POR	16	0.95	2.65	2.23	0.71	6.8	6.8	-0.42	6.8	-0.13
Intermountain Sites											
Salt Lake City UT	SLC	8	1.74	2.73	2.31	0.82	7.3	6.9	0.53	6.9	0.57
Boise ID	BID	6	0.33	3.31	0.35	0.12	7.2	7.0	0.92	7.0	0.71
Reno NV	RNV	6	1.73	3.23	1.54	0.47	6.6	6.8	1.20	6.8	1.23
Las Vegas NV	LNV	6	0.70	3.52	1.75	0.43	6.1	6.3	-0.54	6.3	-0.30
CEUS Sites											
Saint Louis MO	STL	12	0.63	3.47	0.47	0.16	7.2	7.7	1.49	7.6	1.23
Memphis TN	MEM	12	1.30	3.69	1.19	0.33	6.4	7.7	1.15	7.7	1.11
Charleston NC	CHS	8	1.61	4.21	2.59	0.62	6.0	7.2	0.21	7.2	0.20
Chicago IL	CHI	6	0.15	2.19	0.21	0.058	6.3	7.4	0.48	7.7	1.33
New York NY	NY	6	0.27	5.40	0.27	0.029	6.0	NaN	NaN	7.3	1.92

governing 0.2-second and 1.0-second response (Site Class BC site conditions), obtained from deaggregation of the ground motion hazard at each of the 34 sites. Where values of epsilon are less than 1.0, 0.2-second (or 1.0-second) Site Class BC response is, in all cases, governed by probabilistic MCE_R ground motions. Where values of epsilon are greater than 1.0 (and probabilistic MCE_R response is greater than lower limit deterministic MCE_R response), 0.2-second (or 1.0-second) Site Class BC response is governed by deterministic MCE_R ground motions.

Table 6.1-4 Summary of the Values of the MCE_R Ground Motion Parameter S_{MS} from Derived MPRS (Appendix E) for Each of Eight Hypothetical Site Classes and the Default Site Condition for 34 Conterminous U.S. Sites

Site		5%-Damped Response Spectral Acceleration (g) by Site Class								
City (State)	Sym.	A	B	BC	C	CD	D	DE	E	Default
WUS - Southern California Sites										
Los Angeles	LA	1.36	1.57	1.98	2.26	2.33	2.21	1.90	1.68	2.33
Century City	CC	1.47	1.69	2.13	2.47	2.51	2.38	2.10	1.85	2.51
Northridge	NR	1.26	1.48	1.86	2.09	2.16	2.05	1.79	1.64	2.16
Long Beach	LB	1.18	1.37	1.73	2.01	2.07	2.09	1.97	1.92	2.09
Irvine	IRV	0.88	1.02	1.29	1.51	1.60	1.63	1.63	1.66	1.63
Riverside	RIV	0.91	1.07	1.35	1.54	1.65	1.62	1.51	1.44	1.65
San Bernardino	SBO	1.69	2.00	2.51	2.80	2.89	2.65	2.20	1.94	2.89
San Luis Obispo	SLO	0.75	0.87	1.10	1.32	1.47	1.57	1.59	1.47	1.57
San Diego	SD	1.07	1.24	1.56	1.82	1.91	1.90	1.76	1.62	1.91
Santa Barbara	SBA	1.52	1.76	2.21	2.52	2.60	2.47	2.33	2.09	2.60
Ventura	VEN	1.44	1.67	2.10	2.47	2.55	2.37	2.29	2.15	2.55
WUS - Northern California Sites										
Oakland	OAK	1.25	1.47	1.85	2.07	2.14	2.03	1.77	1.62	2.14
Concord	CON	1.66	1.96	2.45	2.71	2.68	2.41	2.00	1.77	2.71
Monterey	MON	0.92	1.07	1.35	1.61	1.76	1.83	1.81	1.67	1.83
Sacramento	SAC	0.40	0.46	0.59	0.73	0.86	0.99	1.13	1.26	0.99
San Francisco	SF	0.96	1.13	1.42	1.61	1.71	1.68	1.56	1.48	1.71
San Mateo	SM	1.26	1.49	1.87	2.10	2.18	2.07	1.81	1.65	2.18
San Jose	SJ	0.91	1.07	1.35	1.54	1.65	1.62	1.51	1.44	1.65
Santa Cruz	SC	1.00	1.18	1.48	1.69	1.79	1.76	1.64	1.55	1.79
Vallejo	VAL	1.40	1.66	2.08	2.31	2.35	2.14	1.77	1.56	2.35
Santa Rosa	SR	1.67	1.97	2.47	2.77	2.87	2.64	2.19	1.94	2.87
WUS - Pacific Northwest Sites										
Seattle WA	SEA	1.15	1.35	1.68	1.94	2.11	2.08	1.88	1.71	2.11
Tacoma WA	TAC	0.91	1.07	1.35	1.54	1.65	1.62	1.51	1.44	1.65
Everett WA	EWA	0.88	1.04	1.29	1.52	1.67	1.65	1.53	1.44	1.67
Portland OR	POR	0.58	0.69	0.85	1.00	1.10	1.19	1.26	1.40	1.19
Intermountain Sites										
Salt Lake City UT	SLC	1.07	1.24	1.57	1.80	1.87	1.86	1.77	1.74	1.87
Boise ID	BID	0.20	0.23	0.30	0.36	0.42	0.46	0.51	0.56	0.46
Reno NV	RNV	0.93	1.10	1.38	1.57	1.65	1.62	1.51	1.44	1.65
Las Vegas NV	LNV	0.42	0.50	0.63	0.74	0.80	0.84	0.87	0.91	0.84
CEUS Sites										
Saint Louis MO	STL	0.38	0.45	0.57	0.70	0.83	0.95	1.09	1.21	0.95
Memphis TN	MEM	0.80	0.93	1.17	1.40	1.52	1.53	1.51	1.44	1.53
Charleston NC	CHS	0.99	1.15	1.45	1.70	1.81	1.84	1.84	1.72	1.84
Chicago IL	CHI	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.30	0.23
New York NY	NY	0.16	0.19	0.24	0.30	0.34	0.38	0.42	0.46	0.38

Tables 6.1-4 and 6.1-5 summarize values of MCE_R ground motion parameters S_{MS} and S_{M1}, respectively, from Derived MPRS (Appendix E) for each of the 34 sites and for eight hypothetical site classes (i.e., Site Class A, B, BC, C, CD, D, DE, and E), as well as the Default site condition.

Table 6.1-5 Summary of the Values of the MCE_R Ground Motion Parameter S_{M1} from Derived MPRS (Appendix E) for Each of Eight Hypothetical Site Classes and the Default Site Condition for 34 Conterminous U.S. Sites

Site		5%-Damped Response Spectral Acceleration (g) by Site Class								
City (State)	Sym.	A	B	BC	C	CD	D	DE	E	Default
WUS - Southern California Sites										
Los Angeles	LA	0.50	0.55	0.79	1.13	1.55	1.76	2.38	2.95	1.76
Century City	CC	0.58	0.64	0.92	1.32	1.81	2.05	2.78	3.44	2.05
Northridge	NR	0.49	0.54	0.77	1.11	1.52	1.74	2.33	2.89	1.74
Long Beach	LB	0.47	0.53	0.75	1.09	1.50	1.71	2.32	2.88	1.71
Irvine	IRV	0.28	0.32	0.45	0.66	0.91	1.12	1.43	1.78	1.12
Riverside	RIV	0.37	0.40	0.58	0.83	1.16	1.42	1.99	2.52	1.42
San Bernardino	SBO	0.67	0.74	1.06	1.53	2.08	2.78	3.87	4.92	2.78
San Luis Obispo	SLO	0.25	0.28	0.40	0.57	0.81	1.03	1.32	1.65	1.03
San Diego	SD	0.33	0.37	0.52	0.75	1.04	1.29	1.63	2.03	1.29
Santa Barbara	SBA	0.54	0.60	0.86	1.24	1.70	1.94	2.61	3.24	1.94
Ventura	VEN	0.63	0.70	1.01	1.45	1.98	2.24	3.04	3.77	2.24
WUS - Northern California Sites										
Oakland	OAK	0.48	0.55	0.78	1.13	1.53	1.96	2.73	3.47	1.96
Concord	CON	0.60	0.68	0.97	1.40	1.88	2.15	2.99	3.73	2.15
Monterey	MON	0.31	0.34	0.49	0.71	0.99	1.24	1.69	2.14	1.24
Sacramento	SAC	0.15	0.17	0.24	0.35	0.49	0.66	0.89	1.14	0.66
San Francisco	SF	0.37	0.42	0.60	0.86	1.22	1.71	2.40	3.00	1.71
San Mateo	SM	0.53	0.60	0.87	1.24	1.69	2.37	3.33	4.16	2.37
San Jose	SJ	0.37	0.42	0.60	0.86	1.22	1.71	2.40	3.00	1.71
Santa Cruz	SC	0.37	0.41	0.59	0.85	1.18	1.46	2.04	2.59	1.46
Vallejo	VAL	0.55	0.62	0.89	1.28	1.73	2.06	2.79	3.46	2.06
Santa Rosa	SR	0.71	0.81	1.16	1.66	2.21	2.64	3.57	4.42	2.64
WUS - Pacific Northwest Sites										
Seattle WA	SEA	0.40	0.49	0.71	1.03	1.35	1.71	2.30	3.01	1.71
Tacoma WA	TAC	0.28	0.34	0.49	0.71	0.98	1.23	1.65	2.18	1.23
Everett WA	EWA	0.28	0.34	0.49	0.69	0.96	1.23	1.66	2.19	1.23
Portland OR	POR	0.19	0.25	0.36	0.54	0.76	1.01	1.36	1.84	1.01
Intermountain Sites										
Salt Lake City UT	SLC	0.40	0.45	0.64	0.92	1.26	1.47	1.96	2.43	1.47
Boise ID	BID	0.06	0.07	0.10	0.14	0.21	0.27	0.35	0.43	0.27
Reno NV	RNV	0.33	0.37	0.54	0.77	1.07	1.31	1.63	2.05	1.31
Las Vegas NV	LNV	0.12	0.14	0.20	0.29	0.40	0.51	0.64	0.78	0.51
CEUS Sites										
Saint Louis MO	STL	0.12	0.14	0.18	0.29	0.42	0.56	0.74	0.91	0.56
Memphis TN	MEM	0.24	0.26	0.35	0.51	0.75	0.98	1.24	1.54	0.98
Charleston NC	CHS	0.26	0.27	0.38	0.55	0.77	1.02	1.26	1.50	1.02
Chicago IL	CHI	0.05	0.05	0.07	0.10	0.14	0.19	0.26	0.34	0.19
New York NY	NY	0.04	0.04	0.05	0.07	0.10	0.16	0.22	0.27	0.16

6.2 Comparison of Ground Motion Parameters S_{MS} and S_{M1} of Derived MPRS with those of Proposed MPRS

This section evaluates the reliability of the design parameters S_{MS} and S_{M1} from Derived MPRS by comparing values of these ground motion parameters with those from Proposed MPRS, for each of the 34 WUS and CEUS sites. Values of the parameter S_{MS} from Derived MPRS (Tables 6.1-4) are compared with those from Proposed MPRS (Table 6.1-1) for each of the

eight site classes and the Default site condition. Similarly, values of the ground motion parameter S_{M1} from Derived MPRS (Tables 6.1-5) are compared with those of Proposed MPRS (Table 6.1-2) for each of the eight site classes and the Default site condition.

The ground motion parameters S_{MS} and S_{M1} are considered useful metrics for comparing the similarity of Derived MPRS and Proposed MPRS because these parameters effectively define the Seismic Design Category (i.e., Tables 11.6-1 and 11.6-2 of ASCE 7-22), which governs seismic detailing requirements, as well as the level of seismic loads required for design (e.g., value of the seismic design coefficient, C_s, required by the equivalent lateral force procedure of Section 12.8 of ASCE 7-22).

Figures 6.1-1 through 6.1-18 show values of the parameter S_{MS} (or S_{M1}) of Proposed MPRS plotted as a function of the value of the parameter S_{MS} (or S_{M1}) of the Derived MPRS, for the site class of interest. Each figure includes values of these parameters for the 34 sites in the conterminous United States, using different symbols to distinguish between WUS sites in California (WUS–CA), the Pacific Northwest (WUS–PNW), and the Intermountain West region (WUS–IM), as well as sites in the CEUS. In general, values of ground motion parameters from Derived MPRS for sites in the CEUS are not expected to compare well with those of Proposed MPRS that are based on a different set of GMMs from those of the WUS sites (recall that WUS GMMs are used to develop the Derived MPRS models in this study).

Each figure includes lines that define approximate upper and lower bounds of plotted values of the parameter of interest, excluding parameters of sites in the CEUS (and the Salt Lake City site). For example, the "– 5%" lower-bound line implies that values of the parameter of interest from Derived MPRS are never less than about 5 percent of the corresponding value of the parameter from Proposed MPRS. Sites falling outside of the upper-bound and lower-bound lines are identified by the abbreviated site name symbols defined in Tables 6.1-1 to 6.1-5.

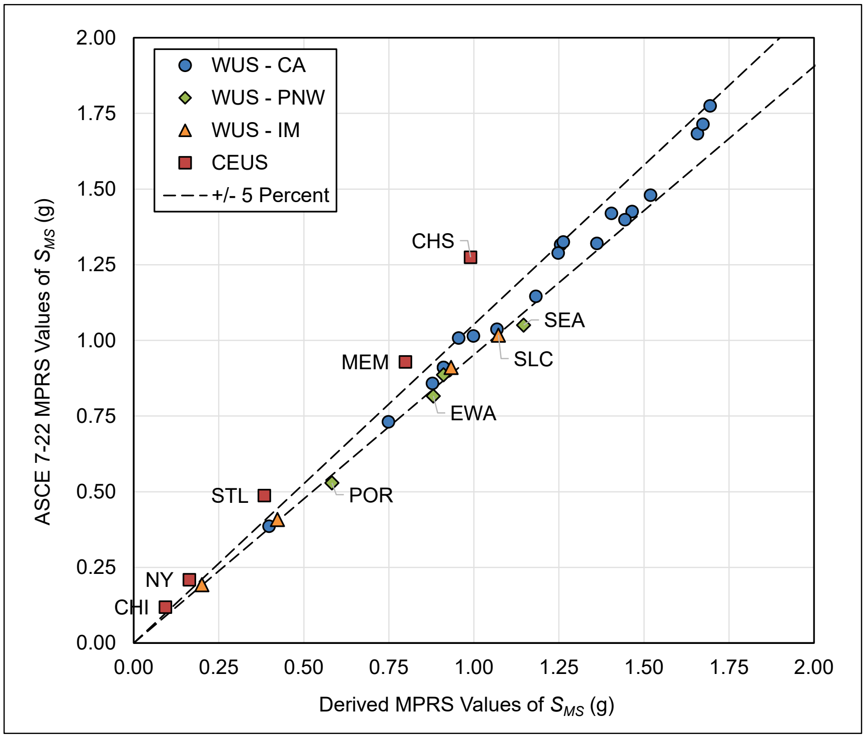


Figure 6.2-1 Comparison of S_{MS} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class A.

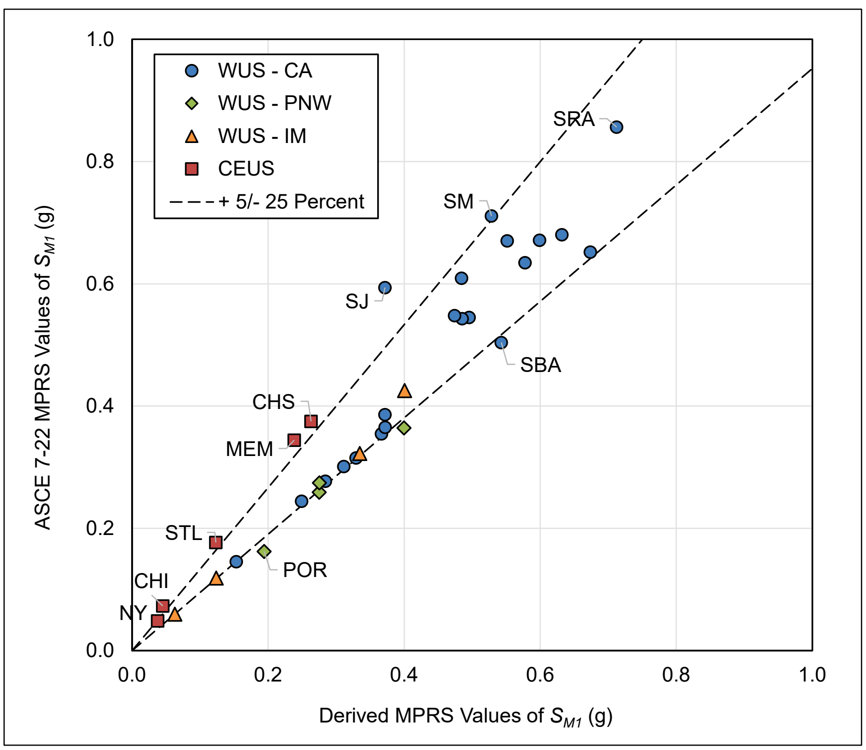


Figure 6.2-2 Comparison of S_{M1} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class A.

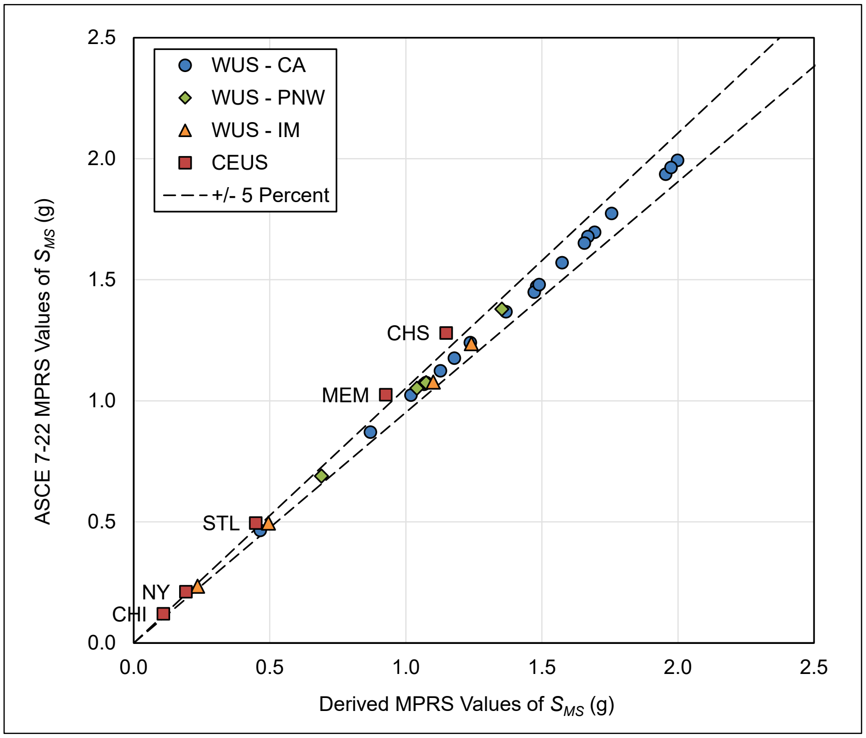


Figure 6.2-3 Comparison of S_{MS} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class B.

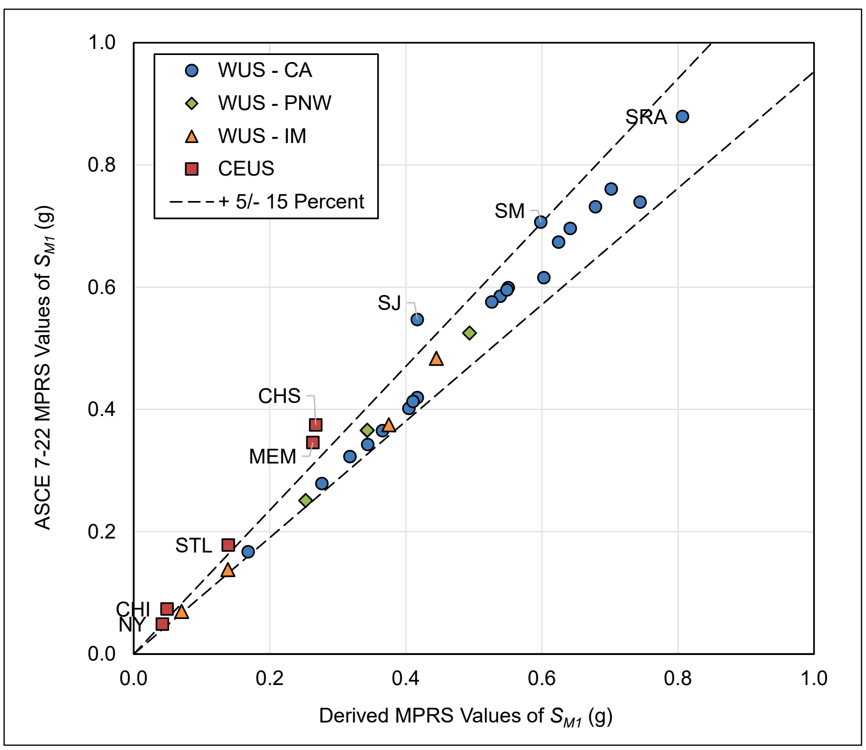


Figure 6.2-4 Comparison of S_{M1} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class B.

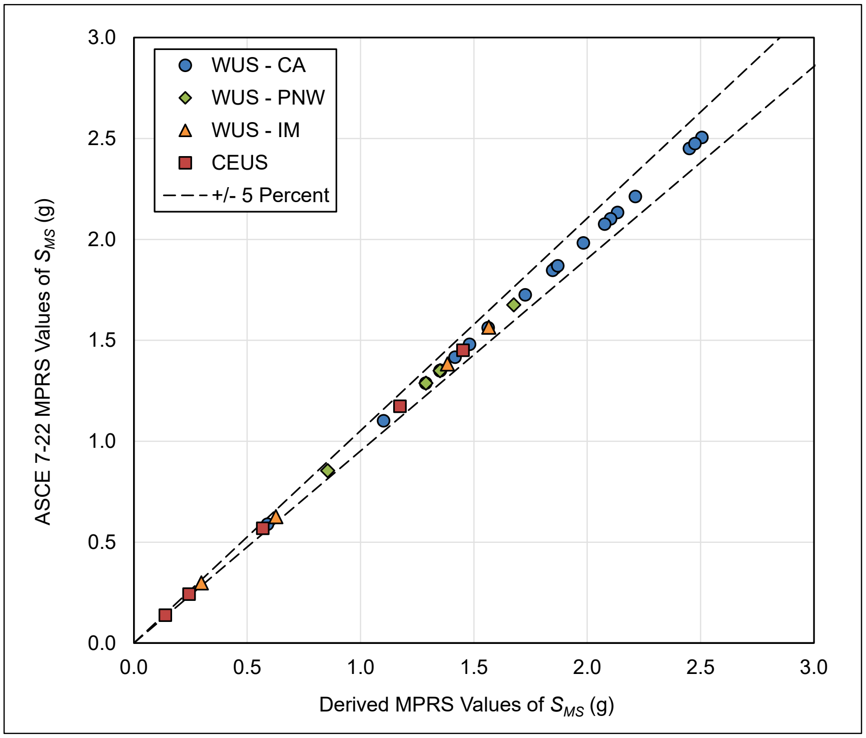


Figure 6.2-5 Comparison of S_{MS} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class BC.

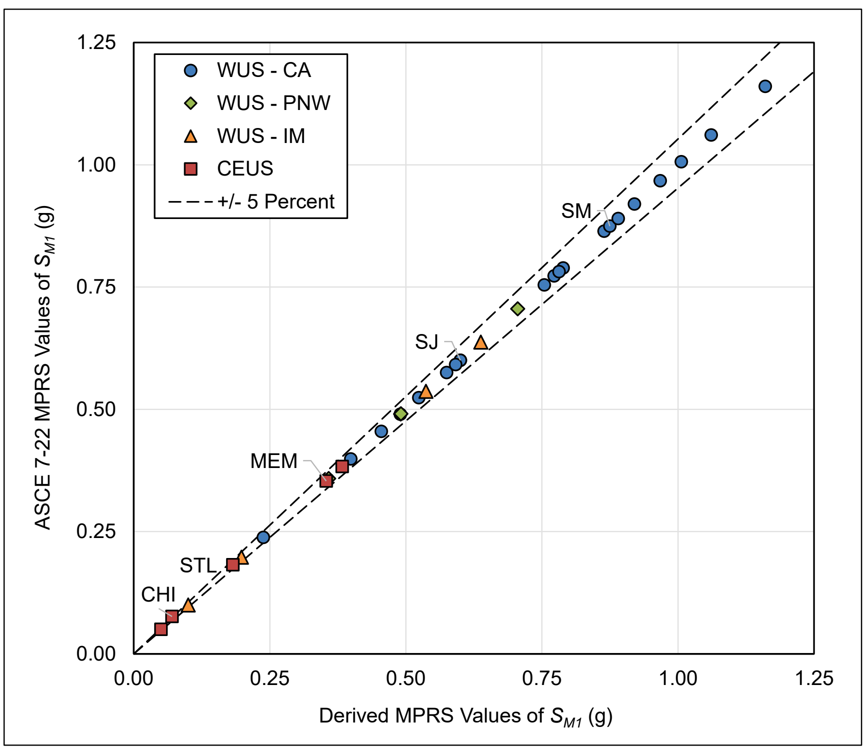


Figure 6.2-6 Comparison of S_{M1} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class BC.

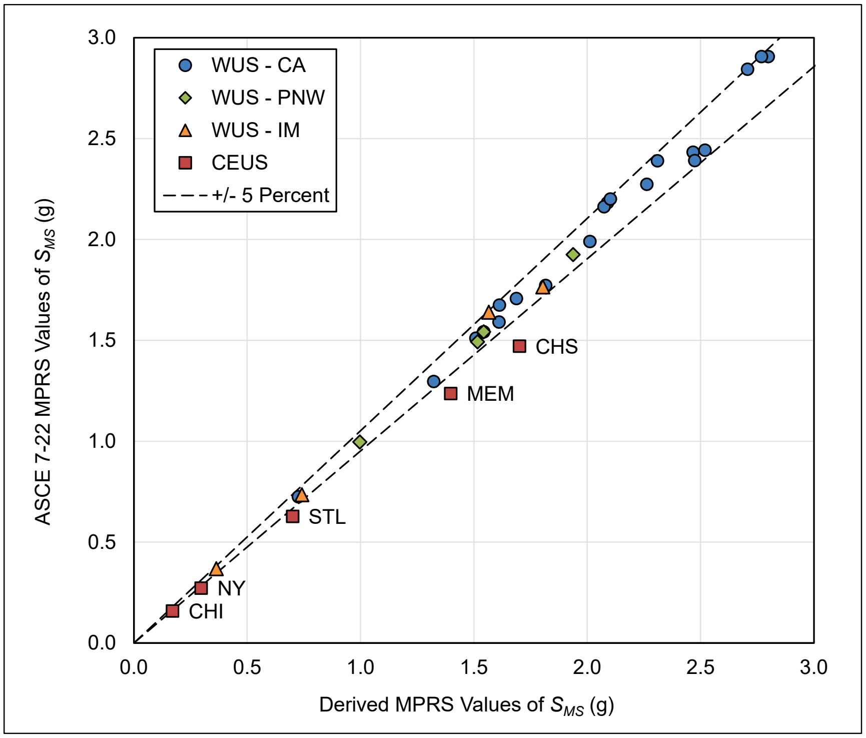


Figure 6.2-7 Comparison of S_{MS} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class C.

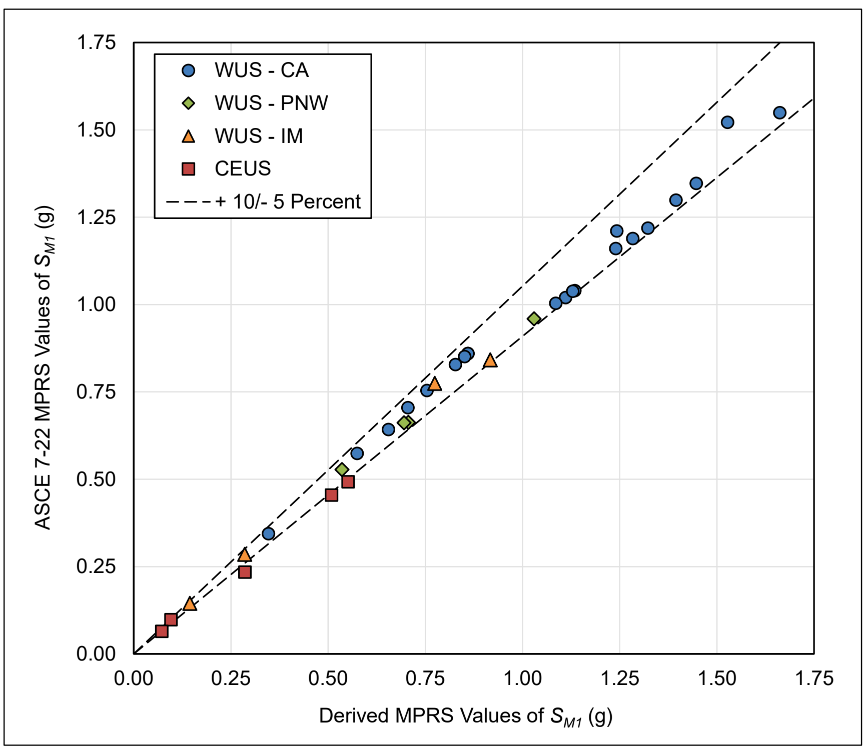


Figure 6.2-8 Comparison of S_{M1} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class C.

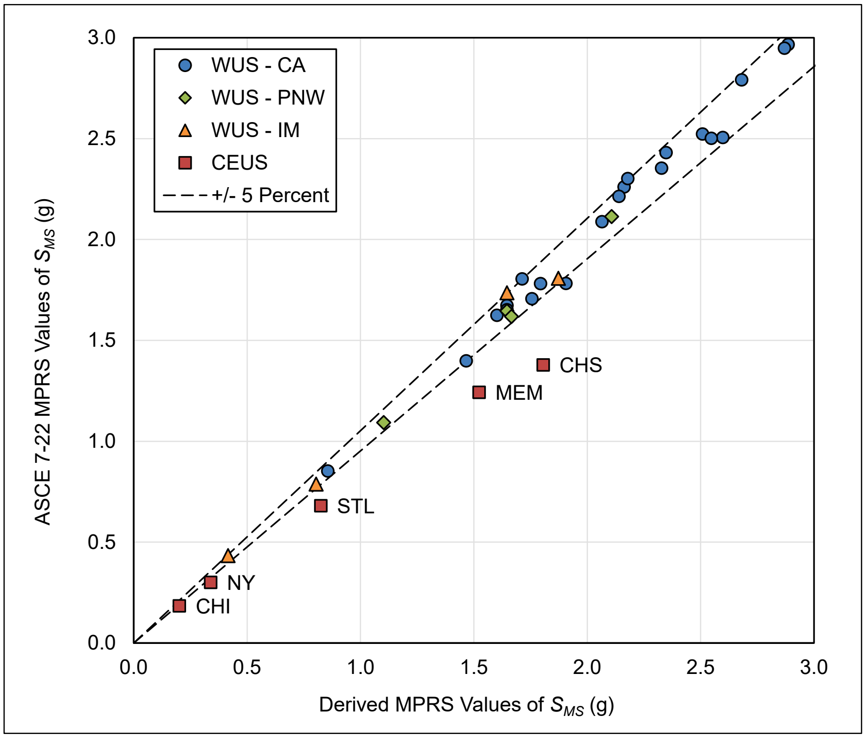


Figure 6.2-9 Comparison of S_{MS} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class CD.

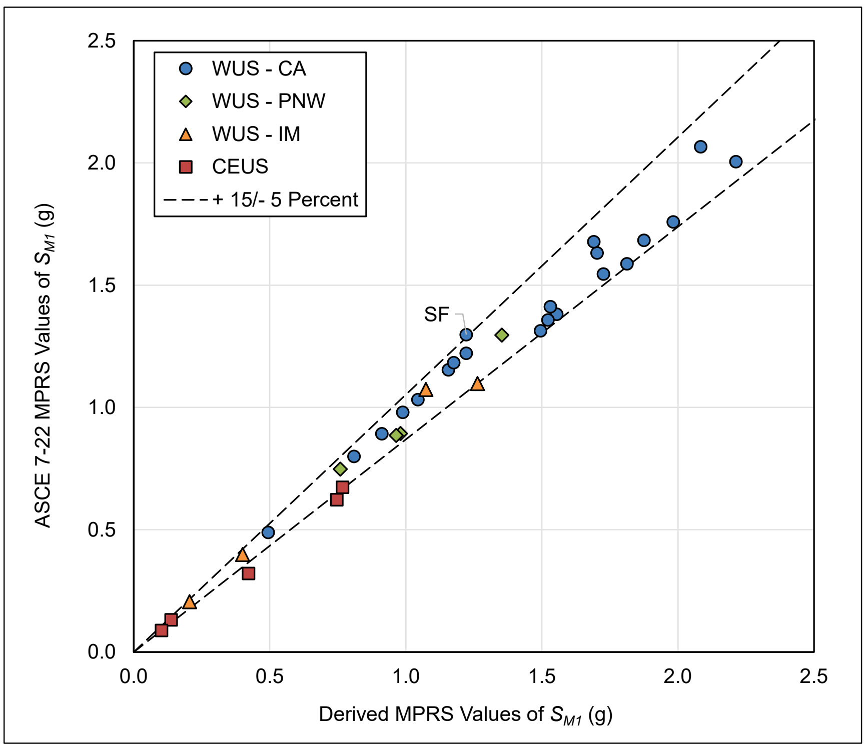


Figure 6.2-10 Comparison of S_{M1} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class CD.

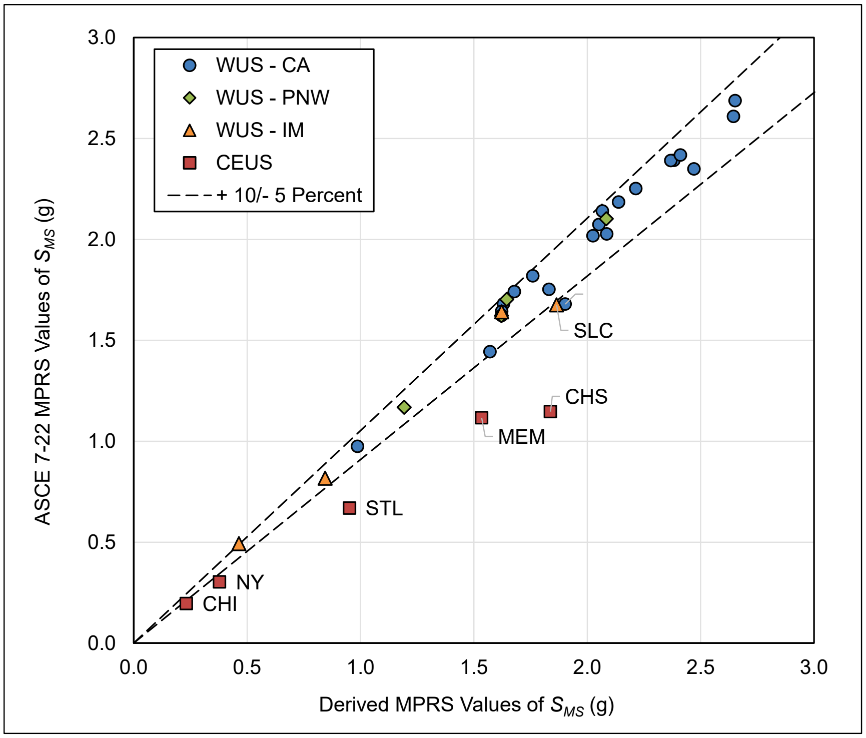


Figure 6.2-11 Comparison of S_{MS} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class D.

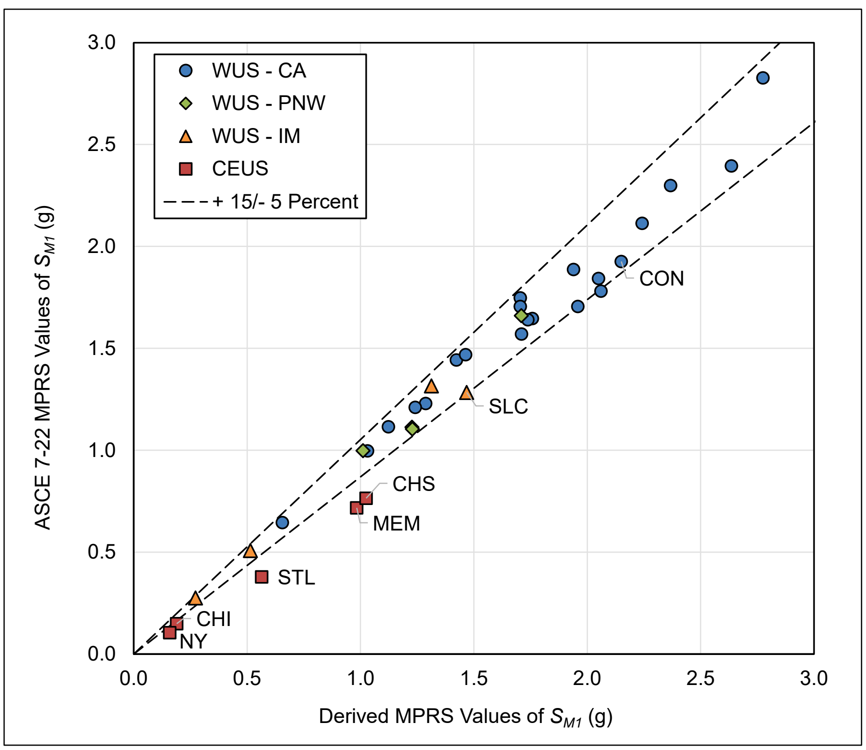


Figure 6.2-12 Comparison of S_{M1} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class D.

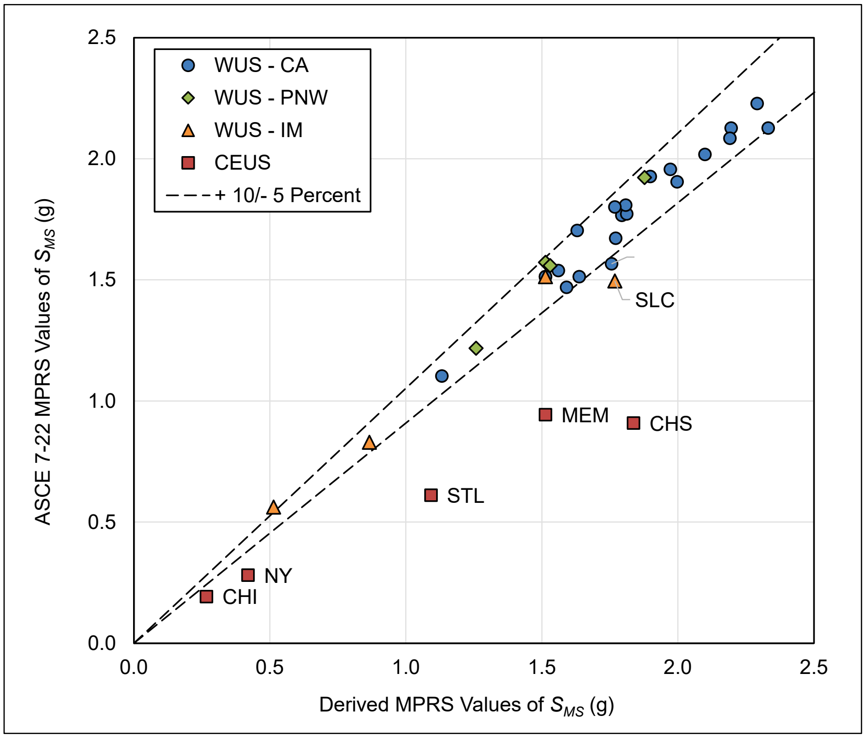


Figure 6.2-13 Comparison of S_{MS} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class DE.

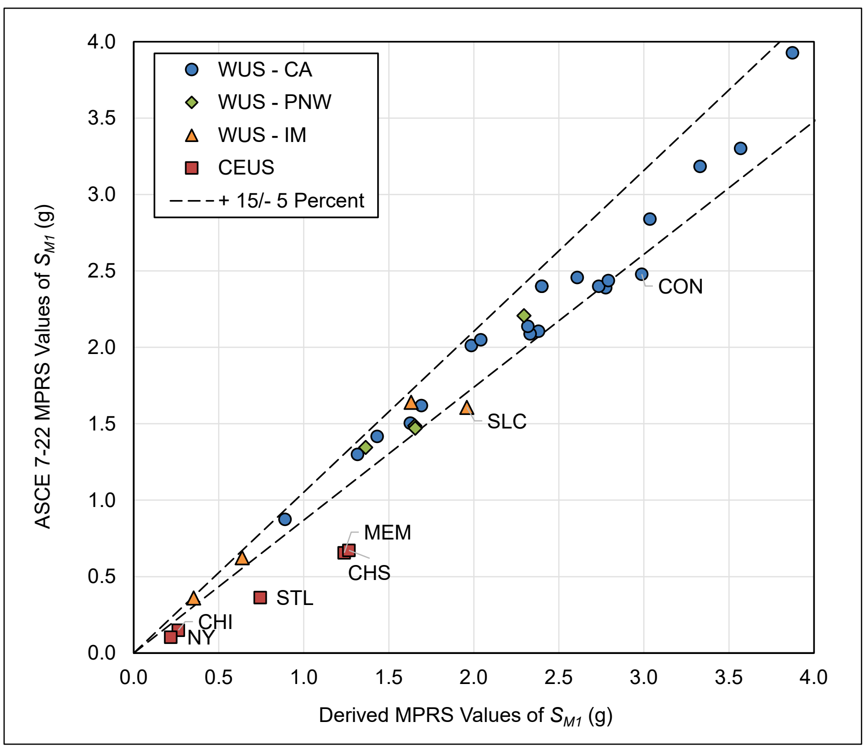


Figure 6.2-14 Comparison of S_{M1} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class DE.

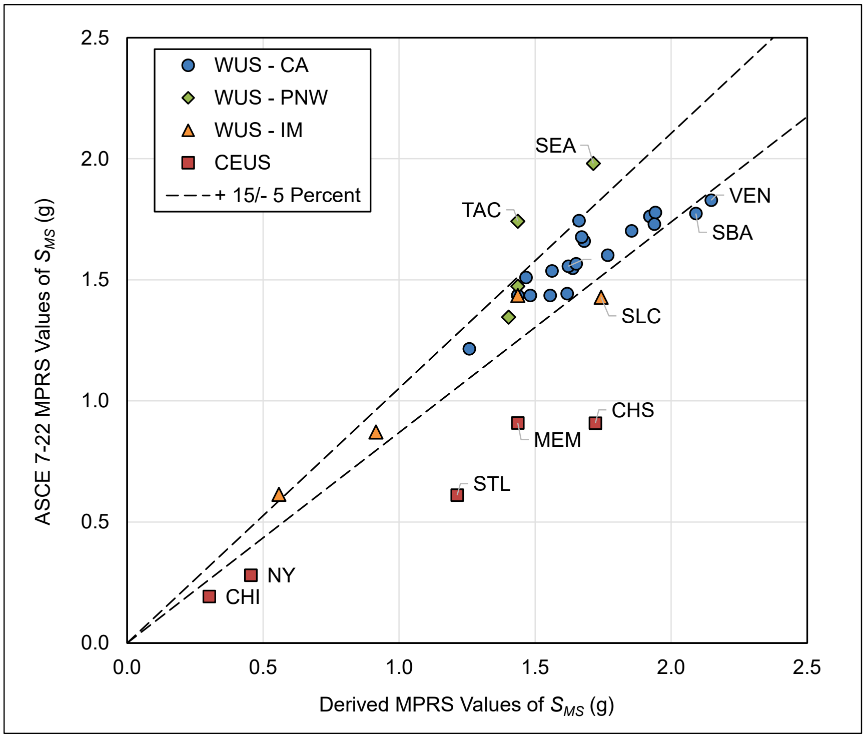


Figure 6.2-15 Comparison of S_{MS} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class E.

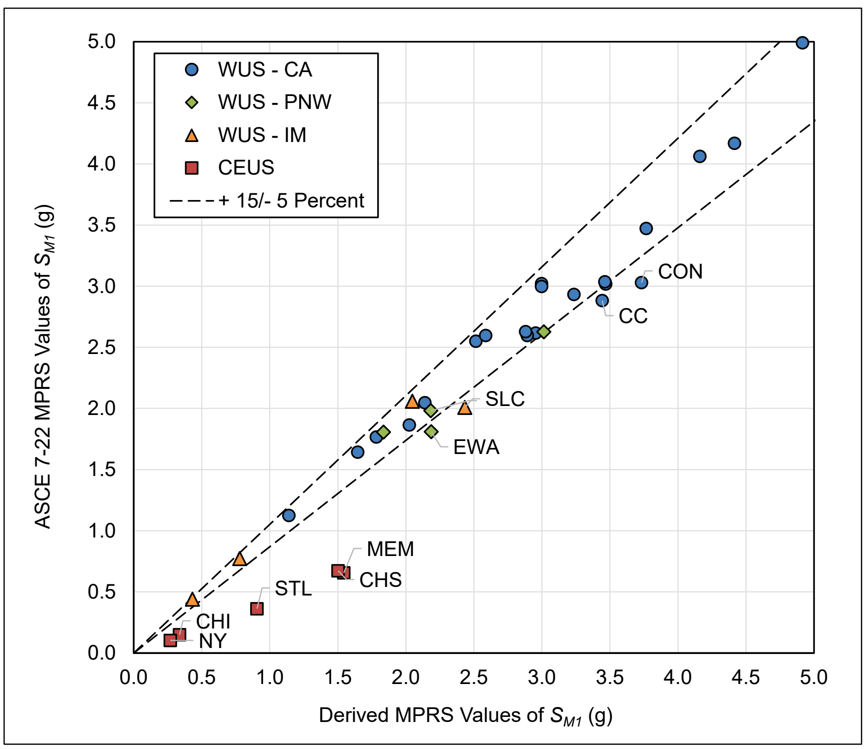


Figure 6.2-16 Comparison of S_{M1} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Site Class E.

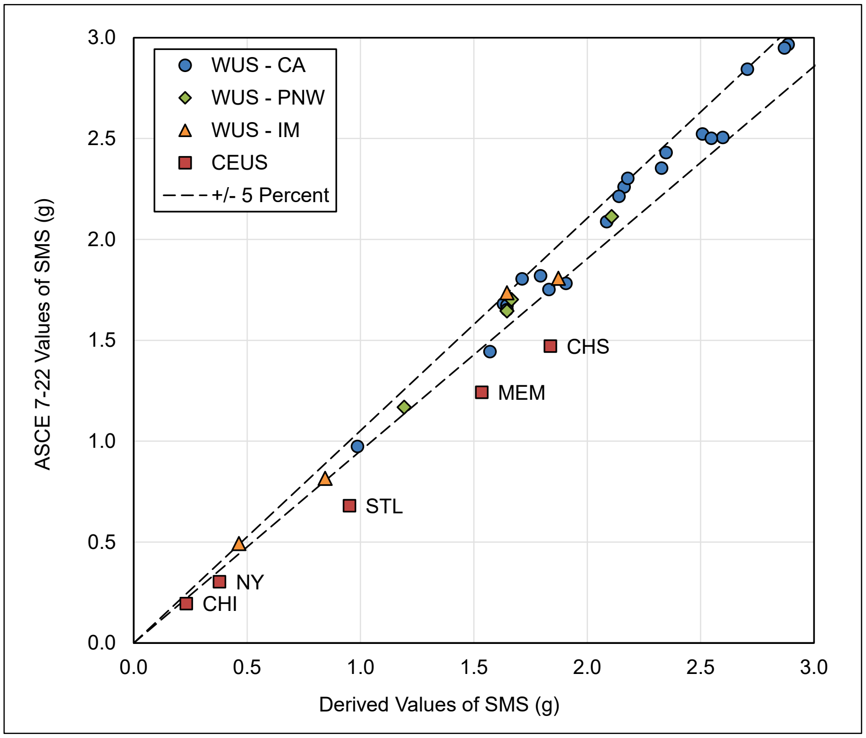


Figure 6.2-17 Comparison of S_{MS} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Default site condition.

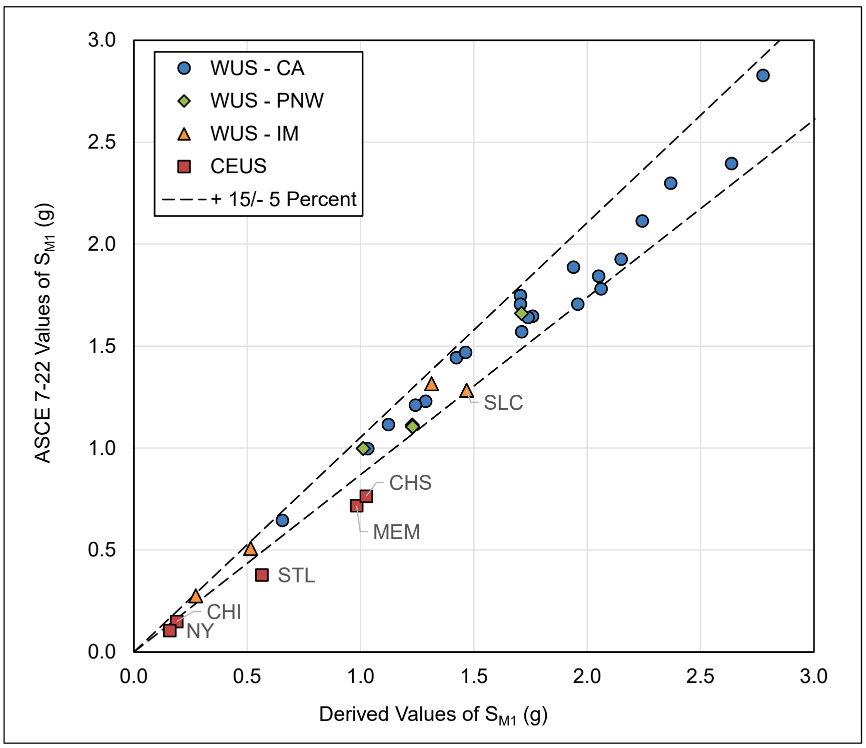


Figure 6.2-18 Comparison of S_{M1} values from Derived MPRS and Proposed (ASCE 7-22) MPRS for 34 WUS and CEUS sites – Default site condition.

In general, values of the ground motion parameters S_{MS} and S_{M1} from Derived MPRS compare well with those from the Proposed MPRS for non-CEUS sites, as shown by the summary of correlation factors (CORR) and upper-bound and lower-bound values of Table 6.2-1.

Table 6.2-1 Summary of Correlation Factors (CORR) and Upper-Bound (UB) and Lower-Bound (LB) Values of Parameters S_{MS} and S_{M1} from Derived MPRS and Proposed MPRS, by Site Class for WUS Sites

Site Class	S_{MS}			S_{M1}		
	CORR	UB	LB	CORR	UB	LB
A	0.995	+ 5%	- 5%	0.951	+ 5%	- 25%
B	1.000	+ 5%	- 5%	0.983	+ 5%	- 15%
BC	1.000	+ 5%	- 5%	0.999	+ 5%	- 5%
C	0.996	+ 5%	- 5%	0.997	+ 10%	- 5%
CD	0.995	+ 5%	- 5%	0.989	+ 15%	- 5%
D	0.989	+ 5%	- 5%	0.987	+ 15%	- 5%
DE	0.979	+ 10%	- 5%	0.987	+ 15%	- 5%
E	0.888	+ 10%	- 5%	0.983	+ 15%	- 5%
Default	0.994	+ 5%	- 5%	0.987	+ 15%	- 5%

As shown in Table 6.2-1, values of the parameters S_{MS} and S_{M1} for WUS sites are better correlated for the more common site classes (Site Classes BC, C, CD, D, and DE) than for relatively uncommon Site Classes A, B, and E. Arguably, Site Class A does not apply to sites outside of the CEUS. Other than values of S_{M1} for Site Class B, values of the ground motion parameters S_{MS} and S_{M1} from Derived MPRS are within ± 5 percent of those from Proposed MPRS, or are conservatively greater than those from Proposed MPRS by not more than about 15 percent. For Site Class B, values of S_{M1} from Derived MPRS are not more than 15 percent less than those from Proposed MPRS.

While values of the ground motion parameters S_{MS} and S_{M1} from Derived MPRS are essentially the same or slightly conservative for WUS sites, such is not the case for sites in the CEUS, for very stiff (rock) sites and for very soft soil sites in particular. Large differences are to be expected because an entirely different set of GMMs are used by the USGS to calculate Proposed MPRS for sites in the CEUS than the WUS GMMs used as the basis of Derived MPRS in this study. Differences in the values of the ground motion parameters S_{MS} and S_{M1} reflect fundamental differences in the frequency content of WUS and CEUS ground motions, as characterized by WUS and CEUS GMMs that have very different site amplification and spectrum shape effects. As previously mentioned, comparisons for CEUS locations can be

improved if a separate set of RSSPs are developed based on CEUS GMMs. However, because the states and U.S. territories under consideration in this report are not in stable continental regions (i.e., similar tectonic settings as the CEUS), developing an alternative set of RSSPs based on CEUS GMMs is not within the scope of this report.

6.3 Comparison of Derived MPRS and Proposed MPRS

This section evaluates the validity of the frequency content of Derived MPRS by comparing plots of Derived MPRS with those of the corresponding Proposed MPRS (which are provisional values subject to change by the USGS), for 23 example sites (of the 34 sites) in the WUS and CEUS. For each site, a figure compares plots of Derived MPRS and Proposed MPRS for each of six Site Classes B, BC, C, CD, D, and DE, which span the range of common site conditions. Accompanying each figure is a table providing the ratio of Derived MPRS and Proposed MPRS for each combination of response period and site class (shown as a percentage of ASCE 7-22 ground motions). Two additional tables identify whether the values of Derived MPRS and Proposed MPRS are based on probabilistic (P), deterministic (D), or deterministic lower limit (DL) MCE_R ground motions for each combination of response period and site class.

The 23 example sites include 7 (of the 11) sites in Southern California, 6 (of the 10) sites in Northern California, 3 (of the 4) sites in the Pacific Northwest, 4 (of the 4) sites in the Intermountain West region, and 3 (of the 5) sites in the CEUS. These sites were selected to provide example sets of Derived MPRS that encompass the full range of different T_L regions, levels of ground motions, and relative contributions of probabilistic, deterministic, and deterministic lower limit MCE_R ground motions to Derived MPRS. The 23 sites intentionally include the Irvine Site used for the example calculation of probabilistic MPRS in Chapter 4, and the San Mateo Site used for the example calculation of deterministic MPRS in Chapter 5. The 11 sites not included in the set of 23 example sites have similar site properties (e.g., T_L region, ground motion level, probabilistic and deterministic contributions) to one or more of the 23 example sites. Their sets of Derived MPRS compare similarly to Proposed MPRS and are not included for brevity (e.g., the Charleston Site is not included since it would show essentially the same comparison of Derived and Proposed MPRS as that shown for the Memphis Site which is included).

Table 6.3-1 lists each of the 23 example sites and summarizes values of probabilistic parameters (T_L, S_S, $R_{S/1}$) and deterministic parameters ($S_S \times S_1$, $M_S = M_1$) used to select RSSPs and develop the Derived MPRS. This table

also indicates whether Derived MPRS are predominantly defined by probabilistic (P), deterministic (D), and/or deterministic lower limit (DL) MCE_R response at short-periods (S_{MS}) and at 1-second (S_{M1}) for each of 23 example sites. Where derived MPRS are not predominantly defined by a single type of ground motion, both the primary and secondary (in parentheses) contributors are indicated.

Table 6.3-1 Summary of the Values of the Probabilistic Parameters (T_L, S_S, $R_{S/1}$) Used to Select Probabilistic RSSPs (of Appendix B) and the Deterministic Parameters ($S_S \times S_1$, $M_S = M_1$) Used to Select Deterministic RSSPs (of Appendix C), and Used to Develop the Derived MPRS of the 23 Example Sites, Including an Indication of Whether the Derived MPRS are Predominantly Defined by Probabilistic (P), Deterministic (D), and/or Deterministic Lower Limit (DL) MCE_R Ground Motions at Short-Periods (S_{MS}) and at 1-second (S_{M1})

Site		Probabilisitc			Deterministic		P, D or DL (?)	
City (State)	Sym.	T_L (s)	S_S	$R_{S/1}$	S_S x S_1	M_S (M_1)	S_{MS}	S_{M1}
WUS - Southern California Sites								
Los Angeles	**LA**	8	S5	R2	> 2.0	7.10	P (D)	P
Irvine	**IRV**	8	S3	R1	> 2.0	6.76	P	P
Riverside	**RIV**	12	S4	R2	< 1.2	7.66	DL	P
San Bernardino	**SBO**	12	S5	R4	> 2.0	7.90	D	P
San Luis Obispo	**SLO**	8	S2	R4	1.2	6.82	P (D)	P
San Diego	**SD**	8	S4	R1	< 1.2	6.74	P (D)	P
Santa Barbara	**SBA**	8	S5	R2	> 2.0	7.38	P (D)	P
WUS - Northern California Sites								
Oakland	**OAK**	8	S5	R2	1.6	7.74	D	D (DL)
Monterey	**MON**	12	S3	R2	1.6	6.80	P (D)	P
Sacramento	**SAC**	12	S1	R4	< 1.2	7.42	P	P
San Mateo	**SM**	12	S5	R4	1.8	7.85	D	D
San Jose	**SJ**	12	S5	R4	< 1.2	8.00	DL	DL(D)
Santa Rosa	**SR**	8	S5	R2	> 2.0	8.00	D	D (P)
WUS - Pacific Northwest Sites								
Seattle WA	**SEA**	6	S4	R1	1.9	8.00	D (P)	P
Tacoma WA	**TAC**	6	S3	R1	< 1.2	9.00	DL	P
Portland OR	**POR**	16	S2	R4	1.6	6.77	P	P
Intermountain Sites								
Salt Lake City UT	**SLC**	8	S4	R2	1.9	7.35	P	P
Boise ID	**BID**	6	S1	R1	<< 1.2	7.24	P	P
Reno NV	**RNV**	6	S3	R1	< 1.2	6.64	DL (D)	P
Las Vegas NV	**LNV**	6	S2	R1	< 1.2	6.09	P	P
CEUS Sites								
Saint Louis MO	**STL**	12	S1	R4	<< 1.2	7.17	P	P
Memphis TN	**MEM**	12	S3	R2	< 1.2	6.37	DL (P)	P
New York NY	**NY**	6	S1	R1	<< 1.2	6.00	P	P

In Table 6.3-1, the probabilistic parameter shown for short-period response (S_S) designates one of five response groups (S1 – S5), as defined in Chapter 4, where S1 is the weakest shaking group (e.g., values of S_S are less than or equal to 0.66g for the T_L = 12 s region) and S5 is the strongest shaking group (e.g., values of S_S are greater than 2.3g for the T_L = 12 s region). Similarly, the probabilistic parameter shown for the spectral response ratio ($R_{S/1}$) designates one of five response ratio groups (R1 – R5), as defined in Chapter 4, where R1 is the response ratio group with the largest values of $R_{S/1}$ (i.e., values of $R_{S/1}$ are greater than or equal to 3.2) and R5 is the response ratio group with the smallest values of $R_{S/1}$ (i.e., values of $R_{S/1}$ are less than 2.5). A total of 15 unique combinations of: (1) the T_L region; (2) the short-period response group, S_S; and (3) the spectral response ratio group, $R_{S/1}$, are required to derive probabilistic MPRS for all 34 WUS and CEUS sites. Each of these 15 combinations of probabilistic parameters is represented by at least 1 of the 23 example sites in Table 6.3-1.

Figures (and tables) comparing Derived MPRS and Proposed MPRS are provided for each of 23 example sites on the following pages of this section, resulting in the following observations:

1. WUS Southern and Northern California Sites (Figures 6.3-1 to 6.3-13): In general, for a given site class, the overall shape (frequency content) and specific values of Derived MPRS of WUS sites are very similar, in some cases virtually identical, to those of the corresponding set of Proposed MPRS (e.g., see Figure 6.3-2 and Table 6.3-5 for the Irvine Site).

   Where noticeably different, specific values of Derived MPRS are typically within ±5 percent for most response periods and site classes, and are seldom more than ±15 percent different (e.g., see Figure 6.3-11 and Table 6.3-31 for the San Mateo Site).

   Such good comparisons show the capability of the proposed models in this study to derive MPRS from the three parameters S_S, $R_{S/1}$, and T_L at sites where ground motions are governed by shallow crustal earthquakes in active tectonic regions (i.e., sites that can be represented by NGA-West2 GMMs). Slightly larger differences may exist in some locations where deep basin effects are included in Proposed MPRS (e.g., Los Angeles and San Francisco basins, see Petersen et al., 2020, for details). The models for Derived MPRS were intentionally developed based on default basin depths so that they can be used for a general site in the United States and U.S. territories under consideration in this study with unknown basin conditions.

2. WUS Pacific Northwest Sites (Figures 6.3-14 to 6.3-16): In general, for a given site class, the overall shape (frequency content) and specific values of Derived MPRS of WUS sites are similar to those of the corresponding set of Proposed MPRS. The comparisons for Portland, OR (Figure 6.3-16), are very good since this site is not located on a known basin. The comparisons for Seattle and Tacoma, WA (Figures 6.3-14 and 6.3-15), show larger differences at softer site classes, because these two sites are near the Seattle basin. The Proposed MPRS values include deep basin effects and are expected to change at shorter periods in the upcoming USGS updates, which will result in smoother MPRS more similar to the Derived MPRS. However, some larger differences will still be seen in these locations because the Derived MPRS are intentionally developed for default basin depths so that they can be used for a general site in the United States and U.S. territories considered in this study with unknown basin conditions.

3. WUS Intermountain Sites (Figures 6.3-17 to 6.3-20): For those locations that are only controlled by WUS sources, i.e., Boise, ID, and Reno and Las Vegas, NV, the overall shape (frequency content) and specific values of Derived MPRS of WUS sites are very similar to those of the corresponding set of Proposed MPRS for a given site class. These comparisons validate the models developed in this study for use in such locations. For locations such as Salt Lake City, UT (Figure 6.3-17), the comparisons are not very good because such sites are also influenced by CEUS sources, for which Proposed MPRS are based also on CEUS GMMs. The Derived MPRS are not developed using CEUS GMMs and therefore should not be used in such locations.

4. CEUS Sites (Figures 6.3-21 to 6.3-23): In general, for a given site class, the overall shape (frequency content) and specific values of derived MPRS of CEUS sites are very different from those of the corresponding set of Proposed MPRS. For example, values of Derived MPRS at longer response periods and softer site conditions can be two or more times those of the corresponding set of Proposed MPRS (e.g., see Figure 6.3-22 and Table 6.3-65 for the Memphis Site). These differences reflect the limitations of this study, in that the methods are based on WUS GMMs and intended for use in deriving MPRS (from values of S_S, S_1 and T_L) for non-conterminous U.S. sites, where ground motion characteristics are known, or can be assumed, to be similar to those of typical WUS sites. The CEUS examples are provided to illustrate the differences between WUS and CEUS ground motions, and not for validating the proposed models.

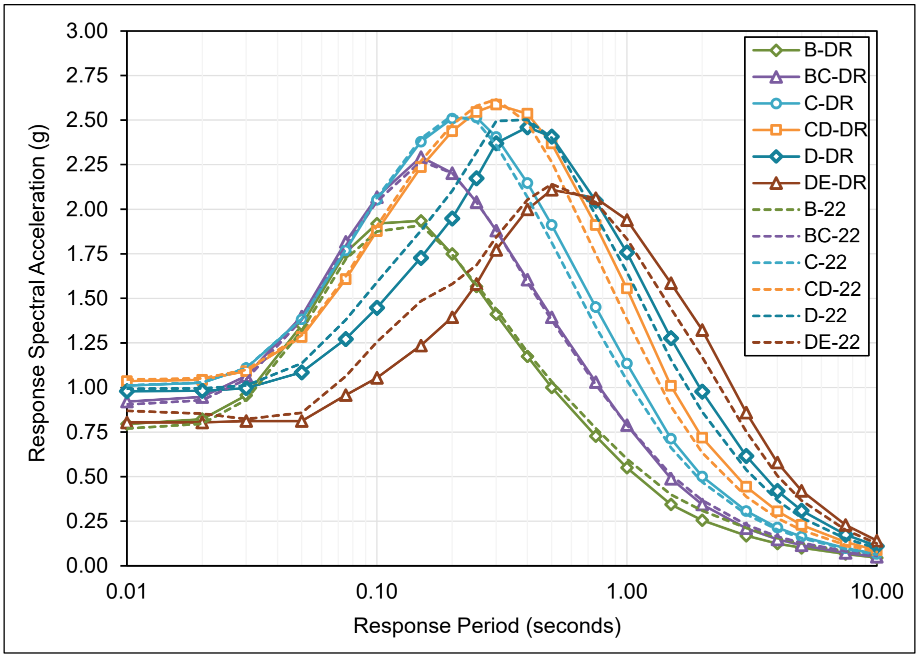


Figure 6.3-1 Comparison of the shape (frequency content) of Derived (DR) MPRS and Proposed (22) MPRS at the Los Angeles Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-2 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Los Angeles Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	106%	103%	102%	100%	99%	99%	93%	93%	99%
0.01	106%	103%	102%	100%	99%	99%	92%	92%	99%
0.02	106%	103%	102%	100%	99%	99%	94%	96%	99%
0.03	105%	103%	102%	100%	99%	99%	99%	102%	100%
0.05	104%	102%	101%	100%	99%	96%	95%	98%	100%
0.08	104%	102%	101%	100%	99%	92%	90%	84%	100%
0.10	105%	102%	101%	99%	98%	91%	84%	77%	99%
0.15	104%	101%	101%	99%	98%	92%	83%	75%	99%
0.20	103%	100%	100%	99%	99%	93%	88%	82%	99%
0.25	103%	99%	100%	101%	99%	94%	94%	92%	99%
0.30	102%	98%	100%	102%	99%	95%	96%	97%	99%
0.40	103%	98%	101%	104%	102%	98%	97%	103%	101%
0.50	101%	97%	101%	105%	105%	100%	99%	101%	100%
0.75	97%	94%	101%	108%	109%	104%	101%	98%	104%
1.0	92%	92%	100%	109%	113%	107%	106%	102%	107%
1.5	83%	86%	96%	108%	113%	110%	110%	109%	110%
2.0	79%	83%	94%	107%	113%	113%	113%	113%	113%
3.0	76%	79%	92%	106%	114%	114%	114%	114%	114%
4.0	77%	80%	90%	106%	115%	115%	115%	115%	115%
5.0	78%	80%	90%	106%	115%	115%	115%	115%	115%
7.5	77%	82%	89%	104%	114%	114%	113%	114%	114%
10	75%	80%	91%	105%	113%	113%	113%	113%	113%
S_{MS} (g)	103%	100%	100%	100%	99%	98%	99%	101%	99%
S_{M1} (g)	82%	89%	100%	109%	113%	113%	113%	113%	113%
S_{DS} (g)	103%	100%	100%	100%	99%	98%	99%	101%	99%
S_{D1} (g)	82%	89%	100%	109%	113%	113%	113%	113%	113%

Table 6.3-3 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Los Angeles Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	D	D	P
0.01	P	P	P	P	P	P	D	D	P
0.02	P	P	P	P	P	P	D	D	P
0.03	P	P	P	P	P	P	D	D	P
0.05	P	P	P	P	P	D	D	D	P
0.08	P	P	P	P	P	D	D	D	P
0.10	P	P	P	P	D	D	D	D	P
0.15	P	P	P	P	P	D	D	D	P
0.20	P	P	P	P	P	D	D	D	P
0.25	P	P	P	P	P	D	D	D	P
0.30	P	P	P	P	P	D	D	D	P
0.40	P	P	P	P	P	P	D	D	P
0.50	P	P	P	P	P	P	D	D	P
0.75	P	P	P	P	P	P	D	D	P
1.0	P	P	P	P	P	P	P	D	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	DL	P	P	P	P	P	P	P	P
10	DL	DL	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	D	D	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	D	D	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-4 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Los Angeles Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	D	D	P
0.01	P	P	P	P	P	P	D	D	P
0.02	P	P	P	P	P	P	D	D	P
0.03	P	P	P	P	P	P	D	D	P
0.05	P	P	P	P	P	P	D	D	P
0.08	P	P	P	P	P	D	D	D	P
0.10	P	P	P	P	P	D	D	D	P
0.15	P	P	P	P	P	D	D	D	P
0.20	P	P	P	P	P	D	D	D	P
0.25	P	P	P	P	P	D	D	D	P
0.30	P	P	P	P	P	P	D	D	P
0.40	P	P	P	P	P	P	D	D	P
0.50	P	P	P	P	P	P	D	D	P
0.75	P	P	P	P	P	P	D	D	P
1.0	P	P	P	P	P	P	P	D	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	D	D	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	D	D	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

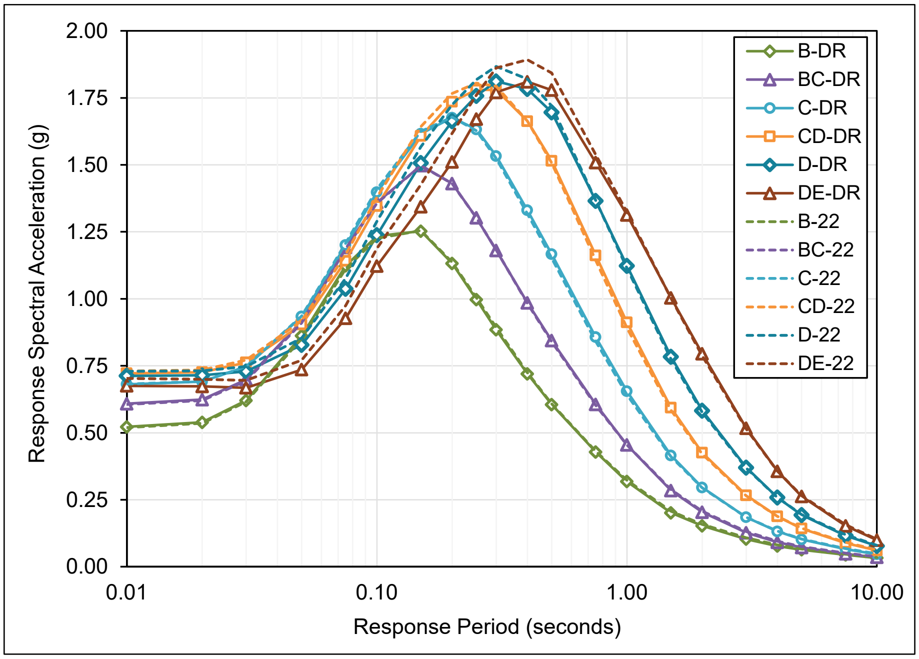


Figure 6.3-2 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Irvine Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-5 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Irvine Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	103%	101%	100%	100%	99%	98%	96%	96%	99%
0.01	103%	101%	100%	100%	99%	98%	96%	96%	99%
0.02	103%	101%	101%	100%	99%	98%	96%	95%	99%
0.03	103%	101%	101%	100%	99%	97%	96%	95%	99%
0.05	103%	101%	101%	100%	98%	97%	95%	96%	100%
0.08	103%	101%	100%	99%	98%	96%	95%	99%	99%
0.10	103%	101%	100%	99%	98%	96%	94%	91%	99%
0.15	103%	100%	100%	99%	98%	96%	94%	88%	98%
0.20	102%	100%	100%	100%	98%	96%	93%	91%	98%
0.25	102%	99%	100%	100%	99%	97%	95%	98%	98%
0.30	103%	99%	100%	101%	99%	97%	95%	101%	97%
0.40	103%	99%	100%	101%	100%	98%	96%	101%	98%
0.50	104%	100%	100%	101%	101%	99%	97%	95%	99%
0.75	104%	99%	101%	102%	102%	100%	98%	97%	100%
1.0	103%	98%	100%	102%	102%	101%	99%	98%	101%
1.5	101%	97%	99%	101%	101%	101%	100%	100%	101%
2.0	101%	97%	98%	101%	101%	101%	101%	101%	101%
3.0	99%	96%	97%	100%	101%	101%	101%	101%	101%
4.0	99%	95%	96%	99%	100%	100%	100%	100%	100%
5.0	98%	95%	96%	99%	99%	99%	99%	99%	99%
7.5	96%	94%	95%	97%	97%	97%	97%	97%	97%
10	96%	94%	95%	97%	97%	97%	97%	97%	97%
S_{MS} (g)	102%	100%	100%	100%	99%	97%	96%	95%	97%
S_{M1} (g)	101%	98%	100%	102%	102%	101%	101%	101%	101%
S_{DS} (g)	102%	100%	100%	100%	99%	97%	96%	95%	97%
S_{D1} (g)	101%	98%	100%	102%	102%	101%	101%	101%	101%

Table 6.3-6 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Irvine Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	D	P
0.10	P	P	P	P	P	P	P	D	P
0.15	P	P	P	P	P	P	D	D	P
0.20	P	P	P	P	P	P	D	D	P
0.25	P	P	P	P	P	P	P	D	P
0.30	P	P	P	P	P	P	P	D	P
0.40	P	P	P	P	P	P	P	D	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-7 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Irvine Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	D	P
0.08	P	P	P	P	P	P	P	D	P
0.10	P	P	P	P	P	P	P	D	P
0.15	P	P	P	P	P	P	D	D	P
0.20	P	P	P	P	P	P	D	D	P
0.25	P	P	P	P	P	P	P	D	P
0.30	P	P	P	P	P	P	P	D	P
0.40	P	P	P	P	P	P	P	D	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	D	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	D	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

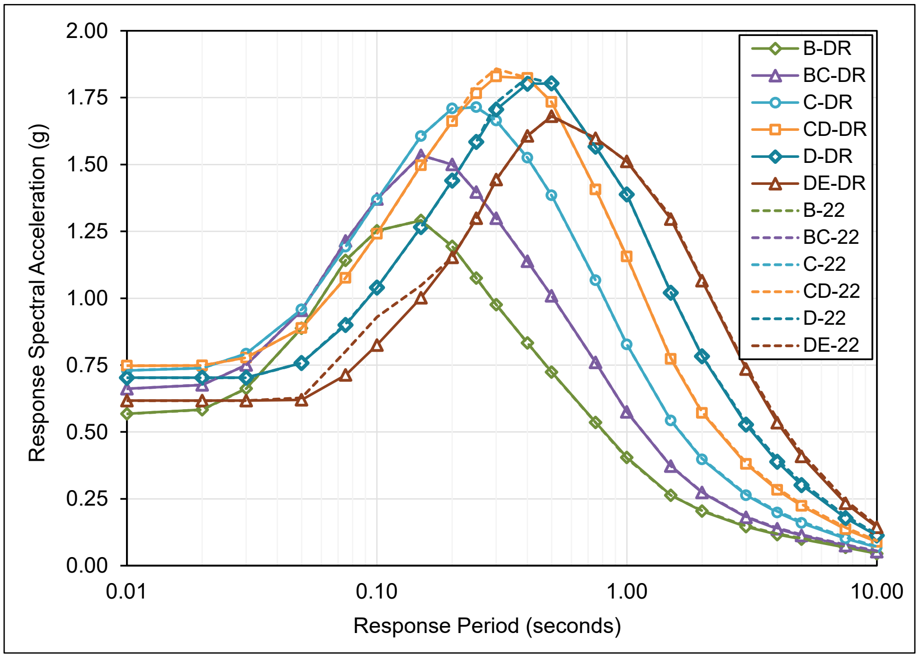


Figure 6.3-3 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Riverside Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-8 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Riverside Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.01	100%	100%	100%	100%	100%	100%	100%	99%	100%
0.02	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.03	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.05	100%	100%	100%	100%	100%	100%	99%	96%	100%
0.08	100%	100%	100%	100%	100%	100%	89%	80%	100%
0.10	100%	100%	100%	100%	100%	100%	89%	79%	100%
0.15	100%	100%	100%	100%	100%	100%	96%	86%	100%
0.20	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.25	98%	100%	100%	100%	98%	100%	100%	100%	98%
0.30	99%	100%	100%	100%	98%	99%	100%	100%	98%
0.40	100%	100%	100%	100%	100%	99%	100%	100%	100%
0.50	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.75	101%	100%	100%	100%	100%	100%	100%	100%	100%
1.0	103%	101%	100%	100%	100%	100%	100%	100%	100%
1.5	103%	100%	100%	100%	100%	100%	99%	99%	100%
2.0	101%	99%	99%	99%	99%	100%	100%	100%	100%
3.0	100%	98%	99%	99%	99%	99%	99%	99%	99%
4.0	100%	97%	98%	98%	98%	98%	98%	98%	98%
5.0	99%	97%	97%	97%	97%	97%	97%	97%	97%
7.5	89%	94%	95%	96%	95%	95%	95%	95%	95%
10	82%	87%	94%	96%	95%	95%	95%	95%	95%
S_{MS} (g)	100%	100%	100%	100%	98%	99%	100%	100%	98%
S_{M1} (g)	101%	99%	100%	100%	100%	99%	99%	99%	99%
S_{DS} (g)	100%	100%	100%	100%	98%	99%	100%	100%	98%
S_{D1} (g)	101%	99%	100%	100%	100%	99%	99%	99%	99%

Table 6.3-9 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Riverside Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.01	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.02	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.03	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.05	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.08	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.10	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.15	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.20	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.25	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.30	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.40	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.50	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.75	DL	DL	DL	DL	DL	DL	DL	DL	DL
1.0	P	P	P	P	P	DL	DL	DL	DL
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	DL	DL	P	P	P	P	P	P	P
10	DL	DL	DL	DL	DL	DL	DL	DL	DL
S_{MS} (g)	DL	DL	DL	DL	DL	DL	DL	DL	DL
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	DL	DL	DL	DL	DL	DL	DL	DL	DL
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-10 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Riverside Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.01	DL	DL	DL	DL	DL	DL	DL	D	DL
0.02	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.03	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.05	DL	DL	DL	DL	DL	DL	D	D	DL
0.08	DL	DL	DL	DL	DL	D	D	D	DL
0.10	DL	DL	DL	DL	DL	DL	D	D	DL
0.15	DL	DL	DL	DL	DL	DL	D	D	DL
0.20	DL	DL	DL	DL	DL	DL	DL	D	DL
0.25	D	DL	DL	DL	D	DL	DL	DL	D
0.30	D	DL	DL	DL	D	D	DL	DL	D
0.40	DL	DL	DL	DL	DL	D	DL	DL	D
0.50	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.75	P	DL	DL	DL	DL	DL	DL	DL	DL
1.0	P	P	P	P	P	DL	DL	DL	DL
1.5	P	P	P	P	P	P	P	DL	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	DL	DL	DL	DL	D	D	DL	DL	D
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	DL	DL	DL	DL	D	D	DL	DL	D
S_{D1} (g)	P	P	P	P	P	P	P	P	P

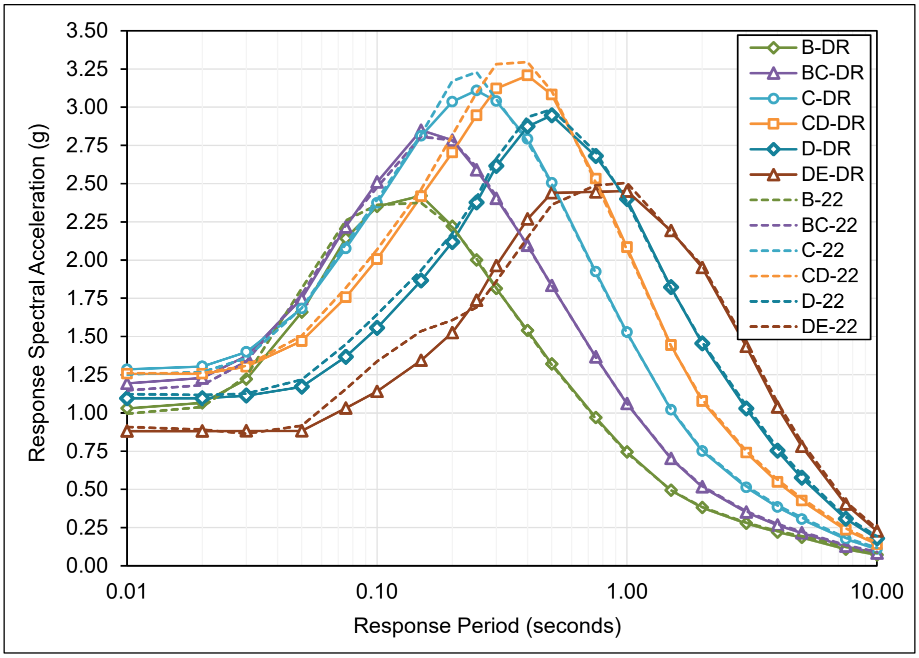


Figure 6.3-4 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the San Bernardino Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-11 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the San Bernardino Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	103%	104%	104%	102%	99%	97%	98%	99%	101%
0.01	103%	104%	104%	103%	100%	98%	97%	97%	102%
0.02	103%	103%	104%	103%	100%	98%	99%	101%	103%
0.03	98%	98%	103%	103%	99%	99%	102%	107%	103%
0.05	91%	91%	98%	100%	98%	96%	96%	98%	100%
0.08	94%	95%	100%	99%	97%	94%	89%	83%	99%
0.10	99%	100%	101%	99%	97%	95%	85%	78%	99%
0.15	99%	102%	101%	100%	98%	97%	87%	80%	100%
0.20	95%	100%	100%	96%	96%	97%	95%	89%	96%
0.25	96%	100%	99%	96%	95%	99%	103%	102%	96%
0.30	98%	100%	99%	100%	95%	98%	106%	108%	95%
0.40	100%	101%	100%	101%	97%	98%	106%	115%	97%
0.50	101%	100%	100%	100%	99%	99%	103%	109%	99%
0.75	103%	101%	100%	100%	101%	99%	98%	98%	99%
1.0	103%	101%	100%	100%	101%	101%	98%	95%	101%
1.5	103%	100%	100%	100%	100%	100%	100%	97%	100%
2.0	102%	99%	99%	99%	99%	99%	99%	99%	99%
3.0	101%	98%	98%	98%	98%	98%	99%	99%	98%
4.0	99%	97%	97%	97%	97%	97%	97%	98%	97%
5.0	94%	96%	96%	96%	96%	97%	97%	97%	97%
7.5	84%	88%	95%	96%	96%	96%	96%	96%	96%
10	81%	85%	91%	93%	93%	93%	93%	94%	93%
S_{MS} (g)	95%	100%	100%	96%	97%	99%	103%	109%	97%
S_{M1} (g)	102%	99%	100%	100%	98%	98%	99%	99%	98%
S_{DS} (g)	95%	100%	100%	96%	97%	99%	103%	109%	97%
S_{D1} (g)	102%	99%	100%	100%	98%	98%	99%	99%	98%

Table 6.3-12 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the San Bernardino Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	D	D	D	D	D	D	D	D	D
0.01	D	D	D	D	D	D	D	D	D
0.02	D	D	D	D	D	D	D	D	D
0.03	D	D	D	D	D	D	D	D	D
0.05	D	D	D	D	D	D	D	D	D
0.08	D	D	D	D	D	D	D	D	D
0.10	D	D	D	D	D	D	D	D	D
0.15	D	D	D	D	D	D	D	D	D
0.20	D	D	D	D	D	D	D	D	D
0.25	D	D	D	D	D	D	D	D	D
0.30	D	D	D	D	D	D	D	D	D
0.40	D	P	P	P	D	D	D	D	D
0.50	D	P	P	P	D	D	D	D	D
0.75	P	P	P	P	P	D	D	D	D
1.0	P	P	P	P	P	P	D	D	P
1.5	P	P	P	P	P	P	P	D	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	D	D	P	P	P	P	P	P	P
7.5	D	D	D	D	D	P	P	P	P
10	D	D	D	D	D	D	D	D	D
S_{MS} (g)	D	D	D	D	D	D	D	D	D
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	D	D	D	D	D	D	D	D	D
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-13 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the San Bernardino Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	D	D	D	D	D	D	D	D	D
0.01	D	D	D	D	D	D	D	D	D
0.02	D	D	D	D	D	D	D	D	D
0.03	D	D	D	D	D	D	D	D	D
0.05	P	P	D	D	D	D	D	D	D
0.08	D	D	D	D	D	D	D	D	D
0.10	D	D	D	D	D	D	D	D	D
0.15	D	D	D	D	D	D	D	D	D
0.20	P	D	D	D	D	D	D	D	D
0.25	P	D	D	D	D	D	D	D	D
0.30	P	D	D	D	D	D	D	D	D
0.40	P	P	P	D	D	D	D	D	D
0.50	P	P	P	P	D	D	D	D	D
0.75	P	P	P	P	P	P	D	D	P
1.0	P	P	P	P	P	P	D	D	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	D	D	D	D	D	D	D	D
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	D	D	D	D	D	D	D	D
S_{D1} (g)	P	P	P	P	P	P	P	P	P

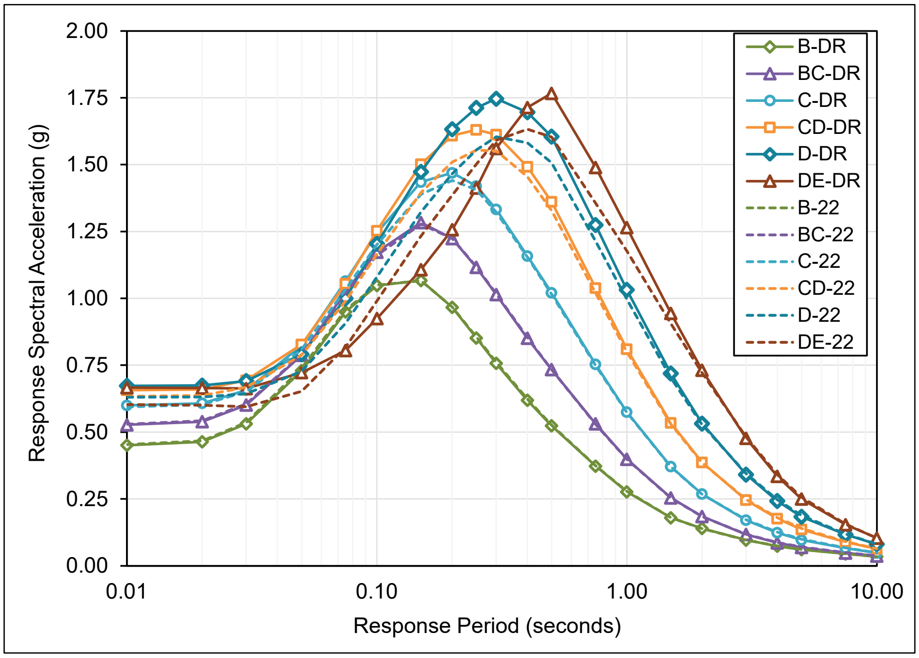


Figure 6.3-5 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the San Luis Obispo Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-14 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the San Luis Obispo Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	102%	99%	100%	101%	104%	107%	110%	101%	106%
0.01	102%	99%	100%	101%	104%	107%	110%	101%	106%
0.02	101%	99%	99%	101%	103%	107%	111%	102%	106%
0.03	101%	99%	99%	101%	104%	107%	111%	104%	104%
0.05	100%	99%	100%	102%	105%	109%	111%	101%	102%
0.08	101%	99%	101%	103%	107%	110%	99%	89%	103%
0.10	102%	100%	101%	104%	107%	111%	93%	83%	104%
0.15	103%	100%	100%	103%	108%	111%	90%	82%	108%
0.20	102%	100%	100%	102%	107%	111%	91%	83%	108%
0.25	102%	100%	100%	101%	105%	110%	94%	89%	110%
0.30	102%	99%	100%	101%	104%	109%	98%	92%	109%
0.40	102%	99%	100%	100%	103%	107%	105%	92%	107%
0.50	102%	99%	100%	101%	102%	106%	110%	97%	106%
0.75	102%	100%	100%	101%	102%	105%	110%	109%	105%
1.0	102%	99%	100%	100%	101%	103%	107%	111%	103%
1.5	103%	100%	100%	100%	101%	102%	104%	106%	102%
2.0	103%	101%	100%	100%	100%	101%	101%	102%	101%
3.0	102%	100%	99%	99%	99%	99%	99%	99%	99%
4.0	101%	99%	98%	98%	98%	98%	98%	98%	98%
5.0	100%	98%	97%	97%	97%	97%	97%	97%	97%
7.5	101%	99%	98%	98%	98%	99%	99%	98%	99%
10	102%	100%	98%	98%	99%	100%	100%	100%	100%
S_{MS} (g)	102%	100%	100%	102%	105%	109%	108%	97%	109%
S_{M1} (g)	103%	100%	100%	100%	101%	102%	101%	100%	102%
S_{DS} (g)	102%	100%	100%	102%	105%	109%	108%	97%	109%
S_{D1} (g)	103%	100%	100%	100%	101%	102%	101%	100%	102%

Table 6.3-15 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the San Luis Obispo Site

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	D	P
0.01	P	P	P	P	P	P	P	D	P
0.02	P	P	P	P	P	P	P	D	P
0.03	P	P	P	P	P	P	P	D	P
0.05	P	P	P	P	P	P	D	D	P
0.08	P	P	P	P	P	P	D	D	P
0.10	P	P	P	P	P	P	D	D	P
0.15	P	P	P	P	P	D	D	D	P
0.20	P	P	P	P	P	P	D	D	P
0.25	P	P	P	P	P	P	D	D	P
0.30	P	P	P	P	P	P	D	D	P
0.40	P	P	P	P	P	P	D	D	P
0.50	P	P	P	P	P	P	D	D	P
0.75	P	P	P	P	P	P	P	D	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	D	D	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	D	D	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-16 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the San Luis Obispo Site

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	D	P
0.15	P	P	P	P	P	P	P	D	P
0.20	P	P	P	P	P	P	P	D	P
0.25	P	P	P	P	P	P	P	D	P
0.30	P	P	P	P	P	P	P	D	P
0.40	P	P	P	P	P	P	P	D	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

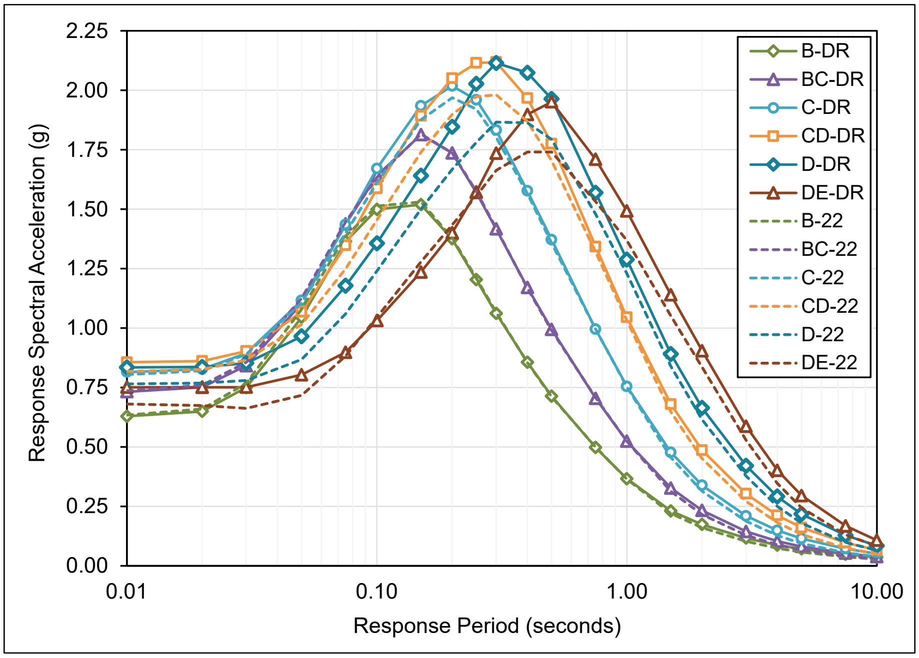


Figure 6.3-6 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the San Diego Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-17 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the San Diego Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	102%	99%	100%	101%	105%	109%	111%	105%	105%
0.01	102%	99%	100%	101%	105%	109%	110%	104%	105%
0.02	101%	98%	99%	101%	104%	109%	111%	106%	104%
0.03	100%	98%	98%	100%	104%	109%	113%	109%	102%
0.05	98%	97%	98%	101%	105%	111%	112%	107%	101%
0.08	100%	98%	99%	102%	108%	111%	102%	96%	102%
0.10	102%	99%	100%	104%	109%	109%	99%	92%	104%
0.15	102%	99%	100%	103%	109%	109%	97%	89%	103%
0.20	103%	100%	100%	102%	108%	111%	98%	91%	104%
0.25	103%	99%	100%	102%	107%	114%	101%	100%	107%
0.30	103%	100%	100%	102%	107%	113%	104%	104%	107%
0.40	104%	100%	100%	101%	105%	111%	109%	103%	111%
0.50	104%	100%	100%	101%	104%	110%	112%	104%	110%
0.75	104%	100%	100%	100%	102%	106%	112%	111%	106%
1.0	104%	100%	100%	100%	101%	105%	109%	112%	105%
1.5	109%	105%	104%	105%	105%	106%	108%	110%	106%
2.0	112%	108%	108%	108%	108%	108%	108%	109%	108%
3.0	116%	113%	112%	112%	112%	111%	111%	111%	111%
4.0	120%	118%	117%	117%	117%	116%	116%	116%	116%
5.0	125%	123%	122%	122%	122%	121%	121%	121%	121%
7.5	132%	131%	130%	130%	130%	129%	129%	129%	129%
10	132%	131%	132%	131%	131%	130%	129%	130%	130%
S_{MS} (g)	103%	100%	100%	102%	107%	113%	112%	104%	107%
S_{M1} (g)	104%	100%	100%	100%	101%	106%	108%	109%	106%
S_{DS} (g)	103%	100%	100%	102%	107%	113%	112%	104%	107%
S_{D1} (g)	104%	100%	100%	100%	101%	106%	108%	109%	106%

Table 6.3-18 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the San Diego Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	D	D	P
0.01	P	P	P	P	P	P	D	D	P
0.02	P	P	P	P	P	P	D	D	P
0.03	P	P	P	P	P	P	D	D	P
0.05	P	P	P	P	P	P	D	D	P
0.08	P	P	P	P	P	D	D	D	P
0.10	P	P	P	P	P	D	D	D	P
0.15	P	P	P	P	P	D	D	D	P
0.20	P	P	P	P	P	D	D	D	P
0.25	P	P	P	P	P	D	D	D	P
0.30	P	P	P	P	P	P	D	D	P
0.40	P	P	P	P	P	P	D	D	P
0.50	P	P	P	P	P	P	D	D	P
0.75	P	P	P	P	P	P	P	D	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	D	D	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	D	D	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-19 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the San Diego Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	P	P
0.15	P	P	P	P	P	P	P	D	P
0.20	P	P	P	P	P	P	P	D	P
0.25	P	P	P	P	P	P	P	D	P
0.30	P	P	P	P	P	P	P	D	P
0.40	P	P	P	P	P	P	P	D	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

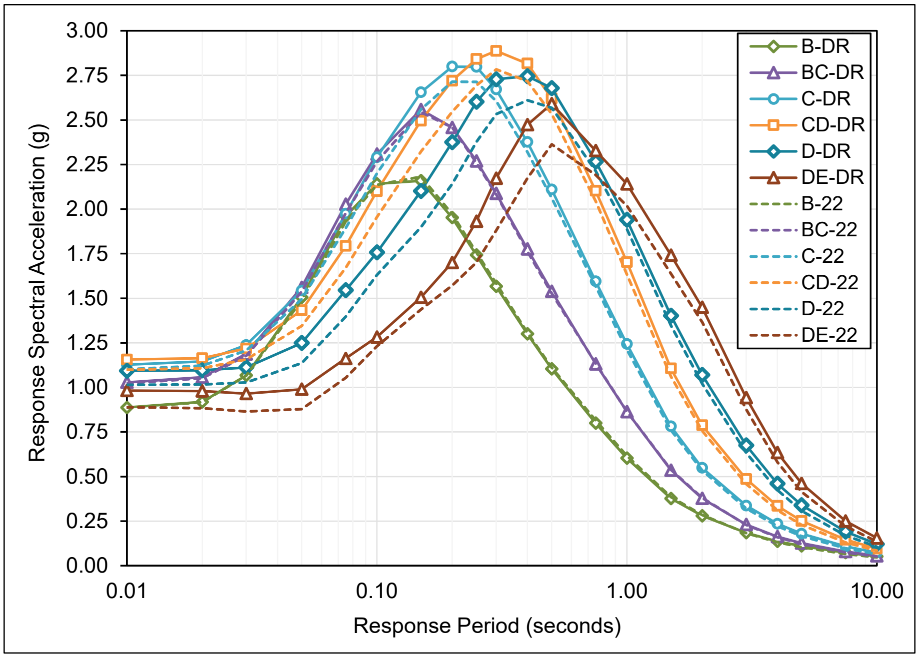


Figure 6.3-7 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Santa Barbara Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-20 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Santa Barbara Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	103%	100%	101%	102%	105%	108%	111%	110%	105%
0.01	103%	100%	101%	102%	105%	108%	110%	109%	105%
0.02	103%	100%	100%	102%	105%	108%	111%	112%	104%
0.03	103%	100%	101%	103%	105%	108%	112%	120%	103%
0.05	103%	101%	102%	103%	106%	110%	113%	119%	103%
0.08	104%	101%	103%	104%	107%	111%	110%	108%	104%
0.10	103%	100%	102%	104%	107%	108%	104%	99%	104%
0.15	102%	99%	101%	104%	107%	111%	105%	97%	104%
0.20	103%	99%	100%	103%	107%	111%	108%	102%	103%
0.25	104%	99%	100%	103%	105%	109%	114%	112%	105%
0.30	104%	99%	100%	103%	104%	108%	116%	118%	104%
0.40	106%	100%	101%	102%	104%	105%	114%	123%	104%
0.50	106%	99%	101%	102%	103%	104%	110%	118%	104%
0.75	107%	98%	100%	102%	103%	102%	106%	111%	102%
1.0	108%	98%	100%	103%	104%	103%	106%	111%	103%
1.5	108%	98%	100%	103%	104%	104%	106%	111%	104%
2.0	109%	99%	99%	103%	104%	105%	106%	110%	105%
3.0	111%	101%	101%	105%	106%	107%	107%	111%	107%
4.0	113%	103%	102%	106%	108%	108%	109%	113%	108%
5.0	115%	106%	104%	108%	110%	110%	111%	115%	110%
7.5	118%	110%	106%	110%	112%	112%	113%	117%	112%
10	117%	111%	109%	112%	113%	114%	115%	118%	114%
S_{MS} (g)	103%	99%	100%	103%	104%	105%	110%	118%	104%
S_{M1} (g)	108%	98%	100%	103%	104%	105%	106%	110%	105%
S_{DS} (g)	103%	99%	100%	103%	104%	105%	110%	118%	104%
S_{D1} (g)	108%	98%	100%	103%	104%	105%	106%	110%	105%

Table 6.3-21 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Santa Barbara Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	D	P
0.01	P	P	P	P	P	P	D	D	P
0.02	P	P	P	P	P	P	P	D	P
0.03	P	P	P	P	P	P	P	D	P
0.05	P	P	P	P	P	P	D	D	P
0.08	P	P	P	P	P	D	D	D	P
0.10	P	P	P	P	P	D	D	D	P
0.15	P	P	P	P	P	D	D	D	P
0.20	P	P	P	P	P	D	D	D	P
0.25	P	P	P	P	P	P	D	D	P
0.30	P	P	P	P	P	P	D	D	P
0.40	P	P	P	P	P	P	D	D	P
0.50	P	P	P	P	P	P	P	D	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	D	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	D	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	D	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-22 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Santa Barbara Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	D	P
0.01	P	P	P	P	P	P	P	D	P
0.02	P	P	P	P	P	P	P	D	P
0.03	P	P	P	P	P	P	P	D	P
0.05	P	P	P	P	P	P	D	D	P
0.08	P	P	P	P	P	P	D	D	P
0.10	P	P	P	P	P	D	D	D	P
0.15	P	P	P	P	P	D	D	D	P
0.20	P	P	P	P	P	D	D	D	P
0.25	P	P	P	P	P	P	D	D	P
0.30	P	P	P	P	P	P	D	D	P
0.40	P	P	P	P	P	P	D	D	P
0.50	P	P	P	P	P	P	D	D	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	D	D	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	D	D	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

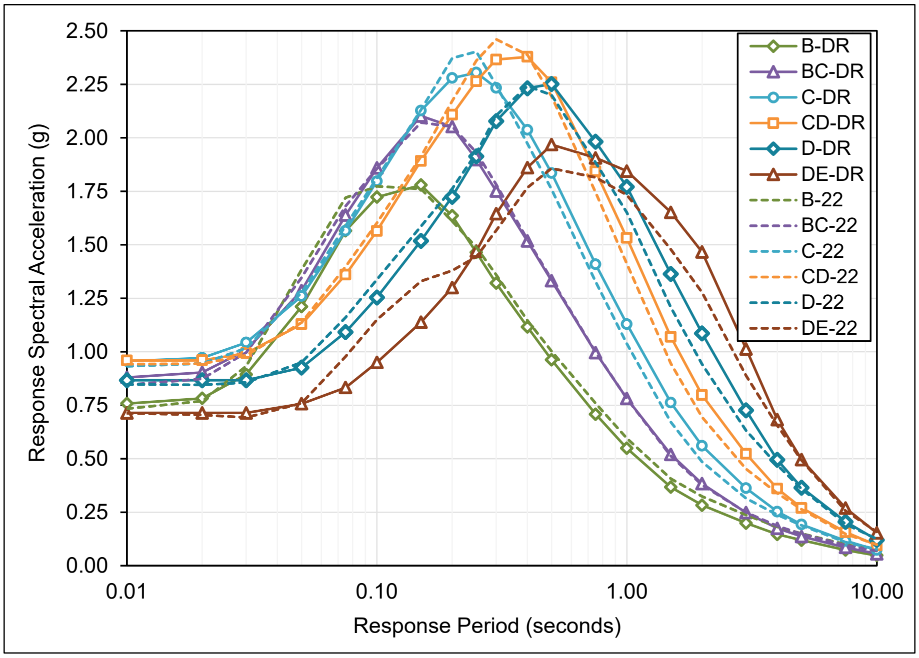


Figure 6.3-8 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Oakland Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-23 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Oakland Site

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	104%	104%	104%	102%	101%	101%	101%	100%	101%
0.01	104%	103%	104%	103%	102%	102%	100%	98%	102%
0.02	103%	102%	103%	103%	102%	102%	101%	101%	103%
0.03	95%	96%	101%	103%	101%	101%	103%	105%	103%
0.05	85%	88%	96%	99%	99%	97%	100%	97%	99%
0.08	90%	91%	98%	99%	97%	94%	85%	80%	99%
0.10	97%	97%	100%	99%	98%	94%	83%	76%	99%
0.15	99%	101%	101%	100%	99%	96%	86%	77%	100%
0.20	97%	102%	100%	96%	97%	98%	94%	86%	96%
0.25	94%	98%	98%	96%	96%	99%	102%	101%	96%
0.30	93%	97%	98%	99%	96%	99%	105%	109%	96%
0.40	93%	97%	100%	103%	100%	100%	105%	111%	100%
0.50	92%	96%	100%	104%	103%	102%	106%	112%	103%
0.75	89%	93%	100%	106%	106%	105%	105%	105%	105%
1.0	86%	92%	100%	109%	108%	107%	106%	105%	107%
1.5	80%	90%	101%	114%	113%	113%	112%	110%	113%
2.0	76%	87%	101%	115%	115%	115%	115%	112%	115%
3.0	73%	84%	100%	115%	116%	115%	114%	115%	115%
4.0	73%	81%	95%	106%	106%	105%	104%	105%	105%
5.0	73%	79%	92%	102%	102%	101%	101%	102%	101%
7.5	68%	73%	89%	105%	106%	105%	105%	105%	105%
10	66%	70%	80%	95%	96%	96%	97%	97%	96%
S_{MS} (g)	97%	102%	100%	96%	97%	100%	106%	112%	97%
S_{M1} (g)	76%	87%	100%	110%	113%	115%	114%	115%	115%
S_{DS} (g)	97%	102%	100%	96%	97%	100%	106%	112%	97%
S_{D1} (g)	76%	87%	100%	110%	113%	115%	114%	115%	115%

Table 6.3-24 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Oakland Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	D	D	D	D	D	D	D	D	D
0.01	D	D	D	D	D	D	D	D	D
0.02	D	D	D	D	D	D	D	D	D
0.03	D	D	D	D	D	D	D	D	D
0.05	D	D	D	D	D	D	D	D	D
0.08	D	D	D	D	D	D	D	D	D
0.10	D	D	D	D	D	D	D	D	D
0.15	D	D	D	D	D	D	D	D	D
0.20	D	D	D	D	D	D	D	D	D
0.25	D	D	D	D	D	D	D	D	D
0.30	D	D	D	D	D	D	D	D	D
0.40	D	D	D	D	D	D	D	D	D
0.50	D	D	D	D	D	D	D	D	D
0.75	D	D	D	D	D	D	D	D	D
1.0	D	D	D	D	D	D	D	D	D
1.5	D	D	D	D	D	D	D	D	D
2.0	D	D	D	D	D	D	D	D	D
3.0	D	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	D	D	P	P	P	P	P	P	P
10	D	D	D	D	D	D	D	D	D
S_{MS} (g)	D	D	D	D	D	D	D	D	D
S_{M1} (g)	D	D	D	D	D	D	D	D	D
S_{DS} (g)	D	D	D	D	D	D	D	D	D
S_{D1} (g)	D	D	D	D	D	D	D	D	D

Table 6.3-25 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Oakland Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	D	D	D	D	D	D	D	D	D
0.01	D	D	D	D	D	D	D	D	D
0.02	D	D	D	D	D	D	D	D	D
0.03	D	D	D	D	D	D	D	D	D
0.05	D	D	D	D	D	D	D	D	D
0.08	D	D	D	D	D	D	D	D	D
0.10	D	D	D	D	D	D	D	D	D
0.15	D	D	D	D	D	D	D	D	D
0.20	D	D	D	D	D	D	D	D	D
0.25	D	D	D	D	D	D	D	D	D
0.30	D	D	D	D	D	D	D	D	D
0.40	D	D	D	D	D	D	D	DL	D
0.50	D	D	D	D	D	D	D	D	D
0.75	D	D	D	D	D	D	D	D	D
1.0	D	D	D	D	D	D	D	D	D
1.5	D	D	D	D	D	D	D	D	D
2.0	D	D	D	D	D	D	D	D	D
3.0	D	D	D	D	D	DL	DL	D	DL
4.0	D	D	D	DL	DL	DL	DL	DL	DL
5.0	D	D	D	DL	DL	DL	DL	DL	DL
7.5	P	D	D	DL	DL	DL	DL	DL	DL
10	P	P	P	D	D	D	D	D	D
S_{MS} (g)	D	D	D	D	D	D	D	D	D
S_{M1} (g)	D	D	D	D	D	DL	DL	D	DL
S_{DS} (g)	D	D	D	D	D	D	D	D	D
S_{D1} (g)	D	D	D	D	D	DL	DL	D	DL

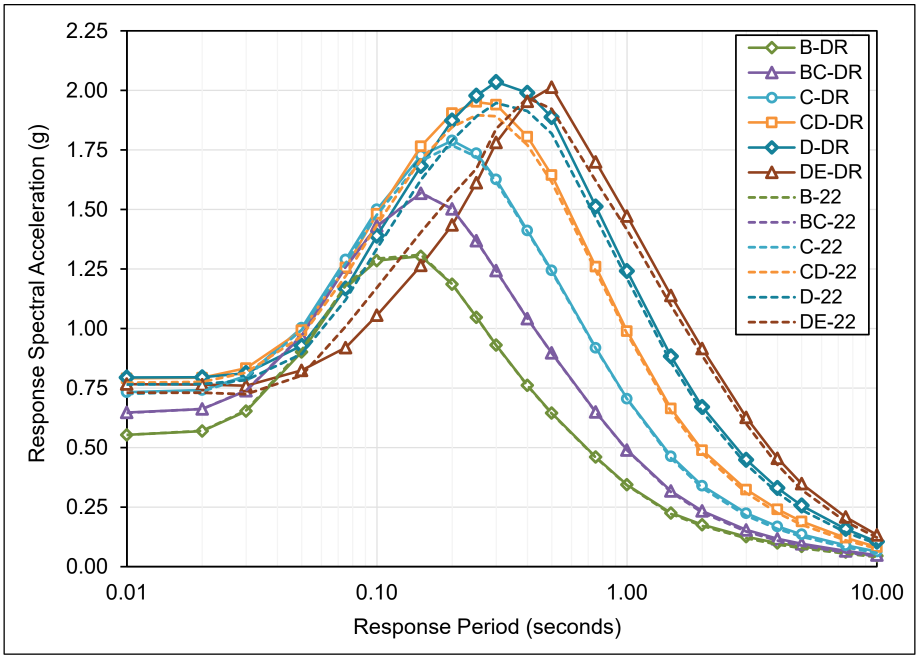


Figure 6.3-9 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Monterey Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-26 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Monterey Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	103%	100%	100%	101%	102%	104%	105%	96%	103%
0.01	103%	100%	100%	101%	102%	104%	105%	95%	103%
0.02	102%	100%	100%	101%	102%	104%	105%	96%	102%
0.03	102%	100%	100%	101%	102%	104%	105%	102%	102%
0.05	101%	99%	100%	101%	103%	104%	103%	101%	101%
0.08	101%	99%	100%	101%	103%	104%	91%	88%	101%
0.10	102%	99%	100%	102%	103%	104%	90%	84%	102%
0.15	102%	100%	100%	101%	103%	104%	90%	83%	103%
0.20	103%	100%	100%	101%	103%	105%	92%	89%	103%
0.25	103%	100%	100%	101%	103%	105%	96%	100%	104%
0.30	103%	100%	100%	101%	103%	105%	97%	105%	105%
0.40	103%	100%	100%	100%	102%	104%	99%	104%	104%
0.50	103%	100%	100%	100%	102%	104%	105%	100%	104%
0.75	104%	100%	100%	100%	101%	103%	105%	104%	103%
1.0	103%	100%	100%	100%	101%	103%	104%	105%	103%
1.5	105%	102%	101%	102%	102%	103%	104%	104%	103%
2.0	106%	103%	103%	103%	103%	103%	103%	103%	103%
3.0	108%	105%	105%	105%	105%	105%	105%	104%	105%
4.0	109%	107%	107%	107%	107%	107%	107%	106%	107%
5.0	111%	109%	108%	108%	108%	108%	108%	108%	108%
7.5	114%	112%	111%	110%	110%	110%	110%	110%	110%
10	109%	111%	110%	109%	109%	109%	110%	109%	109%
S_{MS} (g)	103%	100%	100%	101%	103%	105%	102%	100%	105%
S_{M1} (g)	106%	103%	100%	100%	102%	104%	105%	104%	104%
S_{DS} (g)	103%	100%	100%	101%	103%	105%	102%	100%	105%
S_{D1} (g)	106%	103%	100%	100%	102%	104%	105%	104%	104%

Table 6.3-27 Probabilistic (P), Deterministic (D), or Deterministic lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Monterey Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	D	P
0.01	P	P	P	P	P	P	P	D	P
0.02	P	P	P	P	P	P	P	D	P
0.03	P	P	P	P	P	P	P	D	P
0.05	P	P	P	P	P	P	D	D	P
0.08	P	P	P	P	P	P	D	D	P
0.10	P	P	P	P	P	D	D	D	P
0.15	P	P	P	P	P	D	D	D	P
0.20	P	P	P	P	P	P	D	D	P
0.25	P	P	P	P	P	P	D	D	P
0.30	P	P	P	P	P	P	D	D	P
0.40	P	P	P	P	P	P	D	D	P
0.50	P	P	P	P	P	P	D	D	P
0.75	P	P	P	P	P	P	P	D	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	DL	DL	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	D	D	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	D	D	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-28 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Monterey Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	D	P
0.05	P	P	P	P	P	P	P	D	P
0.08	P	P	P	P	P	P	D	D	P
0.10	P	P	P	P	P	P	D	D	P
0.15	P	P	P	P	P	P	D	D	P
0.20	P	P	P	P	P	P	D	D	P
0.25	P	P	P	P	P	P	D	D	P
0.30	P	P	P	P	P	P	D	D	P
0.40	P	P	P	P	P	P	P	D	P
0.50	P	P	P	P	P	P	P	D	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	D	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	D	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

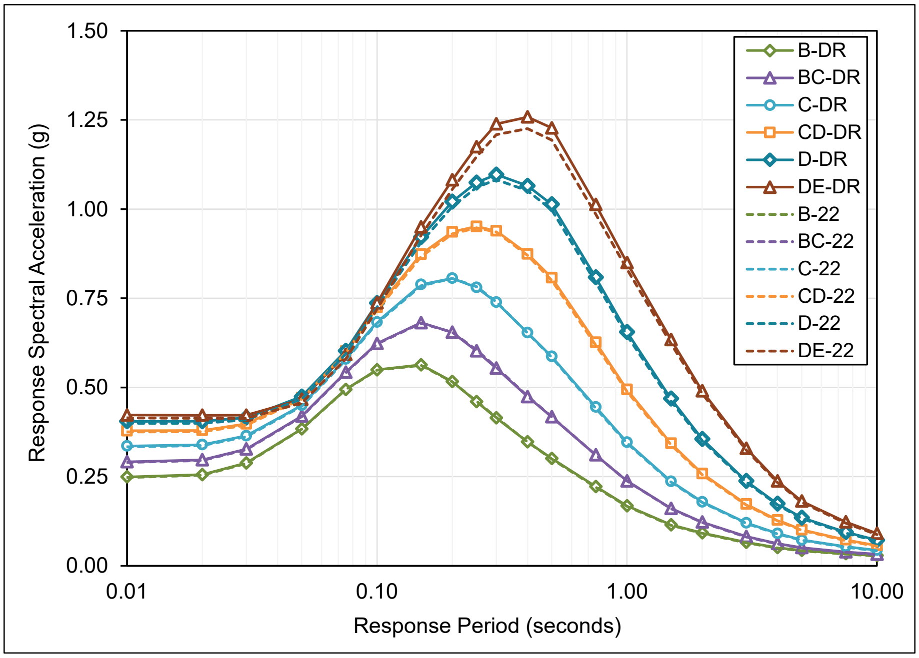


Figure 6.3-10 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Sacramento Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-29 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Sacramento Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	103%	101%	101%	101%	101%	101%	102%	102%	101%
0.01	103%	101%	101%	101%	101%	101%	102%	102%	101%
0.02	103%	101%	101%	101%	101%	101%	102%	102%	101%
0.03	103%	100%	100%	101%	101%	101%	102%	103%	101%
0.05	101%	100%	100%	100%	101%	101%	102%	103%	101%
0.08	102%	100%	100%	100%	101%	101%	102%	103%	101%
0.10	103%	100%	100%	101%	101%	102%	102%	100%	102%
0.15	103%	100%	100%	100%	101%	102%	103%	100%	102%
0.20	103%	100%	100%	100%	101%	101%	103%	100%	101%
0.25	103%	100%	100%	100%	100%	101%	102%	100%	101%
0.30	103%	100%	100%	100%	100%	101%	102%	100%	101%
0.40	104%	100%	100%	100%	100%	101%	103%	103%	101%
0.50	104%	100%	100%	100%	101%	102%	103%	104%	102%
0.75	105%	101%	100%	101%	101%	102%	103%	103%	102%
1.0	104%	101%	100%	101%	101%	102%	102%	102%	102%
1.5	105%	101%	101%	101%	101%	102%	102%	102%	102%
2.0	105%	101%	101%	101%	101%	101%	102%	101%	101%
3.0	106%	102%	101%	101%	101%	101%	102%	101%	101%
4.0	107%	102%	101%	101%	101%	102%	102%	102%	102%
5.0	107%	102%	102%	101%	102%	102%	102%	102%	102%
7.5	108%	103%	103%	103%	103%	103%	103%	103%	103%
10	110%	104%	104%	103%	104%	104%	104%	104%	104%
S_{MS} (g)	103%	100%	100%	100%	100%	101%	103%	103%	101%
S_{M1} (g)	105%	101%	101%	101%	101%	101%	102%	101%	101%
S_{DS} (g)	103%	100%	100%	100%	100%	101%	103%	103%	101%
S_{D1} (g)	105%	101%	101%	101%	101%	101%	102%	101%	101%

Table 6.3-30 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Sacramento Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	DL	P
0.15	P	P	P	P	P	P	P	DL	P
0.20	P	P	P	P	P	P	P	DL	P
0.25	P	P	P	P	P	P	P	DL	P
0.30	P	P	P	P	P	P	P	DL	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-31 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Sacramento Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	DL	P
0.15	P	P	P	P	P	P	P	DL	P
0.20	P	P	P	P	P	P	P	DL	P
0.25	P	P	P	P	P	P	P	DL	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

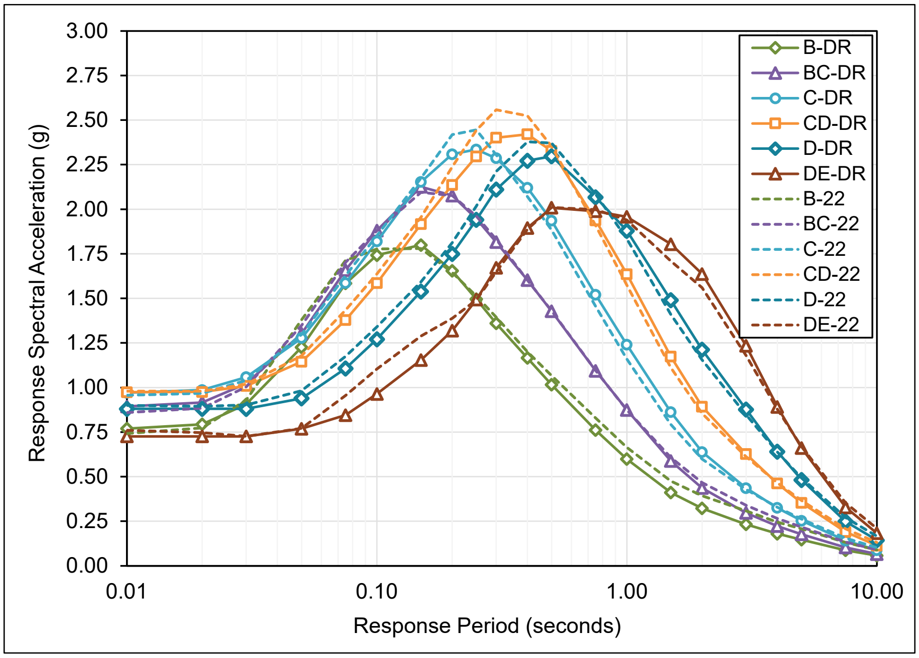


Figure 6.3-11 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the San Mateo Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-32 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the San Mateo Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	104%	104%	104%	101%	98%	97%	97%	96%	99%
0.01	104%	104%	104%	101%	99%	98%	95%	94%	99%
0.02	103%	103%	104%	102%	100%	98%	97%	98%	101%
0.03	96%	97%	102%	102%	99%	98%	100%	103%	102%
0.05	86%	89%	97%	98%	97%	96%	100%	99%	98%
0.08	91%	92%	97%	97%	96%	94%	89%	83%	97%
0.10	97%	98%	100%	98%	97%	95%	87%	80%	98%
0.15	97%	101%	101%	99%	98%	97%	90%	82%	99%
0.20	95%	101%	100%	95%	95%	96%	95%	90%	95%
0.25	93%	99%	99%	95%	94%	96%	100%	101%	95%
0.30	92%	98%	99%	99%	94%	95%	101%	106%	94%
0.40	92%	97%	100%	102%	96%	96%	100%	109%	96%
0.50	90%	95%	100%	103%	99%	97%	100%	105%	98%
0.75	86%	92%	100%	104%	101%	99%	100%	100%	99%
1.0	83%	90%	100%	107%	104%	102%	101%	96%	102%
1.5	77%	86%	97%	109%	106%	106%	106%	98%	106%
2.0	74%	82%	94%	106%	104%	105%	105%	99%	105%
3.0	71%	75%	88%	102%	102%	104%	105%	102%	104%
4.0	69%	73%	84%	99%	99%	100%	101%	100%	100%
5.0	67%	71%	82%	96%	97%	98%	99%	98%	98%
7.5	63%	66%	77%	91%	91%	92%	93%	92%	92%
10	61%	65%	74%	86%	86%	87%	87%	87%	87%
S_{MS} (g)	95%	101%	100%	95%	95%	97%	100%	105%	95%
S_{M1} (g)	74%	82%	95%	108%	101%	103%	105%	102%	103%
S_{DS} (g)	95%	101%	100%	95%	95%	97%	100%	105%	95%
S_{D1} (g)	74%	82%	95%	108%	101%	103%	105%	102%	103%

Table 6.3-33 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the San Mateo Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	D	D	D	D	D	D	D	D	D
0.01	D	D	D	D	D	D	D	D	D
0.02	D	D	D	D	D	D	D	D	D
0.03	D	D	D	D	D	D	D	D	D
0.05	D	D	D	D	D	D	D	D	D
0.08	D	D	D	D	D	D	D	D	D
0.10	D	D	D	D	D	D	D	D	D
0.15	D	D	D	D	D	D	D	D	D
0.20	D	D	D	D	D	D	D	D	D
0.25	D	D	D	D	D	D	D	D	D
0.30	D	D	D	D	D	D	D	D	D
0.40	D	D	D	D	D	D	D	D	D
0.50	D	D	D	D	D	D	D	D	D
0.75	D	D	D	D	D	D	D	D	D
1.0	D	D	D	D	D	D	D	D	D
1.5	D	D	D	D	D	D	D	D	D
2.0	D	D	D	D	D	D	D	D	D
3.0	D	D	D	D	D	D	D	D	D
4.0	D	D	D	D	D	D	D	D	D
5.0	D	D	D	D	D	D	D	D	D
7.5	D	D	D	D	D	D	D	D	D
10	D	D	D	D	D	D	D	D	D
S_{MS} (g)	D	D	D	D	D	D	D	D	D
S_{M1} (g)	D	D	D	D	D	D	D	D	D
S_{DS} (g)	D	D	D	D	D	D	D	D	D
S_{D1} (g)	D	D	D	D	D	D	D	D	D

Table 6.3-34 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the San Mateo Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	D	D	D	D	D	D	D	D	D
0.01	D	D	D	D	D	D	D	D	D
0.02	D	D	D	D	D	D	D	D	D
0.03	D	D	D	D	D	D	D	D	D
0.05	D	D	D	D	D	D	D	D	D
0.08	D	D	D	D	D	D	D	D	D
0.10	D	D	D	D	D	D	D	D	D
0.15	D	D	D	D	D	D	D	D	D
0.20	D	D	D	D	D	D	D	D	D
0.25	D	D	D	D	D	D	D	D	D
0.30	D	D	D	D	D	D	D	D	D
0.40	D	D	D	D	D	D	D	D	D
0.50	D	D	D	D	D	D	D	D	D
0.75	D	D	D	D	D	D	D	D	D
1.0	D	D	D	D	D	D	D	D	D
1.5	D	D	D	D	D	D	D	D	D
2.0	P	D	D	D	D	D	D	D	D
3.0	P	P	D	D	D	D	D	D	D
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	D	D	D	D	D	D	D	D	D
S_{M1} (g)	P	D	D	D	D	D	D	D	D
S_{DS} (g)	D	D	D	D	D	D	D	D	D
S_{D1} (g)	P	D	D	D	D	D	D	D	D

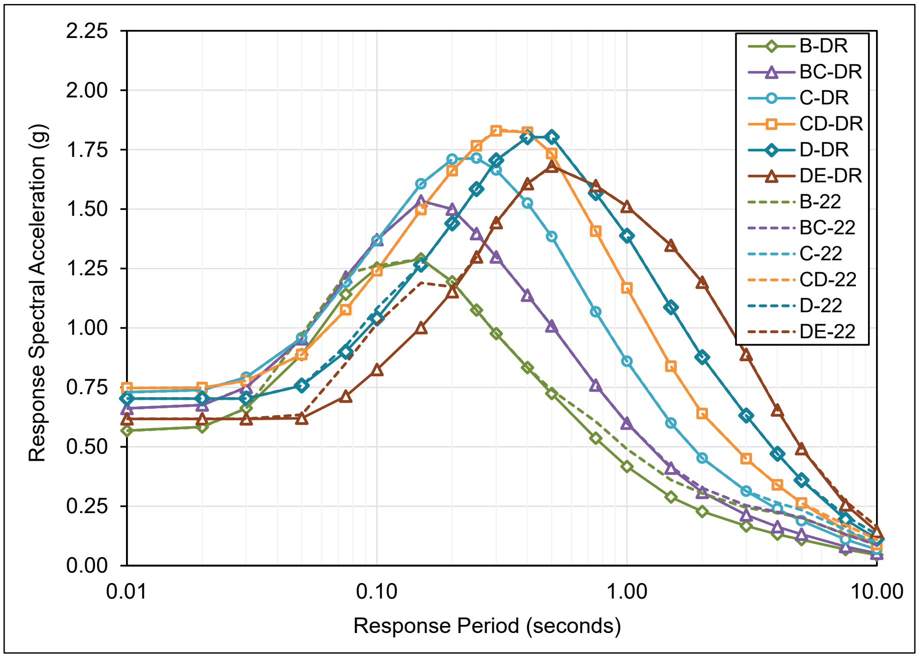


Figure 6.3-12 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the San Jose Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-35 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the San Jose Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.01	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.02	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.03	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.05	88%	91%	100%	100%	100%	100%	98%	92%	100%
0.08	92%	93%	100%	100%	100%	97%	84%	76%	100%
0.10	100%	99%	100%	100%	100%	96%	81%	73%	100%
0.15	100%	100%	100%	100%	100%	100%	84%	75%	100%
0.20	100%	100%	100%	100%	100%	100%	98%	88%	100%
0.25	98%	100%	100%	100%	100%	100%	100%	100%	100%
0.30	97%	100%	100%	100%	100%	100%	100%	100%	100%
0.40	99%	100%	100%	100%	100%	100%	100%	100%	100%
0.50	97%	98%	100%	100%	100%	100%	100%	100%	100%
0.75	84%	88%	100%	100%	100%	100%	100%	100%	100%
1.0	76%	85%	100%	100%	100%	100%	100%	100%	100%
1.5	67%	80%	99%	100%	100%	100%	100%	100%	100%
2.0	63%	75%	95%	100%	100%	100%	100%	100%	100%
3.0	58%	68%	84%	100%	100%	100%	100%	100%	100%
4.0	52%	59%	73%	90%	100%	100%	100%	100%	100%
5.0	50%	54%	65%	80%	100%	100%	100%	100%	100%
7.5	47%	51%	61%	73%	86%	93%	95%	96%	93%
10	48%	52%	60%	71%	81%	86%	87%	87%	86%
S_{MS} (g)	100%	100%	100%	100%	100%	100%	100%	100%	100%
S_{M1} (g)	63%	75%	95%	100%	100%	100%	100%	100%	100%
S_{DS} (g)	100%	100%	100%	100%	100%	100%	100%	100%	100%
S_{D1} (g)	63%	75%	95%	100%	100%	100%	100%	100%	100%

Table 6.3-36 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the San Jose Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.01	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.02	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.03	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.05	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.08	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.10	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.15	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.20	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.25	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.30	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.40	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.50	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.75	DL	DL	DL	DL	DL	DL	DL	DL	DL
1.0	DL	DL	DL	DL	DL	DL	DL	DL	DL
1.5	DL	DL	DL	DL	DL	DL	DL	DL	DL
2.0	DL	DL	DL	DL	DL	DL	DL	DL	DL
3.0	DL	DL	DL	DL	DL	DL	DL	DL	DL
4.0	DL	DL	DL	DL	DL	DL	DL	DL	DL
5.0	DL	DL	DL	DL	DL	DL	DL	DL	DL
7.5	DL	DL	DL	DL	DL	DL	DL	DL	DL
10	DL	DL	DL	DL	DL	DL	DL	DL	DL
S_{MS} (g)	DL	DL	DL	DL	DL	DL	DL	DL	DL
S_{M1} (g)	DL	DL	DL	DL	DL	DL	DL	DL	DL
S_{DS} (g)	DL	DL	DL	DL	DL	DL	DL	DL	DL
S_{D1} (g)	DL	DL	DL	DL	DL	DL	DL	DL	DL

Table 6.3-37 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the San Jose Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.01	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.02	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.03	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.05	D	D	DL	DL	DL	DL	D	D	DL
0.08	D	D	DL	DL	DL	D	D	D	DL
0.10	DL	D	DL	DL	DL	D	D	D	DL
0.15	DL	DL	DL	DL	DL	DL	D	D	DL
0.20	DL	DL	DL	DL	DL	DL	D	D	DL
0.25	D	DL	DL	DL	DL	DL	DL	DL	DL
0.30	D	DL	DL	DL	D	DL	DL	DL	D
0.40	D	DL	DL	DL	DL	DL	DL	DL	DL
0.50	D	D	DL	DL	DL	DL	DL	DL	DL
0.75	D	D	DL	DL	DL	DL	DL	DL	DL
1.0	D	D	DL	DL	DL	DL	DL	DL	DL
1.5	D	D	D	DL	DL	DL	DL	DL	DL
2.0	D	D	D	DL	DL	DL	DL	DL	DL
3.0	D	D	D	DL	DL	DL	DL	DL	DL
4.0	D	D	D	D	DL	DL	DL	DL	DL
5.0	P	P	P	D	DL	DL	DL	DL	DL
7.5	P	P	P	P	P	P	P	D	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	DL	DL	DL	DL	D	DL	DL	DL	D
S_{M1} (g)	D	D	D	DL	DL	DL	DL	DL	DL
S_{DS} (g)	DL	DL	DL	DL	D	DL	DL	DL	D
S_{D1} (g)	D	D	D	DL	DL	DL	DL	DL	DL

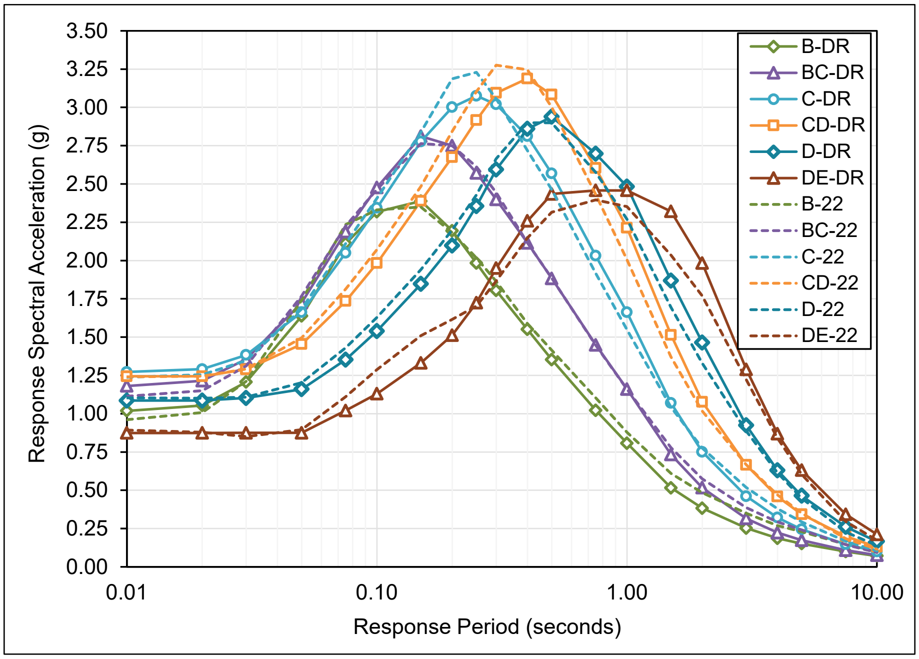


Figure 6.3-13 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Santa Rosa Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-38 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Santa Rosa Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	105%	106%	106%	102%	99%	98%	99%	100%	102%
0.01	105%	106%	106%	103%	100%	98%	98%	98%	103%
0.02	104%	105%	106%	103%	100%	99%	100%	102%	103%
0.03	100%	100%	103%	103%	100%	100%	103%	108%	103%
0.05	93%	94%	98%	99%	97%	96%	98%	101%	99%
0.08	94%	95%	98%	97%	96%	95%	92%	86%	97%
0.10	98%	99%	101%	97%	96%	95%	88%	81%	97%
0.15	98%	102%	102%	98%	96%	95%	88%	80%	98%
0.20	98%	101%	100%	94%	94%	95%	94%	88%	94%
0.25	96%	98%	98%	95%	94%	97%	101%	101%	95%
0.30	95%	97%	98%	99%	94%	97%	105%	109%	94%
0.40	96%	98%	100%	103%	98%	99%	105%	116%	98%
0.50	95%	96%	100%	104%	103%	101%	105%	112%	103%
0.75	91%	93%	100%	106%	107%	105%	103%	102%	105%
1.0	87%	92%	100%	107%	110%	109%	105%	102%	109%
1.5	80%	84%	94%	102%	110%	110%	114%	106%	110%
2.0	75%	79%	90%	97%	106%	110%	112%	112%	110%
3.0	69%	72%	82%	89%	100%	104%	105%	106%	104%
4.0	67%	69%	76%	85%	97%	102%	103%	104%	102%
5.0	64%	66%	72%	83%	98%	104%	105%	106%	104%
7.5	67%	69%	75%	88%	108%	115%	116%	117%	115%
10	76%	76%	81%	97%	114%	119%	123%	115%	119%
S_{MS} (g)	98%	101%	100%	95%	97%	101%	105%	112%	97%
S_{M1} (g)	75%	83%	99%	106%	110%	110%	108%	106%	110%
S_{DS} (g)	98%	101%	100%	95%	97%	101%	105%	112%	97%
S_{D1} (g)	75%	83%	99%	106%	110%	110%	108%	106%	110%

Table 6.3-39 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Santa Rosa Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	D	D	D	D	D	D	D	D	D
0.01	D	D	D	D	D	D	D	D	D
0.02	D	D	D	D	D	D	D	D	D
0.03	D	D	D	D	D	D	D	D	D
0.05	D	D	D	D	D	D	D	D	D
0.08	D	D	D	D	D	D	D	D	D
0.10	D	D	D	D	D	D	D	D	D
0.15	D	D	D	D	D	D	D	D	D
0.20	D	D	D	D	D	D	D	D	D
0.25	D	D	D	D	D	D	D	D	D
0.30	D	D	D	D	D	D	D	D	D
0.40	D	D	D	D	D	D	D	D	D
0.50	D	D	D	D	D	D	D	D	D
0.75	D	D	D	D	D	D	D	D	D
1.0	D	D	D	D	D	P	D	D	P
1.5	P	P	P	P	P	P	P	D	P
2.0	P	P	P	P	P	P	P	D	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	D	D	D	D	D	D	D	D	D
S_{M1} (g)	D	D	D	D	D	P	P	D	P
S_{DS} (g)	D	D	D	D	D	D	D	D	D
S_{D1} (g)	D	D	D	D	D	P	P	D	P

Table 6.3-40 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Santa Rosa Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	D	D	D	D	D	D	D	D	D
0.01	D	D	D	D	D	D	D	D	D
0.02	D	D	D	D	D	D	D	D	D
0.03	P	P	D	D	D	D	D	D	D
0.05	P	P	D	D	D	D	D	D	D
0.08	P	P	D	D	D	D	D	D	D
0.10	D	D	D	D	D	D	D	D	D
0.15	P	D	D	D	D	D	D	D	D
0.20	P	D	D	D	D	D	D	D	D
0.25	P	D	D	P	D	D	D	D	P
0.30	P	D	D	D	D	D	D	D	D
0.40	P	D	D	D	P	D	D	D	P
0.50	P	D	D	D	D	D	D	D	D
0.75	P	D	D	D	D	D	D	D	D
1.0	P	D	D	D	D	D	D	D	D
1.5	P	D	D	D	D	D	D	D	D
2.0	P	P	D	D	P	P	P	P	P
3.0	P	P	D	P	P	P	P	P	P
4.0	P	P	P	P	D	D	P	D	D
5.0	P	P	P	P	D	D	D	D	D
7.5	P	P	P	D	D	D	D	D	D
10	P	P	P	D	D	D	D	D	D
S_{MS} (g)	P	D	D	P	D	D	D	D	D
S_{M1} (g)	P	P	D	D	D	P	P	P	P
S_{DS} (g)	P	D	D	P	D	D	D	D	D
S_{D1} (g)	P	P	D	D	D	P	P	P	P

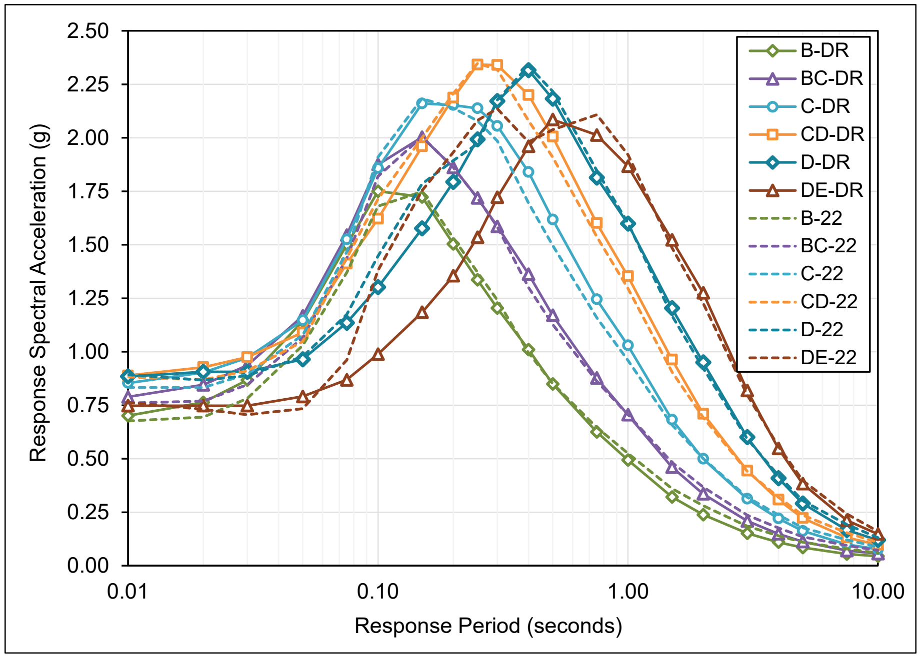


Figure 6.3-14 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Seattle Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-41 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Seattle Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	111%	103%	104%	102%	101%	100%	99%	97%	100%
0.01	111%	104%	104%	102%	101%	99%	98%	98%	100%
0.02	115%	110%	110%	108%	107%	104%	102%	103%	107%
0.03	115%	111%	111%	109%	107%	102%	106%	117%	107%
0.05	115%	111%	110%	106%	104%	99%	108%	108%	106%
0.08	115%	109%	107%	104%	98%	97%	90%	83%	104%
0.10	112%	104%	103%	97%	95%	90%	72%	64%	97%
0.15	107%	99%	100%	99%	98%	88%	68%	59%	99%
0.20	109%	98%	100%	101%	99%	95%	70%	60%	99%
0.25	110%	97%	100%	103%	100%	101%	74%	62%	100%
0.30	111%	97%	100%	104%	101%	100%	81%	68%	101%
0.40	118%	101%	105%	109%	106%	99%	99%	84%	99%
0.50	118%	100%	104%	108%	105%	98%	102%	93%	98%
0.75	114%	97%	102%	107%	104%	98%	95%	95%	98%
1.0	110%	94%	100%	107%	104%	100%	97%	97%	100%
1.5	102%	89%	96%	104%	106%	103%	103%	112%	103%
2.0	96%	85%	91%	100%	103%	103%	104%	115%	103%
3.0	91%	82%	89%	98%	101%	101%	103%	113%	101%
4.0	87%	78%	84%	93%	96%	97%	98%	109%	97%
5.0	85%	78%	83%	91%	95%	96%	97%	107%	96%
7.5	78%	70%	74%	82%	86%	87%	88%	100%	87%
10	82%	74%	79%	87%	91%	91%	92%	105%	91%
S_{MS} (g)	109%	98%	100%	101%	100%	99%	98%	87%	100%
S_{M1} (g)	100%	88%	96%	103%	104%	103%	104%	115%	103%
S_{DS} (g)	109%	98%	100%	101%	100%	99%	98%	87%	100%
S_{D1} (g)	100%	88%	96%	103%	104%	103%	104%	115%	103%

Table 6.3-42 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE$_R$ Ground Motions Governing Values of the Derived MPRS at the Seattle Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	D	D	P
0.01	P	P	P	P	P	P	D	D	P
0.02	P	P	P	P	P	D	D	D	P
0.03	P	P	P	P	P	D	D	D	P
0.05	P	P	P	P	P	D	D	D	P
0.08	P	P	P	P	D	D	D	D	P
0.10	D	P	P	D	D	D	D	D	D
0.15	P	P	P	P	D	D	D	D	D
0.20	P	P	P	P	D	D	D	D	D
0.25	P	P	P	P	P	D	D	D	D
0.30	P	P	P	P	P	D	D	D	D
0.40	P	P	P	P	P	P	D	D	P
0.50	P	P	P	P	P	P	D	D	P
0.75	P	P	P	P	P	P	P	D	P
1.0	P	P	P	P	P	P	P	D	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	D	D	D	D
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	D	D	D	D
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-43 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE$_R$ Ground Motions Governing Values of the Proposed MPRS at the Seattle Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	D	D	D	D
0.01	P	P	P	P	P	D	D	D	D
0.02	P	P	P	P	P	P	D	D	P
0.03	P	P	P	P	P	P	D	D	P
0.05	P	P	P	P	P	D	D	D	P
0.08	P	P	P	P	P	D	D	D	P
0.10	P	P	P	P	D	D	D	D	D
0.15	P	P	P	P	D	D	D	D	D
0.20	P	P	P	P	D	D	D	D	D
0.25	P	P	P	P	P	D	D	D	D
0.30	P	P	P	P	P	D	D	D	D
0.40	P	P	P	P	P	D	D	D	D
0.50	P	P	P	P	P	P	D	D	P
0.75	P	P	P	P	P	P	D	D	P
1.0	P	P	P	P	P	P	P	D	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	D	D	D	D
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	D	D	D	D
S_{D1} (g)	P	P	P	P	P	P	P	P	P

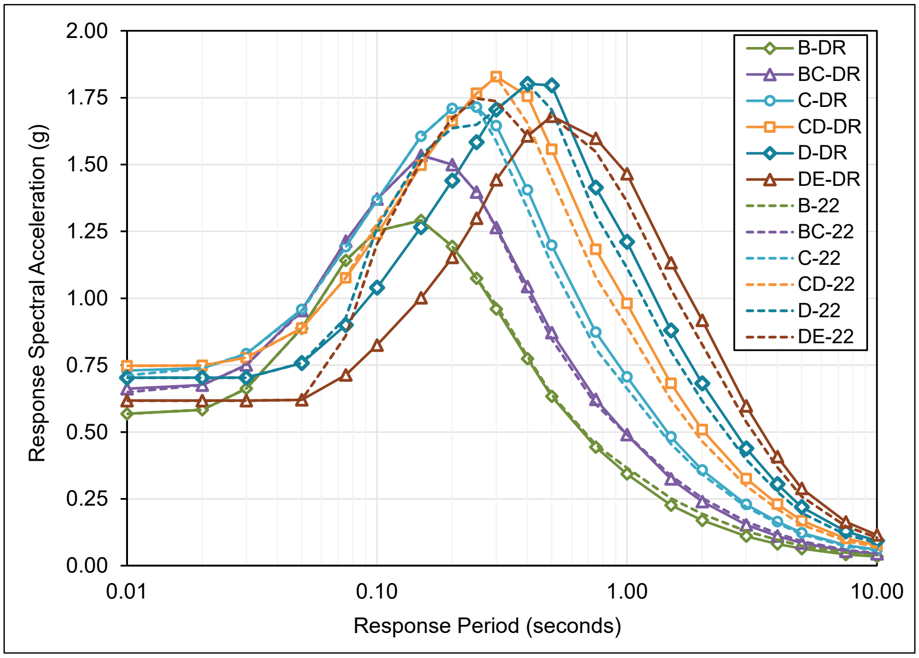


Figure 6.3-15 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Tacoma Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-44 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Tacoma Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	104%	100%	102%	102%	100%	100%	100%	87%	100%
0.01	104%	100%	102%	103%	100%	100%	100%	88%	100%
0.02	100%	100%	100%	100%	100%	100%	100%	91%	100%
0.03	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.05	100%	100%	100%	100%	100%	100%	100%	92%	100%
0.08	100%	100%	100%	100%	100%	97%	83%	74%	100%
0.10	100%	100%	100%	100%	97%	82%	69%	60%	100%
0.15	100%	100%	100%	100%	99%	82%	66%	56%	100%
0.20	103%	100%	100%	100%	100%	88%	69%	57%	100%
0.25	109%	100%	100%	100%	100%	96%	74%	61%	100%
0.30	111%	98%	100%	104%	100%	100%	83%	67%	100%
0.40	115%	99%	102%	105%	106%	100%	100%	82%	100%
0.50	115%	99%	103%	106%	108%	105%	100%	90%	105%
0.75	112%	98%	103%	108%	110%	108%	103%	93%	108%
1.0	106%	94%	100%	107%	110%	109%	108%	94%	109%
1.5	99%	90%	97%	106%	110%	110%	110%	109%	110%
2.0	96%	88%	95%	105%	109%	111%	111%	110%	111%
3.0	93%	85%	93%	104%	109%	111%	111%	111%	111%
4.0	92%	84%	92%	104%	109%	110%	111%	110%	110%
5.0	92%	86%	93%	104%	110%	111%	112%	111%	111%
7.5	92%	85%	92%	104%	109%	111%	111%	110%	111%
10	95%	87%	94%	105%	109%	110%	110%	109%	110%
S_{MS} (g)	103%	100%	100%	100%	100%	100%	96%	82%	100%
S_{M1} (g)	97%	89%	97%	106%	110%	111%	111%	110%	111%
S_{DS} (g)	103%	100%	100%	100%	100%	100%	96%	82%	100%
S_{D1} (g)	97%	89%	97%	106%	110%	111%	111%	110%	111%

Table 6.3-45 **Probabilistic (P), deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Tacoma Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.01	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.02	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.03	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.05	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.08	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.10	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.15	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.20	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.25	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.30	P	P	P	P	DL	DL	DL	DL	DL
0.40	P	P	P	P	P	DL	DL	DL	DL
0.50	P	P	P	P	P	P	DL	DL	P
0.75	P	P	P	P	P	P	DL	DL	P
1.0	P	P	P	P	P	P	P	DL	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	DL	DL	DL	DL	DL	DL	DL	DL	DL
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	DL	DL	DL	DL	DL	DL	DL	DL	DL
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-46 **Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Tacoma Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	DL	P	P	DL	DL	DL	D	DL
0.01	P	DL	P	P	DL	DL	DL	D	DL
0.02	DL	DL	DL	DL	DL	DL	DL	D	DL
0.03	DL	DL	DL	DL	DL	DL	DL	D	DL
0.05	DL	DL	P	P	DL	DL	DL	D	P
0.08	DL	DL	DL	DL	DL	D	D	D	DL
0.10	DL	DL	DL	DL	D	D	D	D	DL
0.15	DL	DL	DL	DL	D	D	D	D	DL
0.20	P	DL	DL	DL	DL	D	D	D	DL
0.25	P	DL	DL	DL	DL	D	D	D	DL
0.30	P	DL	P	P	DL	DL	D	D	DL
0.40	P	P	P	P	P	DL	DL	D	DL
0.50	P	P	P	P	P	P	DL	D	P
0.75	P	P	P	P	P	P	P	D	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	DL	DL	DL	DL	DL	D	D	DL
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	DL	DL	DL	DL	DL	D	D	DL
S_{D1} (g)	P	P	P	P	P	P	P	P	P

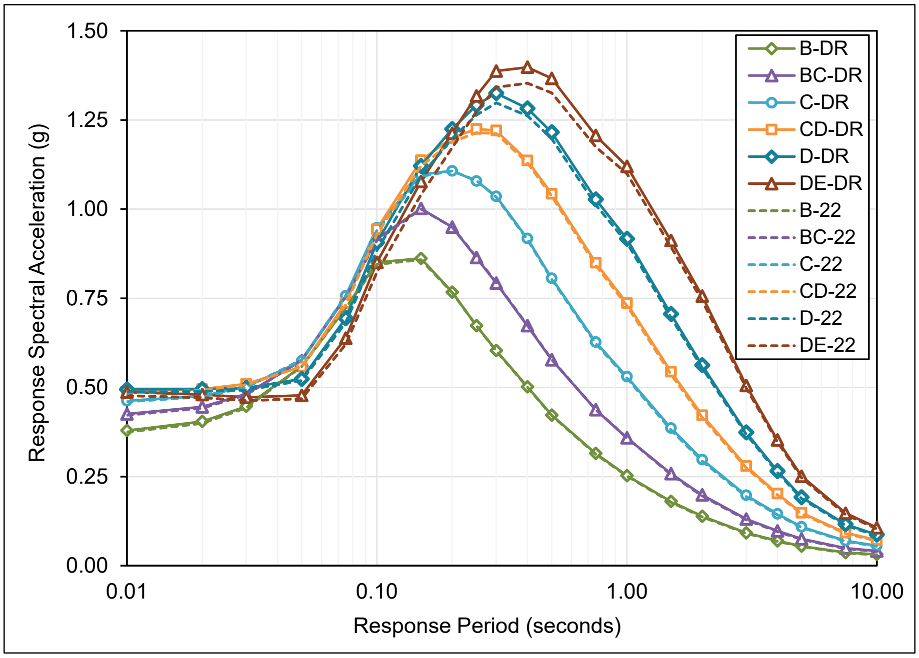


Figure 6.3-16 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Portland Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-47 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Portland Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	108%	101%	101%	101%	101%	102%	102%	103%	102%
0.01	108%	101%	101%	101%	101%	102%	102%	103%	102%
0.02	106%	101%	101%	101%	101%	101%	102%	103%	101%
0.03	105%	101%	100%	100%	100%	101%	102%	103%	100%
0.05	103%	100%	100%	99%	100%	101%	102%	103%	99%
0.08	104%	100%	100%	100%	101%	102%	103%	103%	100%
0.10	107%	101%	100%	101%	101%	102%	103%	104%	101%
0.15	109%	100%	100%	100%	101%	102%	104%	102%	101%
0.20	110%	100%	100%	100%	101%	102%	103%	101%	102%
0.25	111%	100%	100%	100%	101%	102%	103%	103%	102%
0.30	113%	100%	100%	100%	101%	102%	103%	104%	102%
0.40	115%	100%	100%	100%	101%	102%	103%	104%	102%
0.50	116%	100%	100%	100%	101%	102%	103%	104%	102%
0.75	118%	101%	100%	101%	101%	102%	103%	104%	102%
1.0	120%	101%	100%	101%	101%	101%	102%	103%	101%
1.5	123%	101%	101%	101%	101%	101%	102%	103%	101%
2.0	123%	101%	101%	102%	101%	101%	102%	102%	101%
3.0	124%	102%	102%	102%	102%	102%	101%	102%	102%
4.0	125%	102%	102%	102%	102%	102%	102%	101%	102%
5.0	124%	102%	102%	102%	102%	102%	102%	102%	102%
7.5	124%	103%	103%	103%	103%	103%	103%	103%	103%
10	123%	103%	103%	103%	103%	103%	103%	103%	103%
S_{MS} (g)	110%	100%	100%	100%	101%	102%	103%	104%	102%
S_{M1} (g)	123%	101%	101%	102%	101%	101%	101%	102%	101%
S_{DS} (g)	110%	100%	100%	100%	101%	102%	103%	104%	102%
S_{D1} (g)	123%	101%	101%	102%	101%	101%	101%	102%	101%

Table 6.3-48 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Portland Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	P	P
0.15	P	P	P	P	P	P	P	D	P
0.20	P	P	P	P	P	P	P	D	P
0.25	P	P	P	P	P	P	P	D	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-49 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Portland Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	P	P
0.15	P	P	P	P	P	P	P	P	P
0.20	P	P	P	P	P	P	P	P	P
0.25	P	P	P	P	P	P	P	P	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

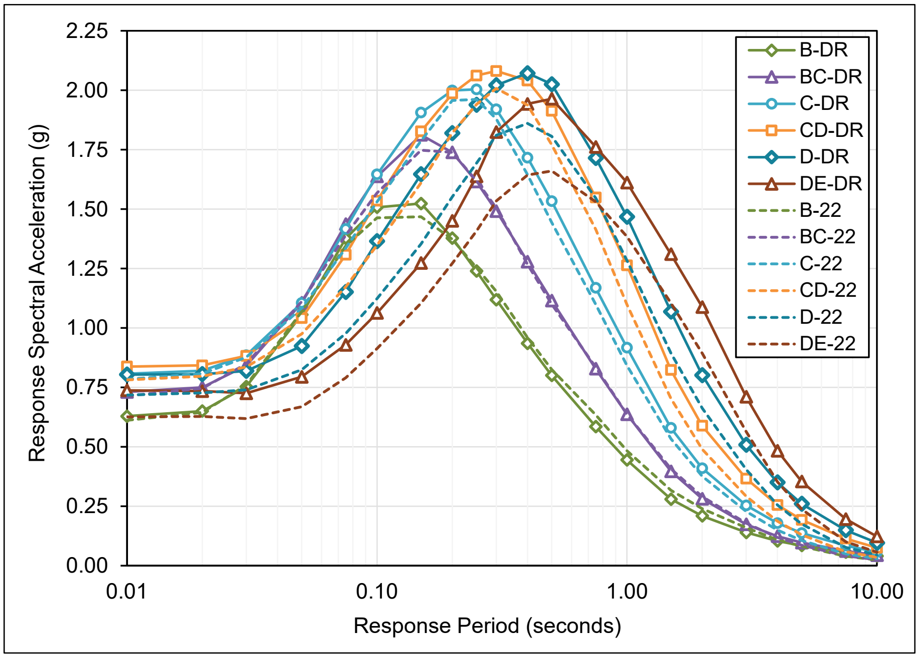


Figure 6.3-17 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Salt Lake City Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-50 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Salt Lake City Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	106%	103%	102%	103%	107%	112%	118%	121%	107%
0.01	106%	103%	102%	103%	107%	112%	118%	120%	107%
0.02	104%	101%	101%	101%	106%	111%	117%	121%	104%
0.03	102%	99%	99%	101%	106%	111%	117%	121%	101%
0.05	101%	99%	99%	102%	107%	112%	119%	122%	102%
0.08	105%	102%	103%	106%	112%	118%	118%	113%	106%
0.10	107%	103%	104%	108%	114%	121%	116%	110%	108%
0.15	108%	104%	104%	107%	113%	122%	115%	108%	107%
0.20	105%	100%	100%	102%	109%	117%	114%	106%	102%
0.25	104%	99%	100%	102%	106%	115%	116%	109%	105%
0.30	103%	97%	99%	102%	104%	112%	119%	112%	104%
0.40	104%	97%	101%	104%	105%	111%	118%	118%	107%
0.50	103%	97%	101%	106%	108%	112%	118%	122%	112%
0.75	97%	92%	99%	106%	109%	111%	115%	118%	111%
1.0	94%	92%	100%	109%	115%	114%	116%	119%	114%
1.5	88%	88%	98%	109%	117%	120%	119%	119%	120%
2.0	87%	87%	97%	109%	120%	121%	122%	121%	121%
3.0	87%	88%	97%	111%	126%	126%	126%	126%	126%
4.0	95%	96%	104%	120%	137%	137%	137%	137%	137%
5.0	103%	104%	112%	129%	148%	149%	149%	148%	149%
7.5	148%	145%	150%	169%	192%	193%	194%	191%	193%
10	176%	169%	172%	191%	212%	214%	215%	210%	214%
S_{MS} (g)	105%	100%	100%	102%	104%	111%	118%	122%	104%
S_{M1} (g)	89%	92%	100%	109%	115%	120%	122%	121%	120%
S_{DS} (g)	105%	100%	100%	102%	104%	111%	118%	122%	104%
S_{D1} (g)	89%	92%	100%	109%	115%	120%	122%	121%	120%

Table 6.3-51 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Salt Lake City Site

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	D	P
0.01	P	P	P	P	P	P	P	D	P
0.02	P	P	P	P	P	P	P	D	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	D	P
0.08	P	P	P	P	P	P	D	D	P
0.10	P	P	P	P	P	P	D	D	P
0.15	P	P	P	P	P	P	D	D	P
0.20	P	P	P	P	P	P	D	D	P
0.25	P	P	P	P	P	P	D	D	P
0.30	P	P	P	P	P	P	D	D	P
0.40	P	P	P	P	P	P	P	D	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-52 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Salt Lake City Site

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	P	P
0.15	P	P	P	P	P	P	P	P	P
0.20	P	P	P	P	P	P	P	P	P
0.25	P	P	P	P	P	P	P	P	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

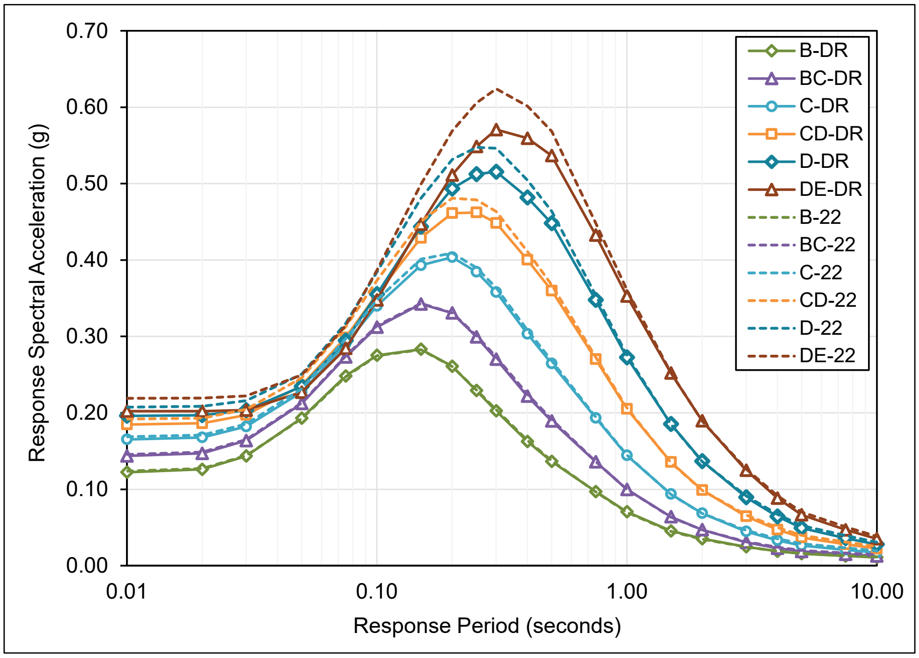


Figure 6.3-18 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Boise Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-53 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Boise Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	101%	99%	99%	98%	96%	94%	92%	91%	94%
0.01	101%	99%	99%	98%	96%	94%	92%	91%	94%
0.02	102%	99%	99%	98%	96%	94%	92%	91%	94%
0.03	102%	100%	99%	98%	96%	94%	92%	90%	94%
0.05	102%	100%	100%	98%	96%	94%	91%	90%	94%
0.08	102%	100%	99%	98%	95%	93%	90%	89%	94%
0.10	103%	100%	99%	98%	95%	92%	90%	89%	92%
0.15	103%	100%	100%	98%	95%	92%	89%	88%	92%
0.20	104%	100%	100%	99%	96%	93%	90%	88%	93%
0.25	104%	100%	99%	99%	97%	94%	91%	89%	94%
0.30	104%	99%	99%	98%	97%	94%	91%	90%	94%
0.40	104%	99%	99%	98%	97%	96%	93%	92%	96%
0.50	104%	99%	99%	99%	98%	97%	94%	93%	97%
0.75	105%	100%	100%	100%	99%	98%	97%	95%	98%
1.0	106%	101%	100%	100%	99%	99%	98%	97%	99%
1.5	107%	102%	101%	101%	101%	100%	100%	99%	100%
2.0	108%	102%	101%	100%	100%	100%	100%	99%	100%
3.0	110%	101%	98%	97%	97%	98%	99%	98%	98%
4.0	111%	99%	95%	94%	95%	96%	97%	95%	96%
5.0	112%	98%	92%	92%	93%	94%	95%	93%	94%
7.5	116%	97%	90%	89%	90%	91%	92%	89%	91%
10	115%	95%	89%	88%	89%	91%	92%	89%	91%
S_{MS} (g)	104%	100%	100%	99%	96%	94%	91%	91%	94%
S_{M1} (g)	108%	101%	100%	100%	99%	100%	100%	98%	100%
S_{DS} (g)	104%	100%	100%	99%	96%	94%	91%	91%	94%
S_{D1} (g)	108%	101%	100%	100%	99%	100%	100%	98%	100%

Table 6.3-54 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Boise Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	P	P
0.15	P	P	P	P	P	P	P	P	P
0.20	P	P	P	P	P	P	P	P	P
0.25	P	P	P	P	P	P	P	P	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-55 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Boise Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	P	P
0.15	P	P	P	P	P	P	P	P	P
0.20	P	P	P	P	P	P	P	P	P
0.25	P	P	P	P	P	P	P	P	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

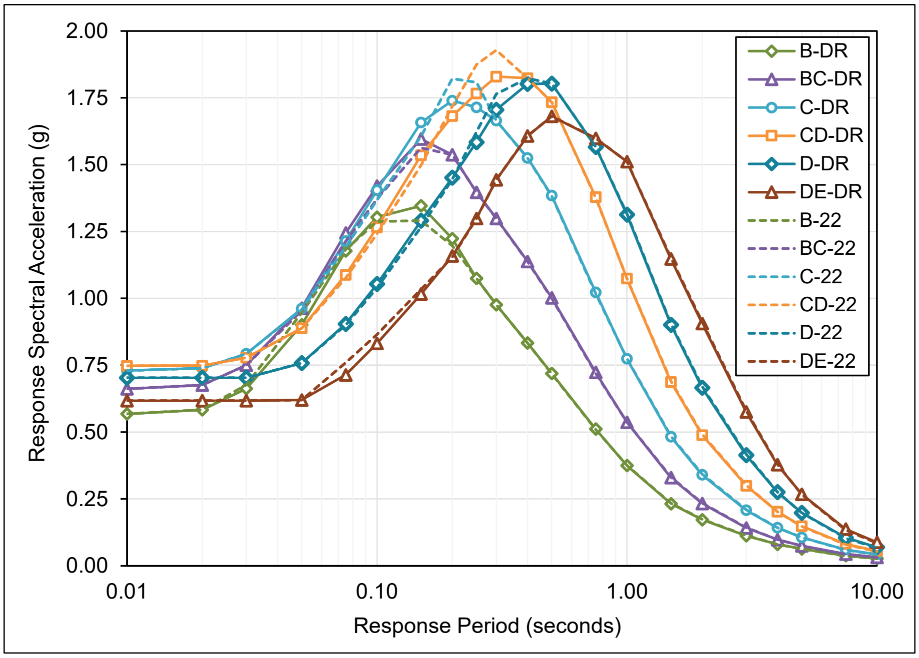


Figure 6.3-19 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Reno Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-56 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Reno Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.01	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.02	100%	100%	100%	100%	100%	100%	100%	100%	100%
0.03	100%	98%	100%	100%	100%	100%	100%	100%	100%
0.05	94%	95%	101%	100%	100%	100%	100%	98%	100%
0.08	101%	99%	103%	102%	101%	101%	94%	85%	102%
0.10	104%	101%	104%	103%	102%	101%	96%	87%	103%
0.15	104%	104%	102%	103%	102%	102%	98%	89%	103%
0.20	102%	102%	100%	95%	98%	100%	100%	94%	95%
0.25	100%	100%	100%	95%	94%	98%	100%	100%	94%
0.30	100%	100%	100%	100%	95%	97%	100%	100%	95%
0.40	100%	100%	100%	100%	100%	99%	100%	100%	100%
0.50	103%	100%	100%	100%	100%	100%	100%	100%	100%
0.75	105%	100%	101%	100%	100%	100%	100%	100%	100%
1.0	104%	100%	100%	100%	100%	100%	100%	100%	100%
1.5	103%	100%	100%	100%	100%	100%	100%	100%	100%
2.0	103%	99%	99%	99%	99%	99%	99%	99%	99%
3.0	103%	99%	99%	99%	99%	99%	99%	99%	99%
4.0	103%	100%	100%	100%	100%	100%	100%	100%	100%
5.0	104%	101%	100%	100%	100%	100%	100%	100%	100%
7.5	107%	103%	103%	103%	103%	103%	103%	103%	103%
10	109%	104%	104%	104%	104%	104%	104%	103%	104%
S_{MS} (g)	102%	102%	100%	95%	95%	99%	100%	100%	95%
S_{M1} (g)	104%	100%	100%	100%	100%	100%	99%	99%	100%
S_{DS} (g)	102%	102%	100%	95%	95%	99%	100%	100%	95%
S_{D1} (g)	104%	100%	100%	100%	100%	100%	99%	99%	100%

Table 6.3-57 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the Reno Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.01	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.02	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.03	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.05	D	D	D	D	DL	DL	DL	DL	D
0.08	D	D	D	D	D	D	D	DL	D
0.10	D	D	D	D	D	D	D	D	D
0.15	D	D	D	D	D	D	D	D	D
0.20	D	D	D	D	D	D	D	D	D
0.25	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.30	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.40	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.50	DL	P	P	DL	DL	DL	DL	DL	DL
0.75	P	P	P	P	P	DL	DL	DL	DL
1.0	P	P	P	P	P	P	DL	DL	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	D	D	D	D	DL	DL	DL	DL	DL
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	D	D	D	D	DL	DL	DL	DL	DL
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-58 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Reno Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.01	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.02	DL	DL	DL	DL	DL	DL	DL	DL	DL
0.03	DL	D	DL	DL	DL	DL	DL	DL	DL
0.05	D	D	DL	DL	DL	DL	DL	D	DL
0.08	D	D	DL	DL	DL	DL	D	D	DL
0.10	DL	D	DL	DL	DL	DL	D	D	DL
0.15	DL	DL	D	DL	DL	DL	D	D	DL
0.20	DL	D	D	D	D	D	D	D	D
0.25	DL	DL	DL	D	D	D	DL	DL	D
0.30	DL	DL	DL	DL	D	D	DL	DL	D
0.40	DL	DL	DL	DL	DL	D	DL	DL	DL
0.50	P	P	P	P	DL	DL	DL	DL	DL
0.75	P	P	P	P	P	DL	DL	DL	DL
1.0	P	P	P	P	P	P	DL	DL	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	DL	D	D	D	D	D	DL	DL	D
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	DL	D	D	D	D	D	DL	DL	D
S_{D1} (g)	P	P	P	P	P	P	P	P	P

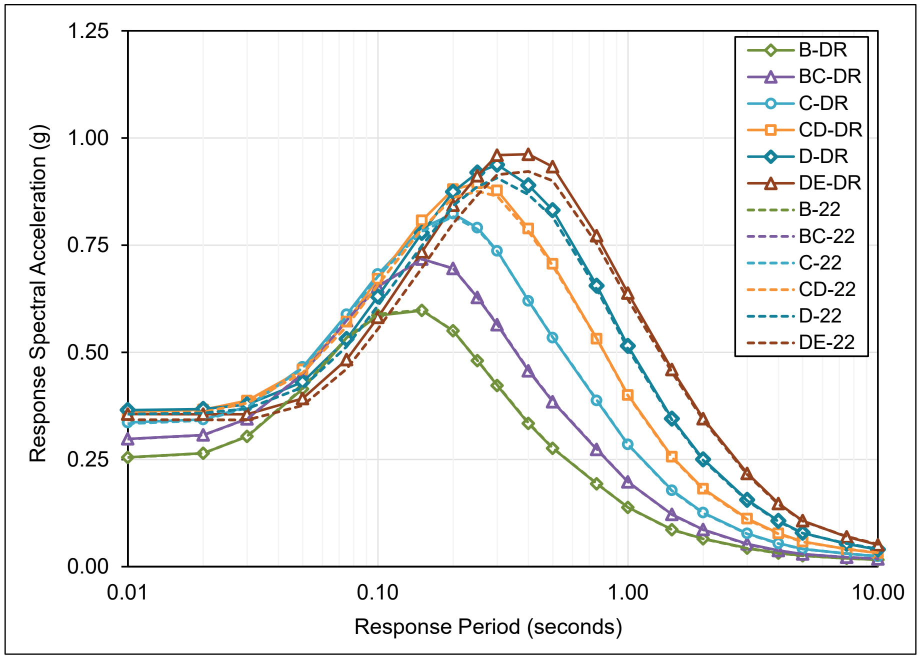


Figure 6.3-20 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Las Vegas Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-59 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Las Vegas Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	103%	100%	100%	101%	102%	103%	104%	104%	103%
0.01	103%	100%	100%	101%	102%	103%	104%	104%	103%
0.02	102%	100%	100%	101%	102%	103%	104%	105%	102%
0.03	102%	100%	100%	101%	102%	103%	104%	105%	102%
0.05	101%	100%	100%	101%	102%	103%	104%	105%	101%
0.08	101%	100%	100%	101%	102%	103%	105%	105%	101%
0.10	102%	100%	100%	101%	102%	104%	105%	106%	101%
0.15	103%	100%	100%	101%	102%	104%	105%	106%	102%
0.20	104%	100%	100%	101%	102%	104%	105%	106%	102%
0.25	104%	100%	100%	100%	102%	104%	105%	106%	104%
0.30	104%	100%	100%	100%	102%	103%	105%	106%	103%
0.40	104%	100%	100%	100%	101%	103%	104%	105%	103%
0.50	105%	100%	100%	100%	101%	102%	104%	104%	102%
0.75	104%	100%	100%	100%	100%	101%	102%	103%	101%
1.0	104%	100%	100%	100%	100%	101%	102%	103%	101%
1.5	104%	100%	100%	101%	101%	101%	101%	102%	101%
2.0	103%	101%	101%	101%	101%	101%	101%	101%	101%
3.0	103%	101%	101%	101%	101%	101%	101%	101%	101%
4.0	102%	101%	101%	101%	101%	101%	101%	101%	101%
5.0	102%	100%	101%	101%	101%	101%	101%	101%	101%
7.5	100%	98%	99%	99%	99%	99%	98%	99%	99%
10	100%	97%	98%	98%	98%	98%	97%	98%	98%
S_{MS} (g)	104%	100%	100%	101%	102%	103%	104%	105%	103%
S_{M1} (g)	104%	100%	100%	100%	100%	101%	101%	101%	101%
S_{DS} (g)	104%	100%	100%	101%	102%	103%	104%	105%	103%
S_{D1} (g)	104%	100%	100%	100%	100%	101%	101%	101%	101%

Table 6.3-60 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values at the Derived MPRS of the Las Vegas Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	P	P
0.15	P	P	P	P	P	P	P	P	P
0.20	P	P	P	P	P	P	P	P	P
0.25	P	P	P	P	P	P	P	P	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-61 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Las Vegas Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	P	P
0.15	P	P	P	P	P	P	P	P	P
0.20	P	P	P	P	P	P	P	P	P
0.25	P	P	P	P	P	P	P	P	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

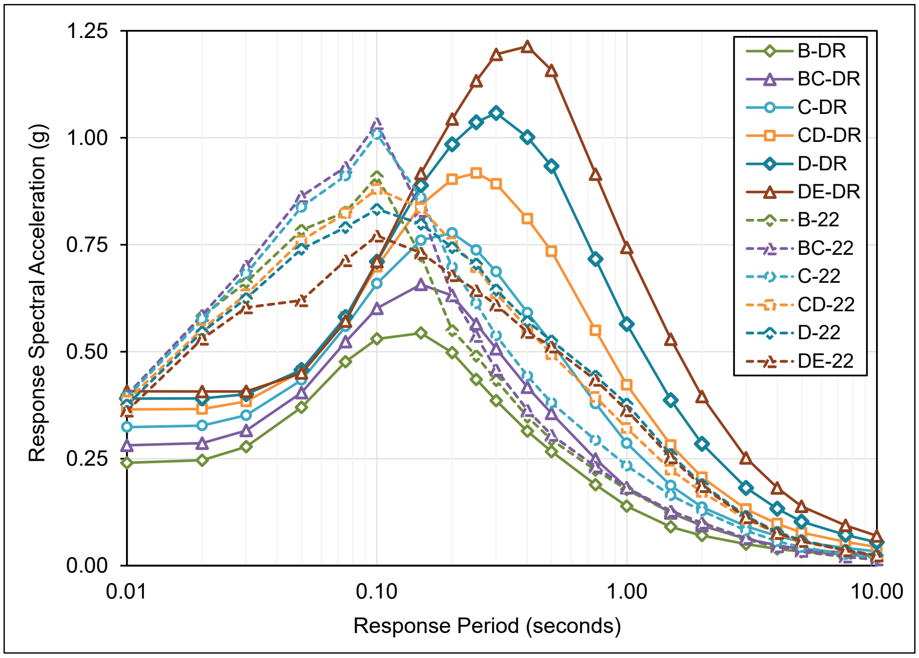


Figure 6.3-21 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the St. Louis Site for six hypothetical Site Classes B, BC, C, CD, D, and DE.

Table 6.3-62 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the St. Louis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	56%	65%	76%	89%	102%	112%	121%	125%	107%
0.01	52%	60%	71%	82%	95%	104%	113%	117%	99%
0.02	43%	42%	49%	57%	66%	72%	77%	79%	68%
0.03	43%	42%	45%	51%	61%	64%	67%	76%	59%
0.05	42%	47%	47%	52%	60%	62%	73%	81%	55%
0.08	56%	58%	56%	61%	70%	74%	80%	91%	64%
0.10	63%	58%	58%	65%	79%	85%	92%	99%	70%
0.15	74%	75%	79%	88%	101%	111%	125%	120%	103%
0.20	79%	91%	100%	111%	120%	132%	154%	149%	130%
0.25	76%	89%	105%	120%	132%	147%	176%	179%	147%
0.30	75%	89%	111%	128%	140%	164%	196%	213%	164%
0.40	75%	90%	115%	133%	146%	175%	222%	247%	175%
0.50	75%	91%	117%	137%	149%	178%	226%	256%	178%
0.75	73%	84%	108%	129%	139%	162%	211%	248%	162%
1.0	70%	78%	100%	122%	131%	149%	205%	247%	149%
1.5	67%	73%	96%	114%	126%	149%	209%	261%	149%
2.0	68%	73%	94%	107%	120%	149%	213%	271%	149%
3.0	74%	82%	98%	112%	121%	157%	223%	286%	157%
4.0	83%	92%	107%	122%	131%	169%	239%	305%	169%
5.0	91%	100%	114%	129%	136%	174%	242%	306%	174%
7.5	116%	127%	140%	155%	158%	196%	263%	331%	196%
10	142%	158%	174%	188%	188%	227%	296%	364%	227%
S_{MS} (g)	79%	91%	100%	111%	121%	142%	179%	199%	140%
S_{M1} (g)	68%	73%	94%	112%	123%	149%	209%	265%	149%
S_{DS} (g)	79%	91%	100%	111%	121%	142%	179%	199%	140%
S_{D1} (g)	68%	73%	94%	112%	123%	149%	209%	265%	149%

Table 6.3-63 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE$_R$ Ground Motions Governing Values of the Derived MPRS at the St. Louis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	P	P
0.15	P	P	P	P	P	P	P	DL	P
0.20	P	P	P	P	P	P	P	DL	P
0.25	P	P	P	P	P	P	P	DL	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-64 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE$_R$ Ground Motions Governing Values of the Proposed MPRS at the St. Louis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	DL	DL	P	P	P	P	P	P	P
0.03	DL	DL	P	P	P	P	P	DL	P
0.05	DL	P	P	P	P	P	DL	DL	P
0.08	P	P	P	P	P	P	DL	DL	P
0.10	P	P	P	P	P	P	P	DL	P
0.15	P	P	P	P	P	P	P	P	P
0.20	P	P	P	P	P	P	P	P	P
0.25	P	P	P	P	P	P	P	P	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

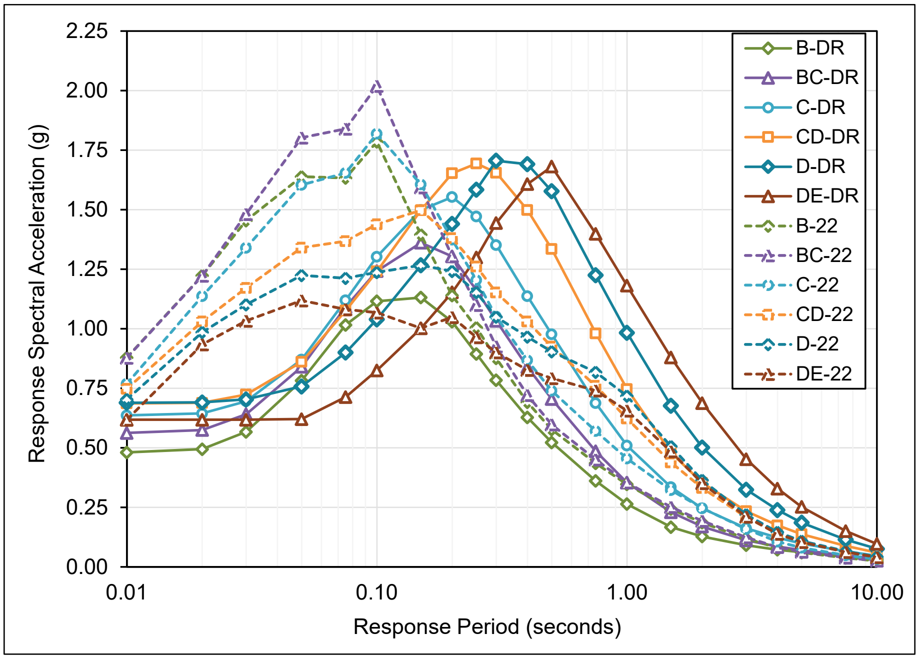


Figure 6.3-22 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the Memphis Site for six hypothetical Site Classes A, B, BC, C, CD, D, and DE.

Table 6.3-65 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the Memphis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	58%	67%	79%	87%	100%	106%	100%	100%	94%
0.01	47%	55%	64%	83%	92%	98%	100%	90%	90%
0.02	35%	40%	47%	57%	67%	70%	66%	59%	61%
0.03	34%	39%	43%	52%	62%	64%	60%	53%	54%
0.05	43%	48%	47%	54%	64%	62%	55%	49%	54%
0.08	61%	62%	59%	68%	79%	74%	66%	58%	68%
0.10	68%	63%	62%	72%	86%	84%	77%	68%	72%
0.15	80%	81%	85%	93%	100%	100%	100%	90%	93%
0.20	86%	90%	100%	113%	120%	116%	110%	100%	120%
0.25	83%	89%	106%	122%	134%	137%	135%	120%	134%
0.30	82%	89%	112%	129%	144%	163%	160%	145%	148%
0.40	77%	91%	116%	131%	145%	175%	195%	180%	164%
0.50	77%	91%	118%	132%	144%	175%	212%	201%	171%
0.75	73%	83%	108%	121%	129%	150%	189%	206%	150%
1.0	69%	76%	100%	112%	120%	137%	180%	202%	137%
1.5	65%	69%	91%	104%	109%	134%	181%	216%	134%
2.0	65%	68%	88%	99%	107%	138%	196%	244%	138%
3.0	71%	76%	90%	103%	112%	148%	215%	272%	148%
4.0	84%	90%	102%	115%	124%	164%	237%	298%	164%
5.0	95%	101%	110%	123%	131%	171%	243%	303%	171%
7.5	113%	119%	123%	133%	138%	174%	241%	294%	174%
10	125%	132%	136%	144%	145%	179%	241%	286%	179%
S_{MS} (g)	86%	90%	100%	113%	123%	137%	160%	158%	124%
S_{M1} (g)	65%	71%	92%	103%	113%	134%	189%	236%	134%
S_{DS} (g)	86%	90%	100%	113%	123%	137%	160%	158%	124%
S_{D1} (g)	65%	71%	92%	103%	113%	134%	189%	236%	134%

Table 6.3-66 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values at the Derived MPRS of the Memphis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	DL	DL	P
0.01	P	P	P	P	P	P	DL	DL	P
0.02	P	P	P	P	P	P	DL	DL	P
0.03	P	P	P	P	P	DL	DL	DL	P
0.05	P	P	P	P	P	DL	DL	DL	P
0.08	P	P	P	P	DL	DL	DL	DL	P
0.10	P	P	P	P	DL	DL	DL	DL	P
0.15	P	P	P	P	DL	DL	DL	DL	DL
0.20	P	P	P	P	P	DL	DL	DL	P
0.25	P	P	P	P	P	DL	DL	DL	DL
0.30	P	P	P	P	P	DL	DL	DL	DL
0.40	P	P	P	P	P	P	DL	DL	P
0.50	P	P	P	P	P	P	DL	DL	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	DL	DL	DL	DL
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	DL	DL	DL	DL
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-67 Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the Memphis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	D	D	D	DL	P	P	DL	DL	DL
0.01	P	P	P	D	DL	DL	DL	D	D
0.02	D	D	D	D	D	D	D	D	D
0.03	D	D	D	D	D	D	D	D	D
0.05	D	D	D	D	D	D	D	D	D
0.08	D	D	D	D	D	D	D	D	D
0.10	D	D	D	D	D	D	D	D	D
0.15	D	D	D	DL	DL	DL	DL	D	DL
0.20	D	P	P	P	P	P	P	DL	P
0.25	D	P	P	P	P	P	P	P	P
0.30	DL	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	D	P	P	P	P	P	P	DL	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	D	P	P	P	P	P	P	DL	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

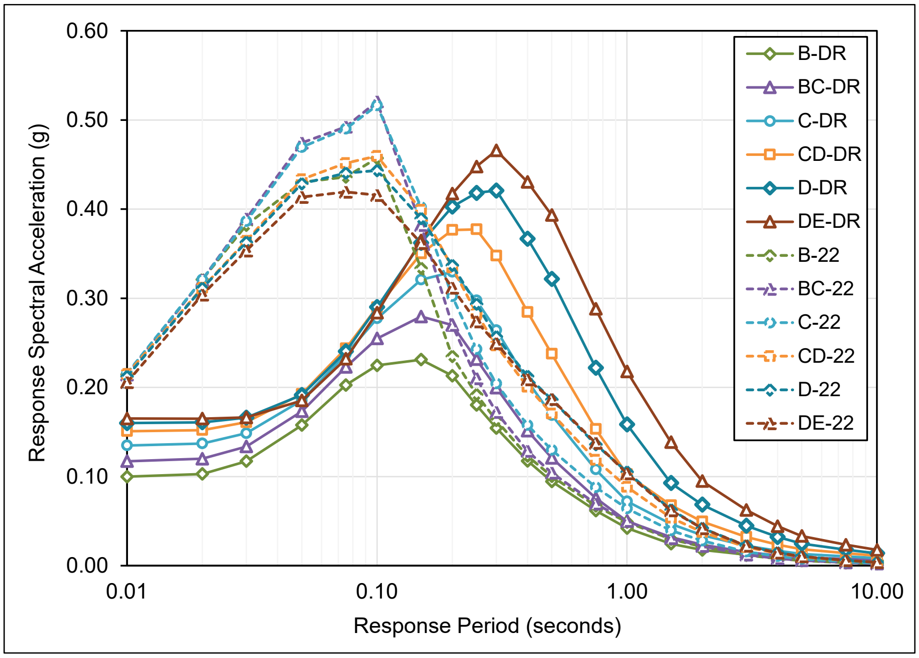


Figure 6.3-23 Comparison of the shape (frequency content) of derived (DR) MPRS and ASCE 7-22 (22) MPRS at the New York Site for six hypothetical Site Classes A, B, BC, C, CD, D, and DE.

Table 6.3-68 Ratios of Derived MPRS and Proposed MPRS and Related Values of Parameters S_{MS} (S_{DS}) and S_{M1} (S_{D1}) at the New York Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	44%	51%	60%	69%	77%	83%	88%	91%	82%
0.01	40%	47%	55%	63%	70%	75%	80%	82%	74%
0.02	28%	32%	37%	43%	49%	52%	54%	55%	50%
0.03	27%	31%	34%	38%	44%	46%	47%	47%	43%
0.05	33%	37%	37%	39%	44%	45%	45%	44%	41%
0.08	45%	46%	45%	48%	54%	55%	55%	54%	50%
0.10	53%	49%	49%	54%	63%	65%	68%	68%	56%
0.15	68%	69%	73%	80%	88%	93%	101%	102%	90%
0.20	78%	91%	100%	109%	113%	120%	134%	138%	120%
0.25	80%	94%	110%	123%	133%	143%	164%	172%	143%
0.30	79%	95%	116%	129%	141%	164%	187%	201%	164%
0.40	79%	95%	118%	131%	142%	173%	206%	242%	173%
0.50	79%	94%	116%	130%	139%	173%	211%	252%	173%
0.75	80%	92%	109%	123%	129%	163%	209%	256%	163%
1.0	77%	86%	100%	112%	116%	151%	211%	261%	151%
1.5	77%	83%	104%	119%	126%	148%	224%	281%	148%
2.0	78%	83%	107%	122%	131%	162%	227%	287%	162%
3.0	97%	106%	126%	144%	156%	199%	281%	357%	199%
4.0	109%	120%	139%	159%	170%	218%	304%	386%	218%
5.0	124%	137%	155%	175%	185%	235%	322%	406%	235%
7.5	167%	189%	214%	239%	246%	299%	391%	498%	299%
10	208%	236%	267%	297%	303%	360%	456%	567%	360%
S_{MS} (g)	78%	91%	100%	109%	113%	125%	149%	162%	125%
S_{M1} (g)	77%	86%	100%	112%	116%	151%	211%	261%	151%
S_{DS} (g)	78%	91%	100%	109%	113%	125%	149%	162%	125%
S_{D1} (g)	77%	86%	100%	112%	116%	151%	211%	261%	151%

Table 6.3-69 **Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Derived MPRS at the New York Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	P	P
0.15	P	P	P	P	P	P	P	P	P
0.20	P	P	P	P	P	P	P	P	P
0.25	P	P	P	P	P	P	P	P	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Table 6.3-70 **Probabilistic (P), Deterministic (D), or Deterministic Lower Limit (DL) MCE_R Ground Motions Governing Values of the Proposed MPRS at the New York Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	P	P	P	P	P	P	P	P	P
0.01	P	P	P	P	P	P	P	P	P
0.02	P	P	P	P	P	P	P	P	P
0.03	P	P	P	P	P	P	P	P	P
0.05	P	P	P	P	P	P	P	P	P
0.08	P	P	P	P	P	P	P	P	P
0.10	P	P	P	P	P	P	P	P	P
0.15	P	P	P	P	P	P	P	P	P
0.20	P	P	P	P	P	P	P	P	P
0.25	P	P	P	P	P	P	P	P	P
0.30	P	P	P	P	P	P	P	P	P
0.40	P	P	P	P	P	P	P	P	P
0.50	P	P	P	P	P	P	P	P	P
0.75	P	P	P	P	P	P	P	P	P
1.0	P	P	P	P	P	P	P	P	P
1.5	P	P	P	P	P	P	P	P	P
2.0	P	P	P	P	P	P	P	P	P
3.0	P	P	P	P	P	P	P	P	P
4.0	P	P	P	P	P	P	P	P	P
5.0	P	P	P	P	P	P	P	P	P
7.5	P	P	P	P	P	P	P	P	P
10	P	P	P	P	P	P	P	P	P
S_{MS} (g)	P	P	P	P	P	P	P	P	P
S_{M1} (g)	P	P	P	P	P	P	P	P	P
S_{DS} (g)	P	P	P	P	P	P	P	P	P
S_{D1} (g)	P	P	P	P	P	P	P	P	P

Chapter 7
Example Development of Multi-Period Response Spectra for Six Non-Conterminous U.S. Sites

This chapter illustrates the methods of this study by deriving example sets of multi-period response spectra (MPRS) from only the values of input parameters T_L, probabilistic S_S and S_1, and deterministic S_S and S_1, for six non-conterminous U.S. sites: Hilo and Honolulu, Hawaii; Anchorage and Fairbanks, Alaska; San Juan, Puerto Rico; and the Anderson Air Force Base (AFB), Guam. Input parameters for these locations are obtained from the USGS web service for ASCE 7-16, and are adjusted for the proposed maximum-direction factors of the 2020 *NEHRP Provisions* and ASCE 7-22. Sets of probabilistic MPRS are calculated in accordance with the methods of Chapters 3 and 4, and sets of deterministic MPRS are calculated in accordance with the methods of Chapters 3 and 5. Finally, for each site, the probabilistic and deterministic MPRS are combined, by taking the lesser values at each response period and site class, to obtain the derived set of MPRS for that site. The values of MCE_R ground motion parameters S_{MS} and S_{M1} are then calculated from the derived MPRS and compared with those of ASCE 7-16 assuming default site conditions.

As stated in Chapter 1, the primary objective of this study is to provide the technical basis and associated methods for the USGS to approximate MPRS for sites in U.S. regions for which seismic hazard analyses have not yet been updated by the USGS to fully define all periods and site classes of interest in the MPRS. These regions include Alaska, Hawaii, Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa. As mentioned in Chapter 3, ground motion models (GMMs) for shallow crustal and subduction earthquakes are more appropriate to use for these regions, as opposed to, for example, GMMs for the stable continental regions of the Central and Eastern United States (CEUS). Previous USGS hazard models for Alaska and Puerto Rico have used both crustal and subduction GMMs, and preliminary analysis of recent Hawaii earthquake recordings show that they are consistent with the NGA-West2 GMMs developed for shallow crustal earthquakes in the Western United States (WUS). Therefore, the models developed for MPRS in Chapters 4 and 5 are

based on WUS GMMs (both shallow crustal and subduction), as summarized in Chapter 3.

7.1 Example Non-Conterminous U.S. Sites

The six non-conterminous U.S. sites used in this chapter are listed in Table 7.1-1. Specific locations (i.e., latitudes and longitudes) of each site, and other information obtained from ASCE 7-16, are also provided. As previously mentioned, in these regions (i.e., Hawaii, Alaska, Puerto Rico, and Guam), either GMMs are not mature enough or seismic hazard analyses have not yet been updated by the USGS to fully define ground motions for all periods and site classes of interest. Therefore, the methods of Chapters 3, 4 and 5 are used to estimate the full set of MPRS (i.e., the 176 MCE_R ground motion values for 22 response periods and eight site classes) from only the values of T_L, and 0.2-second and 1.0-second spectral response acceleration at a reference Site Class BC.

In Table 7.1-1, the values of risk coefficients (i.e., C_{RS} and C_{R1}) and uniform hazard ground motion parameters (i.e., S_{SUH} and S_{1UH}) are provided for each location. As mentioned in Chapter 4, the probabilistic values of S_S and S_1 can be obtained via the product of the risk coefficients and uniform hazard ground motions (i.e., 0.2-second probabilistic $S_S = C_{RS} \times S_{SUH}$, and 1-second probabilistic $S_1 = C_{R1} \times S_{1UH}$). The values of the long-period transition period, T_L, are also listed in Table 7.1-1 for the six example sites.

Table 7.1-1 Six Non-Conterminous U.S. Sites and Their Corresponding Probabilistic Ground Motion Data from the ASCE 7-16 USGS Web Service

Example Site	Lat (°)	Lon (°)	C_{RS}	C_{R1}	S_{SUH} (g)	S_{1UH} (g)	T_L (s)
Hilo, HI	19.70	-155.10	1.222	1.154	1.772	0.725	12
Honolulu, HI	21.30	-157.85	0.940	0.945	0.615	0.178	4
Anchorage, AK	61.20	-149.90	1.112	1.038	1.701	0.799	16
Fairbanks, AK	64.85	-147.70	0.945	0.973	1.045	0.387	6
San Juan, PR	18.45	-66.10	1.016	0.992	0.976	0.398	12
Anderson AFB, GU	13.55	144.90	0.915	0.915	3.375	0.980	12

Table 7.1-2 lists the deterministic values of ground motions S_{SD} and S_{1D}, which have already been floored at the deterministic lower limits of ASCE 7-16 (i.e., 1.5g and 0.6g, respectively). Where the deterministic ground motions are governed by their lower limits, median deterministic ground motion values without lower limits can be obtained from the USGS deterministic web service for certain non-conterminous U.S. regions

(https://earthquake.usgs.gov/ws/designmaps/deterministic.html). These values, after multiplication by 1.8 (i.e., factor of ASCE 7-16 approximately relating 84th percentile to median response) and maximum direction factors (unless from HI), result in the values of $S_{SD,woLL}$ and $S_{1D,woLL}$ listed in Table 7.1-2 for sites in Alaska.

Table 7.1-2 Six Non-Conterminous U.S. Sites and Their Corresponding Deterministic Ground Motion Data from the ASCE 7-16 USGS Deterministic Ground Motion Web Service

Example Site	Lat (°)	Lon (°)	S_{SD} (g)	S_{1D} (g)	$S_{SD,woLL}$ (g)	$S_{1D,woLL}$ (g)
Hilo, HI	19.70	-155.10	1.5	0.6	NA	NA
Honolulu, HI	21.30	-157.85	1.5	0.6	NA	NA
Anchorage, AK	61.20	-149.90	1.5	0.676	1.24	0.676
Fairbanks, AK	64.85	-147.70	1.5	0.6	0.212	0.207
San Juan, PR	18.45	-66.10	1.5	0.6	NA	NA
Anderson AFB, GU	13.55	144.90	8.05	2.52	NA	NA

7.2 Development of Probabilistic and Deterministic MPRS

As mentioned in Chapter 4, when using S_S and S_1 values from the 2015 *NEHRP Provisions* and ASCE 7-16 (and earlier versions), maximum-direction factors must be adjusted to reflect those proposed for 2020 *NEHRP Provisions* and ASCE 7-22, because these new factors have been used to develop the sets of RSSPs in this report.

Table 7.2-1 summarizes the values of the probabilistic input parameters S_S and $R_{S/1}$, after the probabilistic S_S and S_1 values from Table 7.1-1 are adjusted for the new maximum-direction factors (i.e., 1.2 at 0.2-second response instead of the previous value of 1.1, and 1.25 at 1-second response instead of the previous value 1.3). For sites in Hawaii, no adjustment is needed because these ground motions are assumed to be maximum-direction ground motions from previous Hawaii maps. The adjusted maximum-direction values of the deterministic input parameters from Table 7.1-2 are also provided. Where deterministic values are governed by the deterministic lower limits (i.e., 1.5g and 0.6g), no adjustment is needed since these lower limits are assumed to be maximum-direction ground motions.

Table 7.2-1 Input Parameters Adjusted for Maximum-Direction Factors Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Used to Derive Probabilistic and Deterministic Sets of MPRS for Six Non-Conterminous U.S. Sites

Example Site	Adjusted Probabilistic			Adjusted Deterministic		
	S_S (g)	S_1 (g)	$R_{S/1}$	S_S (g)	S_1 (g)	$R_{S/1}$
Hilo, HI	2.165	0.837	2.59	1.500	0.600	2.50
Honolulu, HI	0.578	0.168	3.44	1.500	0.600	2.50
Anchorage, AK	2.063	0.797	2.59	1.500	0.650	2.31
Fairbanks, AK	1.077	0.362	2.98	1.500	0.600	2.50
San Juan, PR	1.082	0.380	2.85	1.500	0.600	2.50
Anderson AFB, GU	3.369	0.862	3.91	8.779	2.423	3.62

The probabilistic input parameters T_L (from Table 7.1-1), S_S and $R_{S/1}$ (both from Table 7.2-1) are used to calculate the probabilistic sets of MPRS for each of the six example sites, in accordance with the methods of Chapters 3 and 4. These derived probabilistic MPRS, along with the sets of RSSPs used to develop them, are provided below in Sections 7.2.1 to 7.2.6 for the six example sites (i.e., in Tables 7.2-1, 7.2-3, 7.2-5, 7.2-7, 7.2-9, and 7.2-11).

The deterministic input parameters S_S and S_1 (from Table 7.2-1) are used to calculate the deterministic sets of MPRS for each of the six example sites, in accordance with the methods of Chapters 3 and 5. The derived deterministic MPRS, after application of the deterministic lower limit (see Section 5.5, Table 5.5-2) are provided in Sections 7.2.1 to 7.2.6 for the six example sites, (i.e., in Tables 7.2-2, 7.2-4, 7.2-6, 7.2-8, 7.2-10, and 7.2-12). Observe that the deterministic MPRS for Hilo, Honolulu, Fairbanks, and San Juan are governed by the deterministic lower limits because the deterministic values without lower limits are not known in these examples.

7.2.1 Hilo, Hawaii

The probabilistic and deterministic MPRS are developed using Table B-23 of Appendix B (i.e., GTL12S5R4) and Tables C-1 and C-2 of Appendix C.

Table 7.2-2 Derived Probabilistic MPRS, Hilo, Hawaii

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.700	0.782	0.910	0.998	1.015	0.947	0.843	0.791	1.015
0.01	0.704	0.787	0.914	1.003	1.021	0.954	0.850	0.798	1.021
0.02	0.732	0.815	0.941	1.019	1.028	0.956	0.846	0.787	1.028
0.03	0.864	0.945	1.056	1.099	1.074	0.970	0.834	0.764	1.099
0.05	1.240	1.327	1.380	1.362	1.257	1.087	0.912	0.830	1.362
0.08	1.591	1.715	1.777	1.726	1.559	1.340	1.140	1.056	1.726
0.10	1.690	1.865	2.012	1.989	1.811	1.572	1.358	1.274	1.989
0.15	1.665	1.887	2.243	2.310	2.146	1.877	1.624	1.524	2.310
0.20	1.490	1.718	**2.165**	2.459	2.349	2.072	1.791	1.682	2.459
0.25	1.319	1.536	2.003	2.459	2.473	2.221	1.941	1.838	2.473
0.30	1.183	1.380	1.845	2.346	2.538	2.339	2.077	1.982	2.538
0.40	0.994	1.160	1.595	2.111	2.498	2.398	2.180	2.097	2.498
0.50	0.860	1.002	1.406	1.908	2.347	2.369	2.195	2.141	2.369
0.75	0.657	0.744	1.066	1.484	1.921	2.063	2.010	2.019	2.063
1.0	0.521	0.576	**0.837**	1.189	1.594	1.827	1.916	1.993	1.827
1.5	0.358	0.386	0.553	0.805	1.117	1.405	1.687	1.916	1.405
2.0	0.280	0.300	0.407	0.592	0.840	1.133	1.517	1.872	1.133
3.0	0.204	0.219	0.277	0.404	0.584	0.811	1.132	1.436	0.811
4.0	0.164	0.173	0.210	0.303	0.432	0.593	0.819	1.032	0.593
5.0	0.139	0.146	0.169	0.240	0.336	0.454	0.616	0.768	0.454
7.5	0.090	0.093	0.102	0.138	0.186	0.243	0.318	0.388	0.243
10	0.062	0.064	0.069	0.090	0.117	0.148	0.187	0.222	0.148

Table 7.2-3 Derived Deterministic MPRS, Hilo, Hawaii

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.811	0.888	0.955	0.958	0.888	0.758	0.620	0.551	0.958
0.08	1.040	1.142	1.214	1.193	1.076	0.900	0.713	0.624	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.825	0.724	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.002	0.875	1.606
0.20	1.012	1.194	**1.500**	1.710	1.662	1.440	1.153	1.010	1.710
0.25	0.897	1.075	1.397	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.810	0.976	1.299	1.665	1.829	1.705	1.443	1.301	1.829
0.40	0.689	0.833	1.138	1.525	1.823	1.802	1.607	1.484	1.823
0.50	0.598	0.724	1.009	1.385	1.734	1.803	1.681	1.596	1.803
0.75	0.460	0.536	0.760	1.067	1.407	1.566	1.598	1.589	1.566
1.0	0.368	0.417	**0.600**	0.859	1.168	1.388	1.512	1.578	1.388
1.5	0.261	0.288	0.410	0.600	0.839	1.086	1.348	1.540	1.086
2.0	0.207	0.228	0.309	0.452	0.640	0.877	1.192	1.458	0.877
3.0	0.152	0.167	0.214	0.314	0.449	0.632	0.889	1.111	0.632
4.0	0.120	0.132	0.164	0.238	0.339	0.471	0.655	0.815	0.471
5.0	0.100	0.109	0.132	0.188	0.263	0.359	0.492	0.607	0.359
7.5	0.063	0.068	0.080	0.110	0.148	0.194	0.256	0.311	0.194
10	0.042	0.045	0.052	0.069	0.089	0.113	0.144	0.170	0.113

7.2.2 Honolulu, Hawaii

The probabilistic and deterministic MPRS are developed using Table B-36 of Appendix B (i.e., GTL6S2R1) and Tables C-1 and C-2 of Appendix C.

Table 7.2-4 Derived Probabilistic MPRS, Honolulu, Hawaii

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.187	0.211	0.247	0.278	0.299	0.302	0.294	0.291	0.302
0.01	0.188	0.212	0.248	0.279	0.301	0.304	0.296	0.293	0.304
0.02	0.196	0.220	0.255	0.285	0.304	0.306	0.296	0.290	0.306
0.03	0.229	0.253	0.287	0.310	0.322	0.315	0.296	0.287	0.322
0.05	0.318	0.345	0.373	0.387	0.382	0.358	0.326	0.311	0.387
0.08	0.406	0.442	0.477	0.489	0.475	0.441	0.402	0.384	0.489
0.10	0.438	0.487	0.543	0.567	0.558	0.524	0.483	0.467	0.567
0.15	0.433	0.497	0.597	0.656	0.671	0.647	0.610	0.597	0.671
0.20	0.390	0.457	**0.578**	0.684	0.732	0.727	0.701	0.695	0.732
0.25	0.338	0.401	0.524	0.659	0.743	0.764	0.758	0.765	0.764
0.30	0.296	0.353	0.472	0.616	0.732	0.780	0.798	0.821	0.780
0.40	0.234	0.280	0.384	0.521	0.661	0.743	0.800	0.845	0.743
0.50	0.194	0.233	0.324	0.450	0.594	0.696	0.778	0.842	0.696
0.75	0.140	0.157	0.224	0.324	0.450	0.552	0.648	0.730	0.552
1.0	0.105	0.118	**0.168**	0.243	0.341	0.436	0.537	0.623	0.436
1.5	0.068	0.073	0.104	0.152	0.218	0.294	0.390	0.474	0.294
2.0	0.052	0.055	0.074	0.107	0.155	0.213	0.294	0.369	0.213
3.0	0.035	0.037	0.045	0.066	0.095	0.133	0.185	0.234	0.133
4.0	0.026	0.027	0.032	0.046	0.066	0.091	0.126	0.158	0.091
5.0	0.021	0.022	0.025	0.036	0.050	0.067	0.091	0.114	0.067
7.5	0.015	0.016	0.019	0.026	0.035	0.045	0.059	0.074	0.045
10	0.013	0.014	0.015	0.021	0.027	0.034	0.043	0.053	0.034

Table 7.2-5 Derived Deterministic MPRS, Honolulu, Hawaii

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.811	0.888	0.955	0.958	0.888	0.758	0.620	0.551	0.958
0.08	1.040	1.142	1.214	1.193	1.076	0.900	0.713	0.624	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.825	0.724	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.002	0.875	1.606
0.20	1.012	1.194	**1.500**	1.710	1.662	1.440	1.153	1.010	1.710
0.25	0.897	1.075	1.397	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.810	0.976	1.299	1.665	1.829	1.705	1.443	1.301	1.829
0.40	0.689	0.833	1.138	1.525	1.823	1.802	1.607	1.484	1.823
0.50	0.598	0.724	1.009	1.385	1.734	1.803	1.681	1.596	1.803
0.75	0.460	0.536	0.760	1.067	1.407	1.566	1.598	1.589	1.566
1.0	0.368	0.417	**0.600**	0.859	1.168	1.388	1.512	1.578	1.388
1.5	0.261	0.288	0.410	0.600	0.839	1.086	1.348	1.540	1.086
2.0	0.207	0.228	0.309	0.452	0.640	0.877	1.192	1.458	0.877
3.0	0.152	0.167	0.214	0.314	0.449	0.632	0.889	1.111	0.632
4.0	0.120	0.132	0.164	0.238	0.339	0.471	0.655	0.815	0.471
5.0	0.100	0.109	0.132	0.188	0.263	0.359	0.492	0.607	0.359
7.5	0.063	0.068	0.080	0.110	0.148	0.194	0.256	0.311	0.194
10	0.042	0.045	0.052	0.069	0.089	0.113	0.144	0.170	0.113

7.2.3 Anchorage, Alaska

The probabilistic and deterministic MPRS are developed using Table B-11 of Appendix B (i.e., GTL16S4R4) and Table C-1 of Appendix C.

Table 7.2-6 Derived Probabilistic MPRS, Anchorage, Alaska

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.777	0.858	0.925	0.918	0.886	0.835	0.772	0.769	0.918
0.01	0.779	0.859	0.925	0.917	0.884	0.832	0.768	0.765	0.917
0.02	0.879	0.950	0.987	0.955	0.902	0.834	0.756	0.731	0.955
0.03	0.995	1.060	1.062	1.001	0.922	0.836	0.742	0.707	1.001
0.05	1.277	1.329	1.239	1.109	0.972	0.845	0.722	0.676	1.109
0.08	1.583	1.684	1.596	1.448	1.287	1.133	0.983	0.937	1.448
0.10	1.829	2.013	1.978	1.848	1.683	1.512	1.346	1.312	1.848
0.15	1.710	1.963	2.159	2.125	1.993	1.829	1.661	1.647	2.125
0.20	1.411	1.684	**2.063**	2.144	2.084	1.965	1.834	1.851	2.144
0.25	1.209	1.490	1.898	2.190	2.183	2.093	1.985	2.045	2.190
0.30	1.066	1.342	1.753	2.202	2.235	2.167	2.074	2.167	2.235
0.40	0.878	1.128	1.506	2.052	2.198	2.168	2.100	2.214	2.198
0.50	0.718	0.938	1.278	1.785	2.077	2.091	2.064	2.227	2.091
0.75	0.530	0.705	0.979	1.401	1.805	1.879	1.911	2.141	1.879
1.0	0.414	0.560	**0.797**	1.180	1.583	1.733	1.846	2.128	1.733
1.5	0.295	0.404	0.582	0.871	1.208	1.445	1.713	2.106	1.445
2.0	0.223	0.305	0.440	0.661	0.929	1.206	1.575	2.089	1.206
3.0	0.140	0.191	0.276	0.417	0.589	0.786	1.060	1.434	0.786
4.0	0.101	0.136	0.194	0.289	0.401	0.525	0.695	0.937	0.525
5.0	0.076	0.100	0.139	0.202	0.275	0.355	0.463	0.618	0.355
7.5	0.049	0.064	0.087	0.124	0.163	0.204	0.257	0.347	0.204
10	0.043	0.054	0.071	0.096	0.123	0.148	0.181	0.235	0.148

Table 7.2-7 Derived Deterministic MPRS, Anchorage, Alaska

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.811	0.888	0.955	0.958	0.888	0.758	0.620	0.551	0.958
0.08	1.040	1.142	1.214	1.193	1.076	0.900	0.713	0.624	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.825	0.724	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.002	0.875	1.606
0.20	1.012	1.194	**1.500**	1.710	1.662	1.440	1.153	1.010	1.710
0.25	0.905	1.084	1.413	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.822	0.991	1.327	1.677	1.829	1.705	1.443	1.301	1.829
0.40	0.706	0.854	1.180	1.555	1.829	1.802	1.607	1.484	1.829
0.50	0.619	0.749	1.058	1.424	1.763	1.803	1.681	1.596	1.803
0.75	0.482	0.562	0.812	1.115	1.449	1.597	1.629	1.596	1.597
1.0	0.390	0.442	**0.650**	0.908	1.214	1.434	1.561	1.596	1.434
1.5	0.280	0.309	0.444	0.643	0.883	1.143	1.417	1.596	1.143
2.0	0.224	0.247	0.335	0.490	0.679	0.934	1.270	1.553	0.934
3.0	0.164	0.181	0.231	0.340	0.483	0.684	0.963	1.203	0.684
4.0	0.130	0.143	0.178	0.258	0.368	0.510	0.710	0.883	0.510
5.0	0.109	0.119	0.143	0.204	0.285	0.389	0.533	0.658	0.389
7.5	0.068	0.074	0.087	0.119	0.160	0.210	0.278	0.337	0.210
10	0.046	0.049	0.056	0.074	0.096	0.122	0.156	0.185	0.122

7.2.4 Fairbanks, Alaska

The probabilistic and deterministic MPRS are developed using Table B-36 of Appendix B (i.e., GTL6S2R1) and Tables C-1 and C-2 of Appendix C.

Table 7.2-8 Derived Probabilistic MPRS, Fairbanks, Alaska

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.349	0.393	0.460	0.518	0.557	0.563	0.548	0.542	0.563
0.01	0.351	0.395	0.462	0.521	0.560	0.566	0.551	0.546	0.566
0.02	0.365	0.410	0.476	0.532	0.567	0.570	0.551	0.541	0.570
0.03	0.426	0.471	0.534	0.579	0.600	0.586	0.551	0.534	0.600
0.05	0.593	0.642	0.696	0.722	0.712	0.668	0.608	0.579	0.722
0.08	0.756	0.824	0.889	0.912	0.885	0.822	0.748	0.715	0.912
0.10	0.816	0.908	1.011	1.057	1.040	0.977	0.901	0.870	1.057
0.15	0.807	0.926	1.112	1.223	1.251	1.206	1.137	1.113	1.251
0.20	0.728	0.852	**1.077**	1.275	1.364	1.355	1.306	1.295	1.364
0.25	0.643	0.763	0.997	1.255	1.385	1.424	1.413	1.426	1.424
0.30	0.573	0.684	0.914	1.193	1.385	1.453	1.487	1.530	1.453
0.40	0.465	0.557	0.763	1.035	1.296	1.422	1.490	1.574	1.422
0.50	0.392	0.472	0.657	0.913	1.192	1.362	1.481	1.574	1.362
0.75	0.297	0.338	0.483	0.690	0.942	1.120	1.280	1.443	1.120
1.0	0.227	0.253	**0.362**	0.522	0.733	0.906	1.090	1.262	0.906
1.5	0.147	0.158	0.223	0.327	0.470	0.632	0.818	0.996	0.632
2.0	0.112	0.119	0.159	0.231	0.333	0.459	0.633	0.793	0.459
3.0	0.075	0.079	0.097	0.142	0.205	0.285	0.399	0.504	0.285
4.0	0.056	0.058	0.069	0.100	0.143	0.196	0.270	0.340	0.196
5.0	0.045	0.047	0.054	0.076	0.107	0.145	0.196	0.245	0.145
7.5	0.033	0.035	0.040	0.055	0.075	0.097	0.127	0.159	0.097
10	0.027	0.029	0.033	0.044	0.058	0.073	0.094	0.115	0.073

Table 7.2-9 Derived Deterministic MPRS, Fairbanks, Alaska

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.811	0.888	0.955	0.958	0.888	0.758	0.620	0.551	0.958
0.08	1.040	1.142	1.214	1.193	1.076	0.900	0.713	0.624	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.825	0.724	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.002	0.875	1.606
0.20	1.012	1.194	**1.500**	1.710	1.662	1.440	1.153	1.010	1.710
0.25	0.897	1.075	1.397	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.810	0.976	1.299	1.665	1.829	1.705	1.443	1.301	1.829
0.40	0.689	0.833	1.138	1.525	1.823	1.802	1.607	1.484	1.823
0.50	0.598	0.724	1.009	1.385	1.734	1.803	1.681	1.596	1.803
0.75	0.460	0.536	0.760	1.067	1.407	1.566	1.598	1.589	1.566
1.0	0.368	0.417	**0.600**	0.859	1.168	1.388	1.512	1.578	1.388
1.5	0.261	0.288	0.410	0.600	0.839	1.086	1.348	1.540	1.086
2.0	0.207	0.228	0.309	0.452	0.640	0.877	1.192	1.458	0.877
3.0	0.152	0.167	0.214	0.314	0.449	0.632	0.889	1.111	0.632
4.0	0.120	0.132	0.164	0.238	0.339	0.471	0.655	0.815	0.471
5.0	0.100	0.109	0.132	0.188	0.263	0.359	0.492	0.607	0.359
7.5	0.063	0.068	0.080	0.110	0.148	0.194	0.256	0.311	0.194
10	0.042	0.045	0.052	0.069	0.089	0.113	0.144	0.170	0.113

7.2.5 San Juan, Puerto Rico

The probabilistic and deterministic MPRS are developed using Table B-16 of Appendix B (i.e., GTL12S2R2) and Tables C-1 and C-2 of Appendix C.

Table 7.2-10 Derived Probabilistic MPRS, San Juan, Puerto Rico

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.358	0.403	0.472	0.543	0.606	0.638	0.653	0.665	0.638
0.01	0.360	0.405	0.475	0.545	0.609	0.641	0.657	0.670	0.641
0.02	0.372	0.415	0.484	0.552	0.611	0.643	0.656	0.665	0.643
0.03	0.430	0.472	0.537	0.595	0.642	0.659	0.657	0.657	0.659
0.05	0.594	0.639	0.697	0.742	0.766	0.757	0.729	0.716	0.766
0.08	0.764	0.829	0.907	0.960	0.980	0.961	0.925	0.913	0.980
0.10	0.828	0.919	1.040	1.128	1.172	1.167	1.143	1.142	1.172
0.15	0.821	0.938	1.134	1.296	1.407	1.448	1.455	1.469	1.448
0.20	0.732	0.853	**1.082**	1.321	1.503	1.597	1.644	1.682	1.597
0.25	0.642	0.759	0.996	1.282	1.521	1.674	1.778	1.852	1.674
0.30	0.572	0.680	0.913	1.211	1.503	1.702	1.868	1.987	1.702
0.40	0.469	0.563	0.776	1.063	1.394	1.655	1.882	2.051	1.655
0.50	0.399	0.483	0.678	0.948	1.280	1.571	1.838	2.043	1.571
0.75	0.302	0.351	0.501	0.712	0.985	1.251	1.522	1.752	1.251
1.0	0.236	0.263	**0.380**	0.548	0.770	1.010	1.278	1.504	1.010
1.5	0.164	0.175	0.248	0.362	0.524	0.714	0.952	1.162	0.714
2.0	0.132	0.140	0.184	0.268	0.386	0.532	0.734	0.916	0.532
3.0	0.093	0.098	0.120	0.175	0.252	0.349	0.485	0.617	0.349
4.0	0.072	0.076	0.090	0.130	0.185	0.253	0.348	0.439	0.253
5.0	0.060	0.064	0.074	0.105	0.146	0.196	0.265	0.332	0.196
7.5	0.048	0.050	0.056	0.078	0.105	0.137	0.179	0.223	0.137
10	0.039	0.041	0.046	0.062	0.081	0.102	0.130	0.158	0.102

Table 7.2-11 Derived Deterministic MPRS, San Juan, Puerto Rico

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.811	0.888	0.955	0.958	0.888	0.758	0.620	0.551	0.958
0.08	1.040	1.142	1.214	1.193	1.076	0.900	0.713	0.624	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.825	0.724	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.002	0.875	1.606
0.20	1.012	1.194	**1.500**	1.710	1.662	1.440	1.153	1.010	1.710
0.25	0.897	1.075	1.397	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.810	0.976	1.299	1.665	1.829	1.705	1.443	1.301	1.829
0.40	0.689	0.833	1.138	1.525	1.823	1.802	1.607	1.484	1.823
0.50	0.598	0.724	1.009	1.385	1.734	1.803	1.681	1.596	1.803
0.75	0.460	0.536	0.760	1.067	1.407	1.566	1.598	1.589	1.566
1.0	0.368	0.417	**0.600**	0.859	1.168	1.388	1.512	1.578	1.388
1.5	0.261	0.288	0.410	0.600	0.839	1.086	1.348	1.540	1.086
2.0	0.207	0.228	0.309	0.452	0.640	0.877	1.192	1.458	0.877
3.0	0.152	0.167	0.214	0.314	0.449	0.632	0.889	1.111	0.632
4.0	0.120	0.132	0.164	0.238	0.339	0.471	0.655	0.815	0.471
5.0	0.100	0.109	0.132	0.188	0.263	0.359	0.492	0.607	0.359
7.5	0.063	0.068	0.080	0.110	0.148	0.194	0.256	0.311	0.194
10	0.042	0.045	0.052	0.069	0.089	0.113	0.144	0.170	0.113

7.2.6 Anderson AFB, Guam

The probabilistic and deterministic MPRS are developed using Table B-21 of Appendix B (i.e., GTL12S5R1) and Tables C-14 and C-15 of Appendix C.

Table 7.2-12 Derived Probabilistic MPRS, Anderson AFB, Guam

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	1.074	1.207	1.412	1.586	1.682	1.642	1.526	1.467	1.682
0.01	1.080	1.214	1.420	1.594	1.691	1.654	1.538	1.482	1.691
0.02	1.119	1.252	1.454	1.617	1.699	1.659	1.537	1.466	1.699
0.03	1.318	1.446	1.630	1.750	1.790	1.697	1.527	1.436	1.790
0.05	1.898	2.032	2.160	2.211	2.141	1.944	1.701	1.581	2.211
0.08	2.473	2.671	2.838	2.868	2.725	2.457	2.173	2.049	2.868
0.10	2.653	2.936	3.240	3.339	3.204	2.917	2.615	2.491	3.339
0.15	2.604	2.959	3.544	3.825	3.779	3.484	3.136	2.982	3.825
0.20	2.307	2.664	**3.369**	3.958	4.059	3.806	3.436	3.275	4.059
0.25	1.965	2.273	2.970	3.733	4.156	4.018	3.697	3.554	4.156
0.30	1.704	1.964	2.623	3.402	4.041	4.144	3.920	3.821	4.144
0.40	1.346	1.504	2.103	2.833	3.605	3.965	4.008	3.983	3.965
0.50	1.109	1.203	1.724	2.415	3.167	3.692	3.848	3.986	3.692
0.75	0.747	0.802	1.150	1.655	2.278	2.863	3.135	3.380	2.863
1.0	0.560	0.602	**0.862**	1.241	1.720	2.280	2.696	2.999	2.280
1.5	0.372	0.387	0.549	0.800	1.138	1.520	2.022	2.396	1.520
2.0	0.280	0.297	0.399	0.581	0.834	1.140	1.591	2.016	1.140
3.0	0.199	0.210	0.261	0.380	0.548	0.760	1.061	1.344	0.760
4.0	0.159	0.166	0.197	0.284	0.405	0.555	0.765	0.962	0.555
5.0	0.136	0.142	0.161	0.227	0.318	0.429	0.582	0.724	0.429
7.5	0.094	0.097	0.104	0.142	0.191	0.249	0.326	0.397	0.249
10	0.067	0.069	0.073	0.096	0.124	0.157	0.200	0.237	0.157

Table 7.2-13 Derived Deterministic MPRS, Anderson AFB, Guam

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	2.838	3.203	3.716	4.004	3.921	3.478	2.862	2.495	4.004
0.01	2.854	3.221	3.737	4.038	3.994	3.531	2.869	2.495	4.038
0.02	2.983	3.353	3.868	4.129	4.010	3.531	2.869	2.495	4.129
0.03	3.483	3.870	4.357	4.468	4.195	3.596	2.904	2.495	4.468
0.05	4.893	5.357	5.662	5.489	4.836	3.885	2.932	2.528	5.489
0.08	6.378	6.999	7.280	6.863	5.852	4.594	3.459	2.943	6.863
0.10	6.884	7.704	8.263	7.872	6.714	5.251	3.884	3.280	7.872
0.15	6.764	7.817	9.213	9.189	7.998	6.256	4.565	3.815	9.189
0.20	5.938	7.004	**8.779**	9.653	8.750	6.984	5.126	4.283	9.653
0.25	5.103	6.112	7.918	9.542	9.241	7.639	5.730	4.839	9.542
0.30	4.420	5.328	7.064	8.957	9.383	8.093	6.272	5.380	9.383
0.40	3.469	4.197	5.706	7.635	8.821	8.196	6.733	5.928	8.821
0.50	2.842	3.400	4.765	6.545	7.996	7.914	6.881	6.252	7.996
0.75	2.001	2.267	3.231	4.663	6.151	6.605	6.320	6.069	6.605
1.0	1.501	1.700	**2.423**	3.498	4.724	5.464	5.769	5.886	5.464
1.5	0.870	0.961	1.361	1.995	2.793	3.566	4.361	4.936	3.566
2.0	0.590	0.651	0.883	1.290	1.836	2.503	3.393	4.145	2.503
3.0	0.341	0.377	0.481	0.706	1.015	1.422	2.000	2.499	1.422
4.0	0.217	0.239	0.296	0.431	0.614	0.851	1.184	1.473	0.851
5.0	0.154	0.168	0.203	0.289	0.404	0.552	0.756	0.932	0.552
7.5	0.071	0.077	0.090	0.124	0.166	0.218	0.288	0.350	0.218
10	0.044	0.047	0.054	0.072	0.093	0.117	0.149	0.177	0.117

7.3 Derived MPRS and Ground Motion Parameters S_{MS} and S_{M1}

For each of the six example sites, the sets of derived MPRS are developed by combining the derived probabilistic and deterministic MPRS for that site (i.e., by taking the lesser of probabilistic and deterministic values at a given response period and site class). Sets of derived MPRS for each site are provided in Sections 7.3.1 to 7.3.6, in Tables 7.3-2 to 7.3-7, and are plotted in Figures 7.3-1 to 7.3-6. The ground motion values in these tables are rounded to two decimal places if greater than 0.20g, and three decimal places if less than or equal to 0.20g.

Finally, values of MCE_R ground motion parameters S_{MS} and S_{M1} are calculated from the derived sets of MPRS for each of the six example sites for the eight hypothetical site classes (i.e., Site Class A, B, BC, CD, D, DE, and E) and the Default site condition. These values, along with the design parameters S_{DS} and S_{D1} (2/3 of S_{MS} and S_{M1}), are listed in the bottom rows of Tables 7.3-2 to 7.3-7. In Table 7.3.1, values of design parameters S_{MS} and S_{M1} of derived MPRS for default site conditions are compared with those of ASCE 7-16 for the six example sites. As shown, values of S_{MS} of derived MPRS are about 10 percent less and values of S_{M1} are about 10 percent greater than those of ASCE 7-16 for Hilo, Honolulu, and Anchorage. The values of S_S and S_1 used to derive MPRS are the same for HI sites (and where the deterministic lower limits govern), but for other sites are about 10 percent more for S_S, and about 5 percent less for S_1 due to the maximum-direction factor adjustments. A trial investigation for the 2020 *NEHRP* Provisions Update Committee found similar trends and modest differences in the values of design parameters S_{MS} and S_{M1} for a collection of 107 test sites (including the 6 sites listed here) in Hawaii, Alaska, Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa.

Table 7.3.1 Summary of the Values of S_{MS} and S_{M1} of Derived MPRS of Six Example Sites Assuming Default Site Condition and Comparison ASCE 7-16

Example Site	Derived MPRS		ASCE 7-16		Percent Difference	
	S_{MS} (g)	S_{M1} (g)	S_{MS} (g)	S_{M1} (g)	S_{MS}	S_{M1}
Hilo, HI	1.646	1.706	1.800	1.530	-8.6%	11.5%
Honolulu, HI	0.702	0.436	0.773	0.406	-9.3%	7.4%
Anchorage, AK	1.646	1.847	1.800	1.724	-8.6%	7.1%
Fairbanks, AK	1.307	0.906	1.186	1.085	10%	-17%
San Juan, PR	1.532	1.010	1.189	1.126	29%	-10%
Anderson AFB, GU	3.740	2.280	3.707	2.287	0.9%	-0.3%

7.3.1 Hilo, Hawaii

The MPRS for this site are derived for a T_L = 12 s region to match probabilistic values S_S = 2.165g and S_1 = 0.837g, and to match deterministic values S_S = 1.500g and S_1 = 0.600g, as shown and plotted below.

Table 7.3-2 Derived MPRS for Hilo, Hawaii

Period	5%-Damped Response Spectral Acceleration (g)								
***T* (s)**	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.811	0.888	0.955	0.958	0.888	0.758	0.620	0.551	0.958
0.08	1.040	1.142	1.214	1.193	1.076	0.900	0.713	0.624	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.825	0.724	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.002	0.875	1.606
0.20	1.012	1.194	**1.500**	1.710	1.662	1.440	1.153	1.010	1.710
0.25	0.897	1.075	1.397	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.810	0.976	1.299	1.665	1.829	1.705	1.443	1.301	1.829
0.40	0.689	0.833	1.138	1.525	1.823	1.802	1.607	1.484	1.823
0.50	0.598	0.724	1.009	1.385	1.734	1.803	1.681	1.596	1.803
0.75	0.460	0.536	0.760	1.067	1.407	1.566	1.598	1.589	1.566
1.0	0.368	0.417	**0.600**	0.859	1.168	1.388	1.512	1.578	1.388
1.5	0.261	0.288	0.410	0.600	0.839	1.086	1.348	1.540	1.086
2.0	0.207	0.228	0.309	0.452	0.640	0.877	1.192	1.458	0.877
3.0	0.152	0.167	0.214	0.314	0.449	0.632	0.889	1.111	0.632
4.0	0.120	0.132	0.164	0.238	0.339	0.471	0.655	0.815	0.471
5.0	0.100	0.109	0.132	0.188	0.263	0.359	0.492	0.607	0.359
7.5	0.063	0.068	0.080	0.110	0.148	0.194	0.256	0.311	0.194
10	0.042	0.045	0.052	0.069	0.089	0.113	0.144	0.170	0.113
S_{MS} (g)	0.91	1.07	1.35	1.54	1.65	1.62	1.51	1.44	1.65
S_{M1} (g)	0.37	0.42	0.60	0.86	1.22	1.71	2.40	3.00	1.71
S_{DS} (g)	0.61	0.72	0.90	1.03	1.10	1.08	1.01	0.96	1.10
S_{D1} (g)	0.25	0.28	0.40	0.57	0.81	1.14	1.60	2.00	1.14

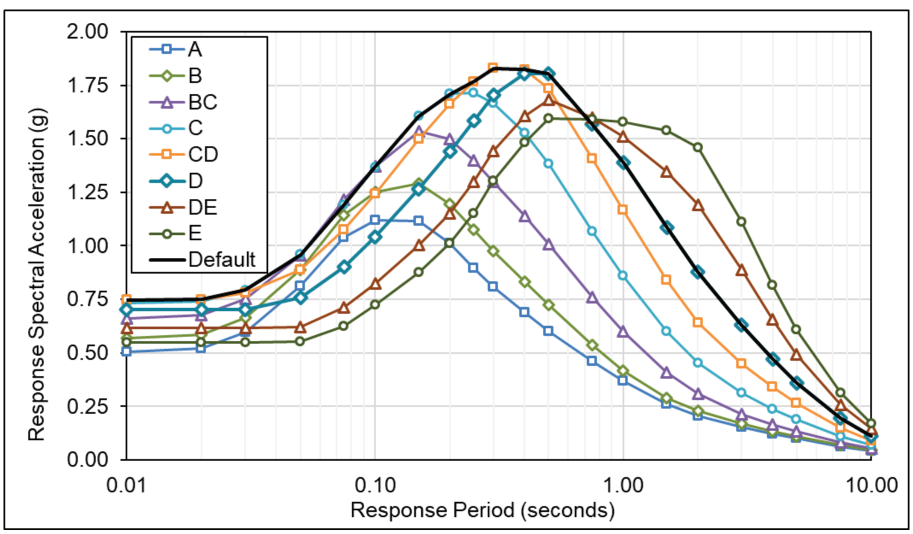


Figure 7.3-1 Plots of derived MPRS for Hilo, Hawaii.

7.3.2 Honolulu, Hawaii

The MPRS for this site are derived for a T_L = 6 s (since generic RSSPs for T_L = 4 s are not available, see Section 4.4.2) to match probabilistic values S_S = 0.578g and S_1 = 0.168g, and to match deterministic values S_S = 1.500g and S_1 = 0.600g, as shown and plotted below.

Table 7.3-3 Derived MPRS for Honolulu, Hawaii

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.187	0.211	0.247	0.278	0.299	0.302	0.294	0.291	0.302
0.01	0.188	0.212	0.248	0.279	0.301	0.304	0.296	0.293	0.304
0.02	0.196	0.220	0.255	0.285	0.304	0.306	0.296	0.290	0.306
0.03	0.229	0.253	0.287	0.310	0.322	0.315	0.296	0.287	0.322
0.05	0.318	0.345	0.373	0.387	0.382	0.358	0.326	0.311	0.387
0.08	0.406	0.442	0.477	0.489	0.475	0.441	0.402	0.384	0.489
0.10	0.438	0.487	0.543	0.567	0.558	0.524	0.483	0.467	0.567
0.15	0.433	0.497	0.597	0.656	0.671	0.647	0.610	0.597	0.671
0.20	0.390	0.457	**0.578**	0.684	0.732	0.727	0.701	0.695	0.732
0.25	0.338	0.401	0.524	0.659	0.743	0.764	0.758	0.765	0.764
0.30	0.296	0.353	0.472	0.616	0.732	0.780	0.798	0.821	0.780
0.40	0.234	0.280	0.384	0.521	0.661	0.743	0.800	0.845	0.743
0.50	0.194	0.233	0.324	0.450	0.594	0.696	0.778	0.842	0.696
0.75	0.140	0.157	0.224	0.324	0.450	0.552	0.648	0.730	0.552
1.0	0.105	0.118	**0.168**	0.243	0.341	0.436	0.537	0.623	0.436
1.5	0.068	0.073	0.104	0.152	0.218	0.294	0.390	0.474	0.294
2.0	0.052	0.055	0.074	0.107	0.155	0.213	0.294	0.369	0.213
3.0	0.035	0.037	0.045	0.066	0.095	0.133	0.185	0.234	0.133
4.0	0.026	0.027	0.032	0.046	0.066	0.091	0.126	0.158	0.091
5.0	0.021	0.022	0.025	0.036	0.050	0.067	0.091	0.114	0.067
7.5	0.015	0.016	0.019	0.026	0.035	0.045	0.059	0.074	0.045
10	0.013	0.014	0.015	0.021	0.027	0.034	0.043	0.053	0.034
S_{MS} (g)	0.35	0.41	0.52	0.62	0.67	0.70	0.72	0.76	0.70
S_{M1} (g)	0.11	0.12	0.17	0.24	0.34	0.44	0.54	0.66	0.44
S_{DS} (g)	0.23	0.27	0.35	0.41	0.45	0.47	0.48	0.51	0.47
S_{D1} (g)	0.07	0.08	0.11	0.16	0.23	0.29	0.36	0.44	0.29

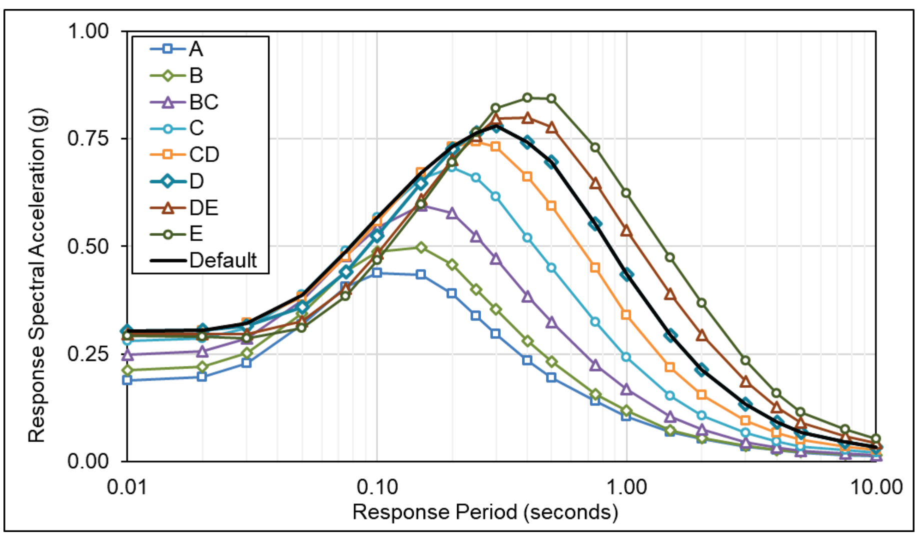


Figure 7.3-2 Plots of derived MPRS for Honolulu, Hawaii.

7.3.3 Anchorage, Alaska

The MPRS for this site are derived for a T_L = 16 s region to match probabilistic values S_S = 2.063g and S_1 = 0.797g, and to match deterministic values S_S = 1.500g and S_1 = 0.650g, as shown and plotted below.

Table 7.3-4 Derived MPRS for Anchorage, Alaska

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.811	0.888	0.955	0.958	0.888	0.758	0.620	0.551	0.958
0.08	1.040	1.142	1.214	1.193	1.076	0.900	0.713	0.624	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.825	0.724	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.002	0.875	1.606
0.20	1.012	1.194	**1.500**	1.710	1.662	1.440	1.153	1.010	1.710
0.25	0.905	1.084	1.413	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.822	0.991	1.327	1.677	1.829	1.705	1.443	1.301	1.829
0.40	0.706	0.854	1.180	1.555	1.829	1.802	1.607	1.484	1.829
0.50	0.619	0.749	1.058	1.424	1.763	1.803	1.681	1.596	1.803
0.75	0.482	0.562	0.812	1.115	1.449	1.597	1.629	1.596	1.597
1.0	0.390	0.442	**0.650**	0.908	1.214	1.434	1.561	1.596	1.434
1.5	0.280	0.309	0.444	0.643	0.883	1.143	1.417	1.596	1.143
2.0	0.223	0.247	0.335	0.490	0.679	0.934	1.270	1.553	0.934
3.0	0.140	0.181	0.231	0.340	0.483	0.684	0.963	1.203	0.684
4.0	0.101	0.136	0.178	0.258	0.368	0.510	0.695	0.883	0.510
5.0	0.076	0.100	0.139	0.202	0.275	0.355	0.463	0.618	0.355
7.5	0.049	0.064	0.087	0.119	0.160	0.204	0.257	0.337	0.204
10	0.043	0.049	0.056	0.074	0.096	0.122	0.156	0.185	0.122
S_{MS} (g)	0.91	1.07	1.35	1.54	1.65	1.62	1.51	1.44	1.65
S_{M1} (g)	0.40	0.44	0.65	0.91	1.32	1.85	2.60	3.25	1.85
S_{DS} (g)	0.61	0.72	0.90	1.03	1.10	1.08	1.01	0.96	1.10
S_{D1} (g)	0.27	0.30	0.43	0.61	0.88	1.23	1.73	2.17	1.23

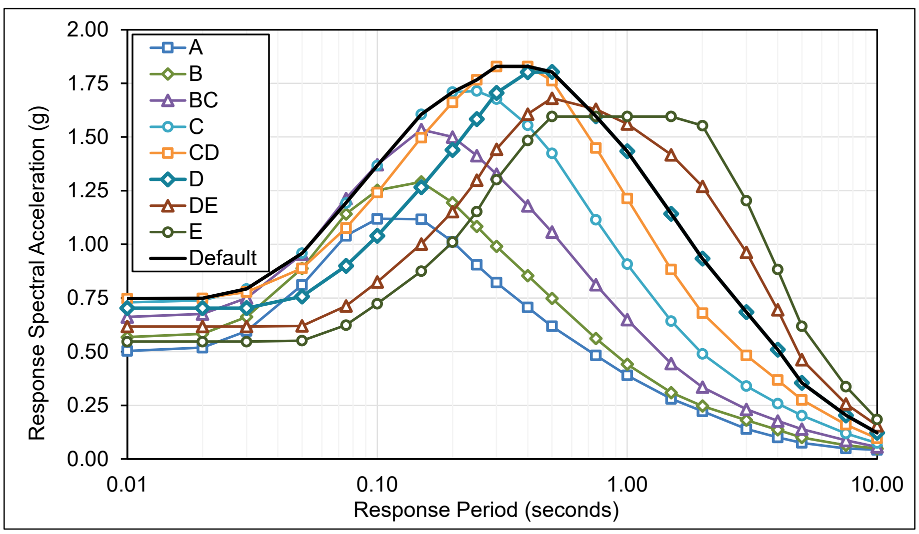


Figure 7.3-3 Plots of derived MPRS for Anchorage, Alaska.

7.3.4 *Fairbanks, Alaska*

The MPRS for this site are derived for a T_L = 6 s region to match probabilistic values S_S = 1.077g and S_1 = 0.362g, and to match deterministic values S_S = 1.500g and S_1 = 0.600g, as shown and plotted below.

Table 7.3-5 Derived MPRS for Fairbanks, Alaska

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.349	0.393	0.460	0.518	0.557	0.563	0.548	0.542	0.563
0.01	0.351	0.395	0.462	0.521	0.560	0.566	0.551	0.546	0.566
0.02	0.365	0.410	0.476	0.532	0.567	0.570	0.551	0.541	0.570
0.03	0.426	0.471	0.534	0.579	0.600	0.586	0.551	0.534	0.600
0.05	0.593	0.642	0.696	0.722	0.712	0.668	0.608	0.551	0.722
0.08	0.756	0.824	0.889	0.912	0.885	0.822	0.713	0.624	0.912
0.10	0.816	0.908	1.011	1.057	1.040	0.977	0.825	0.724	1.057
0.15	0.807	0.926	1.112	1.223	1.251	1.206	1.002	0.875	1.251
0.20	0.728	0.852	**1.077**	1.275	1.364	1.355	1.153	1.010	1.364
0.25	0.643	0.763	0.997	1.255	1.385	1.424	1.299	1.153	1.424
0.30	0.573	0.684	0.914	1.193	1.385	1.453	1.443	1.301	1.453
0.40	0.465	0.557	0.763	1.035	1.296	1.422	1.490	1.484	1.422
0.50	0.392	0.472	0.657	0.913	1.192	1.362	1.481	1.574	1.362
0.75	0.297	0.338	0.483	0.690	0.942	1.120	1.280	1.443	1.120
1.0	0.227	0.253	**0.362**	0.522	0.733	0.906	1.090	1.262	0.906
1.5	0.147	0.158	0.223	0.327	0.470	0.632	0.818	0.996	0.632
2.0	0.112	0.119	0.159	0.231	0.333	0.459	0.633	0.793	0.459
3.0	0.075	0.079	0.097	0.142	0.205	0.285	0.399	0.504	0.285
4.0	0.056	0.058	0.069	0.100	0.143	0.196	0.270	0.340	0.196
5.0	0.045	0.047	0.054	0.076	0.107	0.145	0.196	0.245	0.145
7.5	0.033	0.035	0.040	0.055	0.075	0.097	0.127	0.159	0.097
10	0.027	0.029	0.033	0.044	0.058	0.073	0.094	0.115	0.073
S_{MS} (g)	0.65	0.77	0.97	1.15	1.25	1.31	1.34	1.42	1.31
S_{M1} (g)	0.23	0.25	0.36	0.52	0.73	0.91	1.14	1.43	0.91
S_{DS} (g)	0.44	0.51	0.65	0.77	0.83	0.87	0.89	0.94	0.87
S_{D1} (g)	0.15	0.17	0.24	0.35	0.49	0.60	0.76	0.95	0.60

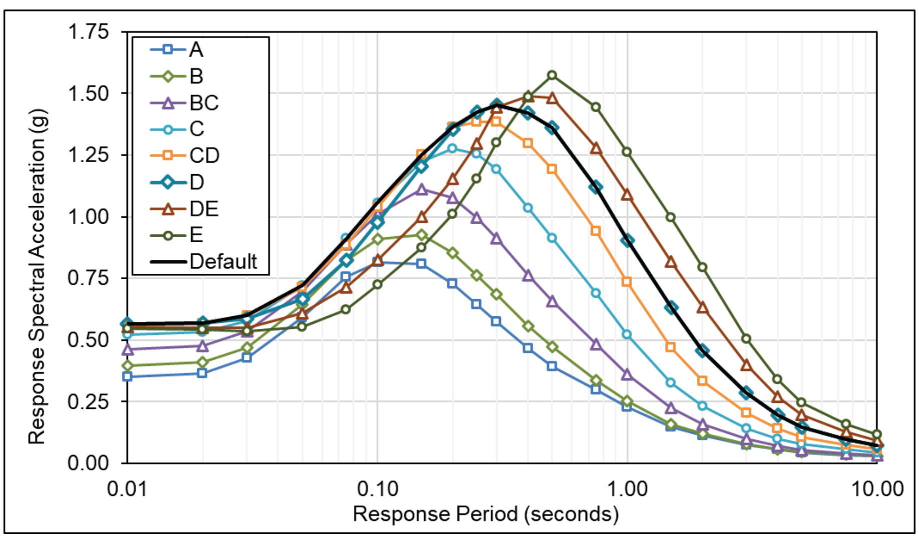


Figure 7.3-4 Plots of derived MPRS for Fairbanks, Alaska.

7.3.5 San Juan, Puerto Rico

The MPRS for this site are derived for a T_L = 12 s region to match probabilistic values S_S = 1.082g and S_1 = 0.380g, and to match deterministic values S_S = 1.500g and S_1 = 0.600g, as shown and plotted below.

Table 7.3-6 Derived MPRS for San Juan, Puerto Rico

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.358	0.403	0.472	0.543	0.606	0.638	0.607	0.547	0.638
0.01	0.360	0.405	0.475	0.545	0.609	0.641	0.617	0.547	0.641
0.02	0.372	0.415	0.484	0.552	0.611	0.643	0.617	0.547	0.643
0.03	0.430	0.472	0.537	0.595	0.642	0.659	0.617	0.547	0.659
0.05	0.594	0.639	0.697	0.742	0.766	0.757	0.620	0.551	0.766
0.08	0.764	0.829	0.907	0.960	0.980	0.900	0.713	0.624	0.980
0.10	0.828	0.919	1.040	1.128	1.172	1.040	0.825	0.724	1.172
0.15	0.821	0.938	1.134	1.296	1.407	1.266	1.002	0.875	1.407
0.20	0.732	0.853	**1.082**	1.321	1.503	1.440	1.153	1.010	1.503
0.25	0.642	0.759	0.996	1.282	1.521	1.584	1.299	1.153	1.584
0.30	0.572	0.680	0.913	1.211	1.503	1.702	1.443	1.301	1.702
0.40	0.469	0.563	0.776	1.063	1.394	1.655	1.607	1.484	1.655
0.50	0.399	0.483	0.678	0.948	1.280	1.571	1.681	1.596	1.571
0.75	0.302	0.351	0.501	0.712	0.985	1.251	1.522	1.589	1.251
1.0	0.236	0.263	**0.380**	0.548	0.770	1.010	1.278	1.504	1.010
1.5	0.164	0.175	0.248	0.362	0.524	0.714	0.952	1.162	0.714
2.0	0.132	0.140	0.184	0.268	0.386	0.532	0.734	0.916	0.532
3.0	0.093	0.098	0.120	0.175	0.252	0.349	0.485	0.617	0.349
4.0	0.072	0.076	0.090	0.130	0.185	0.253	0.348	0.439	0.253
5.0	0.060	0.064	0.074	0.105	0.146	0.196	0.265	0.332	0.196
7.5	0.048	0.050	0.056	0.078	0.105	0.137	0.179	0.223	0.137
10	0.039	0.041	0.046	0.062	0.081	0.102	0.130	0.158	0.102
S_{MS} (g)	0.66	0.77	0.97	1.19	1.37	1.53	1.51	1.44	1.53
S_{M1} (g)	0.24	0.26	0.38	0.55	0.77	1.01	1.32	1.67	1.01
S_{DS} (g)	0.44	0.51	0.65	0.79	0.91	1.02	1.01	0.96	1.02
S_{D1} (g)	0.16	0.18	0.25	0.37	0.51	0.67	0.88	1.11	0.67

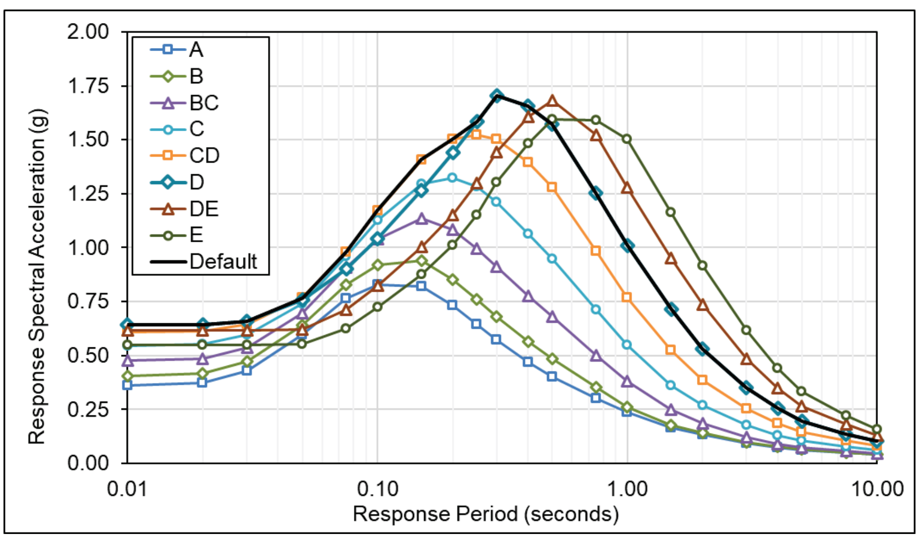


Figure 7.3-5 Plots of derived MPRS for San Juan, Puerto Rico.

7.3.6 *Anderson AFB, Guam*

The MPRS for this site are derived for a T_L = 12 s region to match probabilistic values S_S = 3.369g and S_1 = 0.862g, and to match deterministic values S_S = 8.779g and S_1 = 2.423g, as shown and plotted below.

Table 7.3-7 Derived MPRS for Anderson AFB, Guam

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	1.074	1.207	1.412	1.586	1.682	1.642	1.526	1.467	1.682
0.01	1.080	1.214	1.420	1.594	1.691	1.654	1.538	1.482	1.691
0.02	1.119	1.252	1.454	1.617	1.699	1.659	1.537	1.466	1.699
0.03	1.318	1.446	1.630	1.750	1.790	1.697	1.527	1.436	1.790
0.05	1.898	2.032	2.160	2.211	2.141	1.944	1.701	1.581	2.211
0.08	2.473	2.671	2.838	2.868	2.725	2.457	2.173	2.049	2.868
0.10	2.653	2.936	3.240	3.339	3.204	2.917	2.615	2.491	3.339
0.15	2.604	2.959	3.544	3.825	3.779	3.484	3.136	2.982	3.825
0.20	2.307	2.664	**3.369**	3.958	4.059	3.806	3.436	3.275	4.059
0.25	1.965	2.273	2.970	3.733	4.156	4.018	3.697	3.554	4.156
0.30	1.704	1.964	2.623	3.402	4.041	4.144	3.920	3.821	4.144
0.40	1.346	1.504	2.103	2.833	3.605	3.965	4.008	3.983	3.965
0.50	1.109	1.203	1.724	2.415	3.167	3.692	3.848	3.986	3.692
0.75	0.747	0.802	1.150	1.655	2.278	2.863	3.135	3.380	2.863
1.0	0.560	0.602	**0.862**	1.241	1.720	2.280	2.696	2.999	2.280
1.5	0.372	0.387	0.549	0.800	1.138	1.520	2.022	2.396	1.520
2.0	0.280	0.297	0.399	0.581	0.834	1.140	1.591	2.016	1.140
3.0	0.199	0.210	0.261	0.380	0.548	0.760	1.061	1.344	0.760
4.0	0.159	0.166	0.197	0.284	0.405	0.555	0.765	0.962	0.555
5.0	0.136	0.142	0.161	0.227	0.318	0.429	0.582	0.724	0.429
7.5	0.071	0.077	0.090	0.124	0.166	0.218	0.288	0.350	0.218
10	0.044	0.047	0.054	0.072	0.093	0.117	0.149	0.177	0.117
S_{MS} (g)	2.08	2.40	3.03	3.56	3.74	3.73	3.61	3.59	3.74
S_{M1} (g)	0.56	0.60	0.86	1.24	1.72	2.28	2.86	3.63	2.28
S_{DS} (g)	1.38	1.60	2.02	2.37	2.49	2.49	2.40	2.39	2.49
S_{D1} (g)	0.37	0.40	0.57	0.83	1.15	1.52	1.91	2.42	1.52

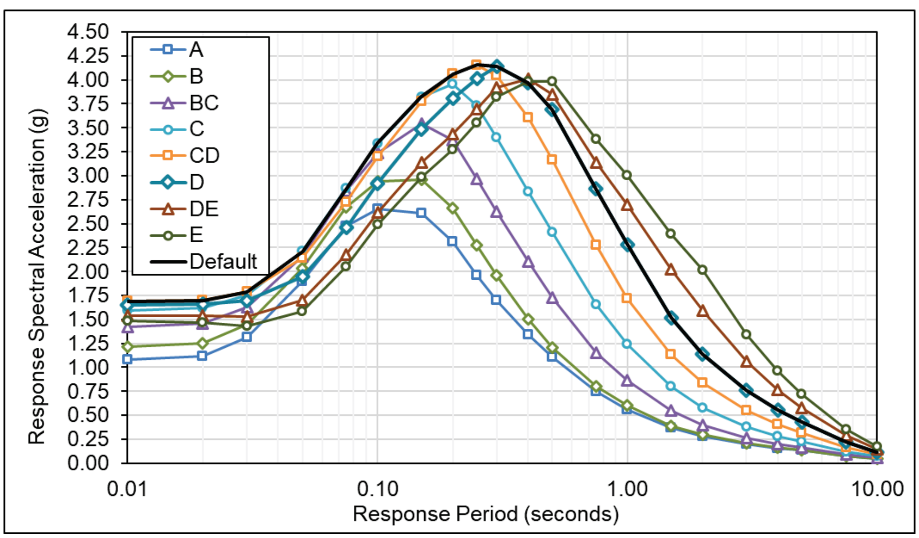


Figure 7.3-6 Plots of derived MPRS for Anderson AFB, Guam.

Chapter 8

Summary and Recommendations

8.1 Summary

This study complements proposals to the Provisions Update Committee of the Building Seismic Safety Council that would incorporate multi-period response spectra (MPRS) in the 2020 edition of the *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures* (2020 *NEHRP Provisions*), as well as related proposals to the ASCE 7-22 Seismic Subcommittee of the American Society of Civil Engineers for the ASCE Standard, ASCE/SEI 7-22, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures* (ASCE 7-22). Ultimately, the intent is that the proposed MPRS and related design requirements of ASCE 7-22 would be adopted, by reference, as part of the *2024 International Building Code* (2024 IBC).

The technical basis and associated methods in this report enable the U.S. Geological Survey (USGS) to develop MPRS and related ground motion parameters for the 2020 *NEHRP Provisions* and ASCE 7-22 for sites in the non-conterminous United States and U.S. territories for which seismic hazard analyses have not yet been updated by the USGS to fully define all periods and site classes of interest. These regions include Alaska, Hawaii, Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa. By reference, this report accompanies the subject MPRS proposals, and, with proposal adoption, would be used by USGS to develop MPRS for the aforementioned regions. The intent is that the 2020 *NEHRP Provisions* and ASCE 7-22 define and provide values of MPRS and associated ground motion parameters in a consistent manner for all U.S. regions. In this sense, the MPRS methods of this study augment the site-specific ground motion procedures of Chapter 21 of ASCE 7-22, which are used by the USGS to develop MPRS for sites in the conterminous U.S.

The primary purpose of this study is to derive MPRS from only the three currently available ground motion parameters S_S, S_1, and T_L for all non-conterminous U.S. regions. The models developed in this study are meant to provide a better approximation of the response spectrum, and a more accurate representation of the frequency content compared to the "two-period

design spectrum" of the 2015 *NEHRP Provisions* and ASCE 7-16, which, in many cases, has been found to significantly underestimate MPRS in the conterminous U.S. (Chapter 2 provides background on the two-period spectrum and site amplifications).

As mentioned in Chapter 3, ground motion models (GMMs) for shallow crustal and subduction earthquakes are more appropriate for the U.S. regions under consideration in this report, as opposed to, for example, GMMs for the stable continental regions of the Central and Eastern United States (CEUS). Therefore, the models developed for MPRS in Chapters 4 and 5 are based only on Western United States (WUS) GMMs. Chapter 6 validates the proposed MPRS models (i.e., Derived MPRS) for WUS sites that are not affected by CEUS sources (i.e., sites with tectonic settings similar to those in non-conterminous U.S. regions), since the "true" MPRS sets (i.e., Proposed MPRS for ASCE 7-22) were available for all periods and site classes of interest for those sites.

Alternative modeling choices could be made to derive MPRS from other existing ground motion parameters. This study chose to follow a simple approach without introducing additional parameters, and without introducing unnecessary model complexities considering that this report is an interim solution. Eventually the USGS will derive MPRS for all United States and U.S. territories directly from applicable ground motion models at each period and site class of interest. To improve the accuracy of the model for deriving MPRS in future studies, which could be useful for region-specific derivation of MPRS, site-specific hazard deaggregations (not currently available for all non-conterminous U.S. regions) could be utilized to directly include parameters such as earthquake magnitude and epsilon that influence the spectral shape (as discussed in Section 3.1.2); or, additional parameters could be introduced in the model to represent local site amplifications, basin effects, or directivity effects.

8.2 Key Results

In general, only values of the short-period (0.2-second) MCE_R ground motion parameter S_S, the 1-second MCE_R ground motion parameter S_1, and the long-period transition period, T_L, are known at non-conterminous U.S. sites. Parameters S_S and S_1 characterize MCE_R ground motions for Site Class BC (reference) site conditions. With site coefficients F_a and F_v, the parameters S_S and S_1 define values of the traditional three-domain (two-period) design spectrum of Figure 11.4-1 of ASCE 7-16 (and prior editions). The subject MPRS proposals (summarized in Section 2.2) would eliminate site coefficients, and instead directly provide values of ground motion parameters

S_{MS} (S_{DS}) and S_{M1} (S_{D1}), and the associated multi-period MCE$_R$ ground motion response spectrum, that incorporate site effects. For the conterminous United States, these results can be computed from the 2018 USGS National Seismic Hazard Model (Petersen et al., 2020). The methods of this study provide the basis for the USGS to develop the results for non-conterminous U.S. sites using only values of the parameters S_S, S_1, and T_L.

The shape of MPRS more accurately characterize the frequency content of the ground motions at the site of interest compared to the traditional three-domain design spectrum. Further, MPRS proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 would eliminate a shortcoming of the shape of the three-domain spectrum discovered during the 2015 *NEHRP Provisions* cycle. The standard three-domain spectral shape defined by the short-period spectral response acceleration parameter S_{DS}, the 1-second spectral response acceleration parameter S_{D1}, and T_L are not appropriate for soft soil sites (Site Class D or softer), in particular where the ground motion hazard is dominated by large magnitude events. On such sites, the standard spectral shape substantially understates spectral response for moderately long period structures.

Accordingly, ASCE 7-16 prohibits the general use of the three-domain spectrum, and instead requires site-specific hazard determination for longer period structures on softer soil sites, including Site Class D sites. Site-specific hazard analysis is a burden for most projects, so as an exception to this requirement for Site Class D sites, ASCE 7-16 permits design using the Equivalent Lateral Force (ELF) design procedure with seismic forces increased by 50 percent at longer periods. The 50 percent increase is a crude approximation of the underestimation of long-period response by the design spectrum of ASCE 7-10, where the actual shortcoming varies as a function of the earthquake magnitude governing site hazard, the shaking intensity, and the site conditions (i.e., values of site shear wave velocity).

Figures 8.2-1 and 8.2-2 are plots of design spectra (i.e., 2/3 of MCE$_R$ spectra) for two WUS sites in the conterminous United States used in this study, Irvine (CA) and San Mateo (CA), illustrating the points discussed above. Five design spectra are shown in each figure: (1) the two-period design spectrum of ASCE 7-10 (ASCE 7-10 2PRS); (2) the two-period design spectrum of ASCE 7-16 (ASCE 7-16 2PRS); (3) the two-period design spectrum proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 (ASCE 7-22 2PRS); (4) the multi-period design spectrum proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 (ASCE 7-22 MPRS); and (5) the multi-period design spectrum derived from values of S_S, S_1, and T_L using the methods of this study (Derived MPRS).

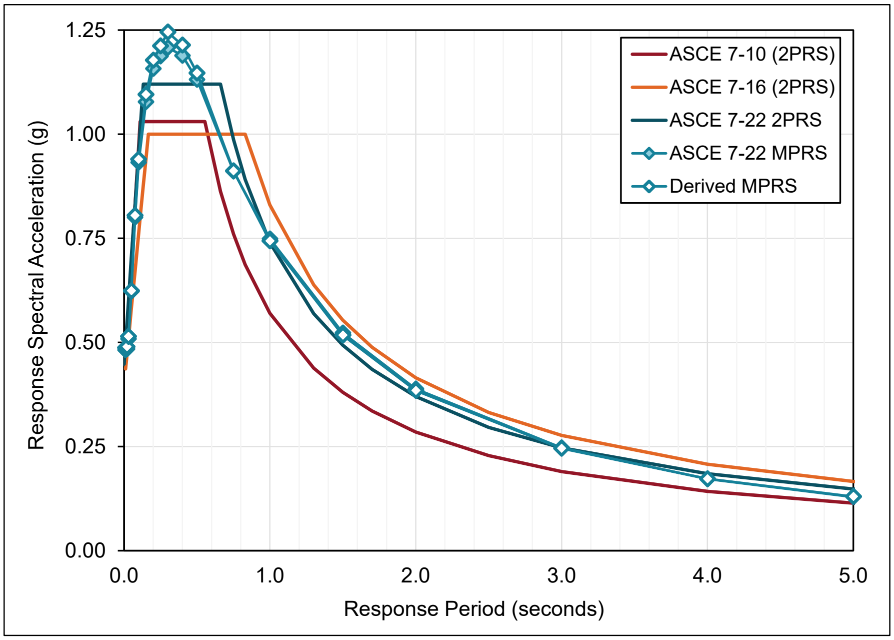


Figure 8.2-1 Comparison of two-period design response spectra (2PRS) of ASCE 7-10, ASCE 7-16, and ASCE 7-22 (as proposed), multi-period design response spectra (MPRS) of ASCE 7-22 (as proposed), and derived MPRS from ASCE 7-22 values of S_S, S_1, and T_L using the methods of this study, for the Irvine Site assuming Default site conditions.

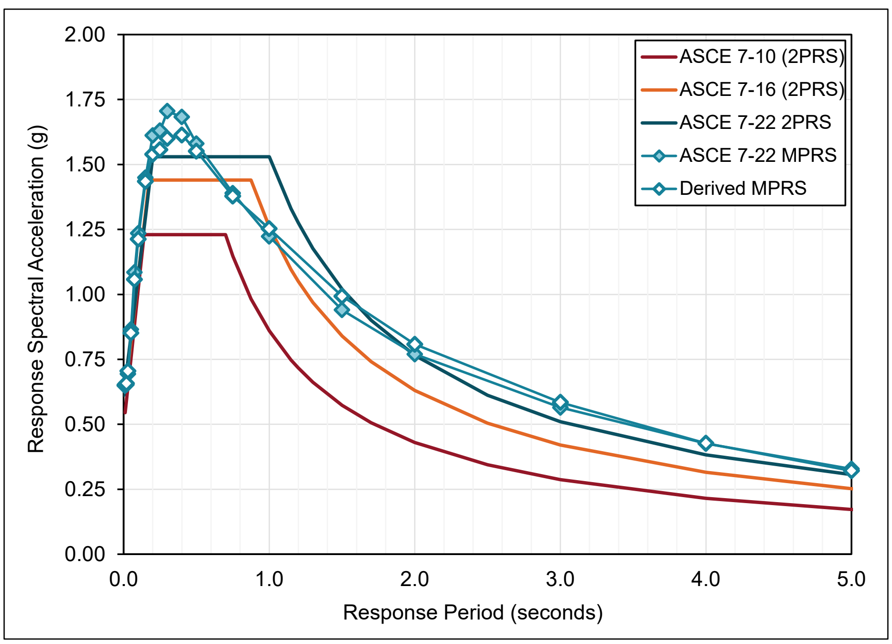


Figure 8.2-2 Comparison of two-period design response spectra (2PRS) of ASCE 7-10, ASCE 7-16, and ASCE 7-22 (as proposed), multi-period design response spectra (MPRS) of ASCE 7-22 (as proposed), and derived MPRS from ASCE 7-22 values of S_S, S_1, and T_L using the methods of this study, for the San Mateo Site assuming Default site conditions.

In Figures 8.2-1 and 8.2-2, the design spectra are based on a hypothetical "Default" site condition, as defined by the respective version of ASCE 7. Default site conditions in ASCE 7-16 are the more critical of Site Classes C and D. As proposed for ASCE 7-22, default site conditions would be the most critical of Site Classes C, CD, and D. In all cases, response at longer periods is governed by Site Class D site conditions in Figures 8.2-1 and 8.2-2. The two-period design spectra of ASCE 7-16 shown in these figures incorporate the 50 percent increase at longer periods that serves as an exception at Site Class D sites where site-specific analysis is not performed.

The design response spectra of the Irvine Site are governed by probabilistic MCE_R ground motions (e.g., Section 21.2.1 of ASCE 7); Irvine is the example site of Chapter 4 used therein to illustrate the probabilistic MPRS methods of this study. The design response spectra of the San Mateo Site are governed by deterministic MCE_R ground motions (e.g., Section 21.2.2 of ASCE 7); San Mateo is the example site of Chapter 5 used therein to illustrate the deterministic MPRS methods of this study. As shown in these figures, the multi-period design response spectra derived from S_S, S_1, and T_L values of ASCE 7-22 closely match the multi-period design response spectra proposed for ASCE 7-22, indicative of the reliability of the methods of this study to replicate MPRS at all periods of interest. Chapter 6 shows similar results for other example sites and site classes in the WUS.

Comparison of the two-period design spectra of ASCE 7-10 with those of ASCE 7-16 illustrates the shortcoming discovered during the 2015 *NEHRP Provisions* cycle that led to substantial changes to the site-specific requirements. The ground motions of ASCE 7-10 substantially underrepresent ground motions for softer soil (Default) site conditions at longer periods. Comparison of the design spectra of ASCE 7-16 with those of ASCE 7-22 shows mixed results for the 50 percent increase correcting for the identified shortcoming. For the Irvine Site, where hazard is governed probabilistically by smaller magnitude earthquakes, the 50 percent increase in seismic demand is sufficient to match the two-period (and multi-period) design spectra of ASCE 7-22.

For the San Mateo Site, where ground motions are stronger and hazard is governed by very large magnitude (M8.0) earthquakes, the 50 percent increase in seismic demand is not sufficient to match the two-period (and multi-period) design spectra proposed for ASCE 7-22 at longer response periods (e.g., 3 seconds). In this case, and at other softer soil sites where hazard is governed by large magnitude earthquakes, the design spectra of ASCE 7-22 better characterize the frequency content of the site-specific ground motions that would otherwise be underrepresented by the two-period

design spectrum of ASCE 7-16 at longer response periods. Likewise, derived multi-period design spectra that closely match those of ASCE 7-22 (as proposed for WUS sites) are expected to reliably represent the frequency content of ground motions at non-conterminous U.S. sites with comparable governing earthquake magnitudes, shaking levels, and site conditions.

To illustrate the above, Figures 8.2-3 through 8.2-6 are plots of design spectra (i.e., 2/3 of MCE_R spectra) for four of the example non-conterminous U.S. sites in Chapter 7—namely, Honolulu (HI), Anchorage (AK), San Juan, Puerto Rico, and Anderson AFB, Guam—comparing design spectra derived from values of S_S, S_1 and T_L with those of prior editions of ASCE 7. Four design spectra are shown in each figure: (1) the two-period design spectrum of ASCE 7-10 (ASCE 7-10 2PRS); (2) the two-period design spectrum of ASCE 7-16 (ASCE 7-16 2PRS); (3) the two-period design spectrum proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 (ASCE 7-22 2PRS); and (4) the multi-period design spectrum proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 (ASCE 7-22 MPRS). In each figure, the two-period and multi-period design spectra proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 are derived from values of S_S, S_1, and T_L from ASCE 7-16 for the site of interest using the methods of this study.

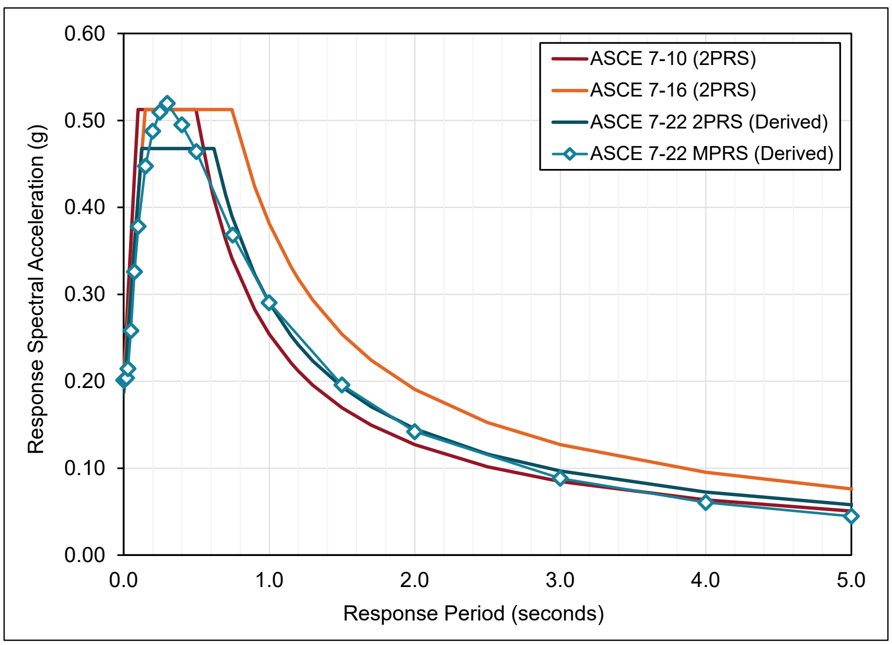


Figure 8.2-3 Comparison of two-period design response spectra (2PRS) of ASCE 7-10, ASCE 7-16, and ASCE 7-22 (as proposed), and multi-period design response spectra (MPRS) of ASCE 7-22 (as proposed) derived from values of S_S, S_1, and T_L using the methods of this study, for the Honolulu (HI) Site assuming Default site conditions.

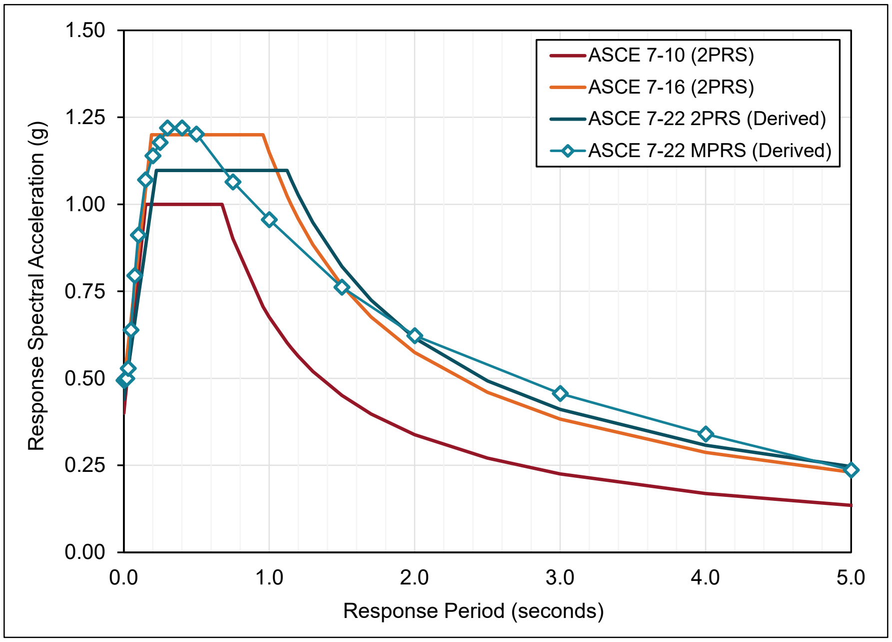


Figure 8.2-4 Comparison of two-period design response spectra (2PRS) of ASCE 7-10, ASCE 7-16, and ASCE 7-22 (as proposed), and multi-period design response spectra (MPRS) of ASCE 7-22 (as proposed) derived from values of S_S, S_1, and T_L using the methods of this study, for the Anchorage (AK) Site assuming Default site conditions.

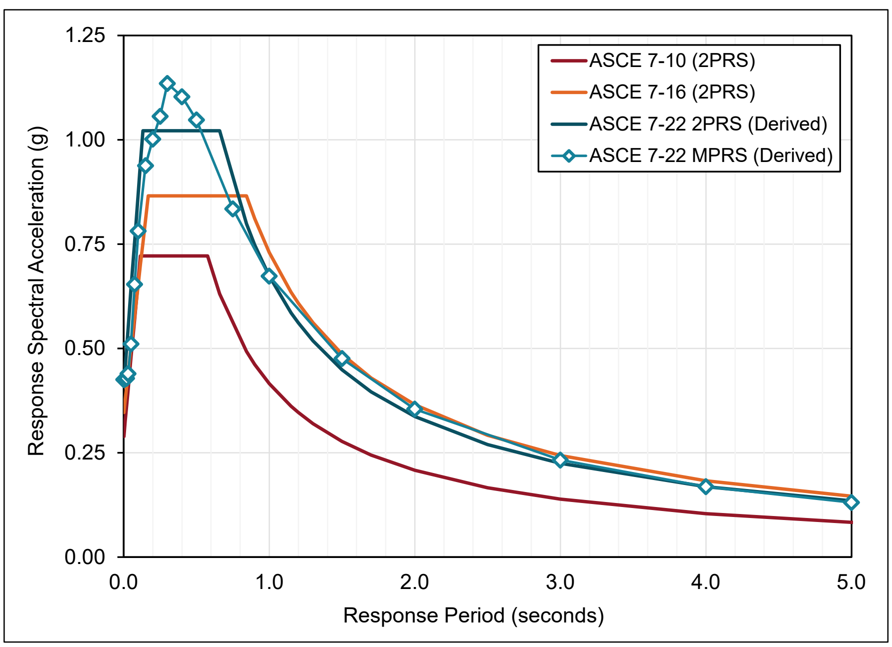


Figure 8.2-5 Comparison of two-period design response spectra (2PRS) of ASCE 7-10, ASCE 7-16, and ASCE 7-22 (as proposed), and multi-period design response spectra (MPRS) of ASCE 7-22 (as proposed) derived from values of S_S, S_1, and T_L using the methods of this study, for the San Juan, Puerto Rico, Site assuming Default site conditions.

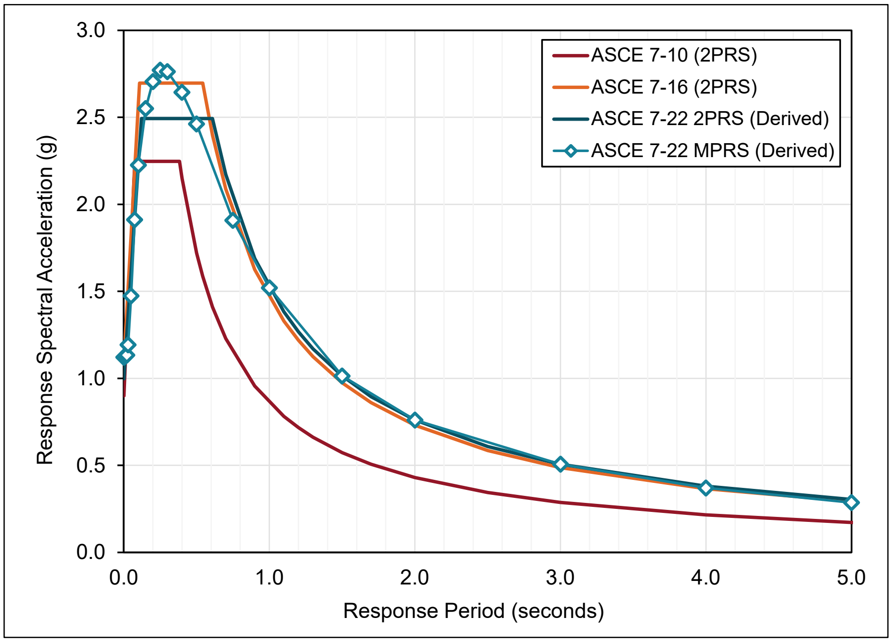


Figure 8.2-6 Comparison of two-period design response spectra (2PRS) of ASCE 7-10, ASCE 7-16, and ASCE 7-22 (as proposed), and multi-period design response spectra (MPRS) of ASCE 7-22 (as proposed) derived from values of S_S, S_1, and T_L using the methods of this study, for the Anderson AFB, Guam, site assuming Default site conditions.

Like those shown previously in Figures 8.2-1 and 8.2-2, the design spectra of Figures 8.2-3 through 8.2-6 are based on a hypothetical "Default" site condition, as defined by the respective version of ASCE 7 (see above for details). In all cases, response at longer periods is governed by Site Class D site conditions. The two-period design spectra of ASCE 7-16 shown in these figures incorporate the 50 percent increase at longer periods required at Site Class D sites.

The four non-conterminous U.S. sites represent a broad range of design ground motion levels, from rather modest shaking at the Honolulu site (i.e., Peak Ground Acceleration, PGA ≈ 0.2 g) to extreme shaking at the Anderson AFB site (i.e., PGA ≈ 1.0 g). In all cases, the multi-period design spectrum proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 (derived from values of S_S, S_1, and T_L) look reasonable and, except for the Honolulu site, the proposed two-period design spectra (ASCE 7-22 2PRS) look similar to those of ASCE 7-16 (ASCE 7-16 2RS). For the Honolulu site, the proposed two-period design spectrum is somewhat less than that of ASCE 7-16 at longer periods, reflecting a modest conservatism in the 50 percent increase required by ASCE 7-16 at longer periods where ground motion levels are relatively low.

The flatter shape of the ASCE 7-22 multi-period design spectrum of the Anchorage site, shown in Figure 8.2-4, reflects stronger shaking at longer periods expected for sites where ground motion hazard is governed by very large magnitude earthquakes (i.e., T_L = 16 s for this site).

8.3 Recommendations

This study recommends the following with respect to MPRS proposals for the 2020 *NEHRP Provisions* and ASCE 7-22.

1. MPRS for non-conterminous U.S. sites: It is recommended that the USGS use the methods of this study to develop MPRS for non-conterminous U.S. sites (i.e., Alaska, Hawaii, Guam and the Northern Mariana Islands, Puerto Rico and the U.S. Virgin Islands, and American Samoa), none of which are believed to be more seismically similar to CEUS sites than the WUS and Cascadia sites upon which this study is based.

   As shown in the figures of Chapter 6, the MPRS of CEUS sites have a very different shape (frequency content) compared to that of other conterminous U.S. sites (i.e., WUS and Cascadia sites), and hence the derived shapes should not be used in the CEUS or any other similar tectonic region (i.e., stable continental regions). For non-conterminous U.S. sites, derived MPRS are expected to be representative because those locations are mainly controlled by "shallow crustal earthquakes" or "deep/subduction earthquakes," which are similar tectonic regions to those seen in the WUS and Cascadia.

2. Deterministic lower-limit MPRS: It is recommended that the 2020 *NEHRP Provisions* and ASCE 7-22 adopt (and the USGS use) a single, M8.0-based set of lower limit deterministic MPRS for all sites, regardless of the magnitude that governs the hazard at the site of interest (i.e., Alternative 1 of Chapter 5). Conceptually, multiple magnitude-based sets of lower limit deterministic MPRS would provide a more accurate lower limit on deterministic ground motions, but would not be practical for incorporation in ASCE 7-22.

3. PGA_M for non-conterminous U.S. sites: It is recommended that the USGS approximate the PGA at any given site class for non-conterminous U.S. sites by scaling the PGA of Site Class BC, which is available from the 2015 *NEHRP Provisions* and ASCE 7-16, with the ratios of 0.0 second-period response of derived MPRS. The suggested scale factors would provide a replacement for the PGA site amplification coefficients of ASCE 7-16 that would be eliminated by the MPRS proposals.

Appendix A
Development of Census Tract-Based Ground Motion Data

This appendix describes the development of census tract-based ground motion data that include the sets of probabilistic MPRS used in statistical analyses of Chapter 4 to develop generic probabilistic response spectrum shape parameters (RSSPs) as a function of MCE_R ground motion parameters S_S, S_1, and the T_L region of interest.

A.1 Census Tract Sites

Census tract-based ground motion data are developed for 9,050 sites in California, Oregon and Washington, and 847 (T_L = 6 s) sites in Idaho and Nevada. The total of 9,897 census-tract sites in these five states are selected to provide ground motion data that: (1) represent a broad range of ground motion levels for each T_L region of interest; and (2) provide statistically large samples of ground motions for each ground motion level and T_L region of interest. The original sample of 9,050 census tracts in California, Oregon and Washington has only a few T_L = 6 s sites outside of the Puget Sound region, and is augmented with 847 Idaho and Nevada census tracts that are all T_L = 6 s sites. Centroid locations and other census tract data are obtained from TIGER files (U.S. Census Bureau, 2012).

The 9,897 sites are located at the centroids of the denser census tracts of the five mentioned states, representing about 90 percent of the population (living in less than 6 percent of the land area) of these five states. For reference, there are a little more than 1,000 buildings in a census tract, on average, so roughly a total of 10 million buildings are located in the 9,897 census tracts. These buildings account for over 85 percent of the seismic risk (annualized dollar loss) in the conterminous U.S. (Jaiswal et al., 2015).

Approximately 1,400 census tracts in the five states are excluded from the 9,897 census tracts in this study because they are: (1) census tracts with null data (i.e., zero population and/or area); or (2) they represent large, sparsely populated, census tracts with locations (defined by census tract centroid) that often do not align well with population centers (and hence building locations). In such cases, seismic hazard parameters and site conditions

(based on census tract centroid) could be very different from, and misrepresent the hazard at, building locations of interest.

A.2 Collection and Sorting of Ground Motion Data

The following ground motion data are collected for each census tract site:

1. MCE_R design values (from the 2015 *NEHRP Provisions*), including the probabilistic and the deterministic components of parameters S_S and S_1, and values of T_L (USGS, 2015) https://earthquake.usgs.gov/ws/designmaps/nehrp-2015.html.
2. Probabilistic MPRS developed by this study from an early version of the 2018 USGS NSHM hazard curves that are essentially the same as those proposed for the 2020 *NEHRP Provisions* and ASCE 7-22.
3. Other ground motion data, including estimates of site shear wave velocity from Wald and Allen (2007), and Wills and Clahan (2006) for California sites, and the corresponding site class. Site condition data are not used to develop probabilistic RSSPs, but are informative with respect to likely site conditions (i.e., Site Classes C, CD and D), unlikely site conditions (i.e., Site Classes BC and DE) and extremely rare site conditions (i.e., Site Classes A and E), as shown in Table A.2-1.

Table A.2-1 Distribution of the Number of Census Tracts of Densely Populated Areas of California, Oregon, and Washington by the Five Site Classes of ASCE 7-16 (7-16) and the Seven Site Classes Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 (7-22) Where Site Class is Based on Estimates of Shear Wave Velocity from Surficial Geology

Site Class	California		Oregon and Washington		Total (3 States)	
	7-22	7-16	7-22	7-16	7-22	7-16
A	0	0	0	0	0	0
B	0	8	0	0	0	8
BC	133		39		172	
C	890	2,398	470	929	1,360	3,327
CD	3,294		763		4,057	
D	2,767	4,725	546	979	3,313	5,704
DE	55		93		148	
E	0	8	0	3	0	11
Total	7,139	7,139	1,911	1,911	9,050	9,050

The probabilistic and the deterministic components of MCE_R design parameters S_S and S_1 of the 2015 *NEHRP Provisions* are used to sort census tract-based ground motion data into the following "probabilistic" and "deterministic" groups:

1. Probabilistic MCE_R ground motions The values of S_S and S_1 are both controlled by probabilistic hazard at the site of interest (7,392 census tract sites).
2. Deterministic MCE_R ground motions. The values of S_S and S_1 are both controlled by deterministic hazard at the site of interest where greater than the lower-limit deterministic MCE_R values of S_S and S_1 (1,346 census tract sites).
3. Lower-limit deterministic MCE_R ground motions. The values of either S_S or S_1 are controlled by lower-limit deterministic MCE_R ground motions at the site of interest (652 census tract sites).
4. Mixed MCE_R ground motions. The values S_S or S_1 are controlled by some combination of probabilistic and deterministic hazard at the site of interest (507 census tract sites).

The probabilistic MPRS of the 7,392 census tract sites controlled by probabilistic MCE_R ground motions at both short (S_S) and 1-second (S_1) response periods are used in Chapter 4 of this study to develop probabilistic RSSPs. Although the ground motion data of the 1,998 census tract sites (i.e., 1,998 sites = 1,346 sites + 652 sites) controlled by deterministic MCE_R ground motions are not used in this study to develop deterministic RSSPs (i.e., in Chapter 5, deterministic RSSPs are based on representative MPRS of WUS ground motion models), they are informative with respect to the fraction of WUS sites controlled by deterministic MCE_R ground motions. Approximately 20 percent (i.e., 1,998 sites/9,897 sites) of all sites are controlled by deterministic MCE_R ground motions and about 1/3 (652 sites/1,998 sites) of those sites are controlled by lower limit MCE_R ground motions. Ground motion data from the 507 census tract sites controlled by mixed probabilistic/deterministic hazard are not used in this study.

Ideally, the MCE_R design parameters S_S and S_1 proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 would be used to sort "probabilistic" and "deterministic" census tract sites, but these parameters were not available at the time of this study and those of the 2015 *NEHRP Provisions* were used as a surrogate. In general, the vast majority of all sites controlled by the probabilistic MCE_R ground motions of the 2015 *NEHRP Provisions* are also controlled by the probabilistic MCE_R ground motions proposed for the 2020 *NEHRP Provisions* and ASCE 7-22.

A.3 Binning of Ground Motions

Sets of probabilistic (and deterministic) MCE_R ground motions are binned based on factored values of parameters S_S and S_1 of the 2015 *NEHRP Provisions* where bins are defined by discrete ranges of S_S and S_1 for each T_L region of interest. Table A.3-1 summarizes the discrete ranges of S_S and S_1 in terms of MCE_R ground motions proposed for the 2020 *NEHRP Provisions* and ASCE 7-22. For the purpose of binning, the values of S_S and S_1 of the 2015 *NEHRP Provisions* are factored (i.e., S_S by 1.2/1.1 and S_1 by 1.25/1.3) to account for systematic differences in the RotD100 to RotD50 ratios of the 2015 *NEHRP Provisions* MCE_R ground motions (i.e., 1.1 at 0.2 s and 1.3 at 1.0 s) used to develop census tract groups and the RotD100 to RotD50 ratios of MCE_R ground motions proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 (i.e., 1.2 at 0.2 s and 1.25 at 1.0 s).

Table A.3-1 Discrete Ranges of S_S and S_1 Used to Bin Census Tract-Based MCE_R Ground Motions Where the 2015 *NEHRP Provisions* Values of S_S are Factored by 1.2/1.1 and Values of S_1 are Factored by 1.25/1.3 for the Purpose of Binning

MCE_R Design Parameter S_S (g)			MCE_R Design Parameter S_1 (g)		
Nominal Center	Range of Values		Nominal Center	Range of Values	
	Minimum	Maximum		Minimum	Maximum
0.25		< 0.375	0.1		< 0.15
0.5	≥ 0.375	< 0.625	0.2	≥ 0.15	< 0.25
0.75	≥ 0.625	< 0.875	0.3	≥ 0.25	< 0.35
1.0	≥ 0.875	< 1.125	0.4	≥ 0.35	< 0.45
1.25	≥ 1.125	< 1.375	0.5	≥ 0.45	< 0.55
1.5	≥ 1.375	< 1.625	0.6	≥ 0.55	< 0.65
1.75	≥ 1.625	< 1.875	0.7	≥ 0.65	< 0.75
2.0	≥ 1.875	< 2.125	0.8	≥ 0.75	< 0.85
2.25	≥ 2.125	< 2.375	0.9	≥ 0.85	< 0.95
2.5	≥ 2.375		1.0	≥ 0.95	

A.4 Sets of Probabilistic MPRS

Sets of probabilistic MPRS are developed by binning on the basis of the census tract-based values of S_S and S_1 for each of five T_L regions, T_L = 16 s, T_L = 12 s, T_L = 8 s, T_L = 6 s (Puget Sound region) and T_L = 6 s (Idaho and Nevada). These sets of probabilistic MPRS are used in the statistical analyses of Chapter 4 to develop generic shapes of probabilistic MCE_R response spectra (i.e., probabilistic RSSPs). Tables A.4-1 through A.4-5

show the number of “probabilistic” census tracts (i.e., probabilistic MPRS) in each set (i.e., each S_S/S_1 bin) for each of the five T_L regions, respectively.

Table A.4-1 Number of "Probabilistic" Census Tracts by S_S/S_1 Bin in the T_L = 16 s Region

	S_S (g)										
S_1 (g)	**0.25**	**0.50**	**0.75**	**1.00**	**1.25**	**1.50**	**1.75**	**2.00**	**2.25**	**2.50**	**All**
0.1	111	34	0	0	0	0	0	0	0	0	145
0.2	0	112	0	0	0	0	0	0	0	0	112
0.3	0	0	105	62	0	0	0	0	0	0	167
0.4	0	0	107	469	51	0	0	0	0	0	627
0.5	0	0	0	25	10	54	7	0	0	0	96
0.6	0	0	0	0	0	5	15	0	0	0	20
0.7	0	0	0	0	0	15	12	0	0	0	27
0.8	0	0	0	0	0	0	6	0	0	0	6
0.9	0	0	0	0	0	0	0	0	2	0	2
1.0	0	0	0	0	0	0	0	0	0	0	0
All	111	146	212	556	61	74	40	0	2	0	1,202

Table A.4-2 Number of "Probabilistic" Census Tracts by S_S/S_1 Bin in the T_L = 12 s Region

	S_S (g)										
S_1 (g)	**0.25**	**0.50**	**0.75**	**1.00**	**1.25**	**1.50**	**1.75**	**2.00**	**2.25**	**2.50**	**All**
0.1	0	0	0	0	0	0	0	0	0	0	0
0.2	0	437	234	0	0	0	0	0	0	0	671
0.3	0	0	189	92	0	0	0	0	0	0	281
0.4	0	0	0	0	34	0	0	0	0	0	34
0.5	0	0	0	0	7	43	4	0	0	0	54
0.6	0	0	0	0	0	4	28	19	0	0	51
0.7	0	0	0	0	0	0	0	14	14	0	28
0.8	0	0	0	0	0	0	0	0	2	2	4
0.9	0	0	0	0	0	0	0	0	0	0	0
1.0	0	0	0	0	0	0	0	0	0	0	0
All	0	437	423	92	41	47	32	33	16	2	1,123

Table A.4-3 Number of "Probabilistic" Census Tracts by S_S/S_1 Bin in the $T_L = 8$ s Region

S_1 (g)	S_S (g)										
	0.25	**0.50**	**0.75**	**1.00**	**1.25**	**1.50**	**1.75**	**2.00**	**2.25**	**2.50**	**All**
0.1	4	0	0	0	0	0	0	0	0	0	4
0.2	0	0	0	0	0	0	0	0	0	0	0
0.3	0	0	96	301	14	0	0	0	0	0	411
0.4	0	0	0	23	283	142	0	0	0	0	448
0.5	0	0	0	0	0	393	222	0	0	0	615
0.6	0	0	0	0	0	0	399	731	0	0	1,130
0.7	0	0	0	0	0	0	0	197	551	0	748
0.8	0	0	0	0	0	0	0	0	14	57	71
0.9	0	0	0	0	0	0	0	0		12	12
1.0	0	0	0	0	0	0	0	0	0	0	0
All	4	0	96	324	297	535	621	928	565	69	3,439

Table A.4-4 Number of "Probabilistic" Census Tracts by S_S/S_1 Bin in the $T_L = 6$ s (Puget Sound) Region

S_1 (g)	S_S (g)										
	0.25	**0.50**	**0.75**	**1.00**	**1.25**	**1.50**	**1.75**	**2.00**	**2.25**	**2.50**	**All**
0.1	3	0	0	0	0	0	0	0	0	0	3
0.2	0	0	0	0	0	0	0	0	0	0	0
0.3	0	0	0	0	0	0	0	0	0	0	0
0.4	0	0	0	3	128	321	0	0	0	0	452
0.5	0	0	0	0	0	242	84	0	0	0	326
0.6	0	0	0	0	0	0	0	0	0	0	0
0.7	0	0	0	0	0	0	0	0	0	0	0
0.8	0	0	0	0	0	0	0	0	0	0	0
0.9	0	0	0	0	0	0	0	0	0	0	0
1.0	0	0	0	0	0	0	0	0	0	0	0
All	3	0	0	3	128	563	84	0	0	0	781

Table A.4-5 Number of "Probabilistic" Census Tracts by S_S/S_1 Bin in the T_L = 6 s (Idaho and Nevada) Region

	S_S (g)										
S_1 (g)	**0.25**	**0.50**	**0.75**	**1.00**	**1.25**	**1.50**	**1.75**	**2.00**	**2.25**	**2.50**	**All**
0.1	160	88	0	0	0	0	0	0	0	0	248
0.2	0	319	142	0	0	0	0	0	0	0	461
0.3	0	0	0	2	0	0	0	0	0	0	2
0.4	0	0	0	0	2	4	0	0	0	0	6
0.5	0	0	0	0	0	32	31	0	0	0	63
0.6	0	0	0	0	0	0	15	28	0	0	43
0.7	0	0	0	0	0	0	0	6	16	0	22
0.8	0	0	0	0	0	0	0	0	2	0	2
0.9	0	0	0	0	0	0	0	0	0	0	0
1.0	0	0	0	0	0	0	0	0	0	0	0
All	160	407	142	2	2	36	46	34	18	0	847

Appendix B

Probabilistic Response Spectrum Shape Parameters

This appendix provides tables and figures of probabilistic response spectrum shape parameters (RSSPs) that characterize the generic shape (frequency content) of probabilistic MCE_R ground motions for each of the 41 nonempty combinations of T_L, S_S and $R_{S/1}$ levels described in Chapter 4, Section 4.1.1. These probabilistic RSSPs are used in Chapter 4 to develop probabilistic multi-period response spectra (MPRS) for given values of site-specific T_L, S_S, and S_1 ground motion parameters, following instructions in Section 4.4.2.

Probabilistic RSSPs describe 5%-damped, maximum-direction, risk-targeted spectral response accelerations at 22 response periods (from 0.00 s to 10 s) for each of the eight site classes (i.e., Site Classes A, B, BC, C, CD, D, DE, and E) and the Default site class (i.e., maximum of Site Classes C, CD, and D at the period of interest), normalized to be 1.0g at 0.2 s for Site Class, BC (i.e., S_S = 1.0g).

Each of the RSSP tables in this appendix follow a naming convention and are labeled as "GTL#S#R#," where "G" stands for "group" and each # character is an identifier for one of the five groups of T_L, S_S, and $R_{S/1}$ defined in Section 4.1.1. T_L can take on five values of 16 s, 12 s, 8 s, 6 s (WA, using data from WA), and 6 s (IDNV, using data from ID and NV). The ground motion level, S_S, can be one of S1 (very low), S2 (low), S3 (moderate), S4 (high), or S5 (very high). The range of S_S that specifies each level varies slightly depending on the T_L region of the site and is summarized in Table 4.4-1. Five spectral response ratio groups (R1, R2, R3, R4, and R5) are defined in Section 4.1.1. Instructions on selecting the appropriate sets of generic RSSPs are provide in Section 4.4.2.

As mentioned in Chapter 3, different scaled sets of probabilistic RSSPs are used to describe short-period and long-period MPRS. Boundaries of these period ranges are defined by the period parameters, T_{amax} and T_{vmax}, which vary by site class. Values of the period parameters, T_{amax} and T_{vmax}, and corresponding values of normalized spectral response, $S_{a,Tamax}$ and $S_{a,Tvmax}$, at these periods are provided by site class in each table.

Table B-1 GTL16S1R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S1 Ground Motion Level ($S_S \leq 0.66$g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.335	0.378	0.443	0.512	0.578	0.619	0.645	0.666	0.619
0.01	0.337	0.380	0.445	0.515	0.581	0.622	0.649	0.670	0.622
0.02	0.347	0.389	0.454	0.520	0.582	0.622	0.646	0.663	0.622
0.03	0.398	0.439	0.501	0.560	0.612	0.639	0.647	0.655	0.639
0.05	0.540	0.584	0.644	0.694	0.729	0.733	0.717	0.709	0.733
0.08	0.698	0.760	0.840	0.901	0.937	0.936	0.913	0.904	0.937
0.10	0.764	0.851	0.970	1.067	1.131	1.148	1.139	1.142	1.148
0.15	0.762	0.874	1.058	1.226	1.359	1.427	1.457	1.484	1.427
0.20	0.675	0.790	**1.000**	1.229	1.426	1.551	1.632	1.692	1.551
0.25	0.583	0.691	0.904	1.165	1.413	1.593	1.733	1.838	1.593
0.30	0.511	0.610	0.815	1.081	1.364	1.587	1.785	1.936	1.587
0.40	0.406	0.486	0.666	0.912	1.205	1.462	1.718	1.914	1.462
0.50	0.335	0.402	0.561	0.784	1.068	1.335	1.617	1.847	1.335
0.75	0.237	0.277	0.391	0.557	0.779	1.005	1.264	1.503	1.005
1.0	0.178	0.204	0.292	0.425	0.604	0.801	1.044	1.276	0.801
1.5	0.118	0.134	0.190	0.280	0.404	0.550	0.746	0.945	0.550
2.0	0.093	0.106	0.146	0.216	0.310	0.425	0.586	0.761	0.425
3.0	0.065	0.077	0.103	0.154	0.220	0.299	0.411	0.539	0.299
4.0	0.051	0.062	0.082	0.121	0.169	0.225	0.303	0.398	0.225
5.0	0.044	0.053	0.069	0.099	0.136	0.178	0.235	0.307	0.178
7.5	0.036	0.044	0.056	0.080	0.106	0.134	0.171	0.228	0.134
10	0.032	0.039	0.049	0.067	0.086	0.105	0.130	0.168	0.105
$S_{a,amax}$ (g)	0.675	0.790	1.000	1.229	1.426	1.593	1.785	1.936	1.593
T_{amax} (s)	0.20	0.20	0.20	0.20	0.20	0.25	0.30	0.30	0.25
$S_{a,vmax}$ (g)	0.093	0.106	0.292	0.216	0.310	0.225	0.411	0.539	0.225
T_{vmax} (s)	2.00	2.00	1.00	2.00	2.00	4.00	3.00	3.00	4.00

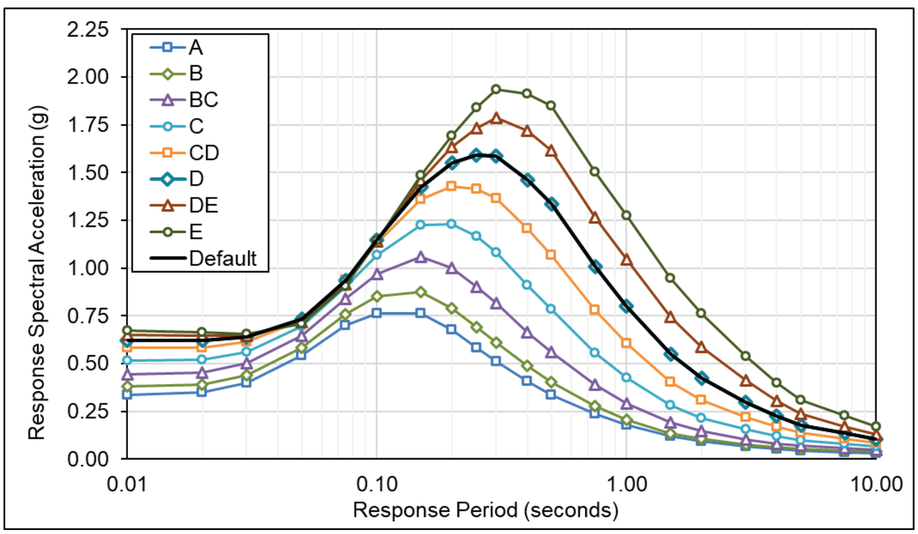


Figure B-1 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-1, GTL16S1R1.

Table B-2 GTL16S1R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S1 Ground Motion Level ($S_S \leq 0.66$g), and R2 Spectral Response Ratio Group ($2.9 \leq R_{S/1} < 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.342	0.384	0.445	0.507	0.564	0.596	0.614	0.635	0.596
0.01	0.344	0.385	0.447	0.509	0.566	0.599	0.617	0.638	0.599
0.02	0.362	0.400	0.459	0.519	0.572	0.603	0.619	0.632	0.603
0.03	0.411	0.447	0.504	0.556	0.599	0.617	0.618	0.622	0.617
0.05	0.545	0.585	0.634	0.672	0.694	0.687	0.663	0.653	0.694
0.08	0.702	0.760	0.829	0.876	0.898	0.886	0.856	0.850	0.898
0.10	0.776	0.861	0.969	1.052	1.101	1.107	1.092	1.104	1.107
0.15	0.768	0.880	1.055	1.209	1.321	1.371	1.389	1.427	1.371
0.20	0.678	0.795	**1.000**	1.218	1.393	1.497	1.563	1.635	1.497
0.25	0.583	0.695	0.905	1.160	1.389	1.546	1.667	1.784	1.546
0.30	0.512	0.616	0.820	1.084	1.351	1.551	1.725	1.887	1.551
0.40	0.411	0.499	0.679	0.927	1.210	1.448	1.679	1.883	1.448
0.50	0.341	0.416	0.577	0.805	1.084	1.337	1.598	1.841	1.337
0.75	0.246	0.297	0.418	0.595	0.824	1.050	1.304	1.571	1.050
1.0	0.192	0.231	0.330	0.482	0.679	0.888	1.141	1.416	0.888
1.5	0.132	0.159	0.228	0.337	0.482	0.646	0.864	1.113	0.646
2.0	0.104	0.127	0.178	0.265	0.379	0.513	0.700	0.925	0.513
3.0	0.073	0.090	0.124	0.186	0.265	0.357	0.487	0.647	0.357
4.0	0.057	0.071	0.096	0.143	0.200	0.264	0.353	0.468	0.264
5.0	0.048	0.059	0.078	0.114	0.155	0.202	0.266	0.350	0.202
7.5	0.036	0.044	0.058	0.082	0.108	0.136	0.174	0.232	0.136
10	0.032	0.038	0.049	0.067	0.086	0.105	0.130	0.168	0.105
$S_{a,amax}$(g)	0.678	0.795	1.000	1.218	1.393	1.551	1.725	1.887	1.551
T_{amax} (s)	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30	0.30
$S_{a,vmax}$(g)	0.104	0.127	0.330	0.265	0.379	0.357	0.487	0.647	0.357
T_{vmax} (s)	2.00	2.00	1.00	2.00	2.00	3.00	3.00	3.00	3.00

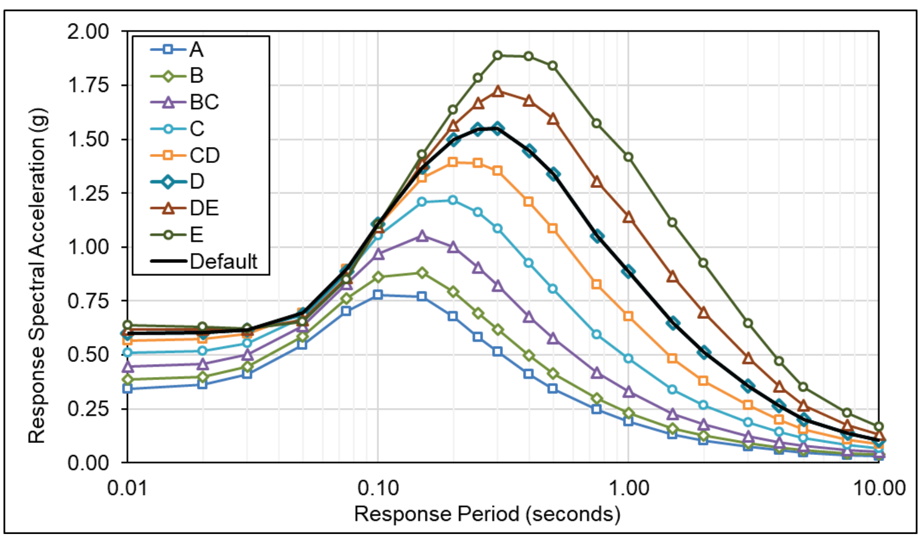


Figure B-2 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-2, GTL16S1R2.

Table B-3 GTL16S2R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S2 Ground Motion Level (0.66g < $S_S \leq$ 1.203g), and R2 Spectral Response Ratio Group (2.9 $\leq R_{S/1}$ < 3.2)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.343	0.382	0.433	0.479	0.514	0.526	0.524	0.538	0.526
0.01	0.344	0.383	0.434	0.479	0.514	0.527	0.524	0.537	0.527
0.02	0.381	0.411	0.459	0.501	0.530	0.538	0.528	0.528	0.538
0.03	0.433	0.462	0.504	0.536	0.555	0.550	0.528	0.520	0.555
0.05	0.564	0.596	0.622	0.631	0.622	0.591	0.546	0.529	0.631
0.08	0.726	0.779	0.822	0.836	0.825	0.788	0.736	0.724	0.836
0.10	0.823	0.909	0.993	1.041	1.054	1.029	0.986	0.994	1.054
0.15	0.794	0.910	1.068	1.186	1.248	1.252	1.229	1.259	1.252
0.20	0.682	0.805	**1.000**	1.184	1.302	1.350	1.365	1.424	1.350
0.25	0.574	0.693	0.894	1.127	1.298	1.390	1.448	1.549	1.390
0.30	0.498	0.609	0.804	1.053	1.262	1.390	1.485	1.621	1.390
0.40	0.396	0.491	0.663	0.900	1.135	1.301	1.441	1.605	1.301
0.50	0.323	0.404	0.557	0.774	1.013	1.199	1.368	1.567	1.199
0.75	0.229	0.287	0.402	0.572	0.779	0.955	1.137	1.363	0.955
1.0	0.177	0.223	0.319	0.467	0.651	0.823	1.016	1.253	0.823
1.5	0.120	0.152	0.218	0.325	0.460	0.603	0.786	1.011	0.603
2.0	0.092	0.117	0.165	0.247	0.351	0.471	0.635	0.845	0.471
3.0	0.061	0.078	0.108	0.163	0.231	0.311	0.422	0.564	0.311
4.0	0.046	0.058	0.081	0.120	0.167	0.220	0.294	0.392	0.220
5.0	0.037	0.046	0.063	0.091	0.124	0.161	0.211	0.279	0.161
7.5	0.025	0.031	0.041	0.059	0.078	0.098	0.125	0.167	0.098
10	0.022	0.027	0.034	0.047	0.060	0.073	0.090	0.117	0.073
$S_{a,amax}$(g)	0.682	0.805	1.000	1.184	1.302	1.390	1.485	1.621	1.390
T_{amax} (s)	0.20	0.20	0.20	0.20	0.20	0.30	0.30	0.30	0.30
$S_{a,vmax}$(g)	0.092	0.117	0.319	0.247	0.351	0.471	0.635	0.564	0.471
T_{vmax} (s)	2.00	2.00	1.00	2.00	2.00	2.00	2.00	3.00	2.00

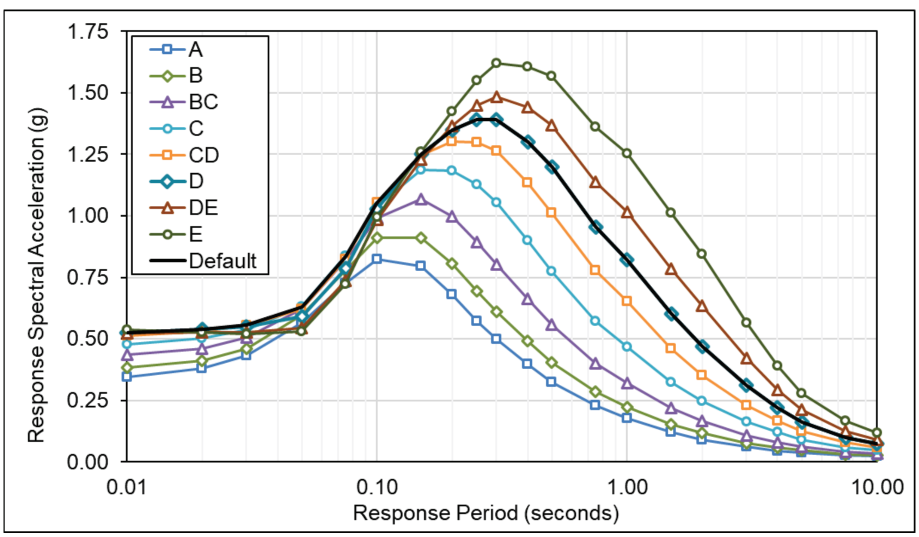


Figure B-3 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-3, GTL16S2R2.

Table B-4 GTL16S2R4, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S2 Ground Motion Level (0.66g < $S_S \leq$ 1.203g), and R4 Spectral Response Ratio Group (2.5 $\leq R_{S/1}$ < 2.7)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.358	0.398	0.447	0.487	0.514	0.521	0.513	0.523	0.521
0.01	0.359	0.399	0.448	0.487	0.514	0.521	0.512	0.522	0.521
0.02	0.392	0.426	0.469	0.501	0.522	0.521	0.505	0.504	0.522
0.03	0.439	0.471	0.507	0.529	0.537	0.525	0.497	0.488	0.537
0.05	0.559	0.589	0.606	0.605	0.588	0.551	0.503	0.484	0.605
0.08	0.710	0.762	0.793	0.797	0.776	0.730	0.672	0.654	0.797
0.10	0.811	0.895	0.965	0.998	0.994	0.954	0.896	0.890	0.998
0.15	0.791	0.907	1.055	1.155	1.197	1.181	1.134	1.145	1.197
0.20	0.682	0.808	**1.000**	1.166	1.264	1.290	1.277	1.313	1.290
0.25	0.584	0.710	0.912	1.138	1.290	1.360	1.388	1.462	1.360
0.30	0.516	0.638	0.840	1.095	1.288	1.396	1.461	1.574	1.396
0.40	0.423	0.532	0.715	0.972	1.202	1.355	1.472	1.622	1.355
0.50	0.352	0.449	0.616	0.856	1.106	1.287	1.443	1.641	1.287
0.75	0.261	0.336	0.469	0.669	0.905	1.093	1.279	1.532	1.093
1.0	0.208	0.270	0.386	0.567	0.786	0.979	1.191	1.468	0.979
1.5	0.147	0.193	0.278	0.414	0.584	0.757	0.974	1.256	0.757
2.0	0.113	0.149	0.214	0.320	0.454	0.605	0.810	1.086	0.605
3.0	0.075	0.099	0.141	0.212	0.300	0.402	0.544	0.732	0.402
4.0	0.057	0.075	0.105	0.156	0.217	0.286	0.379	0.508	0.286
5.0	0.046	0.059	0.081	0.117	0.159	0.206	0.270	0.359	0.206
7.5	0.031	0.040	0.053	0.075	0.099	0.125	0.158	0.213	0.125
10	0.028	0.034	0.044	0.060	0.077	0.093	0.115	0.149	0.093
$S_{a,amax}$ (g)	0.682	0.808	1.000	1.166	1.290	1.396	1.472	1.641	1.396
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.50	0.30
$S_{a,vmax}$ (g)	0.113	0.149	0.386	0.320	0.454	0.605	0.544	0.732	0.605
T_{vmax} (s)	2.00	2.00	1.00	2.00	2.00	2.00	3.00	3.00	2.00

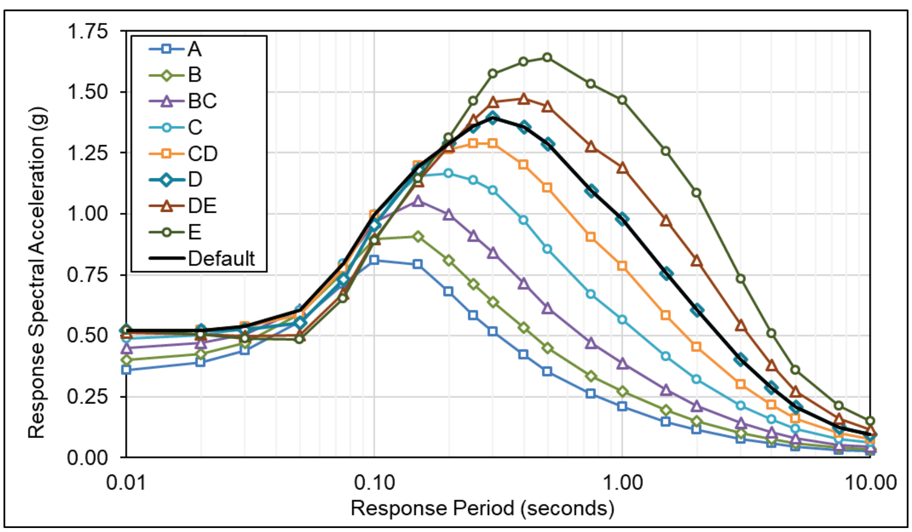


Figure B-4 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-4, GTL16S2R4.

Table B-5 GTL16S2R5, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S2 Ground Motion Level (0.66g < $S_S \leq$ 1.203g), and R5 Spectral Response Ratio Group ($R_{S/1}$ < 2.5)

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.379	0.420	0.462	0.490	0.509	0.513	0.503	0.518	0.513
0.01	0.380	0.420	0.462	0.489	0.508	0.511	0.501	0.515	0.511
0.02	0.419	0.454	0.486	0.504	0.512	0.506	0.485	0.487	0.512
0.03	0.462	0.493	0.516	0.522	0.518	0.501	0.471	0.464	0.522
0.05	0.564	0.588	0.584	0.564	0.535	0.498	0.451	0.435	0.564
0.08	0.705	0.752	0.763	0.749	0.721	0.677	0.618	0.602	0.749
0.10	0.826	0.909	0.957	0.972	0.960	0.919	0.854	0.847	0.972
0.15	0.802	0.921	1.050	1.134	1.167	1.149	1.096	1.107	1.167
0.20	0.683	0.816	**1.000**	1.143	1.231	1.258	1.242	1.279	1.258
0.25	0.589	0.727	0.927	1.142	1.280	1.350	1.376	1.456	1.350
0.30	0.526	0.664	0.868	1.129	1.303	1.410	1.471	1.593	1.410
0.40	0.442	0.569	0.760	1.035	1.254	1.404	1.517	1.684	1.404
0.50	0.370	0.486	0.663	0.923	1.179	1.358	1.515	1.739	1.358
0.75	0.281	0.375	0.522	0.746	1.005	1.203	1.399	1.690	1.203
1.0	0.228	0.309	0.441	0.651	0.900	1.108	1.335	1.656	1.108
1.5	0.167	0.228	0.328	0.492	0.691	0.886	1.129	1.463	0.886
2.0	0.129	0.177	0.255	0.383	0.542	0.718	0.956	1.290	0.718
3.0	0.085	0.116	0.167	0.253	0.358	0.477	0.643	0.871	0.477
4.0	0.065	0.088	0.125	0.186	0.258	0.338	0.448	0.602	0.338
5.0	0.052	0.068	0.095	0.138	0.187	0.242	0.315	0.421	0.242
7.5	0.035	0.046	0.062	0.088	0.116	0.145	0.183	0.247	0.145
10	0.031	0.039	0.051	0.070	0.089	0.108	0.133	0.172	0.108
$S_{a,amax}$ (g)	0.683	0.816	1.000	1.143	1.303	1.410	1.517	1.739	1.410
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.30	0.40	0.50	0.30
$S_{a,vmax}$ (g)	0.129	0.177	0.441	0.383	0.542	0.718	0.643	0.871	0.718
T_{vmax} (s)	2.00	2.00	1.00	2.00	2.00	2.00	3.00	3.00	2.00

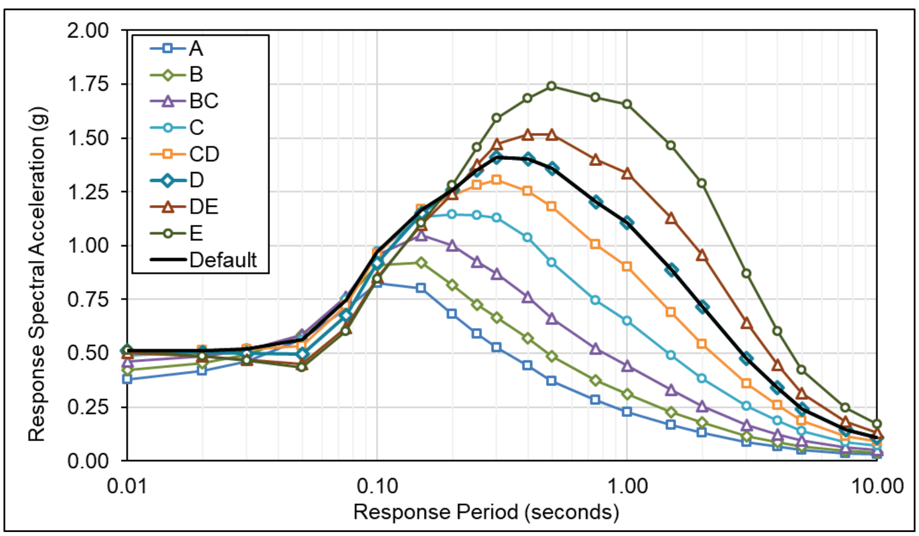


Figure B-5 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-5, GTL16S2R5.

Table B-6 GTL16S3R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S3 Ground Motion Level (1.203g < $S_S \leq$ 1.708g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.349	0.387	0.430	0.464	0.490	0.501	0.500	0.521	0.501
0.01	0.350	0.388	0.430	0.464	0.490	0.499	0.498	0.518	0.499
0.02	0.406	0.429	0.467	0.496	0.514	0.515	0.502	0.500	0.515
0.03	0.458	0.481	0.511	0.531	0.540	0.530	0.506	0.497	0.540
0.05	0.583	0.608	0.616	0.608	0.590	0.558	0.515	0.502	0.608
0.08	0.750	0.800	0.824	0.825	0.811	0.778	0.728	0.722	0.825
0.10	0.874	0.962	1.030	1.068	1.083	1.066	1.025	1.041	1.083
0.15	0.823	0.945	1.089	1.200	1.265	1.280	1.263	1.309	1.280
0.20	0.684	0.814	**1.000**	1.169	1.286	1.346	1.376	1.454	1.346
0.25	0.562	0.690	0.883	1.104	1.264	1.364	1.435	1.559	1.364
0.30	0.481	0.601	0.788	1.029	1.216	1.340	1.438	1.595	1.340
0.40	0.379	0.482	0.645	0.877	1.083	1.231	1.358	1.531	1.231
0.50	0.302	0.390	0.534	0.742	0.957	1.115	1.260	1.461	1.115
0.75	0.210	0.274	0.382	0.545	0.735	0.882	1.028	1.241	0.882
1.0	0.162	0.213	0.304	0.448	0.620	0.765	0.922	1.137	0.765
1.5	0.110	0.147	0.211	0.316	0.444	0.571	0.728	0.936	0.571
2.0	0.083	0.111	0.159	0.238	0.337	0.447	0.597	0.800	0.447
3.0	0.054	0.071	0.102	0.153	0.217	0.290	0.392	0.528	0.290
4.0	0.040	0.053	0.074	0.110	0.153	0.201	0.266	0.357	0.201
5.0	0.031	0.040	0.055	0.080	0.109	0.142	0.185	0.246	0.142
7.5	0.021	0.026	0.035	0.050	0.066	0.083	0.105	0.141	0.083
10	0.018	0.022	0.029	0.039	0.050	0.061	0.075	0.097	0.061
$S_{a,amax}$(g)	0.684	0.814	1.000	1.169	1.286	1.364	1.438	1.595	1.364
T_{amax} (s)	0.20	0.20	0.20	0.20	0.20	0.25	0.30	0.30	0.25
$S_{a,vmax}$(g)	0.083	0.111	0.304	0.238	0.337	0.447	0.597	0.800	0.447
T_{vmax} (s)	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00

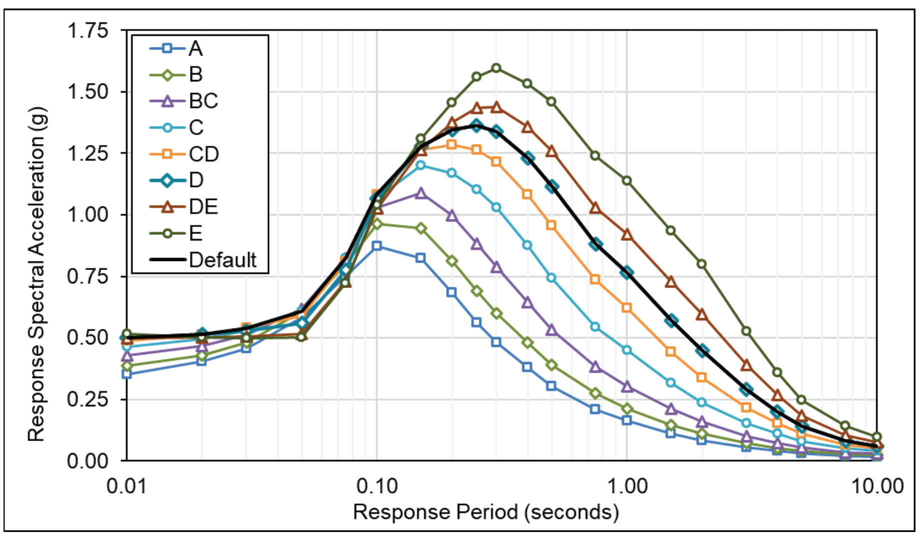


Figure B-6 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-6, GTL16S3R1.

Table B-7 **GTL16S3R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S3 Ground Motion Level (1.203g < $S_S \le$ 1.708g), and R2 Spectral Response Ratio Group (2.9 $\le R_{S/1}$ < 3.2)**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.343	0.382	0.433	0.474	0.504	0.509	0.500	0.508	0.509
0.01	0.344	0.383	0.434	0.475	0.505	0.510	0.500	0.508	0.510
0.02	0.380	0.411	0.458	0.495	0.519	0.519	0.503	0.498	0.519
0.03	0.432	0.463	0.503	0.531	0.543	0.531	0.502	0.490	0.543
0.05	0.569	0.601	0.624	0.628	0.612	0.574	0.524	0.504	0.628
0.08	0.734	0.788	0.825	0.833	0.811	0.764	0.705	0.688	0.833
0.10	0.831	0.918	0.996	1.033	1.031	0.992	0.937	0.935	1.033
0.15	0.799	0.915	1.071	1.175	1.217	1.201	1.158	1.173	1.217
0.20	0.683	0.805	**1.000**	1.172	1.267	1.289	1.278	1.316	1.289
0.25	0.575	0.693	0.894	1.119	1.267	1.330	1.357	1.431	1.330
0.30	0.499	0.609	0.804	1.048	1.236	1.334	1.395	1.500	1.334
0.40	0.397	0.491	0.663	0.900	1.118	1.256	1.361	1.492	1.256
0.50	0.323	0.404	0.556	0.772	1.001	1.161	1.295	1.459	1.161
0.75	0.229	0.287	0.402	0.572	0.774	0.932	1.082	1.277	0.932
1.0	0.176	0.222	0.317	0.465	0.645	0.802	0.970	1.178	0.802
1.5	0.119	0.151	0.217	0.323	0.456	0.593	0.762	0.971	0.593
2.0	0.091	0.115	0.163	0.244	0.346	0.463	0.621	0.825	0.463
3.0	0.059	0.075	0.105	0.158	0.224	0.301	0.409	0.547	0.301
4.0	0.044	0.056	0.077	0.115	0.160	0.211	0.281	0.374	0.211
5.0	0.035	0.044	0.059	0.085	0.116	0.151	0.199	0.262	0.151
7.5	0.024	0.030	0.038	0.054	0.072	0.091	0.116	0.154	0.091
10	0.021	0.025	0.031	0.043	0.055	0.067	0.083	0.106	0.067
$S_{a,amax}$ (g)	0.683	0.805	1.000	1.172	1.267	1.334	1.395	1.500	1.334
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.30	0.30	0.30
$S_{a,vmax}$ (g)	0.091	0.115	0.317	0.244	0.346	0.463	0.621	0.825	0.463
T_{vmax} (s)	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00

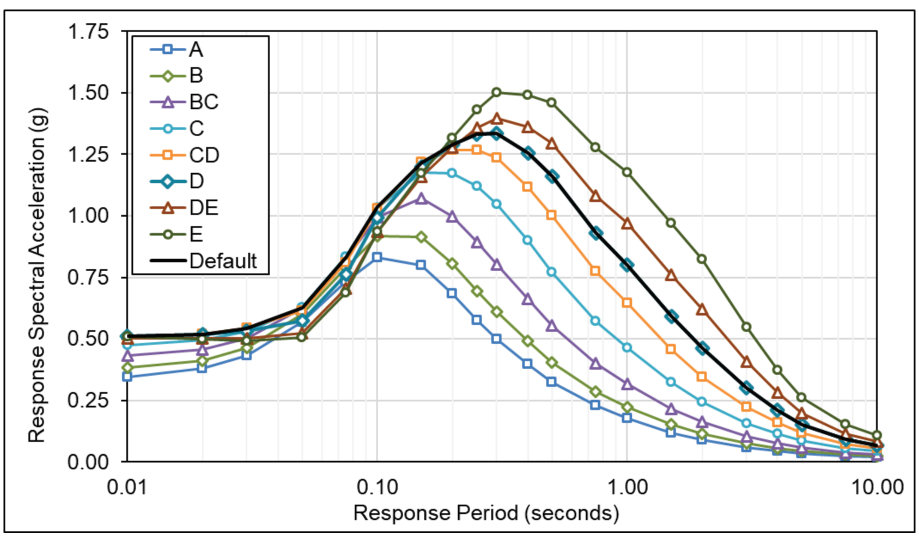


Figure B-7 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-7, GTL16S3R2.

Table B-8 GTL16S3R5, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S3 Ground Motion Level (1.203g < $S_S \le$ 1.708g), and R5 Spectral Response Ratio Group ($R_{S/1}$ < 2.5)

Period *T (s)*	5% -Damped Response Spectral Acceleration (g)								
	A	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.389	0.430	0.459	0.448	0.424	0.393	0.358	0.354	0.448
0.01	0.390	0.431	0.459	0.447	0.423	0.392	0.356	0.351	0.447
0.02	0.439	0.476	0.488	0.462	0.426	0.387	0.345	0.333	0.462
0.03	0.493	0.527	0.520	0.479	0.431	0.383	0.334	0.317	0.479
0.05	0.627	0.651	0.594	0.517	0.441	0.375	0.313	0.290	0.517
0.08	0.768	0.818	0.758	0.670	0.579	0.497	0.422	0.398	0.670
0.10	0.890	0.979	0.942	0.857	0.758	0.664	0.576	0.555	0.857
0.15	0.831	0.954	1.035	0.992	0.905	0.810	0.717	0.703	0.992
0.20	0.684	0.820	**1.000**	1.012	0.957	0.882	0.804	0.802	1.012
0.25	0.594	0.735	0.936	1.060	1.029	0.964	0.893	0.908	1.060
0.30	0.528	0.670	0.875	1.090	1.078	1.022	0.956	0.986	1.090
0.40	0.442	0.573	0.764	1.041	1.093	1.055	1.001	1.043	1.093
0.50	0.364	0.480	0.654	0.912	1.053	1.042	1.009	1.079	1.053
0.75	0.273	0.366	0.510	0.728	0.936	0.969	0.978	1.090	0.969
1.0	0.215	0.295	0.420	0.620	0.832	0.907	0.964	1.112	0.907
1.5	0.157	0.216	0.311	0.466	0.644	0.773	0.912	1.126	0.773
2.0	0.119	0.164	0.236	0.355	0.499	0.649	0.845	1.120	0.649
3.0	0.075	0.103	0.149	0.225	0.317	0.423	0.570	0.773	0.423
4.0	0.054	0.073	0.105	0.156	0.217	0.284	0.375	0.506	0.284
5.0	0.041	0.054	0.075	0.110	0.149	0.192	0.250	0.335	0.192
7.5	0.027	0.035	0.047	0.067	0.088	0.110	0.140	0.188	0.110
10	0.023	0.029	0.038	0.052	0.067	0.081	0.098	0.128	0.081
$S_{a,amax}$**(g)**	0.684	0.820	1.000	1.090	1.093	1.055	1.009	1.079	1.093
T_{amax} **(s)**	0.20	0.20	0.20	0.30	0.40	0.40	0.50	0.50	0.40
$S_{a,vmax}$**(g)**	0.119	0.164	0.420	0.355	0.499	0.649	0.570	0.773	0.649
T_{vmax} **(s)**	2.00	2.00	1.00	2.00	2.00	2.00	3.00	3.00	2.00

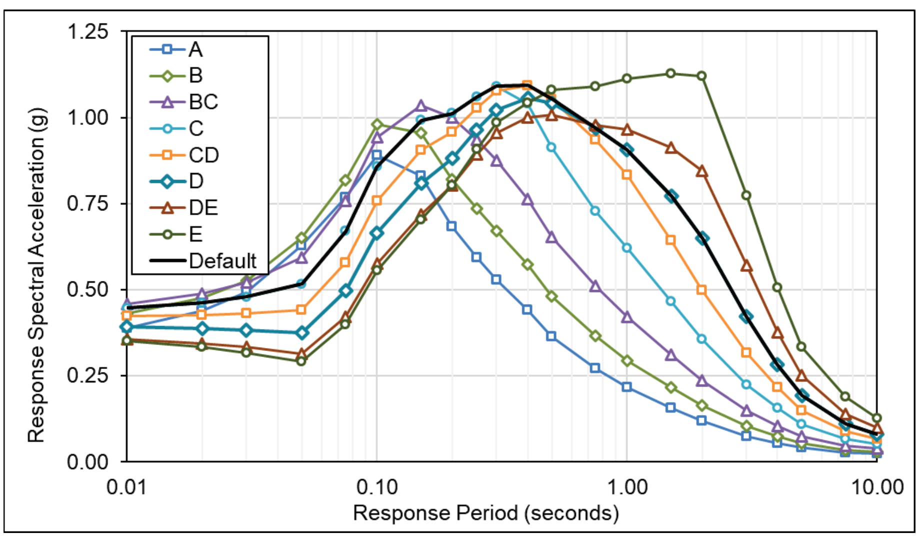


Figure B-8 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-8, GTL16S3R5.

Table B-9 GTL16S4R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S4 Ground Motion Level (1.708g < $S_S \leq$ 2.298g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.344	0.381	0.426	0.460	0.483	0.487	0.481	0.498	0.487
0.01	0.345	0.382	0.426	0.460	0.482	0.486	0.480	0.495	0.486
0.02	0.397	0.422	0.461	0.490	0.505	0.501	0.483	0.478	0.505
0.03	0.452	0.475	0.508	0.526	0.531	0.516	0.486	0.475	0.531
0.05	0.585	0.612	0.621	0.610	0.586	0.547	0.499	0.483	0.610
0.08	0.754	0.804	0.828	0.823	0.799	0.757	0.702	0.693	0.823
0.10	0.869	0.957	1.024	1.055	1.057	1.030	0.984	0.997	1.057
0.15	0.819	0.939	1.085	1.185	1.233	1.234	1.210	1.250	1.234
0.20	0.684	0.812	**1.000**	1.162	1.258	1.298	1.315	1.386	1.298
0.25	0.564	0.689	0.882	1.100	1.241	1.315	1.369	1.483	1.315
0.30	0.483	0.599	0.787	1.024	1.197	1.295	1.371	1.513	1.295
0.40	0.381	0.479	0.644	0.872	1.072	1.195	1.295	1.449	1.195
0.50	0.305	0.388	0.532	0.738	0.946	1.085	1.203	1.379	1.085
0.75	0.212	0.270	0.377	0.537	0.722	0.855	0.980	1.165	0.855
1.0	0.162	0.207	0.296	0.434	0.599	0.735	0.875	1.065	0.735
1.5	0.108	0.139	0.200	0.298	0.419	0.539	0.685	0.871	0.539
2.0	0.080	0.104	0.148	0.221	0.314	0.417	0.558	0.742	0.417
3.0	0.051	0.066	0.093	0.140	0.199	0.267	0.362	0.485	0.267
4.0	0.037	0.048	0.067	0.100	0.139	0.183	0.243	0.325	0.183
5.0	0.029	0.037	0.050	0.073	0.099	0.129	0.169	0.223	0.129
7.5	0.019	0.024	0.032	0.045	0.059	0.074	0.094	0.126	0.074
10	0.016	0.020	0.026	0.035	0.044	0.054	0.066	0.086	0.054
$S_{a,amax}$ (g)	0.684	0.812	1.000	1.162	1.258	1.315	1.371	1.513	1.315
T_{amax} (s)	0.20	0.20	0.20	0.20	0.20	0.25	0.30	0.30	0.25
$S_{a,vmax}$ (g)	0.108	0.139	0.296	0.298	0.419	0.417	0.558	0.742	0.417
T_{vmax} (s)	1.50	1.50	1.00	1.50	1.50	2.00	2.00	2.00	2.00

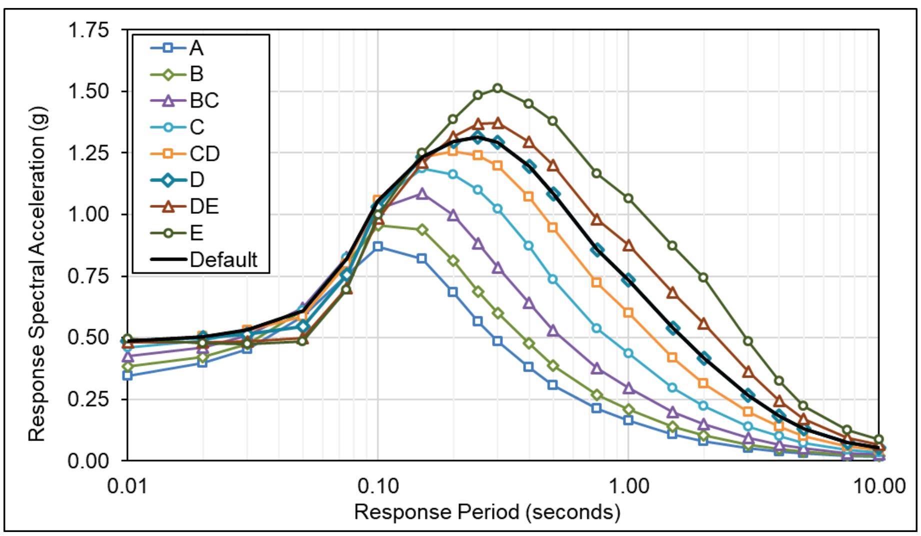


Figure B-9 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-9, GTL16S4R1.

Table B-10 GTL16S4R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S4 Ground Motion Level (1.708g < $S_S \leq$ 2.298g), and R2 Spectral Response Ratio Group (2.9 $\leq R_{S/1}$ < 3.2)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.352	0.389	0.432	0.458	0.472	0.469	0.455	0.467	0.472
0.01	0.353	0.390	0.432	0.458	0.471	0.468	0.454	0.465	0.471
0.02	0.402	0.430	0.465	0.485	0.491	0.479	0.455	0.448	0.491
0.03	0.457	0.483	0.509	0.519	0.512	0.490	0.456	0.442	0.519
0.05	0.591	0.618	0.617	0.595	0.560	0.514	0.461	0.443	0.595
0.08	0.755	0.805	0.816	0.796	0.758	0.706	0.646	0.633	0.796
0.10	0.869	0.958	1.009	1.019	1.001	0.959	0.903	0.908	1.019
0.15	0.819	0.940	1.077	1.152	1.172	1.151	1.111	1.139	1.172
0.20	0.684	0.812	**1.000**	1.138	1.202	1.216	1.210	1.266	1.216
0.25	0.569	0.697	0.891	1.095	1.203	1.246	1.270	1.362	1.246
0.30	0.492	0.612	0.803	1.038	1.178	1.241	1.284	1.401	1.241
0.40	0.393	0.498	0.667	0.905	1.081	1.171	1.234	1.362	1.171
0.50	0.317	0.406	0.557	0.773	0.972	1.081	1.163	1.315	1.081
0.75	0.225	0.290	0.406	0.578	0.771	0.885	0.984	1.152	0.885
1.0	0.173	0.226	0.322	0.473	0.649	0.777	0.898	1.078	0.777
1.5	0.118	0.155	0.223	0.333	0.467	0.590	0.737	0.931	0.590
2.0	0.088	0.116	0.166	0.249	0.352	0.466	0.618	0.823	0.466
3.0	0.055	0.073	0.104	0.157	0.222	0.298	0.403	0.542	0.298
4.0	0.040	0.053	0.074	0.111	0.154	0.202	0.268	0.360	0.202
5.0	0.031	0.040	0.055	0.079	0.108	0.140	0.183	0.244	0.140
7.5	0.020	0.026	0.034	0.049	0.064	0.080	0.102	0.137	0.080
10	0.017	0.021	0.028	0.038	0.048	0.058	0.072	0.093	0.058
$S_{a,amax}$(g)	0.684	0.812	1.000	1.138	1.203	1.246	1.284	1.401	1.246
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.25	0.30	0.30	0.25
$S_{a,vmax}$(g)	0.118	0.155	0.322	0.333	0.352	0.466	0.618	0.823	0.466
T_{vmax} (s)	1.50	1.50	1.00	1.50	2.00	2.00	2.00	2.00	2.00

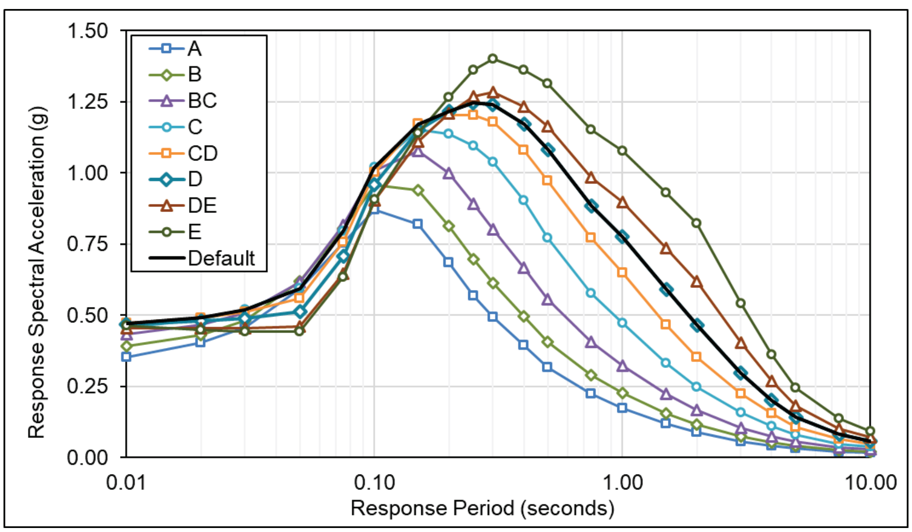


Figure B-10 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-10, GTL16S4R2.

Table B-11 **GTL16S4R4, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S4 Ground Motion Level (1.708g < S_S ≤ 2.298g), and R4 Spectral Response Ratio Group (2.5 ≤ $R_{S/1}$< 2.7)**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.376	0.416	0.448	0.445	0.429	0.404	0.374	0.373	0.445
0.01	0.378	0.417	0.448	0.444	0.428	0.403	0.372	0.371	0.444
0.02	0.426	0.461	0.478	0.463	0.437	0.404	0.366	0.354	0.463
0.03	0.482	0.514	0.515	0.485	0.447	0.405	0.360	0.342	0.485
0.05	0.619	0.644	0.601	0.537	0.471	0.409	0.350	0.328	0.537
0.08	0.767	0.816	0.774	0.702	0.624	0.549	0.476	0.454	0.702
0.10	0.887	0.976	0.958	0.895	0.816	0.733	0.652	0.636	0.895
0.15	0.829	0.951	1.046	1.030	0.966	0.886	0.805	0.798	1.030
0.20	0.684	0.816	**1.000**	1.039	1.010	0.952	0.889	0.897	1.039
0.25	0.586	0.723	0.921	1.061	1.058	1.014	0.962	0.991	1.061
0.30	0.517	0.651	0.851	1.067	1.083	1.050	1.005	1.050	1.083
0.40	0.427	0.548	0.732	0.996	1.066	1.050	1.018	1.073	1.066
0.50	0.349	0.456	0.622	0.867	1.009	1.014	1.001	1.079	1.014
0.75	0.258	0.343	0.477	0.681	0.877	0.913	0.928	1.039	0.913
1.0	0.202	0.273	0.389	0.574	0.770	0.843	0.897	1.034	0.843
1.5	0.144	0.197	0.284	0.425	0.589	0.704	0.834	1.025	0.704
2.0	0.109	0.149	0.214	0.323	0.453	0.588	0.767	1.018	0.588
3.0	0.068	0.093	0.135	0.203	0.288	0.384	0.517	0.699	0.384
4.0	0.049	0.066	0.094	0.141	0.196	0.256	0.339	0.457	0.256
5.0	0.037	0.049	0.068	0.099	0.134	0.173	0.226	0.302	0.173
7.5	0.024	0.031	0.042	0.060	0.080	0.099	0.125	0.169	0.099
10	0.021	0.026	0.034	0.047	0.060	0.072	0.088	0.115	0.072
$S_{a,amax}$(g)	0.684	0.816	1.000	1.067	1.083	1.050	1.018	1.079	1.083
T_{amax} (s)	0.20	0.20	0.20	0.30	0.30	0.40	0.40	0.50	0.30
$S_{a,vmax}$(g)	0.109	0.149	0.389	0.323	0.453	0.588	0.517	0.699	0.588
T_{vmax} (s)	2.00	2.00	1.00	2.00	2.00	2.00	3.00	3.00	2.00

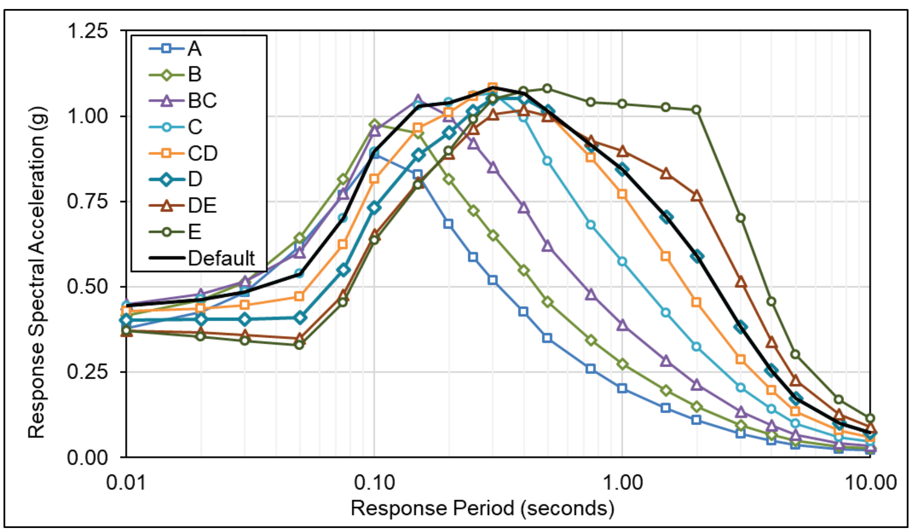


Figure B-11 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-11, GTL16S4R4.

Table B-12 GTL16S4R5, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S4 Ground Motion Level (1.708g < $S_S \leq$ 2.298g), and R5 Spectral Response Ratio Group ($R_{S/1}$ < 2.5)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.383	0.424	0.454	0.444	0.421	0.388	0.348	0.337	0.444
0.01	0.384	0.424	0.454	0.443	0.420	0.387	0.346	0.335	0.443
0.02	0.431	0.469	0.482	0.457	0.422	0.380	0.332	0.315	0.457
0.03	0.487	0.521	0.516	0.476	0.427	0.375	0.319	0.297	0.476
0.05	0.629	0.653	0.598	0.523	0.446	0.374	0.304	0.273	0.523
0.08	0.768	0.818	0.760	0.673	0.577	0.485	0.393	0.357	0.673
0.10	0.883	0.975	0.938	0.851	0.743	0.628	0.516	0.474	0.851
0.15	0.826	0.949	1.036	0.989	0.891	0.772	0.644	0.597	0.989
0.20	0.684	0.814	**1.000**	1.015	0.948	0.847	0.727	0.683	1.015
0.25	0.593	0.734	0.934	1.064	1.031	0.942	0.828	0.796	1.064
0.30	0.528	0.667	0.871	1.090	1.082	1.010	0.907	0.891	1.090
0.40	0.441	0.569	0.760	1.035	1.096	1.057	0.977	0.982	1.096
0.50	0.361	0.475	0.648	0.903	1.048	1.042	0.995	1.035	1.048
0.75	0.269	0.360	0.501	0.716	0.923	0.963	0.972	1.074	0.963
1.0	0.211	0.287	0.409	0.605	0.812	0.892	0.951	1.092	0.892
1.5	0.152	0.210	0.302	0.452	0.625	0.753	0.892	1.102	0.753
2.0	0.114	0.158	0.228	0.344	0.484	0.628	0.818	1.088	0.628
3.0	0.071	0.098	0.142	0.214	0.302	0.403	0.543	0.736	0.403
4.0	0.051	0.069	0.098	0.147	0.204	0.267	0.353	0.475	0.267
5.0	0.038	0.051	0.070	0.103	0.139	0.179	0.234	0.313	0.179
7.5	0.025	0.032	0.044	0.062	0.082	0.102	0.129	0.175	0.102
10	0.022	0.027	0.036	0.049	0.062	0.075	0.091	0.118	0.075
$S_{a,amax}$**(g)**	0.684	0.814	1.000	1.090	1.096	1.057	0.995	1.035	1.096
T_{amax} **(s)**	0.20	0.20	0.20	0.30	0.40	0.40	0.50	0.50	0.40
$S_{a,vmax}$**(g)**	0.114	0.158	0.409	0.344	0.484	0.628	0.818	0.736	0.628
T_{vmax} **(s)**	2.00	2.00	1.00	2.00	2.00	2.00	2.00	3.00	2.00

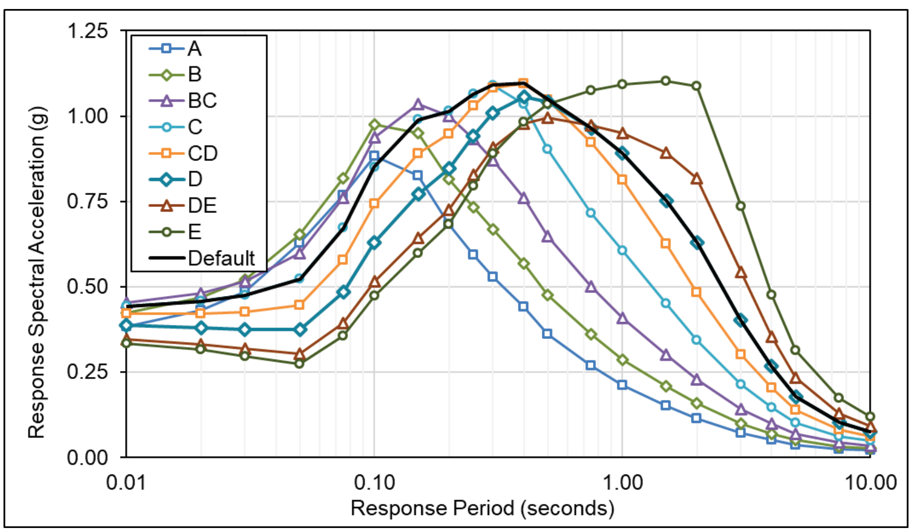


Figure B-12 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-12, GTL16S4R5.

Table B-13 GTL16S5R4, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 16 s, S5 Ground Motion Level (S_S> 2.298g), and R4 Spectral Response Ratio Group (2.5 ≤ $R_{S/1}$< 2.7)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.377	0.417	0.447	0.434	0.403	0.360	0.314	0.299	0.434
0.01	0.378	0.418	0.447	0.433	0.402	0.359	0.313	0.298	0.433
0.02	0.423	0.461	0.474	0.446	0.403	0.353	0.302	0.283	0.446
0.03	0.482	0.517	0.511	0.466	0.410	0.350	0.292	0.269	0.466
0.05	0.637	0.663	0.604	0.523	0.437	0.359	0.291	0.263	0.523
0.08	0.781	0.832	0.767	0.666	0.556	0.455	0.370	0.338	0.666
0.10	0.891	0.980	0.934	0.827	0.694	0.573	0.470	0.434	0.827
0.15	0.831	0.950	1.032	0.959	0.828	0.692	0.573	0.534	0.959
0.20	0.684	0.818	**1.000**	0.993	0.886	0.757	0.637	0.600	0.993
0.25	0.595	0.727	0.931	1.046	0.966	0.838	0.712	0.678	1.046
0.30	0.527	0.661	0.866	1.070	1.021	0.900	0.774	0.745	1.070
0.40	0.438	0.560	0.749	1.014	1.046	0.952	0.833	0.809	1.046
0.50	0.358	0.465	0.635	0.883	1.004	0.945	0.850	0.847	1.004
0.75	0.265	0.349	0.486	0.693	0.885	0.883	0.833	0.872	0.885
1.0	0.206	0.274	0.391	0.576	0.769	0.816	0.826	0.904	0.816
1.5	0.147	0.198	0.285	0.427	0.588	0.696	0.804	0.967	0.696
2.0	0.110	0.149	0.213	0.320	0.451	0.586	0.756	0.996	0.586
3.0	0.068	0.092	0.131	0.198	0.279	0.373	0.504	0.680	0.373
4.0	0.048	0.063	0.089	0.133	0.184	0.241	0.320	0.430	0.241
5.0	0.036	0.046	0.063	0.091	0.124	0.161	0.210	0.280	0.161
7.5	0.023	0.029	0.039	0.055	0.073	0.091	0.115	0.154	0.091
10	0.020	0.024	0.031	0.042	0.054	0.065	0.080	0.103	0.065
$S_{a,amax}$(g)	0.684	0.818	1.000	1.070	1.046	0.952	0.850	0.847	1.070
T_{amax} (s)	0.20	0.20	0.20	0.30	0.40	0.40	0.50	0.50	0.30
$S_{a,vmax}$(g)	0.110	0.198	0.391	0.320	0.451	0.586	0.756	0.680	0.586
T_{vmax} (s)	2.00	1.50	1.00	2.00	2.00	2.00	2.00	3.00	2.00

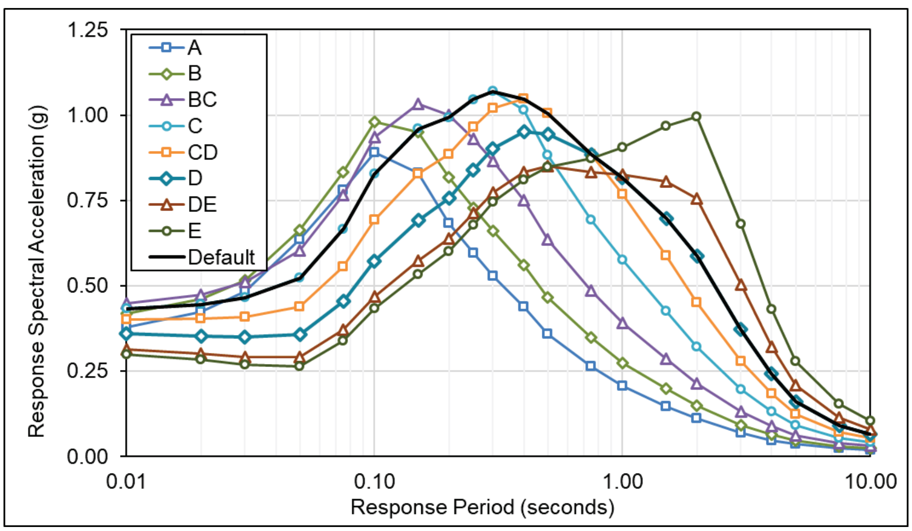


Figure B-13 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-13, GTL16S5R4.

Table B-14 GTL12S1R4, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 12 s, S1 Ground Motion Level ($S_S \leq 0.696$g), and R4 Spectral Response Ratio Group ($2.5 \leq R_{S/1} < 2.7$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.337	0.378	0.443	0.511	0.576	0.615	0.642	0.664	0.615
0.01	0.339	0.380	0.445	0.513	0.578	0.619	0.646	0.669	0.619
0.02	0.350	0.390	0.453	0.518	0.579	0.619	0.644	0.662	0.619
0.03	0.402	0.440	0.500	0.557	0.608	0.634	0.645	0.655	0.634
0.05	0.546	0.586	0.641	0.687	0.720	0.724	0.713	0.709	0.724
0.08	0.696	0.755	0.829	0.886	0.920	0.920	0.905	0.903	0.920
0.10	0.756	0.839	0.952	1.044	1.105	1.125	1.126	1.138	1.125
0.15	0.752	0.861	1.041	1.204	1.334	1.407	1.451	1.489	1.407
0.20	0.675	0.789	**1.000**	1.231	1.430	1.559	1.652	1.722	1.559
0.25	0.595	0.705	0.923	1.195	1.453	1.641	1.794	1.907	1.641
0.30	0.532	0.636	0.851	1.133	1.437	1.675	1.892	2.053	1.675
0.40	0.442	0.534	0.732	1.005	1.341	1.632	1.922	2.135	1.632
0.50	0.380	0.464	0.646	0.905	1.242	1.556	1.880	2.130	1.556
0.75	0.293	0.344	0.485	0.689	0.967	1.247	1.559	1.834	1.247
1.0	0.232	0.261	0.372	0.538	0.765	1.014	1.312	1.581	1.014
1.5	0.164	0.179	0.252	0.369	0.533	0.727	0.984	1.227	0.727
2.0	0.133	0.144	0.192	0.280	0.403	0.554	0.763	0.973	0.554
3.0	0.095	0.103	0.128	0.188	0.270	0.372	0.515	0.661	0.372
4.0	0.074	0.080	0.098	0.142	0.201	0.272	0.372	0.475	0.272
5.0	0.062	0.067	0.080	0.114	0.158	0.211	0.284	0.359	0.211
7.5	0.049	0.053	0.061	0.084	0.114	0.147	0.193	0.242	0.147
10	0.041	0.045	0.051	0.068	0.089	0.112	0.143	0.175	0.112
$S_{a,amax}$**(g)**	0.675	0.789	1.000	1.231	1.453	1.675	1.922	2.135	1.675
T_{amax} **(s)**	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.40	0.30
$S_{a,vmax}$**(g)**	0.133	0.144	0.372	0.280	0.403	0.372	0.515	0.661	0.372
T_{vmax} **(s)**	2.00	2.00	1.00	2.00	2.00	3.00	3.00	3.00	3.00

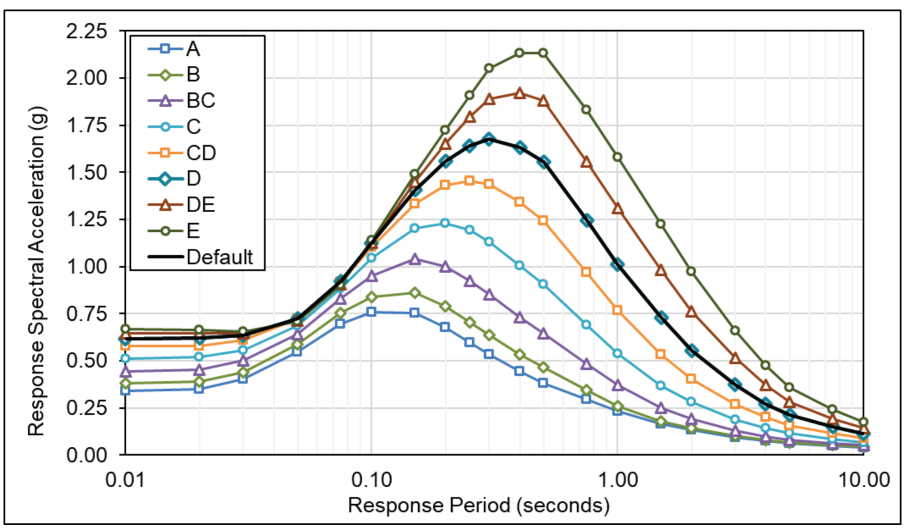


Figure B-14 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-14, GTL12S1R4.

Table B-15 GTL12S2R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 12 s, S2 Ground Motion Level (0.696g < S_S ≤ 1.114g), and R1 Spectral Response Ratio Group ($R_{S/1}$ ≥ 3.2)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.329	0.369	0.433	0.494	0.540	0.552	0.544	0.540	0.552
0.01	0.331	0.371	0.435	0.496	0.543	0.556	0.548	0.545	0.556
0.02	0.341	0.382	0.445	0.503	0.545	0.557	0.546	0.539	0.557
0.03	0.397	0.437	0.496	0.543	0.574	0.570	0.544	0.530	0.574
0.05	0.557	0.599	0.648	0.680	0.684	0.653	0.603	0.577	0.684
0.08	0.720	0.781	0.846	0.880	0.872	0.825	0.764	0.736	0.880
0.10	0.778	0.863	0.968	1.029	1.034	0.991	0.931	0.907	1.034
0.15	0.767	0.874	1.053	1.178	1.231	1.209	1.154	1.131	1.231
0.20	0.680	0.789	**1.000**	1.203	1.314	1.327	1.290	1.274	1.327
0.25	0.590	0.693	0.907	1.157	1.331	1.393	1.392	1.396	1.393
0.30	0.520	0.614	0.821	1.079	1.311	1.420	1.466	1.499	1.420
0.40	0.418	0.497	0.680	0.927	1.200	1.367	1.478	1.549	1.367
0.50	0.350	0.418	0.583	0.811	1.084	1.283	1.432	1.534	1.283
0.75	0.256	0.295	0.417	0.592	0.818	1.008	1.178	1.313	1.008
1.0	0.197	0.218	0.311	0.448	0.632	0.810	0.993	1.137	0.810
1.5	0.133	0.142	0.199	0.291	0.419	0.564	0.742	0.894	0.564
2.0	0.105	0.111	0.146	0.211	0.305	0.419	0.576	0.718	0.419
3.0	0.075	0.078	0.094	0.137	0.197	0.274	0.383	0.483	0.274
4.0	0.058	0.061	0.071	0.102	0.145	0.199	0.275	0.345	0.199
5.0	0.050	0.051	0.058	0.081	0.114	0.155	0.210	0.261	0.155
7.5	0.038	0.039	0.042	0.058	0.078	0.102	0.135	0.164	0.102
10	0.030	0.030	0.033	0.043	0.056	0.072	0.092	0.109	0.072
$S_{a,amax}$(g)	0.680	0.789	1.000	1.203	1.331	1.420	1.478	1.549	1.420
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.40	0.30
$S_{a,vmax}$(g)	0.105	0.111	0.311	0.448	0.632	0.564	0.576	0.483	0.564
T_{vmax} (s)	2.00	2.00	1.00	1.00	1.00	1.50	2.00	3.00	1.50

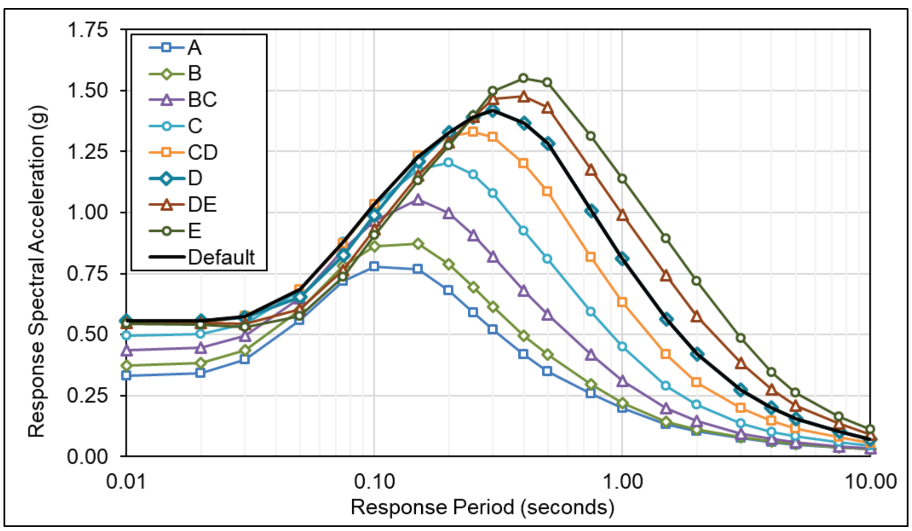


Figure B-15 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-15, GTL12S2R1.

Table B-16 GTL12S2R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 12 s, S2 Ground Motion Level (0.696g < $S_S \leq$ 1.114g), and R2 Spectral Response Ratio Group (2.9 $\leq R_{S/1}$ < 3.2)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.331	0.372	0.437	0.502	0.560	0.590	0.603	0.615	0.590
0.01	0.333	0.374	0.439	0.504	0.563	0.593	0.607	0.619	0.593
0.02	0.343	0.384	0.447	0.510	0.565	0.594	0.606	0.614	0.594
0.03	0.397	0.437	0.496	0.550	0.594	0.610	0.607	0.607	0.610
0.05	0.549	0.591	0.644	0.686	0.708	0.700	0.674	0.662	0.708
0.08	0.707	0.766	0.838	0.887	0.906	0.888	0.855	0.844	0.906
0.10	0.766	0.850	0.961	1.042	1.083	1.079	1.056	1.055	1.083
0.15	0.759	0.867	1.048	1.198	1.301	1.338	1.345	1.358	1.338
0.20	0.677	0.788	**1.000**	1.221	1.389	1.476	1.520	1.555	1.476
0.25	0.591	0.698	0.915	1.177	1.406	1.548	1.644	1.712	1.548
0.30	0.524	0.623	0.834	1.106	1.382	1.574	1.727	1.837	1.574
0.40	0.427	0.513	0.703	0.963	1.273	1.517	1.740	1.896	1.517
0.50	0.362	0.438	0.610	0.853	1.161	1.431	1.688	1.878	1.431
0.75	0.271	0.316	0.445	0.633	0.884	1.126	1.380	1.595	1.126
1.0	0.211	0.235	0.335	0.483	0.686	0.901	1.149	1.360	0.901
1.5	0.146	0.156	0.218	0.319	0.462	0.629	0.846	1.041	0.629
2.0	0.116	0.123	0.162	0.236	0.340	0.469	0.647	0.815	0.469
3.0	0.082	0.087	0.106	0.154	0.222	0.307	0.428	0.544	0.307
4.0	0.063	0.067	0.080	0.115	0.163	0.223	0.307	0.387	0.223
5.0	0.053	0.056	0.065	0.092	0.129	0.173	0.234	0.293	0.173
7.5	0.042	0.044	0.050	0.068	0.092	0.120	0.158	0.196	0.120
10	0.035	0.036	0.041	0.054	0.071	0.090	0.115	0.140	0.090
$S_{a,amax}$(g)	0.677	0.788	1.000	1.221	1.406	1.574	1.740	1.896	1.574
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.40	0.30
$S_{a,vmax}$(g)	0.116	0.123	0.335	0.483	0.462	0.629	0.647	0.544	0.629
T_{vmax} (s)	2.00	2.00	1.00	1.00	1.50	1.50	2.00	3.00	1.50

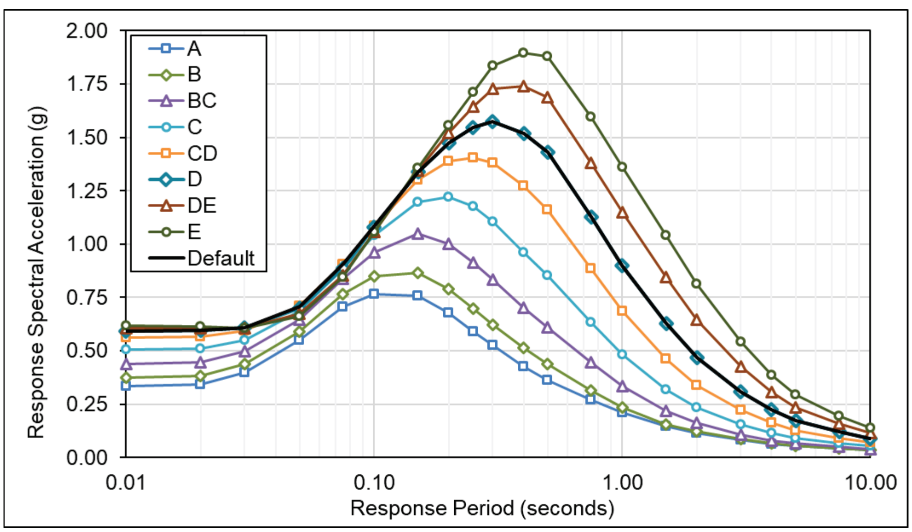


Figure B-16 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-16, GTL12S2R2.

Table B-17 GTL12S3R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 12 s, S3 Ground Motion Level (1.114g < S_S ≤ 1.684g), and R2 Spectral Response Ratio Group (2.9 ≤ $R_{S/1}$ < 3.2)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.326	0.366	0.429	0.485	0.524	0.525	0.507	0.498	0.525
0.01	0.328	0.368	0.431	0.488	0.527	0.529	0.510	0.502	0.529
0.02	0.339	0.379	0.441	0.494	0.528	0.530	0.509	0.496	0.530
0.03	0.396	0.435	0.492	0.533	0.555	0.541	0.506	0.487	0.555
0.05	0.559	0.600	0.644	0.668	0.660	0.618	0.561	0.533	0.668
0.08	0.720	0.779	0.837	0.859	0.836	0.777	0.710	0.682	0.859
0.10	0.773	0.856	0.953	0.999	0.986	0.928	0.862	0.837	0.999
0.15	0.762	0.868	1.044	1.150	1.175	1.131	1.063	1.037	1.175
0.20	0.681	0.789	**1.000**	1.191	1.268	1.247	1.185	1.164	1.268
0.25	0.595	0.698	0.913	1.157	1.299	1.317	1.280	1.270	1.317
0.30	0.527	0.621	0.830	1.085	1.293	1.355	1.354	1.363	1.355
0.40	0.430	0.508	0.697	0.944	1.205	1.327	1.381	1.418	1.327
0.50	0.363	0.431	0.601	0.833	1.099	1.260	1.350	1.416	1.260
0.75	0.269	0.308	0.436	0.618	0.844	1.011	1.136	1.236	1.011
1.0	0.209	0.231	0.330	0.475	0.664	0.832	0.986	1.105	0.832
1.5	0.142	0.152	0.214	0.312	0.447	0.593	0.764	0.907	0.593
2.0	0.112	0.119	0.158	0.229	0.329	0.451	0.615	0.766	0.451
3.0	0.081	0.085	0.104	0.151	0.218	0.302	0.422	0.534	0.302
4.0	0.064	0.067	0.079	0.114	0.162	0.223	0.307	0.385	0.223
5.0	0.055	0.057	0.065	0.091	0.128	0.173	0.235	0.292	0.173
7.5	0.040	0.041	0.045	0.061	0.082	0.107	0.140	0.171	0.107
10	0.030	0.030	0.033	0.043	0.056	0.071	0.090	0.107	0.071
$S_{a,amax}$(g)	0.681	0.789	1.000	1.191	1.299	1.355	1.381	1.418	1.355
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.40	0.30
$S_{a,vmax}$(g)	0.112	0.119	0.330	0.475	0.447	0.302	0.422	0.534	0.302
T_{vmax} (s)	2.00	2.00	1.00	1.00	1.50	3.00	3.00	3.00	3.00

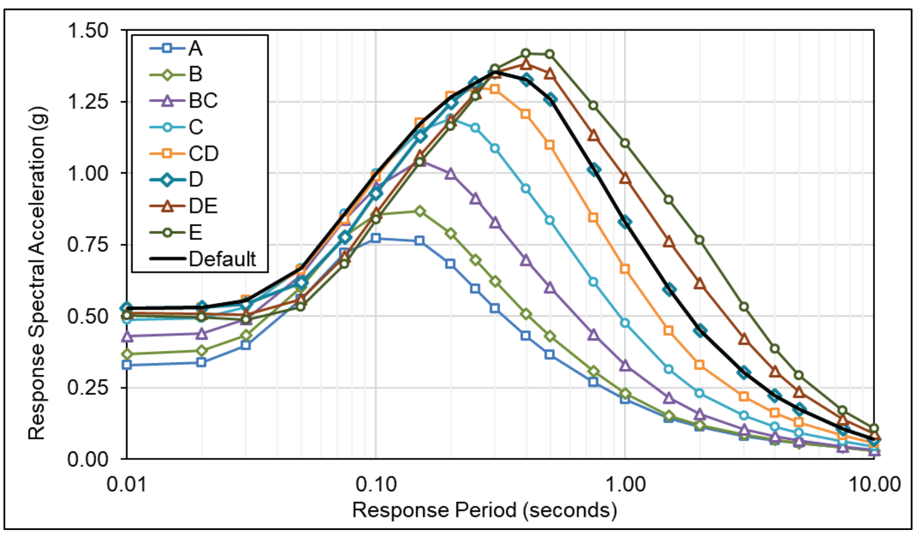


Figure B-17 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-17, GTL12S3R2.

Table B-18 GTL12S3R3, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 12 s, S3 Ground Motion Level (1.114g < S_S ≤ 1.684g), and R3 Spectral Response Ratio Group (2.7 ≤ $R_{S/1}$ < 2.9)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.328	0.367	0.430	0.482	0.512	0.501	0.468	0.450	0.512
0.01	0.330	0.369	0.432	0.485	0.514	0.504	0.472	0.454	0.514
0.02	0.341	0.380	0.441	0.490	0.516	0.504	0.469	0.447	0.516
0.03	0.398	0.437	0.491	0.528	0.540	0.512	0.462	0.435	0.540
0.05	0.563	0.603	0.643	0.657	0.635	0.577	0.504	0.469	0.657
0.08	0.722	0.779	0.830	0.838	0.794	0.714	0.629	0.590	0.838
0.10	0.770	0.850	0.939	0.968	0.928	0.843	0.753	0.714	0.968
0.15	0.761	0.862	1.035	1.119	1.107	1.023	0.923	0.879	1.119
0.20	0.685	0.791	**1.000**	1.178	1.211	1.141	1.035	0.991	1.211
0.25	0.603	0.704	0.920	1.159	1.261	1.222	1.130	1.091	1.261
0.30	0.538	0.630	0.842	1.095	1.275	1.278	1.211	1.184	1.278
0.40	0.446	0.525	0.718	0.969	1.219	1.288	1.271	1.263	1.288
0.50	0.382	0.450	0.628	0.867	1.128	1.247	1.269	1.287	1.247
0.75	0.288	0.327	0.463	0.656	0.886	1.032	1.108	1.168	1.032
1.0	0.226	0.249	0.356	0.512	0.712	0.873	0.998	1.089	0.873
1.5	0.157	0.168	0.238	0.347	0.495	0.649	0.817	0.958	0.649
2.0	0.126	0.134	0.180	0.261	0.374	0.510	0.694	0.861	0.510
3.0	0.093	0.099	0.123	0.179	0.259	0.359	0.501	0.635	0.359
4.0	0.077	0.081	0.097	0.140	0.198	0.272	0.375	0.472	0.272
5.0	0.067	0.070	0.080	0.113	0.158	0.214	0.290	0.361	0.214
7.5	0.048	0.050	0.053	0.072	0.097	0.127	0.167	0.203	0.127
10	0.035	0.035	0.037	0.049	0.063	0.080	0.102	0.120	0.080
$S_{a,amax}$ (g)	0.685	0.791	1.000	1.178	1.275	1.288	1.271	1.287	1.288
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.40	0.40	0.50	0.40
$S_{a,vmax}$ (g)	0.126	0.134	0.356	0.261	0.374	0.272	0.501	0.635	0.272
T_{vmax} (s)	2.00	2.00	1.00	2.00	2.00	4.00	3.00	3.00	4.00

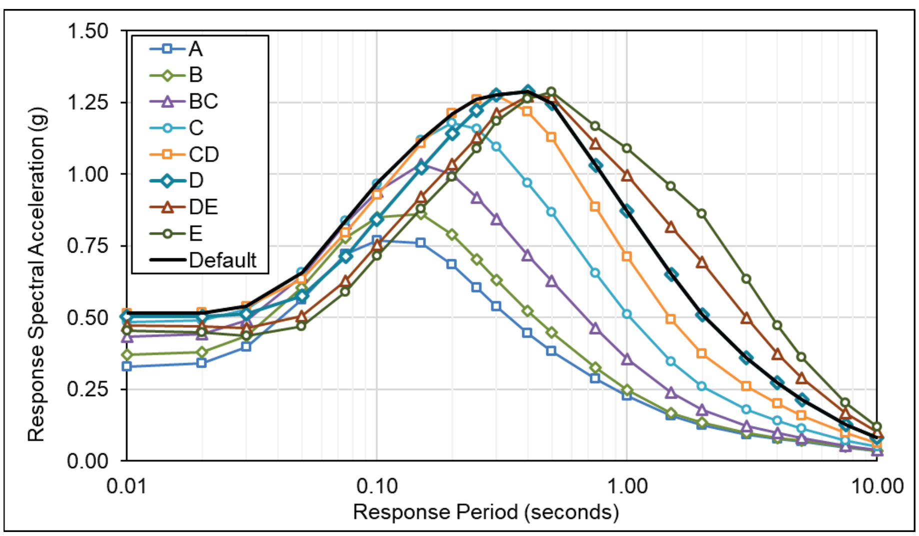


Figure B-18 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-18, GTL12S3R3.

Table B-19 GTL12S4R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 12 s, S4 Ground Motion Level ($1.684g < S_S \leq 2.165g$), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.319	0.359	0.420	0.474	0.506	0.501	0.473	0.459	0.506
0.01	0.321	0.361	0.422	0.476	0.509	0.504	0.476	0.463	0.509
0.02	0.332	0.372	0.432	0.483	0.512	0.506	0.476	0.459	0.512
0.03	0.391	0.429	0.484	0.523	0.539	0.518	0.474	0.450	0.539
0.05	0.559	0.599	0.640	0.660	0.646	0.595	0.530	0.497	0.660
0.08	0.729	0.788	0.842	0.857	0.825	0.754	0.678	0.645	0.857
0.10	0.784	0.868	0.963	1.000	0.973	0.900	0.821	0.789	1.000
0.15	0.771	0.877	1.053	1.147	1.151	1.081	0.992	0.954	1.151
0.20	0.683	0.790	**1.000**	1.183	1.234	1.181	1.090	1.051	1.234
0.25	0.592	0.691	0.903	1.140	1.258	1.242	1.170	1.139	1.258
0.30	0.520	0.609	0.813	1.059	1.245	1.273	1.234	1.220	1.273
0.40	0.418	0.490	0.671	0.907	1.144	1.233	1.250	1.261	1.233
0.50	0.349	0.410	0.572	0.791	1.032	1.162	1.215	1.253	1.162
0.75	0.252	0.288	0.407	0.576	0.781	0.920	1.013	1.090	0.920
1.0	0.192	0.213	0.304	0.439	0.610	0.755	0.881	0.979	0.755
1.5	0.127	0.136	0.192	0.281	0.401	0.527	0.674	0.797	0.527
2.0	0.098	0.104	0.140	0.203	0.292	0.399	0.544	0.678	0.399
3.0	0.069	0.073	0.090	0.132	0.190	0.264	0.368	0.466	0.264
4.0	0.055	0.058	0.068	0.098	0.140	0.192	0.265	0.333	0.192
5.0	0.047	0.049	0.056	0.079	0.110	0.149	0.202	0.251	0.149
7.5	0.034	0.034	0.037	0.050	0.068	0.089	0.116	0.142	0.089
10	0.024	0.025	0.027	0.035	0.045	0.057	0.073	0.087	0.057
$S_{a,amax}$(g)	0.683	0.790	1.000	1.183	1.258	1.273	1.250	1.261	1.273
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.40	0.30
$S_{a,vmax}$(g)	0.098	0.213	0.304	0.439	0.610	0.399	0.368	0.466	0.399
T_{vmax} (s)	2.00	1.00	1.00	1.00	1.00	2.00	3.00	3.00	2.00

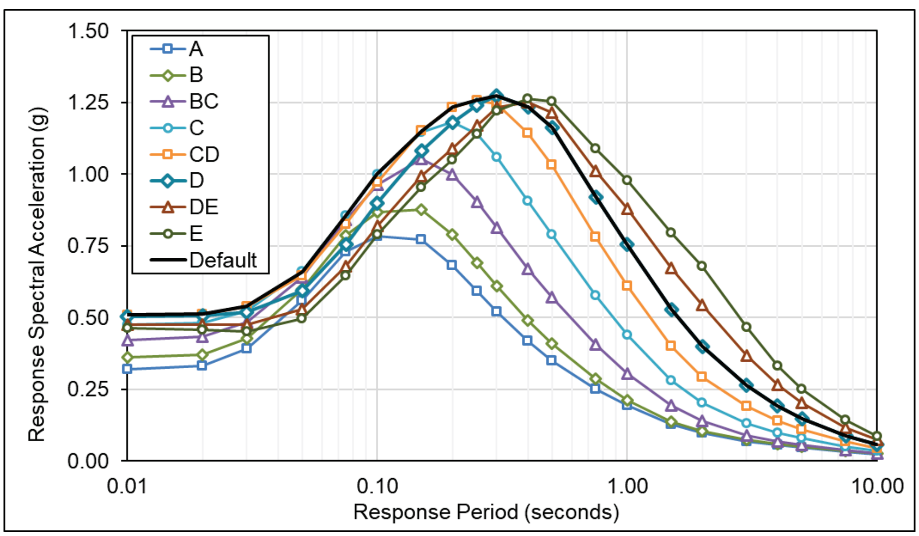


Figure B-19 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-19, GTL12S4R1.

Table B-20 GTL12S4R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 12 s, S4 Ground Motion Level (1.684g < $S_S \leq$ 2.165g), and R2 Spectral Response Ratio Group (2.9 $\leq R_{S/1}$ < 3.2)

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.322	0.361	0.422	0.474	0.505	0.496	0.465	0.449	0.505
0.01	0.323	0.363	0.424	0.477	0.507	0.499	0.469	0.454	0.507
0.02	0.335	0.374	0.434	0.483	0.510	0.500	0.468	0.448	0.510
0.03	0.393	0.431	0.486	0.522	0.536	0.511	0.464	0.438	0.536
0.05	0.563	0.602	0.640	0.656	0.638	0.583	0.514	0.479	0.656
0.08	0.728	0.786	0.836	0.846	0.807	0.732	0.651	0.615	0.846
0.10	0.779	0.861	0.951	0.983	0.949	0.869	0.784	0.749	0.983
0.15	0.767	0.871	1.044	1.132	1.127	1.049	0.953	0.911	1.132
0.20	0.685	0.791	**1.000**	1.178	1.218	1.155	1.054	1.013	1.218
0.25	0.597	0.697	0.910	1.146	1.253	1.224	1.139	1.104	1.253
0.30	0.528	0.619	0.826	1.074	1.253	1.266	1.210	1.188	1.266
0.40	0.431	0.507	0.694	0.935	1.175	1.250	1.246	1.245	1.250
0.50	0.365	0.429	0.598	0.826	1.073	1.193	1.227	1.253	1.193
0.75	0.269	0.306	0.433	0.612	0.828	0.967	1.048	1.114	0.967
1.0	0.208	0.230	0.329	0.473	0.657	0.807	0.929	1.022	0.807
1.5	0.140	0.150	0.213	0.310	0.442	0.579	0.734	0.864	0.579
2.0	0.110	0.117	0.156	0.227	0.327	0.446	0.606	0.754	0.446
3.0	0.079	0.083	0.103	0.151	0.217	0.301	0.420	0.533	0.301
4.0	0.063	0.066	0.079	0.114	0.162	0.222	0.306	0.385	0.222
5.0	0.054	0.057	0.065	0.091	0.128	0.172	0.234	0.291	0.172
7.5	0.039	0.039	0.043	0.058	0.078	0.102	0.133	0.162	0.102
10	0.028	0.028	0.030	0.039	0.051	0.065	0.082	0.098	0.065
$S_{a,amax}$(g)	0.685	0.791	1.000	1.178	1.253	1.266	1.246	1.253	1.266
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.30	0.40	0.50	0.30
$S_{a,vmax}$(g)	0.110	0.117	0.329	0.473	0.442	0.301	0.420	0.533	0.301
T_{vmax} (s)	2.00	2.00	1.00	1.00	1.50	3.00	3.00	3.00	3.00

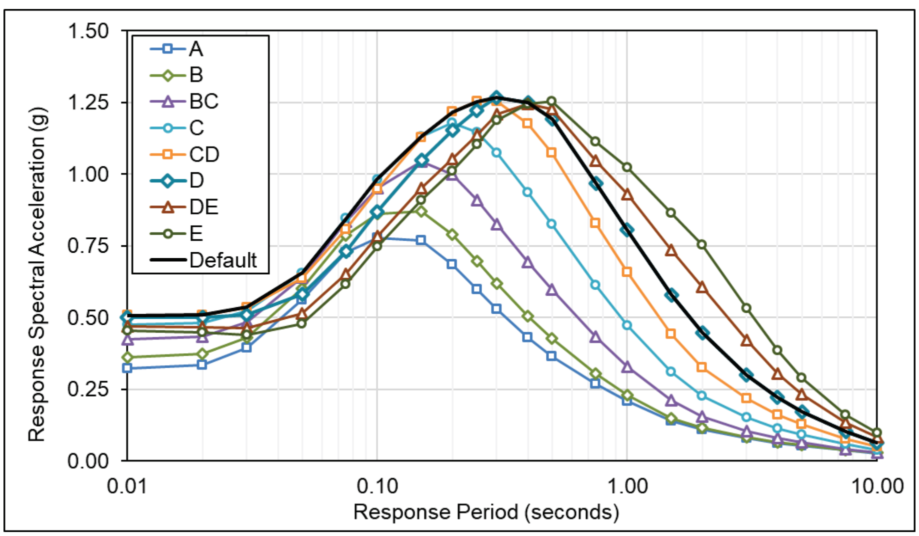


Figure B-20 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-20, GTL12S4R2.

Table B-21 GTL12S5R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 12 s, S5 Ground Motion Level (S_S> 2.165g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.319	0.358	0.419	0.471	0.499	0.487	0.453	0.436	0.499
0.01	0.321	0.360	0.421	0.473	0.502	0.491	0.457	0.440	0.502
0.02	0.332	0.372	0.432	0.480	0.504	0.492	0.456	0.435	0.504
0.03	0.391	0.429	0.484	0.520	0.531	0.504	0.453	0.426	0.531
0.05	0.563	0.603	0.641	0.656	0.636	0.577	0.505	0.469	0.656
0.08	0.734	0.793	0.843	0.851	0.809	0.729	0.645	0.608	0.851
0.10	0.788	0.872	0.962	0.991	0.951	0.866	0.776	0.739	0.991
0.15	0.773	0.878	1.052	1.135	1.122	1.034	0.931	0.885	1.135
0.20	0.685	0.791	**1.000**	1.175	1.205	1.130	1.020	0.972	1.205
0.25	0.594	0.692	0.904	1.136	1.234	1.193	1.097	1.055	1.234
0.30	0.522	0.610	0.815	1.057	1.228	1.230	1.164	1.134	1.230
0.40	0.422	0.494	0.676	0.911	1.139	1.204	1.190	1.182	1.204
0.50	0.354	0.415	0.578	0.797	1.032	1.141	1.165	1.183	1.141
0.75	0.257	0.292	0.414	0.584	0.787	0.914	0.985	1.045	0.914
1.0	0.197	0.217	0.311	0.448	0.621	0.759	0.871	0.956	0.759
1.5	0.131	0.140	0.198	0.289	0.411	0.537	0.679	0.798	0.537
2.0	0.101	0.107	0.144	0.210	0.301	0.411	0.559	0.696	0.411
3.0	0.072	0.076	0.094	0.137	0.198	0.274	0.383	0.485	0.274
4.0	0.057	0.060	0.071	0.103	0.146	0.200	0.276	0.347	0.200
5.0	0.049	0.051	0.058	0.082	0.115	0.155	0.210	0.261	0.155
7.5	0.034	0.035	0.038	0.051	0.069	0.090	0.118	0.143	0.090
10	0.024	0.025	0.026	0.035	0.045	0.057	0.072	0.086	0.057
$S_{a,amax}$**(g)**	0.685	0.791	1.000	1.175	1.234	1.230	1.190	1.183	1.234
T_{amax} **(s)**	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.50	0.25
$S_{a,vmax}$**(g)**	0.101	0.217	0.311	0.448	0.621	0.274	0.383	0.485	0.274
T_{vmax} **(s)**	2.00	1.00	1.00	1.00	1.00	3.00	3.00	3.00	3.00

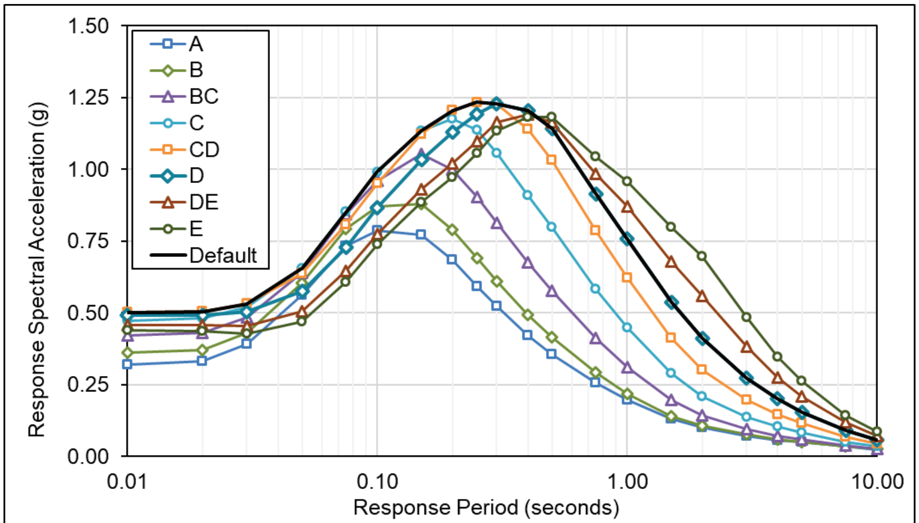


Figure B-21 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-21, GTL12S5R1.

Table B-22 GTL12S5R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 12 s, S5 Ground Motion Level (S_S> 2.165g), and R2 Spectral Response Ratio Group (2.9 ≤ $R_{S/1}$ < 3.2)

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.319	0.358	0.418	0.465	0.486	0.466	0.425	0.403	0.486
0.01	0.321	0.360	0.420	0.468	0.489	0.470	0.428	0.407	0.489
0.02	0.333	0.372	0.430	0.474	0.492	0.471	0.427	0.401	0.492
0.03	0.393	0.431	0.483	0.514	0.516	0.480	0.422	0.391	0.516
0.05	0.569	0.608	0.640	0.645	0.613	0.544	0.465	0.427	0.645
0.08	0.736	0.794	0.834	0.829	0.771	0.680	0.587	0.548	0.829
0.10	0.784	0.866	0.946	0.960	0.901	0.802	0.703	0.662	0.960
0.15	0.771	0.875	1.043	1.108	1.068	0.960	0.843	0.793	1.108
0.20	0.687	0.793	**1.000**	1.159	1.158	1.056	0.929	0.875	1.159
0.25	0.600	0.698	0.911	1.134	1.200	1.124	1.003	0.953	1.200
0.30	0.532	0.621	0.828	1.066	1.210	1.171	1.070	1.028	1.210
0.40	0.438	0.512	0.700	0.937	1.150	1.175	1.115	1.085	1.175
0.50	0.373	0.435	0.607	0.833	1.059	1.133	1.111	1.104	1.133
0.75	0.276	0.312	0.443	0.623	0.830	0.937	0.970	1.003	0.937
1.0	0.215	0.236	0.339	0.487	0.668	0.799	0.886	0.951	0.799
1.5	0.145	0.155	0.220	0.320	0.453	0.584	0.724	0.840	0.584
2.0	0.113	0.120	0.162	0.235	0.337	0.458	0.620	0.769	0.458
3.0	0.081	0.086	0.107	0.157	0.226	0.314	0.438	0.555	0.314
4.0	0.065	0.069	0.082	0.118	0.168	0.230	0.317	0.399	0.230
5.0	0.056	0.058	0.066	0.094	0.132	0.177	0.241	0.300	0.177
7.5	0.037	0.038	0.042	0.056	0.076	0.099	0.129	0.158	0.099
10	0.026	0.027	0.029	0.037	0.048	0.061	0.077	0.092	0.061
$S_{a,amax}$(g)	0.687	0.793	1.000	1.159	1.210	1.175	1.115	1.104	1.210
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.40	0.40	0.50	0.30
$S_{a,vmax}$(g)	0.113	0.120	0.339	0.487	0.453	0.314	0.438	0.555	0.314
T_{vmax} (s)	2.00	2.00	1.00	1.00	1.50	3.00	3.00	3.00	3.00

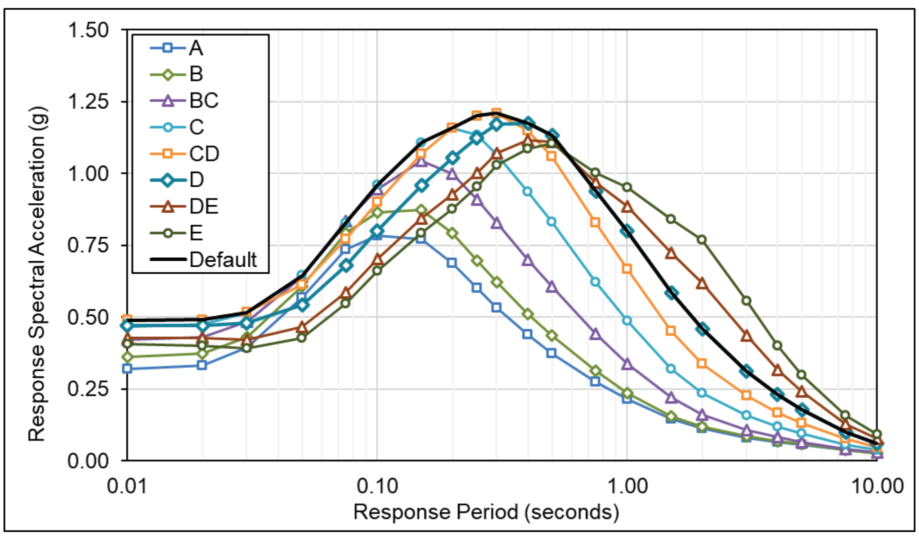


Figure B-22 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-22, GTL12S5R2.

Table B-23 GTL12S5R4, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 12 s, S5 Ground Motion Level ($S_S \geq 2.165$g), and R4 Spectral Response Ratio Group ($2.5 \leq R_{S/1} < 2.7$)

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.323	0.361	0.420	0.461	0.469	0.437	0.389	0.365	0.469
0.01	0.325	0.363	0.422	0.463	0.471	0.440	0.393	0.369	0.471
0.02	0.338	0.377	0.434	0.471	0.475	0.442	0.391	0.363	0.475
0.03	0.399	0.436	0.488	0.507	0.496	0.448	0.385	0.353	0.507
0.05	0.573	0.613	0.637	0.629	0.580	0.502	0.421	0.383	0.629
0.08	0.735	0.792	0.821	0.797	0.720	0.619	0.527	0.488	0.797
0.10	0.781	0.861	0.929	0.919	0.836	0.726	0.627	0.588	0.919
0.15	0.769	0.872	1.036	1.067	0.991	0.867	0.750	0.704	1.067
0.20	0.688	0.793	**1.000**	1.136	1.085	0.957	0.827	0.777	1.136
0.25	0.607	0.706	0.920	1.131	1.142	1.026	0.896	0.849	1.142
0.30	0.542	0.633	0.843	1.074	1.172	1.080	0.959	0.915	1.172
0.40	0.453	0.529	0.723	0.961	1.148	1.107	1.007	0.968	1.148
0.50	0.391	0.455	0.634	0.865	1.074	1.089	1.014	0.989	1.089
0.75	0.296	0.336	0.476	0.667	0.872	0.940	0.919	0.924	0.940
1.0	0.234	0.258	0.371	0.531	0.720	0.828	0.871	0.906	0.828
1.5	0.160	0.172	0.245	0.357	0.501	0.631	0.759	0.862	0.631
2.0	0.124	0.133	0.180	0.262	0.375	0.506	0.678	0.837	0.506
3.0	0.091	0.097	0.123	0.179	0.259	0.359	0.501	0.636	0.359
4.0	0.072	0.077	0.093	0.134	0.192	0.263	0.363	0.457	0.263
5.0	0.061	0.065	0.075	0.106	0.149	0.201	0.273	0.340	0.201
7.5	0.040	0.041	0.045	0.061	0.082	0.108	0.141	0.172	0.108
10	0.028	0.028	0.031	0.040	0.052	0.065	0.083	0.098	0.065
$S_{a,amax}$(g)	0.688	0.793	1.000	1.136	1.172	1.107	1.014	0.989	1.172
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.40	0.50	0.50	0.30
$S_{a,vmax}$(g)	0.124	0.133	0.371	0.357	0.375	0.359	0.501	0.636	0.359
T_{vmax} (s)	2.00	2.00	1.00	1.50	2.00	3.00	3.00	3.00	3.00

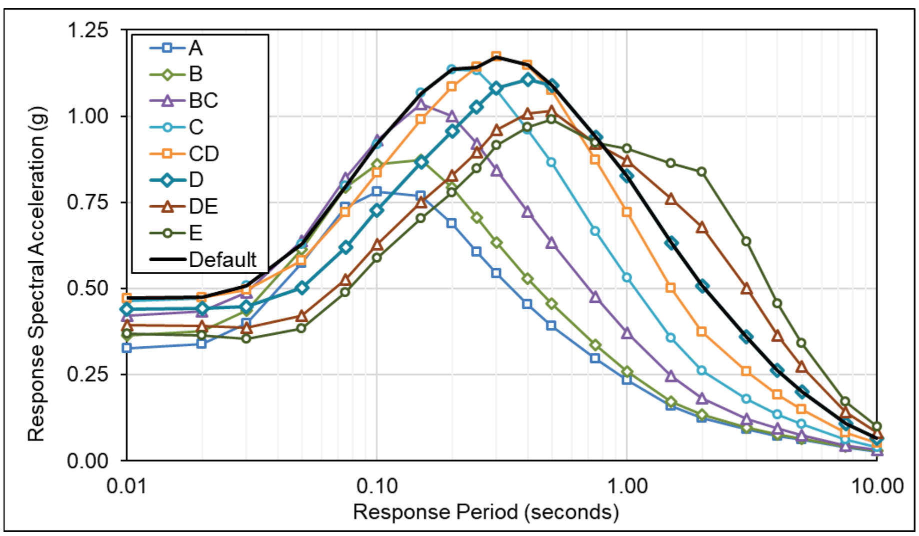


Figure B-23 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-23, GTL12S5R4.

Table B-24 GTL8S1R5, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 8 s, S1 Ground Motion Level ($S_S \leq 0.677$g), and R5 Spectral Response Ratio Group ($R_{S/1} < 2.5$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.351	0.394	0.463	0.541	0.621	0.680	0.729	0.767	0.680
0.01	0.353	0.396	0.466	0.543	0.624	0.683	0.733	0.771	0.683
0.02	0.362	0.404	0.472	0.547	0.623	0.682	0.731	0.765	0.682
0.03	0.412	0.452	0.517	0.583	0.650	0.697	0.731	0.756	0.697
0.05	0.549	0.590	0.651	0.710	0.762	0.789	0.802	0.813	0.789
0.08	0.678	0.735	0.817	0.891	0.953	0.984	0.999	1.013	0.984
0.10	0.727	0.806	0.925	1.037	1.134	1.193	1.234	1.268	1.193
0.15	0.729	0.833	1.014	1.200	1.377	1.509	1.618	1.692	1.509
0.20	0.674	0.785	**1.000**	1.251	1.502	1.702	1.878	1.997	1.702
0.25	0.612	0.726	0.953	1.245	1.558	1.822	2.069	2.242	1.822
0.30	0.564	0.673	0.903	1.211	1.570	1.888	2.206	2.436	1.888
0.40	0.490	0.594	0.816	1.125	1.527	1.902	2.301	2.589	1.902
0.50	0.437	0.534	0.746	1.047	1.455	1.858	2.292	2.620	1.858
0.75	0.353	0.411	0.579	0.824	1.165	1.521	1.929	2.268	1.521
1.0	0.283	0.312	0.444	0.639	0.914	1.225	1.605	1.921	1.225
1.5	0.205	0.216	0.303	0.442	0.642	0.884	1.206	1.486	0.884
2.0	0.168	0.175	0.228	0.330	0.477	0.662	0.919	1.149	0.662
3.0	0.122	0.126	0.150	0.218	0.315	0.439	0.616	0.773	0.439
4.0	0.095	0.098	0.113	0.161	0.231	0.319	0.443	0.551	0.319
5.0	0.080	0.082	0.090	0.127	0.179	0.244	0.334	0.411	0.244
7.5	0.064	0.064	0.068	0.092	0.126	0.166	0.221	0.265	0.166
10	0.051	0.051	0.053	0.070	0.093	0.120	0.155	0.182	0.120
$S_{a,amax}$ (g)	0.674	0.785	1.000	1.251	1.570	1.902	2.301	2.620	1.902
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.40	0.40	0.50	0.40
$S_{a,vmax}$ (g)	0.168	0.175	0.444	0.442	0.642	0.884	0.616	0.773	0.884
T_{vmax} (s)	2.00	2.00	1.00	1.50	1.50	1.50	3.00	3.00	1.50

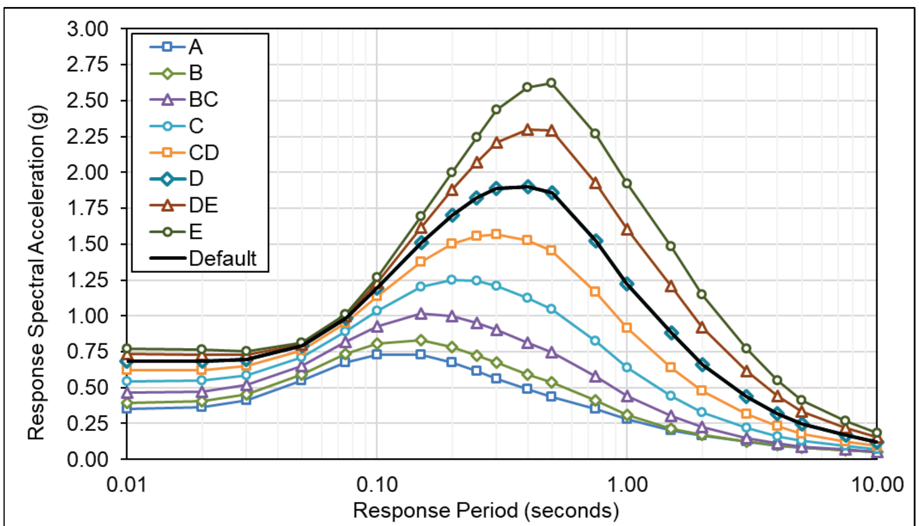


Figure B-24 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-24, GTL8S1R5.

Table B-25 GTL8S2R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 8 s, S2 Ground Motion Level (0.677g < S_S ≤ 1.233g), and R2 Spectral Response Ratio Group (2.9 ≤ $R_{S/1}$ < 3.2)

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.326	0.366	0.429	0.488	0.533	0.547	0.541	0.540	0.547
0.01	0.328	0.368	0.431	0.490	0.536	0.550	0.544	0.544	0.550
0.02	0.339	0.379	0.440	0.496	0.539	0.551	0.543	0.538	0.551
0.03	0.395	0.434	0.491	0.537	0.567	0.565	0.542	0.530	0.567
0.05	0.555	0.596	0.643	0.673	0.677	0.646	0.600	0.576	0.677
0.08	0.717	0.776	0.839	0.870	0.862	0.817	0.759	0.734	0.870
0.10	0.773	0.856	0.958	1.017	1.024	0.984	0.928	0.908	1.024
0.15	0.765	0.872	1.049	1.172	1.227	1.210	1.164	1.148	1.227
0.20	0.680	0.790	**1.000**	1.201	1.314	1.334	1.308	1.302	1.334
0.25	0.590	0.694	0.908	1.156	1.332	1.399	1.410	1.427	1.399
0.30	0.520	0.615	0.823	1.081	1.312	1.427	1.485	1.531	1.427
0.40	0.421	0.501	0.686	0.934	1.207	1.378	1.501	1.585	1.378
0.50	0.354	0.423	0.589	0.820	1.095	1.299	1.459	1.575	1.299
0.75	0.259	0.299	0.423	0.600	0.828	1.023	1.203	1.350	1.023
1.0	0.199	0.221	0.316	0.456	0.642	0.824	1.015	1.170	0.824
1.5	0.134	0.143	0.201	0.294	0.423	0.570	0.752	0.910	0.570
2.0	0.105	0.111	0.146	0.213	0.306	0.422	0.580	0.725	0.422
3.0	0.073	0.076	0.093	0.135	0.195	0.270	0.378	0.477	0.270
4.0	0.056	0.058	0.068	0.098	0.140	0.192	0.265	0.332	0.192
5.0	0.046	0.048	0.054	0.077	0.107	0.145	0.198	0.245	0.145
7.5	0.035	0.035	0.038	0.052	0.070	0.093	0.122	0.149	0.093
10	0.027	0.027	0.029	0.038	0.050	0.064	0.082	0.098	0.064
$S_{a,amax}$(g)	0.680	0.790	1.000	1.201	1.332	1.427	1.501	1.585	1.427
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.40	0.30
$S_{a,vmax}$(g)	0.105	0.111	0.316	0.456	0.642	0.570	0.580	0.725	0.570
T_{vmax} (s)	2.00	2.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

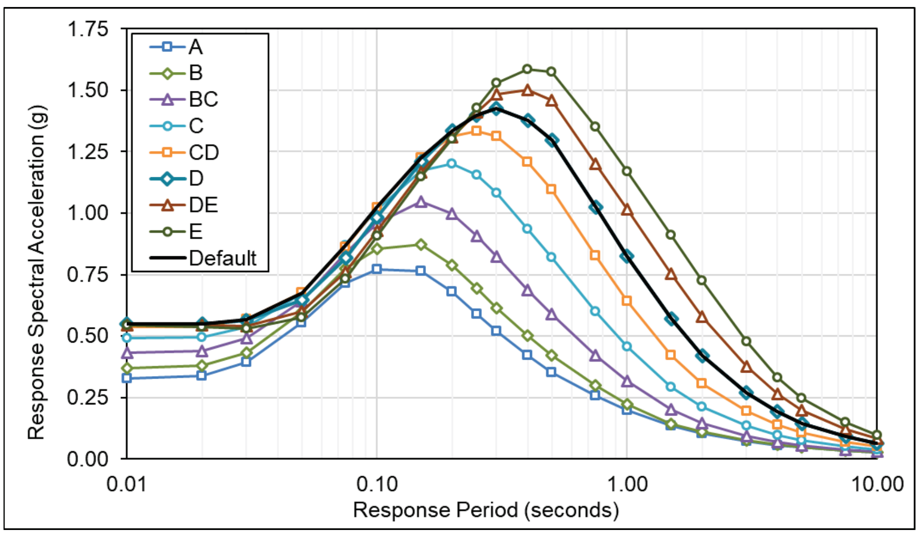


Figure B-25 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-25, GTL8S2R2.

Table B-26 GTL8S3R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 8 s, S3 Ground Motion Level (1.233g < $S_S \leq$ 1.720g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.324	0.363	0.423	0.473	0.502	0.495	0.469	0.456	0.502
0.01	0.326	0.365	0.426	0.476	0.505	0.498	0.472	0.460	0.505
0.02	0.338	0.377	0.436	0.483	0.508	0.499	0.471	0.455	0.508
0.03	0.396	0.434	0.488	0.522	0.533	0.510	0.467	0.445	0.533
0.05	0.562	0.603	0.641	0.653	0.632	0.579	0.514	0.483	0.653
0.08	0.727	0.785	0.833	0.839	0.798	0.725	0.648	0.615	0.839
0.10	0.780	0.863	0.951	0.977	0.941	0.865	0.785	0.753	0.977
0.15	0.769	0.876	1.047	1.130	1.124	1.053	0.967	0.932	1.130
0.20	0.682	0.792	**1.000**	1.172	1.214	1.162	1.081	1.048	1.214
0.25	0.592	0.695	0.907	1.138	1.245	1.229	1.168	1.147	1.245
0.30	0.521	0.615	0.821	1.065	1.240	1.267	1.238	1.235	1.267
0.40	0.421	0.498	0.682	0.921	1.153	1.241	1.266	1.289	1.241
0.50	0.352	0.418	0.582	0.805	1.047	1.177	1.240	1.290	1.177
0.75	0.256	0.294	0.416	0.588	0.797	0.942	1.045	1.131	0.942
1.0	0.195	0.217	0.311	0.447	0.623	0.772	0.906	1.012	0.772
1.5	0.128	0.137	0.194	0.284	0.405	0.535	0.688	0.817	0.535
2.0	0.098	0.104	0.139	0.202	0.291	0.398	0.543	0.677	0.398
3.0	0.067	0.071	0.087	0.126	0.182	0.253	0.353	0.447	0.253
4.0	0.050	0.053	0.062	0.090	0.128	0.176	0.243	0.306	0.176
5.0	0.042	0.043	0.049	0.070	0.098	0.132	0.179	0.223	0.132
7.5	0.030	0.030	0.033	0.045	0.060	0.079	0.104	0.127	0.079
10	0.022	0.022	0.024	0.032	0.042	0.053	0.068	0.081	0.053
$S_{a,amax}$(g)	0.682	0.792	1.000	1.172	1.245	1.267	1.266	1.290	1.267
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.50	0.30
$S_{a,vmax}$(g)	0.098	0.217	0.311	0.447	0.623	0.535	0.543	0.677	0.535
T_{vmax} (s)	2.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

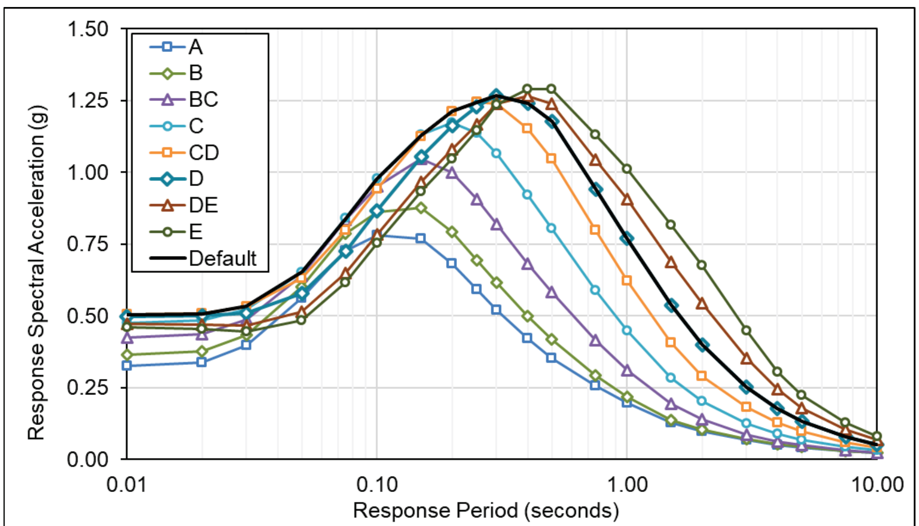


Figure B-26 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-26, GTL8S3R1.

Table B-27 GTL8S4R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 8 s, S4 Ground Motion Level (1.720g < $S_S \leq$ 2.143g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.322	0.360	0.419	0.467	0.490	0.478	0.445	0.429	0.490
0.01	0.324	0.362	0.422	0.469	0.493	0.481	0.449	0.433	0.493
0.02	0.335	0.374	0.432	0.476	0.496	0.482	0.447	0.427	0.496
0.03	0.394	0.432	0.485	0.515	0.520	0.491	0.443	0.418	0.520
0.05	0.562	0.602	0.636	0.643	0.615	0.556	0.487	0.453	0.643
0.08	0.728	0.786	0.828	0.826	0.776	0.696	0.614	0.578	0.826
0.10	0.781	0.863	0.945	0.962	0.914	0.828	0.740	0.705	0.962
0.15	0.769	0.875	1.044	1.114	1.090	1.003	0.906	0.865	1.114
0.20	0.683	0.792	**1.000**	1.162	1.181	1.108	1.008	0.967	1.181
0.25	0.594	0.696	0.908	1.134	1.218	1.176	1.091	1.058	1.218
0.30	0.524	0.616	0.822	1.063	1.220	1.218	1.161	1.142	1.220
0.40	0.423	0.500	0.683	0.920	1.141	1.201	1.193	1.196	1.201
0.50	0.354	0.418	0.583	0.804	1.036	1.142	1.172	1.201	1.142
0.75	0.257	0.294	0.416	0.588	0.792	0.920	0.997	1.064	0.920
1.0	0.196	0.217	0.311	0.448	0.621	0.759	0.875	0.965	0.759
1.5	0.128	0.137	0.194	0.283	0.404	0.529	0.673	0.794	0.529
2.0	0.097	0.103	0.138	0.201	0.289	0.394	0.537	0.669	0.394
3.0	0.066	0.069	0.086	0.125	0.180	0.250	0.349	0.442	0.250
4.0	0.049	0.052	0.061	0.088	0.126	0.173	0.239	0.300	0.173
5.0	0.041	0.042	0.048	0.068	0.095	0.129	0.175	0.218	0.129
7.5	0.028	0.029	0.031	0.043	0.058	0.076	0.100	0.122	0.076
10	0.021	0.021	0.023	0.030	0.039	0.050	0.064	0.076	0.050
$S_{a,amax}$**(g)**	0.683	0.792	1.000	1.162	1.220	1.218	1.193	1.201	1.220
T_{amax} **(s)**	0.20	0.20	0.20	0.20	0.30	0.30	0.40	0.50	0.30
$S_{a,vmax}$**(g)**	0.196	0.217	0.311	0.448	0.621	0.529	0.537	0.669	0.529
T_{vmax} **(s)**	1.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

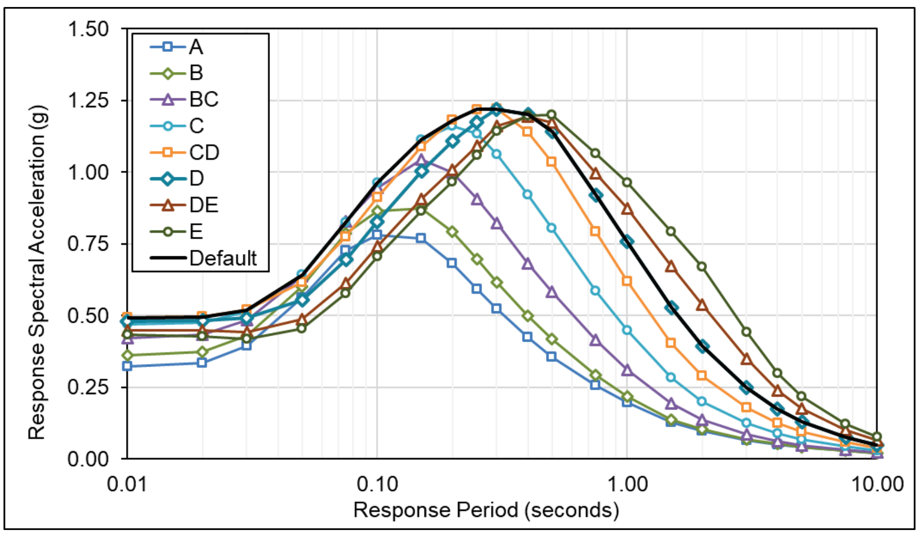


Figure B-27 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-27, GTL8S4R1.

Table B-28 GTL8S4R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 8 s, S4 Ground Motion Level (1.720g < $S_S \le$ 2.143g), and R2 Spectral Response Ratio Group (2.9 $\le R_{S/1}$ < 3.2)

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.321	0.360	0.418	0.462	0.479	0.459	0.421	0.401	0.479
0.01	0.323	0.362	0.420	0.464	0.482	0.462	0.424	0.405	0.482
0.02	0.336	0.374	0.432	0.472	0.485	0.464	0.422	0.399	0.485
0.03	0.396	0.433	0.484	0.509	0.508	0.471	0.417	0.389	0.509
0.05	0.568	0.607	0.636	0.635	0.599	0.532	0.457	0.422	0.635
0.08	0.734	0.792	0.827	0.815	0.752	0.662	0.574	0.536	0.815
0.10	0.785	0.867	0.942	0.946	0.883	0.785	0.690	0.652	0.946
0.15	0.771	0.876	1.042	1.096	1.051	0.947	0.838	0.793	1.096
0.20	0.685	0.793	**1.000**	1.150	1.142	1.046	0.931	0.884	1.150
0.25	0.596	0.698	0.909	1.128	1.186	1.115	1.010	0.967	1.186
0.30	0.527	0.619	0.825	1.062	1.197	1.163	1.078	1.046	1.197
0.40	0.428	0.504	0.689	0.924	1.131	1.159	1.117	1.102	1.159
0.50	0.359	0.422	0.589	0.809	1.031	1.109	1.105	1.114	1.109
0.75	0.261	0.298	0.422	0.595	0.795	0.905	0.955	1.001	0.905
1.0	0.199	0.221	0.317	0.456	0.628	0.755	0.851	0.924	0.755
1.5	0.129	0.139	0.197	0.288	0.409	0.531	0.667	0.780	0.531
2.0	0.098	0.104	0.140	0.204	0.292	0.398	0.541	0.672	0.398
3.0	0.066	0.070	0.087	0.126	0.182	0.253	0.353	0.447	0.253
4.0	0.049	0.052	0.062	0.089	0.127	0.174	0.240	0.302	0.174
5.0	0.041	0.042	0.048	0.068	0.096	0.129	0.176	0.219	0.129
7.5	0.028	0.029	0.031	0.042	0.057	0.074	0.098	0.119	0.074
10	0.020	0.020	0.022	0.029	0.038	0.048	0.061	0.073	0.048
$S_{a,amax}$(g)	0.685	0.793	1.000	1.150	1.197	1.163	1.117	1.114	1.197
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.30	0.40	0.50	0.30
$S_{a,vmax}$(g)	0.199	0.221	0.317	0.456	0.628	0.531	0.541	0.672	0.531
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

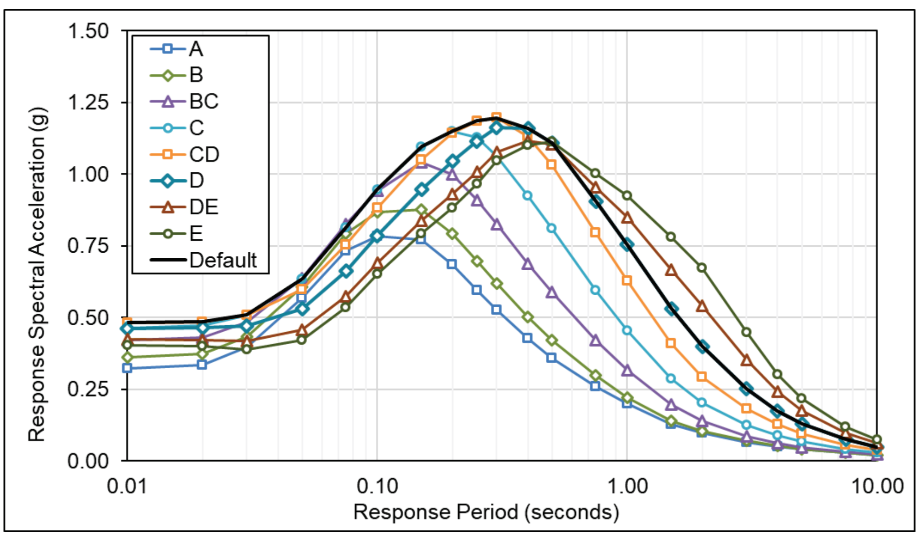


Figure B-28 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-28, GTL8S4R2.

Table B-29 GTL8S5R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 8 s, S5 Ground Motion Level (S_S> 2.143g), and R2 Spectral Response Ratio Group (2.9 ≤ $R_{S/1}$ < 3.2)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.321	0.359	0.416	0.456	0.468	0.442	0.397	0.374	0.468
0.01	0.323	0.361	0.418	0.459	0.470	0.445	0.401	0.378	0.470
0.02	0.336	0.374	0.430	0.466	0.473	0.446	0.399	0.372	0.473
0.03	0.398	0.434	0.483	0.503	0.495	0.452	0.393	0.361	0.503
0.05	0.574	0.612	0.635	0.627	0.583	0.508	0.428	0.391	0.627
0.08	0.741	0.798	0.825	0.803	0.730	0.631	0.537	0.496	0.803
0.10	0.790	0.871	0.939	0.932	0.855	0.745	0.643	0.601	0.932
0.15	0.774	0.878	1.041	1.080	1.015	0.895	0.775	0.725	1.080
0.20	0.687	0.794	**1.000**	1.139	1.107	0.989	0.859	0.804	1.139
0.25	0.598	0.699	0.911	1.123	1.156	1.058	0.932	0.880	1.156
0.30	0.530	0.622	0.828	1.060	1.175	1.110	1.000	0.954	1.175
0.40	0.432	0.507	0.693	0.926	1.119	1.117	1.044	1.011	1.119
0.50	0.362	0.425	0.592	0.812	1.023	1.075	1.039	1.028	1.075
0.75	0.263	0.300	0.425	0.599	0.794	0.887	0.911	0.939	0.887
1.0	0.201	0.223	0.319	0.459	0.630	0.746	0.824	0.883	0.746
1.5	0.129	0.139	0.198	0.289	0.409	0.527	0.654	0.760	0.527
2.0	0.097	0.103	0.139	0.203	0.291	0.396	0.536	0.665	0.396
3.0	0.064	0.068	0.085	0.124	0.180	0.249	0.348	0.442	0.249
4.0	0.048	0.050	0.060	0.087	0.124	0.170	0.235	0.295	0.170
5.0	0.039	0.041	0.047	0.066	0.093	0.125	0.170	0.212	0.125
7.5	0.026	0.027	0.029	0.040	0.054	0.070	0.093	0.113	0.070
10	0.019	0.019	0.021	0.027	0.035	0.045	0.057	0.068	0.045
$S_{a,amax}$ (g)	0.687	0.794	1.000	1.139	1.175	1.117	1.044	1.028	1.175
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.40	0.40	0.50	0.30
$S_{a,vmax}$ (g)	0.201	0.223	0.319	0.459	0.630	0.396	0.536	0.665	0.396
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	2.00	2.00	2.00	2.00

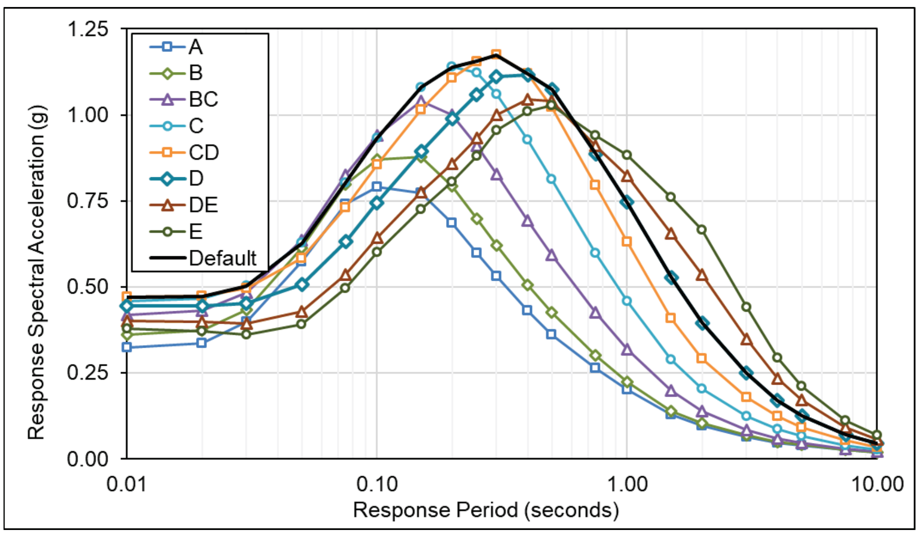


Figure B-29 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-29, GTL8S5R2.

Table B-30 GTL6(WA)S1R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (WA), S1 Ground Motion Level ($S_S \le 0.74$g), and R1 Spectral Response Ratio Group ($R_{S/1} \ge 3.2$)

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.330	0.373	0.438	0.507	0.573	0.615	0.644	0.666	0.615
0.01	0.332	0.374	0.440	0.509	0.575	0.619	0.648	0.670	0.619
0.02	0.343	0.385	0.450	0.516	0.579	0.621	0.648	0.666	0.621
0.03	0.395	0.437	0.499	0.559	0.613	0.643	0.654	0.664	0.643
0.05	0.538	0.584	0.644	0.697	0.735	0.743	0.731	0.726	0.743
0.08	0.686	0.749	0.829	0.893	0.933	0.936	0.918	0.911	0.936
0.10	0.746	0.832	0.948	1.046	1.113	1.134	1.129	1.133	1.134
0.15	0.745	0.856	1.037	1.206	1.343	1.418	1.454	1.483	1.418
0.20	0.672	0.789	**1.000**	1.232	1.436	1.570	1.659	1.722	1.570
0.25	0.584	0.695	0.909	1.175	1.431	1.620	1.771	1.879	1.620
0.30	0.515	0.616	0.824	1.095	1.386	1.620	1.830	1.986	1.620
0.40	0.410	0.494	0.676	0.927	1.230	1.498	1.768	1.972	1.498
0.50	0.342	0.412	0.575	0.804	1.098	1.378	1.674	1.911	1.378
0.75	0.248	0.290	0.409	0.583	0.816	1.054	1.326	1.570	1.054
1.0	0.186	0.210	0.301	0.436	0.621	0.825	1.076	1.303	0.825
1.5	0.123	0.136	0.193	0.283	0.409	0.559	0.760	0.952	0.559
2.0	0.096	0.106	0.144	0.212	0.305	0.420	0.581	0.745	0.420
3.0	0.067	0.076	0.099	0.146	0.210	0.287	0.397	0.514	0.287
4.0	0.052	0.060	0.077	0.113	0.159	0.214	0.290	0.376	0.214
5.0	0.044	0.051	0.064	0.092	0.127	0.168	0.223	0.288	0.168
7.5	0.035	0.041	0.052	0.074	0.098	0.125	0.160	0.211	0.125
10	0.030	0.036	0.045	0.062	0.079	0.097	0.121	0.155	0.097
$S_{a,amax}$(g)	0.672	0.789	1.000	1.232	1.436	1.620	1.830	1.986	1.620
T_{amax} (s)	0.20	0.20	0.20	0.20	0.20	0.25	0.30	0.30	0.25
$S_{a,vmax}$(g)	0.096	0.106	0.301	0.436	0.305	0.287	0.397	0.514	0.287
T_{vmax} (s)	2.00	2.00	1.00	1.00	2.00	3.00	3.00	3.00	3.00

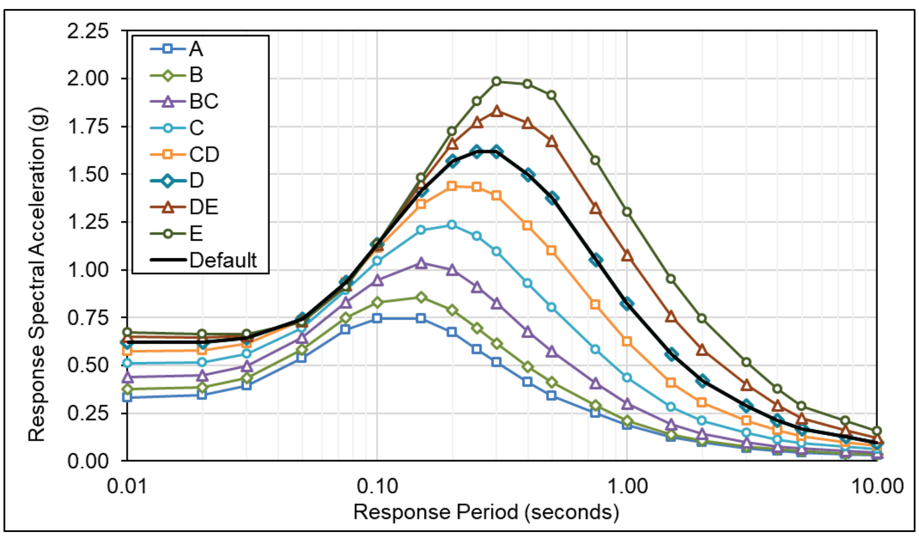


Figure B-30 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-30, GTL6(WA)S1R1.

Table B-31 GTL6(WA)S2R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (WA), S2 Ground Motion Level (0.74g < S_S ≤ 1.313g), and R1 Spectral Response Ratio Group ($R_{S/1}$ ≥ 3.2)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.338	0.376	0.427	0.473	0.510	0.525	0.527	0.545	0.525
0.01	0.339	0.377	0.428	0.474	0.511	0.525	0.527	0.544	0.525
0.02	0.381	0.408	0.456	0.500	0.533	0.544	0.538	0.539	0.544
0.03	0.434	0.460	0.503	0.538	0.561	0.560	0.542	0.535	0.561
0.05	0.567	0.598	0.624	0.635	0.629	0.601	0.559	0.546	0.635
0.08	0.735	0.788	0.831	0.849	0.843	0.811	0.767	0.762	0.849
0.10	0.836	0.922	1.009	1.064	1.086	1.074	1.045	1.068	1.086
0.15	0.800	0.916	1.075	1.200	1.274	1.295	1.292	1.344	1.295
0.20	0.683	0.806	**1.000**	1.190	1.320	1.386	1.425	1.512	1.386
0.25	0.570	0.688	0.887	1.122	1.304	1.412	1.496	1.626	1.412
0.30	0.490	0.599	0.791	1.037	1.253	1.393	1.510	1.673	1.393
0.40	0.386	0.477	0.644	0.874	1.109	1.280	1.434	1.615	1.280
0.50	0.311	0.387	0.534	0.742	0.975	1.161	1.335	1.542	1.161
0.75	0.216	0.267	0.375	0.533	0.728	0.896	1.070	1.287	0.896
1.0	0.165	0.204	0.292	0.427	0.596	0.757	0.938	1.157	0.757
1.5	0.109	0.136	0.195	0.289	0.410	0.541	0.706	0.905	0.541
2.0	0.083	0.103	0.146	0.217	0.309	0.416	0.562	0.745	0.416
3.0	0.054	0.068	0.094	0.142	0.201	0.271	0.369	0.491	0.271
4.0	0.041	0.051	0.070	0.104	0.144	0.191	0.255	0.339	0.191
5.0	0.033	0.041	0.054	0.078	0.107	0.139	0.183	0.241	0.139
7.5	0.023	0.027	0.036	0.050	0.067	0.084	0.108	0.143	0.084
10	0.019	0.023	0.029	0.040	0.051	0.062	0.077	0.099	0.062
$S_{a,amax}$ (g)	0.683	0.806	1.000	1.190	1.320	1.412	1.510	1.673	1.412
T_{amax} (s)	0.20	0.20	0.20	0.20	0.20	0.25	0.30	0.30	0.25
$S_{a,vmax}$ (g)	0.083	0.103	0.292	0.217	0.309	0.416	0.562	0.745	0.416
T_{vmax} (s)	2.00	2.00	1.00	2.00	2.00	2.00	2.00	2.00	2.00

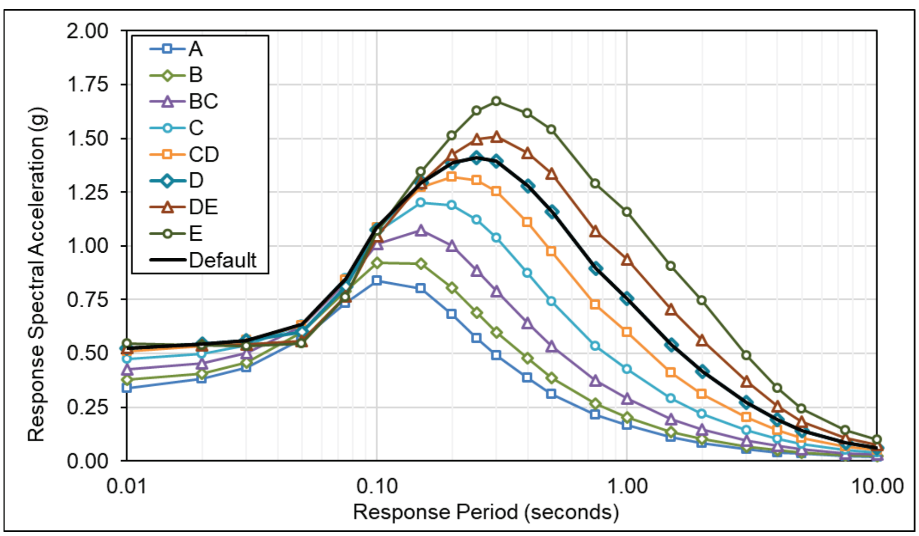


Figure B-31 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-31, GTL6(WA)S2R1.

Table B-32 GTL6(WA)S3R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (WA), S3 Ground Motion Level (1.313g < $S_S \leq$ 1.628g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.338	0.376	0.424	0.465	0.494	0.502	0.498	0.514	0.502
0.01	0.339	0.377	0.425	0.465	0.494	0.502	0.498	0.513	0.502
0.02	0.386	0.412	0.456	0.493	0.517	0.519	0.505	0.501	0.519
0.03	0.441	0.465	0.504	0.531	0.544	0.534	0.509	0.498	0.544
0.05	0.576	0.606	0.624	0.624	0.608	0.572	0.525	0.510	0.624
0.08	0.745	0.797	0.831	0.837	0.819	0.780	0.729	0.721	0.837
0.10	0.851	0.938	1.015	1.057	1.066	1.044	1.006	1.023	1.066
0.15	0.808	0.926	1.080	1.191	1.247	1.254	1.238	1.284	1.254
0.20	0.684	0.808	**1.000**	1.176	1.284	1.331	1.354	1.432	1.331
0.25	0.568	0.687	0.884	1.110	1.267	1.351	1.414	1.533	1.351
0.30	0.487	0.597	0.787	1.027	1.220	1.331	1.420	1.568	1.331
0.40	0.383	0.475	0.640	0.868	1.084	1.225	1.344	1.504	1.225
0.50	0.307	0.384	0.529	0.734	0.953	1.110	1.248	1.431	1.110
0.75	0.212	0.264	0.371	0.527	0.714	0.861	1.003	1.194	0.861
1.0	0.162	0.202	0.288	0.421	0.585	0.730	0.885	1.079	0.730
1.5	0.107	0.133	0.191	0.283	0.401	0.523	0.673	0.856	0.523
2.0	0.080	0.100	0.141	0.210	0.299	0.401	0.540	0.713	0.401
3.0	0.052	0.065	0.090	0.135	0.191	0.258	0.351	0.467	0.258
4.0	0.038	0.048	0.065	0.097	0.135	0.179	0.240	0.318	0.179
5.0	0.031	0.038	0.050	0.072	0.099	0.129	0.170	0.223	0.129
7.5	0.020	0.025	0.032	0.045	0.060	0.076	0.097	0.128	0.076
10	0.017	0.020	0.026	0.035	0.045	0.055	0.068	0.087	0.055
$S_{a,amax}$**(g)**	0.684	0.808	1.000	1.176	1.284	1.351	1.420	1.568	1.351
T_{amax} **(s)**	0.20	0.20	0.20	0.20	0.20	0.25	0.30	0.30	0.25
$S_{a,vmax}$**(g)**	0.162	0.202	0.288	0.283	0.401	0.401	0.540	0.713	0.401
T_{vmax} **(s)**	1.00	1.00	1.00	1.50	1.50	2.00	2.00	2.00	2.00

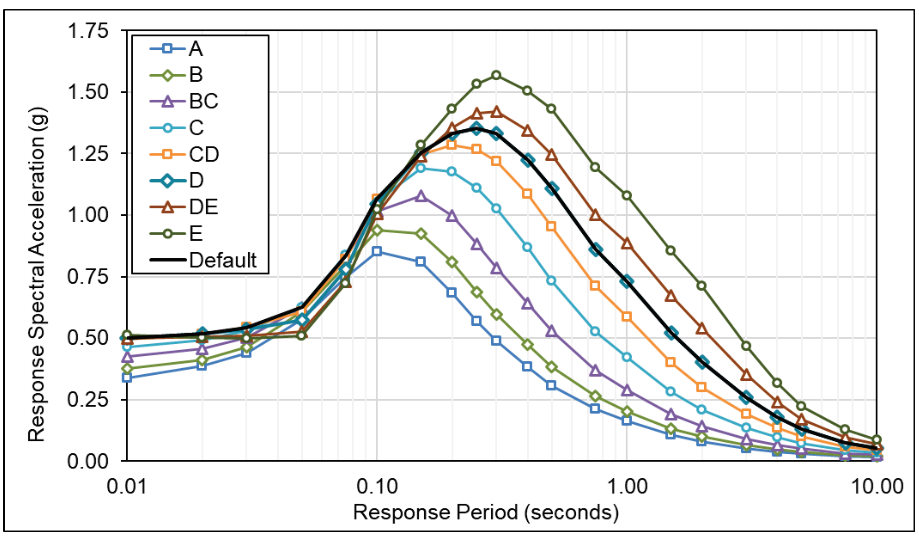


Figure B-32 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-32, GTL6(WA)S3R1.

Table B-33 GTL6(WA)S4R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (WA), S4 Ground Motion Level (S_S> 1.628g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.338	0.375	0.423	0.458	0.477	0.475	0.462	0.473	0.477
0.01	0.339	0.376	0.424	0.459	0.478	0.475	0.461	0.471	0.478
0.02	0.384	0.410	0.454	0.485	0.498	0.489	0.466	0.458	0.498
0.03	0.441	0.466	0.503	0.522	0.523	0.502	0.468	0.454	0.523
0.05	0.583	0.614	0.627	0.616	0.585	0.538	0.483	0.465	0.616
0.08	0.753	0.805	0.830	0.819	0.783	0.729	0.670	0.658	0.819
0.10	0.854	0.940	1.007	1.028	1.013	0.974	0.925	0.936	1.028
0.15	0.808	0.926	1.076	1.160	1.184	1.165	1.135	1.172	1.184
0.20	0.684	0.808	**1.000**	1.157	1.223	1.235	1.238	1.302	1.235
0.25	0.569	0.688	0.885	1.101	1.217	1.258	1.291	1.392	1.258
0.30	0.490	0.600	0.790	1.025	1.183	1.247	1.298	1.423	1.247
0.40	0.387	0.479	0.646	0.872	1.068	1.163	1.234	1.365	1.163
0.50	0.312	0.388	0.535	0.739	0.945	1.063	1.152	1.301	1.063
0.75	0.217	0.268	0.376	0.533	0.715	0.838	0.941	1.099	0.838
1.0	0.164	0.203	0.290	0.423	0.583	0.712	0.838	1.003	0.712
1.5	0.107	0.132	0.189	0.280	0.395	0.511	0.648	0.813	0.511
2.0	0.079	0.098	0.138	0.205	0.291	0.390	0.523	0.687	0.390
3.0	0.050	0.062	0.086	0.128	0.182	0.246	0.336	0.446	0.246
4.0	0.036	0.045	0.061	0.091	0.127	0.168	0.225	0.297	0.168
5.0	0.028	0.035	0.046	0.067	0.091	0.119	0.157	0.206	0.119
7.5	0.018	0.022	0.029	0.041	0.054	0.068	0.087	0.116	0.068
10	0.015	0.018	0.023	0.032	0.040	0.049	0.061	0.078	0.049
$S_{a,amax}$(g)	0.684	0.808	1.000	1.157	1.223	1.258	1.298	1.423	1.258
T_{amax} (s)	0.20	0.20	0.20	0.20	0.20	0.25	0.30	0.30	0.25
$S_{a,vmax}$(g)	0.164	0.203	0.290	0.423	0.395	0.390	0.523	0.687	0.390
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.50	2.00	2.00	2.00	2.00

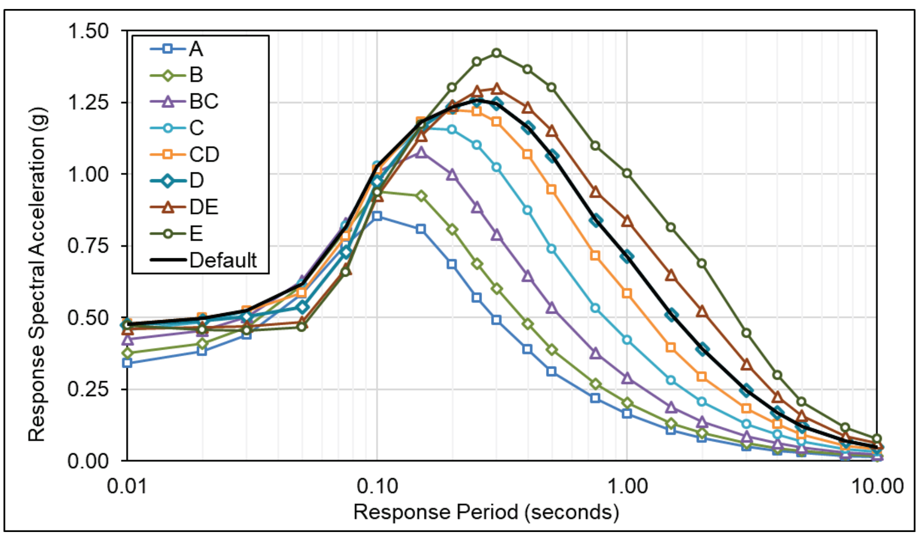


Figure B-33 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-33, GTL6(WA)S4R1.

Table B-34 GTL6(IDNV)S1R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (ID, NV), S1 Ground Motion Level ($S_S \leq 0.553$g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.326	0.368	0.432	0.497	0.556	0.590	0.608	0.622	0.590
0.01	0.328	0.370	0.434	0.500	0.559	0.593	0.611	0.626	0.593
0.02	0.340	0.381	0.445	0.507	0.563	0.596	0.611	0.622	0.596
0.03	0.393	0.434	0.495	0.550	0.596	0.615	0.616	0.619	0.615
0.05	0.539	0.584	0.642	0.687	0.714	0.709	0.687	0.676	0.714
0.08	0.688	0.751	0.826	0.879	0.903	0.890	0.859	0.846	0.903
0.10	0.747	0.832	0.944	1.028	1.074	1.074	1.052	1.047	1.074
0.15	0.745	0.856	1.035	1.188	1.297	1.341	1.351	1.365	1.341
0.20	0.673	0.789	**1.000**	1.221	1.395	1.492	1.546	1.588	1.492
0.25	0.584	0.695	0.909	1.167	1.398	1.549	1.658	1.742	1.549
0.30	0.515	0.615	0.823	1.089	1.361	1.559	1.725	1.853	1.559
0.40	0.412	0.495	0.678	0.928	1.221	1.464	1.698	1.873	1.464
0.50	0.345	0.417	0.581	0.812	1.103	1.366	1.634	1.845	1.366
0.75	0.255	0.298	0.420	0.598	0.834	1.067	1.325	1.551	1.067
1.0	0.194	0.217	0.310	0.448	0.637	0.841	1.085	1.297	0.841
1.5	0.131	0.141	0.199	0.291	0.421	0.575	0.780	0.966	0.575
2.0	0.103	0.110	0.146	0.213	0.307	0.425	0.589	0.744	0.425
3.0	0.072	0.077	0.095	0.139	0.201	0.278	0.388	0.493	0.278
4.0	0.055	0.059	0.071	0.103	0.147	0.200	0.275	0.349	0.200
5.0	0.045	0.049	0.058	0.082	0.114	0.153	0.207	0.261	0.153
7.5	0.036	0.039	0.046	0.065	0.087	0.112	0.146	0.185	0.112
10	0.031	0.034	0.039	0.053	0.069	0.087	0.109	0.136	0.087
$S_{a,amax}$(g)	0.673	0.789	1.000	1.221	1.398	1.559	1.725	1.873	1.559
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.30	0.40	0.30
$S_{a,vmax}$(g)	0.103	0.110	0.310	0.448	0.637	0.575	0.589	0.744	0.575
T_{vmax} (s)	2.00	2.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

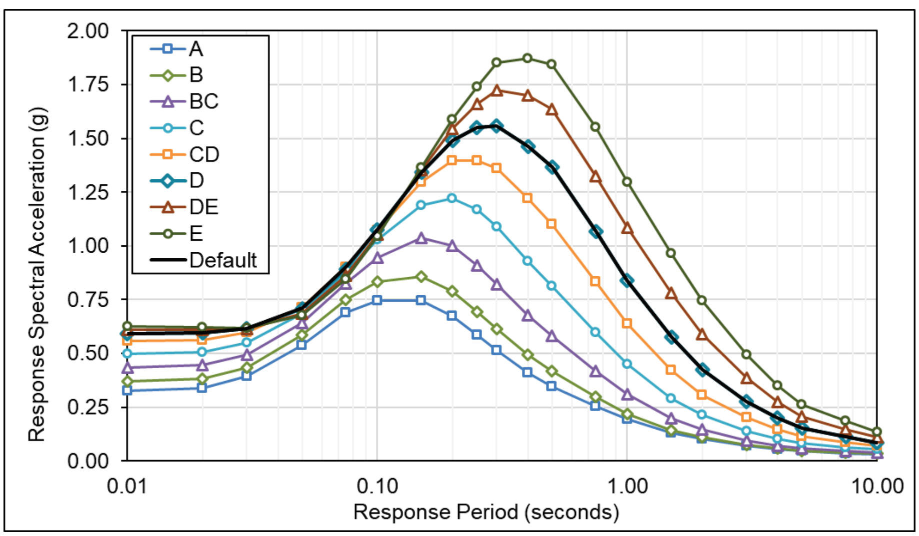


Figure B-34 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-34, GTL6(IDNV)S1R1.

Table B-35 GTL6(IDNV)S1R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (ID, NV), S1 Ground Motion Level ($S_S \leq 0.553$g), and R2 Spectral Response Ratio Group ($2.9 \leq R_{S/1} < 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.328	0.370	0.434	0.502	0.568	0.609	0.637	0.659	0.609
0.01	0.329	0.371	0.436	0.505	0.571	0.613	0.641	0.663	0.613
0.02	0.340	0.382	0.446	0.512	0.575	0.616	0.642	0.660	0.616
0.03	0.393	0.434	0.496	0.555	0.608	0.637	0.649	0.659	0.637
0.05	0.538	0.583	0.642	0.694	0.731	0.738	0.728	0.724	0.738
0.08	0.687	0.749	0.828	0.889	0.928	0.931	0.915	0.910	0.931
0.10	0.745	0.831	0.946	1.041	1.106	1.126	1.122	1.128	1.126
0.15	0.744	0.854	1.035	1.202	1.336	1.409	1.448	1.478	1.409
0.20	0.672	0.788	**1.000**	1.232	1.434	1.565	1.656	1.720	1.565
0.25	0.586	0.697	0.912	1.179	1.435	1.623	1.775	1.886	1.623
0.30	0.518	0.620	0.830	1.103	1.398	1.632	1.845	2.005	1.632
0.40	0.418	0.504	0.690	0.947	1.260	1.536	1.815	2.025	1.536
0.50	0.353	0.428	0.597	0.835	1.143	1.436	1.745	1.989	1.436
0.75	0.264	0.309	0.435	0.620	0.869	1.122	1.412	1.667	1.122
1.0	0.202	0.226	0.322	0.466	0.664	0.883	1.151	1.384	0.883
1.5	0.138	0.148	0.208	0.305	0.442	0.606	0.825	1.023	0.606
2.0	0.109	0.115	0.152	0.221	0.320	0.443	0.616	0.776	0.443
3.0	0.076	0.079	0.097	0.141	0.204	0.284	0.397	0.502	0.284
4.0	0.057	0.060	0.071	0.102	0.146	0.200	0.276	0.347	0.200
5.0	0.046	0.049	0.056	0.079	0.111	0.150	0.203	0.254	0.150
7.5	0.035	0.037	0.042	0.058	0.079	0.102	0.134	0.168	0.102
10	0.028	0.030	0.035	0.046	0.060	0.076	0.097	0.119	0.076
$S_{a,amax}$(g)	0.672	0.788	1.000	1.232	1.435	1.632	1.845	2.025	1.632
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.30	0.40	0.30
$S_{a,vmax}$(g)	0.109	0.115	0.322	0.466	0.664	0.606	0.825	0.776	0.606
T_{vmax} (s)	2.00	2.00	1.00	1.00	1.00	1.50	1.50	2.00	1.50

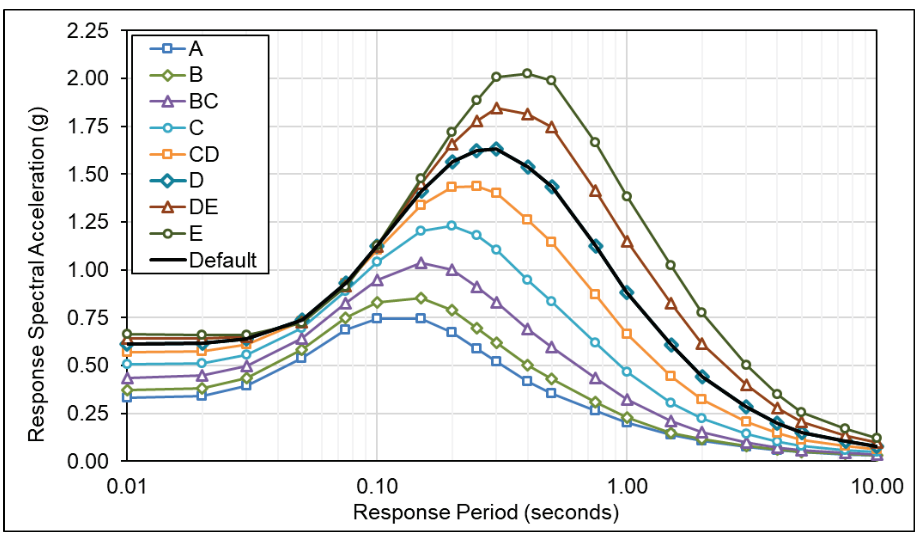


Figure B-35 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-35, GTL6(IDNV)S1R2.

Table B-36 GTL6(IDNV)S2R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (ID, NV), S2 Ground Motion Level (0.553g < $S_S \leq$ 1.155g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq$ 3.2)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.324	0.365	0.427	0.481	0.517	0.522	0.509	0.503	0.522
0.01	0.326	0.367	0.429	0.483	0.520	0.525	0.512	0.507	0.525
0.02	0.339	0.380	0.442	0.494	0.527	0.529	0.512	0.502	0.529
0.03	0.396	0.437	0.496	0.537	0.557	0.544	0.512	0.496	0.557
0.05	0.550	0.596	0.646	0.670	0.661	0.620	0.564	0.537	0.670
0.08	0.702	0.764	0.826	0.846	0.822	0.763	0.695	0.664	0.846
0.10	0.757	0.843	0.939	0.981	0.966	0.907	0.836	0.807	0.981
0.15	0.749	0.859	1.032	1.136	1.161	1.120	1.056	1.033	1.161
0.20	0.675	0.791	**1.000**	1.184	1.266	1.257	1.212	1.202	1.266
0.25	0.584	0.694	0.906	1.141	1.286	1.322	1.311	1.324	1.322
0.30	0.512	0.612	0.817	1.066	1.266	1.348	1.380	1.420	1.348
0.40	0.405	0.485	0.664	0.901	1.143	1.285	1.383	1.461	1.285
0.50	0.335	0.403	0.561	0.779	1.028	1.205	1.346	1.457	1.205
0.75	0.245	0.284	0.401	0.569	0.780	0.956	1.121	1.264	0.956
1.0	0.182	0.204	0.292	0.420	0.590	0.755	0.931	1.078	0.755
1.5	0.118	0.127	0.180	0.263	0.378	0.509	0.675	0.821	0.509
2.0	0.090	0.096	0.128	0.186	0.268	0.369	0.509	0.639	0.369
3.0	0.061	0.064	0.078	0.114	0.165	0.230	0.321	0.406	0.230
4.0	0.045	0.047	0.056	0.080	0.115	0.158	0.218	0.273	0.158
5.0	0.036	0.038	0.043	0.062	0.086	0.116	0.158	0.197	0.116
7.5	0.027	0.028	0.032	0.045	0.060	0.078	0.103	0.128	0.078
10	0.022	0.024	0.027	0.036	0.047	0.059	0.075	0.092	0.059
$S_{a,amax}$ (g)	0.675	0.791	1.000	1.184	1.286	1.348	1.383	1.461	1.348
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.40	0.30
$S_{a,vmax}$ (g)	0.182	0.204	0.292	0.420	0.590	0.509	0.509	0.639	0.509
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

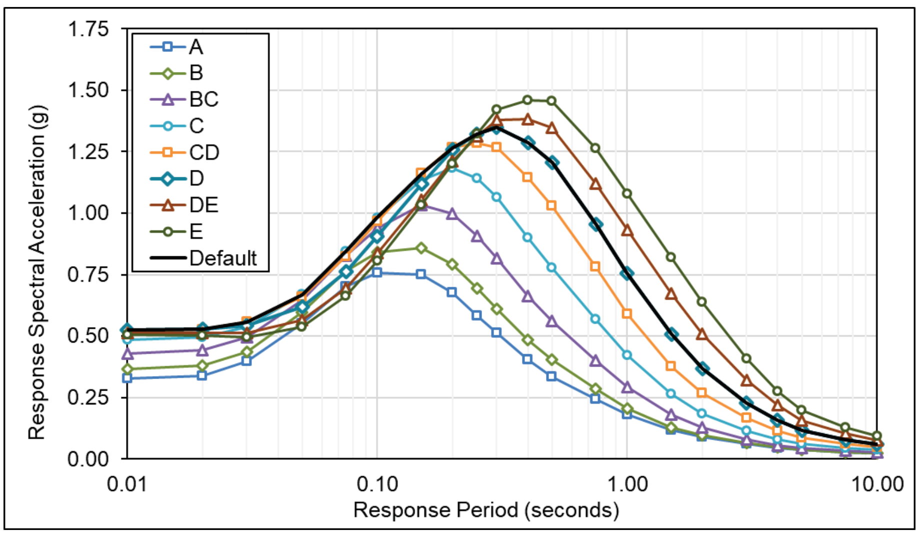


Figure B-36 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-36, GTL6(IDNV)S2R1.

Table B-37 GTL6(IDNV)S3R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (ID, NV), S3 Ground Motion Level (1.155g < $S_S \leq$ 1.825g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.317	0.357	0.415	0.461	0.484	0.473	0.443	0.428	0.484
0.01	0.319	0.359	0.417	0.463	0.487	0.476	0.447	0.432	0.487
0.02	0.333	0.373	0.430	0.472	0.492	0.479	0.447	0.428	0.492
0.03	0.393	0.432	0.484	0.512	0.519	0.491	0.445	0.422	0.519
0.05	0.564	0.605	0.637	0.643	0.618	0.562	0.495	0.462	0.643
0.08	0.722	0.782	0.822	0.820	0.774	0.698	0.619	0.584	0.820
0.10	0.772	0.857	0.935	0.951	0.906	0.824	0.740	0.705	0.951
0.15	0.756	0.866	1.035	1.105	1.086	1.005	0.911	0.871	1.105
0.20	0.676	0.791	**1.000**	1.167	1.191	1.123	1.026	0.987	1.191
0.25	0.586	0.693	0.905	1.136	1.227	1.190	1.108	1.078	1.227
0.30	0.516	0.613	0.818	1.063	1.227	1.230	1.176	1.160	1.230
0.40	0.415	0.494	0.675	0.912	1.138	1.204	1.199	1.205	1.204
0.50	0.347	0.413	0.575	0.794	1.027	1.138	1.173	1.207	1.138
0.75	0.253	0.292	0.413	0.585	0.789	0.918	1.000	1.075	0.918
1.0	0.191	0.214	0.306	0.442	0.613	0.751	0.871	0.969	0.751
1.5	0.122	0.133	0.188	0.275	0.392	0.514	0.656	0.781	0.514
2.0	0.091	0.098	0.133	0.194	0.279	0.380	0.517	0.649	0.380
3.0	0.060	0.064	0.081	0.119	0.171	0.236	0.328	0.419	0.236
4.0	0.043	0.046	0.056	0.081	0.115	0.157	0.216	0.274	0.157
5.0	0.034	0.036	0.043	0.061	0.085	0.113	0.153	0.193	0.113
7.5	0.020	0.022	0.025	0.035	0.046	0.060	0.078	0.099	0.060
10	0.014	0.016	0.018	0.024	0.032	0.040	0.050	0.062	0.040
$S_{a,amax}$(g)	0.676	0.791	1.000	1.167	1.227	1.230	1.199	1.207	1.230
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.30	0.40	0.50	0.30
$S_{a,vmax}$(g)	0.191	0.214	0.306	0.442	0.613	0.514	0.517	0.649	0.514
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

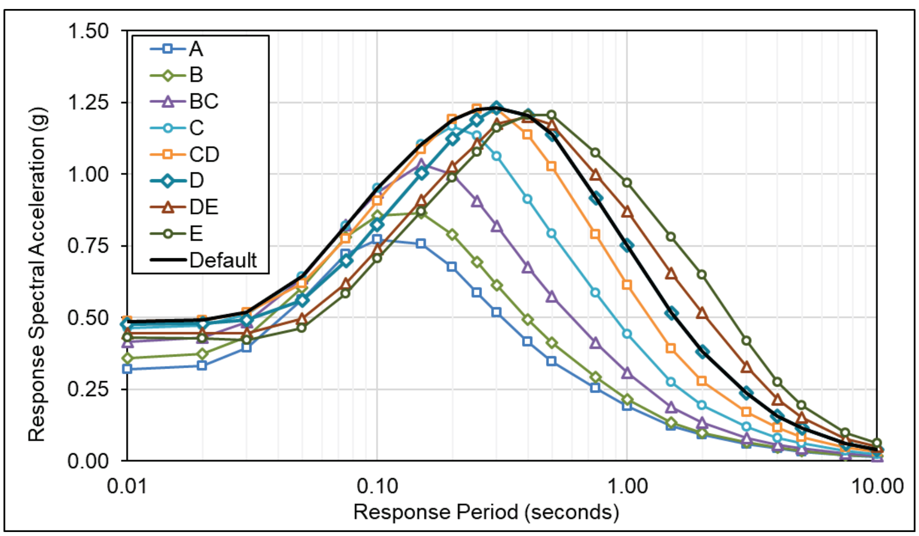


Figure B-37 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-37, GTL6(IDNV)S3R1.

Table B-38 GTL6(IDNV)S3R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (ID, NV), S3 Ground Motion Level (1.155g < S_S ≤ 1.825g), and R2 Spectral Response Ratio Group (2.9 ≤ $R_{S/1}$ < 3.2)

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.322	0.362	0.421	0.470	0.496	0.489	0.462	0.450	0.496
0.01	0.324	0.364	0.424	0.472	0.499	0.492	0.465	0.453	0.499
0.02	0.337	0.377	0.436	0.481	0.504	0.494	0.465	0.448	0.504
0.03	0.397	0.436	0.489	0.521	0.531	0.506	0.463	0.441	0.531
0.05	0.565	0.606	0.643	0.653	0.631	0.577	0.512	0.482	0.653
0.08	0.722	0.782	0.827	0.830	0.788	0.714	0.636	0.603	0.830
0.10	0.771	0.854	0.938	0.960	0.920	0.842	0.760	0.727	0.960
0.15	0.758	0.866	1.036	1.114	1.105	1.032	0.945	0.909	1.114
0.20	0.679	0.791	**1.000**	1.170	1.208	1.155	1.073	1.042	1.208
0.25	0.590	0.697	0.910	1.140	1.244	1.225	1.163	1.143	1.244
0.30	0.521	0.618	0.825	1.070	1.243	1.265	1.234	1.233	1.265
0.40	0.424	0.504	0.689	0.930	1.159	1.241	1.260	1.283	1.241
0.50	0.356	0.423	0.590	0.815	1.056	1.180	1.235	1.286	1.180
0.75	0.262	0.302	0.427	0.603	0.815	0.956	1.053	1.142	0.956
1.0	0.200	0.224	0.320	0.462	0.641	0.789	0.920	1.029	0.789
1.5	0.131	0.142	0.201	0.294	0.419	0.550	0.704	0.838	0.550
2.0	0.099	0.107	0.144	0.211	0.302	0.413	0.562	0.705	0.413
3.0	0.067	0.072	0.091	0.133	0.191	0.264	0.368	0.469	0.264
4.0	0.049	0.053	0.065	0.094	0.133	0.182	0.249	0.316	0.182
5.0	0.040	0.042	0.050	0.071	0.099	0.133	0.180	0.226	0.133
7.5	0.024	0.026	0.030	0.042	0.056	0.073	0.095	0.119	0.073
10	0.018	0.019	0.022	0.030	0.038	0.048	0.061	0.075	0.048
$S_{a,amax}$(g)	0.679	0.791	1.000	1.170	1.244	1.265	1.260	1.286	1.265
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.50	0.30
$S_{a,vmax}$(g)	0.200	0.224	0.320	0.462	0.641	0.550	0.562	0.705	0.550
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

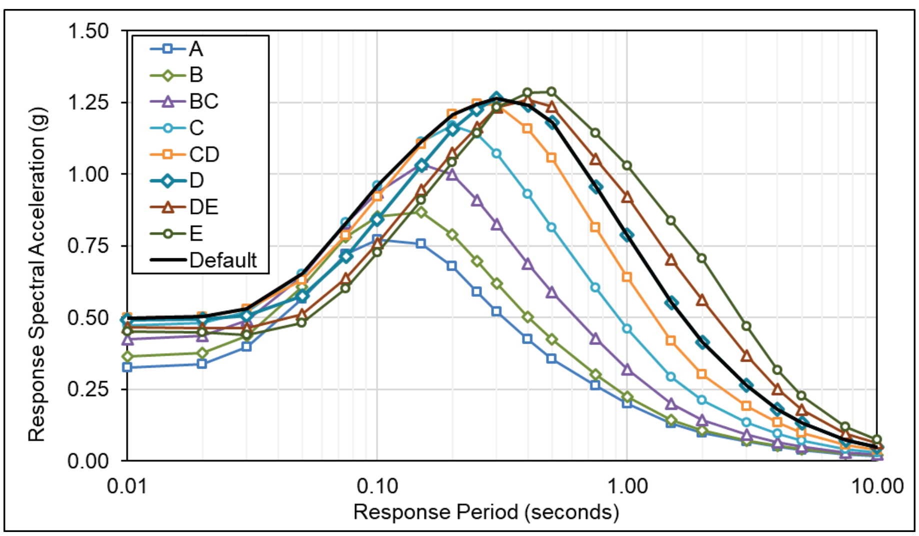


Figure B-38 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-38, GTL6(IDNV)S3R2.

Table B-39 GTL6(IDNV)S4R1, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (ID, NV), S4 Ground Motion Level (1.825g < $S_S \leq$ 2.193g), and R1 Spectral Response Ratio Group ($R_{S/1} \geq 3.2$)

Period *T (s)*	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.318	0.357	0.413	0.452	0.466	0.446	0.409	0.390	0.466
0.01	0.320	0.359	0.415	0.455	0.468	0.449	0.412	0.394	0.468
0.02	0.334	0.374	0.429	0.465	0.474	0.452	0.412	0.390	0.474
0.03	0.398	0.436	0.485	0.504	0.499	0.463	0.410	0.384	0.504
0.05	0.575	0.616	0.639	0.632	0.593	0.527	0.455	0.421	0.632
0.08	0.733	0.792	0.819	0.800	0.738	0.651	0.567	0.530	0.800
0.10	0.781	0.866	0.931	0.926	0.860	0.765	0.674	0.637	0.926
0.15	0.758	0.867	1.031	1.076	1.027	0.926	0.822	0.778	1.076
0.20	0.677	0.791	**1.000**	1.147	1.132	1.035	0.923	0.878	1.147
0.25	0.586	0.693	0.904	1.125	1.176	1.102	0.998	0.958	1.176
0.30	0.517	0.614	0.819	1.057	1.189	1.148	1.062	1.032	1.189
0.40	0.416	0.495	0.676	0.911	1.116	1.138	1.092	1.077	1.138
0.50	0.347	0.413	0.575	0.792	1.011	1.084	1.076	1.085	1.084
0.75	0.255	0.295	0.417	0.589	0.787	0.891	0.936	0.987	0.891
1.0	0.191	0.215	0.308	0.444	0.611	0.734	0.826	0.903	0.734
1.5	0.121	0.132	0.188	0.275	0.390	0.506	0.635	0.748	0.506
2.0	0.089	0.097	0.132	0.192	0.276	0.374	0.507	0.636	0.374
3.0	0.058	0.062	0.079	0.116	0.167	0.230	0.321	0.410	0.230
4.0	0.041	0.044	0.053	0.078	0.110	0.150	0.207	0.262	0.150
5.0	0.032	0.034	0.040	0.057	0.080	0.107	0.144	0.182	0.107
7.5	0.018	0.019	0.023	0.031	0.042	0.054	0.071	0.089	0.054
10	0.013	0.014	0.016	0.022	0.028	0.035	0.045	0.055	0.035
$S_{a,amax}$(g)	0.677	0.791	1.000	1.147	1.189	1.148	1.092	1.085	1.189
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.30	0.40	0.50	0.30
$S_{a,vmax}$(g)	0.191	0.215	0.308	0.444	0.611	0.506	0.507	0.636	0.506
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

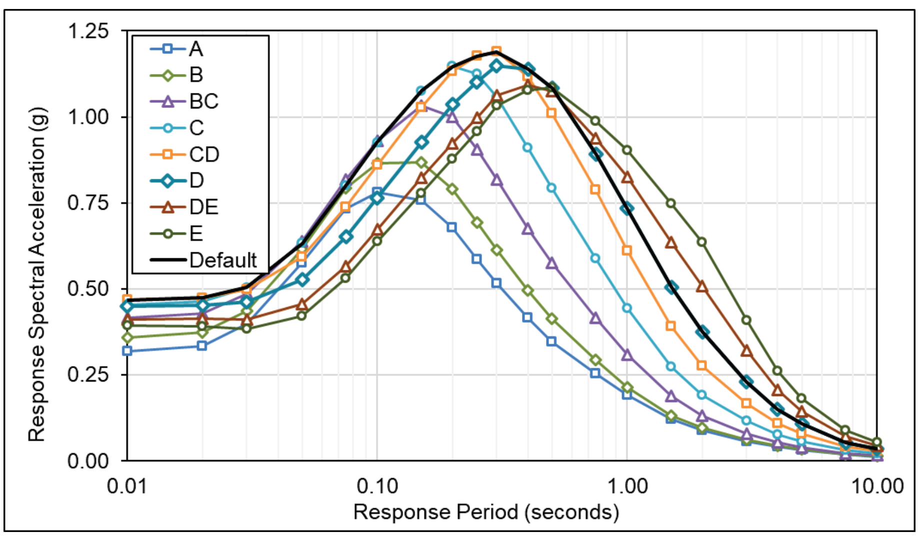


Figure B-39 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-39, GTL6(IDNV)S4R1.

Table B-40 GTL6(IDNV)S4R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (ID, NV), S4 Ground Motion Level (1.825g < S_S ≤ 2.193g), and R2 Spectral Response Ratio Group (2.9 ≤ $R_{S/1}$ < 3.2

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.319	0.357	0.412	0.447	0.451	0.423	0.379	0.358	0.451
0.01	0.321	0.359	0.414	0.449	0.453	0.426	0.382	0.361	0.453
0.02	0.337	0.376	0.430	0.460	0.459	0.429	0.382	0.357	0.460
0.03	0.402	0.441	0.487	0.498	0.483	0.438	0.379	0.350	0.498
0.05	0.584	0.625	0.640	0.622	0.571	0.496	0.418	0.382	0.622
0.08	0.739	0.797	0.813	0.780	0.702	0.605	0.516	0.478	0.780
0.10	0.784	0.868	0.921	0.898	0.813	0.706	0.609	0.570	0.898
0.15	0.757	0.865	1.025	1.045	0.971	0.852	0.740	0.694	1.045
0.20	0.679	0.792	**1.000**	1.130	1.080	0.959	0.834	0.785	1.130
0.25	0.590	0.697	0.908	1.121	1.137	1.029	0.905	0.858	1.137
0.30	0.523	0.620	0.827	1.061	1.164	1.083	0.969	0.928	1.164
0.40	0.424	0.504	0.689	0.924	1.114	1.095	1.010	0.978	1.114
0.50	0.356	0.423	0.589	0.809	1.018	1.056	1.007	0.995	1.056
0.75	0.265	0.307	0.434	0.613	0.811	0.895	0.905	0.932	0.895
1.0	0.200	0.225	0.322	0.465	0.637	0.748	0.818	0.875	0.748
1.5	0.128	0.140	0.199	0.290	0.411	0.527	0.650	0.756	0.527
2.0	0.094	0.102	0.139	0.203	0.291	0.394	0.532	0.663	0.394
3.0	0.061	0.066	0.084	0.123	0.177	0.245	0.342	0.436	0.245
4.0	0.043	0.046	0.056	0.082	0.116	0.159	0.219	0.278	0.159
5.0	0.033	0.036	0.042	0.060	0.083	0.112	0.152	0.190	0.112
7.5	0.018	0.020	0.023	0.031	0.042	0.055	0.071	0.089	0.055
10	0.013	0.014	0.016	0.021	0.028	0.035	0.044	0.054	0.035
$S_{a,amax}$(g)	0.679	0.792	1.000	1.130	1.164	1.095	1.010	0.995	1.164
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.40	0.40	0.50	0.30
$S_{a,vmax}$(g)	0.200	0.225	0.322	0.465	0.637	0.527	0.532	0.663	0.527
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

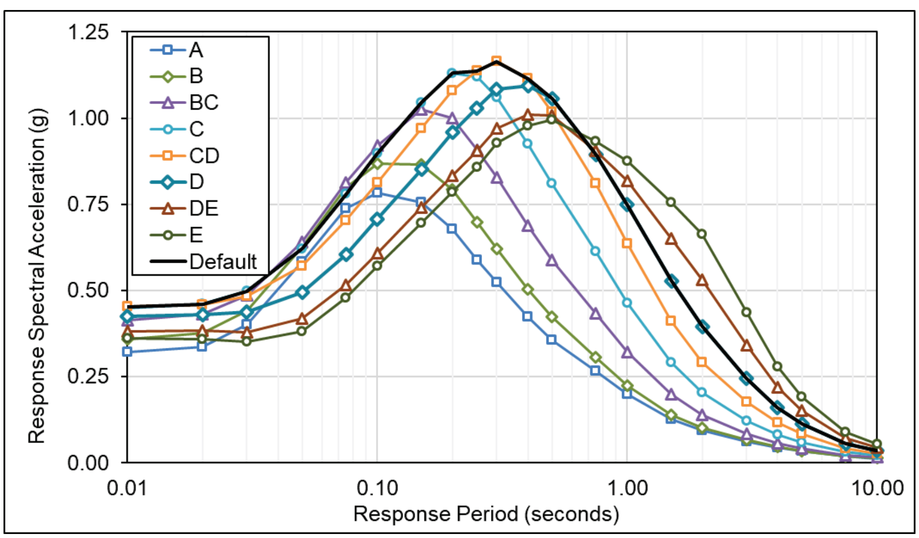


Figure B-40 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-40, GTL6(IDNV)S4R2.

Table B-41 GTL6(IDNV)S5R2, Probabilistic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for T_L = 6 s (ID, NV), S5 Ground Motion Level (S_S> 2.193g), and R2 Spectral Response Ratio Group (2.9 ≤ $R_{S/1}$ < 3.2)

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.319	0.357	0.412	0.443	0.443	0.412	0.365	0.342	0.443
0.01	0.321	0.360	0.414	0.445	0.446	0.415	0.368	0.345	0.446
0.02	0.337	0.376	0.430	0.456	0.452	0.418	0.368	0.341	0.456
0.03	0.403	0.441	0.487	0.494	0.474	0.426	0.364	0.334	0.494
0.05	0.586	0.627	0.639	0.615	0.559	0.481	0.401	0.364	0.615
0.08	0.741	0.800	0.809	0.769	0.685	0.584	0.492	0.452	0.769
0.10	0.785	0.870	0.919	0.885	0.792	0.679	0.578	0.537	0.885
0.15	0.754	0.865	1.023	1.032	0.945	0.818	0.700	0.652	1.032
0.20	0.676	0.791	**1.000**	1.124	1.057	0.923	0.790	0.738	1.124
0.25	0.586	0.695	0.907	1.119	1.119	0.995	0.859	0.807	1.119
0.30	0.519	0.619	0.824	1.058	1.153	1.054	0.924	0.876	1.153
0.40	0.421	0.502	0.685	0.921	1.109	1.074	0.971	0.928	1.109
0.50	0.352	0.421	0.584	0.804	1.011	1.038	0.972	0.949	1.038
0.75	0.262	0.305	0.430	0.607	0.804	0.880	0.880	0.898	0.880
1.0	0.197	0.222	0.318	0.458	0.627	0.733	0.795	0.846	0.733
1.5	0.125	0.137	0.194	0.284	0.402	0.514	0.633	0.734	0.514
2.0	0.092	0.100	0.136	0.198	0.283	0.383	0.516	0.643	0.383
3.0	0.059	0.063	0.080	0.118	0.170	0.235	0.327	0.418	0.235
4.0	0.041	0.044	0.054	0.078	0.110	0.151	0.208	0.263	0.151
5.0	0.032	0.034	0.040	0.056	0.079	0.106	0.143	0.180	0.106
7.5	0.017	0.019	0.021	0.029	0.040	0.051	0.067	0.084	0.051
10	0.012	0.013	0.015	0.020	0.026	0.033	0.041	0.051	0.033
$S_{a,amax}$(g)	0.676	0.791	1.000	1.124	1.153	1.074	0.972	0.949	1.153
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.40	0.50	0.50	0.30
$S_{a,vmax}$(g)	0.197	0.222	0.318	0.458	0.627	0.514	0.516	0.643	0.514
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

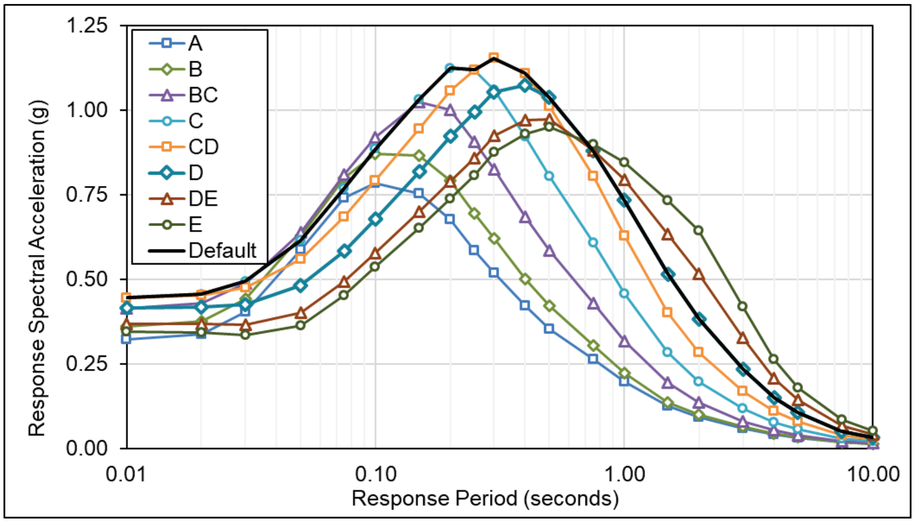


Figure B-41 Plots of probabilistic response spectrum shape parameters (RSSPs) by site class, for Table B-41, GTL6(IDNV)S5R2.

Appendix C

Deterministic Response Spectrum Shape Parameters

This appendix provides tables and figures of deterministic response spectrum shape parameters (RSSPs) that characterize the generic shape (frequency content) of deterministic MCE_R ground motions for each of 15 combinations of three levels of ground motion and five earthquake magnitudes. Deterministic RSSPs are used in Chapter 5 to develop deterministic multi-period response spectra (MPRS) for a given pair of site-specific values of ground motion parameters S_S and S_1.

Deterministic RSSPs describe 5%-damped, 84^{th}-percentile, maximum-direction spectral response acceleration at 22 response periods (from 0.00 s to 10 s) for each of eight site classes (i.e., Site Classes A, B, BC, C, CD, D, DE, and E) and the Default site class (i.e., maximum of Site Classes C, CD, and D at the period of interest), normalized to be 1.0g at 0.2 s for Site Class BC (e.g., S_S = 1.0g).

The three ground motion levels are defined by paired values of ground motion parameters S_S and S_1 as follows: (1) S_S = 1.5g/S_1 = 0.6g, (2) S_S = 2.0g/S_1 = 0.8g, and (3) S_S = 2.5g/S_1 = 1.0g. The five discrete earthquake magnitudes (M6.0, M6.5, M7.0, M7.5, and M8.0) represent the range of earthquake magnitudes that typically govern deterministic MCE_R ground motions. The set(s) of deterministic RSSPs deemed to best represent the frequency content of deterministic MCE_R ground motions at the site of interest is(are) selected based on the site-specific values of parameters, S_S and S_1, and the earthquake magnitude(s) that govern short-period (0.2-second) response (M_S) and 1-second response (M_1).

To account for differences in the shape (frequency content) of deterministic MCE_R ground motions, different scaled sets of deterministic RSSPs are used to describe short-period and long-period response, respectively. Boundaries of these period ranges are defined by the period parameters, T_{amax} and T_{vmax}, which vary by site class. Values of the period parameters, T_{amax} and T_{vmax}, and corresponding values of normalized spectral response, $S_{a,Tamax}$ and $S_{a,Tvmax}$, at these periods are provided by site class in each table.

Table C-1 Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 1.5g/S_1 = 0.6g and Earthquake Magnitude 8.0

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.334	0.377	0.439	0.484	0.494	0.462	0.405	0.365	0.494
0.01	0.336	0.379	0.441	0.487	0.498	0.469	0.412	0.365	0.498
0.02	0.346	0.389	0.450	0.493	0.499	0.469	0.412	0.365	0.499
0.03	0.397	0.442	0.500	0.528	0.519	0.469	0.412	0.365	0.528
0.05	0.541	0.592	0.636	0.639	0.592	0.505	0.413	0.368	0.639
0.08	0.693	0.761	0.809	0.795	0.717	0.600	0.475	0.416	0.795
0.10	0.746	0.835	0.914	0.912	0.827	0.693	0.550	0.482	0.912
0.15	0.745	0.861	1.023	1.071	0.998	0.844	0.668	0.583	1.071
0.20	0.675	0.796	**1.000**	1.140	1.108	0.960	0.769	0.674	1.140
0.25	0.596	0.714	0.927	1.143	1.177	1.056	0.866	0.768	1.177
0.30	0.537	0.647	0.859	1.107	1.219	1.137	0.962	0.867	1.219
0.40	0.455	0.550	0.748	1.010	1.211	1.201	1.071	0.990	1.211
0.50	0.394	0.477	0.661	0.913	1.149	1.202	1.121	1.064	1.202
0.75	0.301	0.351	0.494	0.700	0.927	1.037	1.058	1.051	1.037
1.0	0.240	0.272	0.388	0.561	0.767	0.914	0.995	1.039	0.914
1.5	0.169	0.187	0.265	0.389	0.548	0.710	0.881	1.007	0.710
2.0	0.133	0.147	0.200	0.292	0.417	0.571	0.776	0.949	0.571
3.0	0.098	0.108	0.138	0.203	0.291	0.408	0.574	0.717	0.408
4.0	0.078	0.085	0.106	0.154	0.219	0.304	0.423	0.526	0.304
5.0	0.065	0.071	0.085	0.122	0.170	0.232	0.318	0.392	0.232
7.5	0.041	0.044	0.052	0.071	0.096	0.125	0.166	0.201	0.125
10	0.027	0.029	0.034	0.044	0.057	0.073	0.093	0.110	0.073
$S_{a,amax}$ (g)	0.675	0.796	1.000	1.143	1.219	1.202	1.121	1.064	1.219
T_{amax} (s)	0.20	0.20	0.20	0.25	0.30	0.50	0.50	0.50	0.30
$S_{a,vmax}$ (g)	0.133	0.147	0.388	0.292	0.219	0.408	0.574	0.717	0.408
T_{vmax} (s)	2.00	2.00	1.00	2.00	4.00	3.00	3.00	3.00	3.00

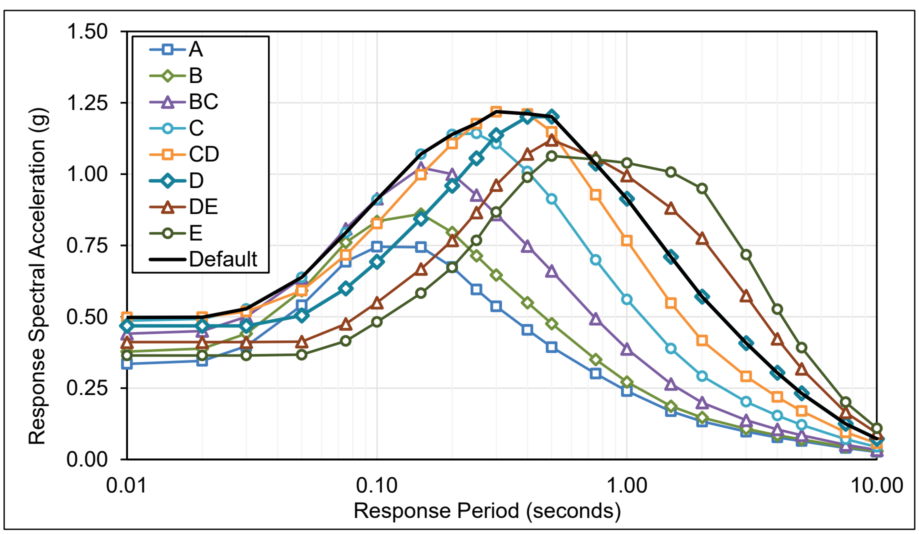


Figure C-1 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 1.5g/S_1 = 0.6g and earthquake magnitude 8.0.

Table C-2 **Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 1.5g/S_1 = 0.6g and Earthquake Magnitude 7.5**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.324	0.366	0.426	0.469	0.478	0.447	0.391	0.348	0.478
0.01	0.326	0.368	0.428	0.472	0.483	0.455	0.392	0.348	0.483
0.02	0.337	0.379	0.438	0.479	0.484	0.455	0.392	0.348	0.484
0.03	0.388	0.432	0.488	0.515	0.504	0.455	0.392	0.348	0.515
0.05	0.533	0.583	0.626	0.627	0.580	0.493	0.402	0.360	0.627
0.08	0.689	0.756	0.802	0.786	0.707	0.590	0.466	0.407	0.786
0.10	0.745	0.834	0.912	0.906	0.820	0.685	0.542	0.475	0.906
0.15	0.748	0.865	1.027	1.071	0.995	0.839	0.662	0.577	1.071
0.20	0.675	0.796	**1.000**	1.136	1.102	0.952	0.760	0.666	1.136
0.25	0.592	0.709	0.920	1.132	1.163	1.042	0.853	0.756	1.163
0.30	0.528	0.636	0.844	1.087	1.194	1.113	0.941	0.848	1.194
0.40	0.440	0.532	0.724	0.977	1.169	1.159	1.035	0.957	1.169
0.50	0.376	0.454	0.630	0.871	1.094	1.146	1.071	1.018	1.146
0.75	0.282	0.328	0.462	0.656	0.869	0.972	0.998	0.993	0.972
1.0	0.222	0.251	0.358	0.518	0.709	0.846	0.924	0.968	0.846
1.5	0.150	0.165	0.234	0.344	0.484	0.628	0.781	0.895	0.628
2.0	0.114	0.126	0.171	0.251	0.358	0.489	0.666	0.816	0.489
3.0	0.080	0.088	0.112	0.165	0.237	0.332	0.467	0.584	0.332
4.0	0.060	0.066	0.082	0.119	0.170	0.235	0.328	0.408	0.235
5.0	0.048	0.053	0.064	0.091	0.127	0.173	0.237	0.293	0.173
7.5	0.028	0.031	0.036	0.049	0.066	0.087	0.115	0.140	0.087
10	0.019	0.020	0.023	0.030	0.039	0.050	0.063	0.075	0.050
$S_{a,amax}$ (g)	0.675	0.796	1.000	1.136	1.194	1.159	1.071	1.018	1.194
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.40	0.50	0.50	0.30
$S_{a,vmax}$ (g)	0.114	0.126	0.358	0.518	0.484	0.332	0.467	0.584	0.332
T_{vmax} (s)	2.00	2.00	1.00	1.00	1.50	3.00	3.00	3.00	3.00

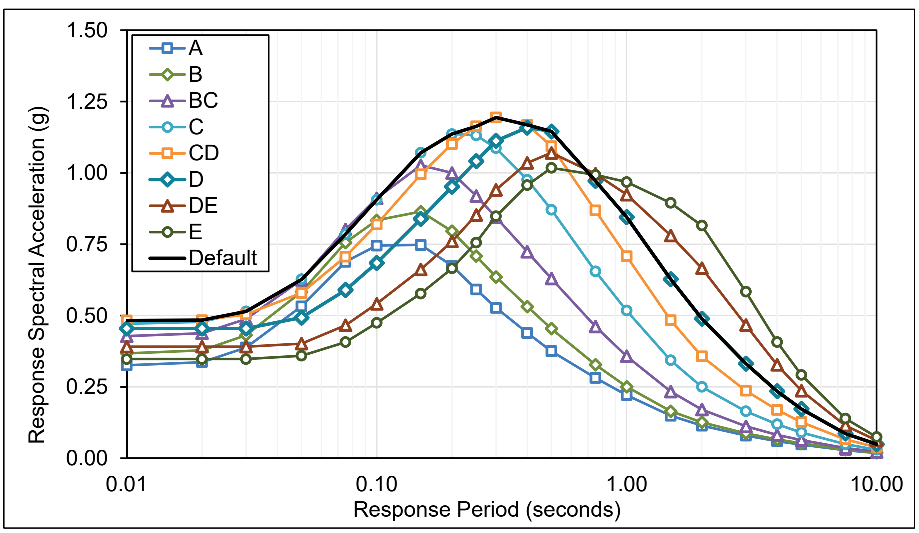


Figure C-2 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 1.5g/S_1 = 0.6g and earthquake magnitude 7.5.

Table C-3 **Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 1.5g/S_1 = 0.6g and Earthquake Magnitude 7.0**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.319	0.360	0.419	0.459	0.466	0.434	0.378	0.342	0.466
0.01	0.321	0.362	0.421	0.462	0.472	0.444	0.388	0.342	0.472
0.02	0.332	0.373	0.432	0.470	0.474	0.444	0.388	0.342	0.474
0.03	0.384	0.427	0.483	0.507	0.494	0.445	0.388	0.342	0.507
0.05	0.531	0.582	0.622	0.620	0.570	0.483	0.393	0.347	0.620
0.08	0.691	0.758	0.801	0.781	0.699	0.580	0.456	0.398	0.781
0.10	0.750	0.839	0.914	0.904	0.813	0.675	0.532	0.464	0.904
0.15	0.753	0.870	1.032	1.070	0.988	0.828	0.650	0.565	1.070
0.20	0.675	0.796	**1.000**	1.131	1.090	0.936	0.744	0.649	1.131
0.25	0.588	0.704	0.913	1.121	1.146	1.021	0.832	0.736	1.146
0.30	0.519	0.626	0.831	1.068	1.168	1.083	0.913	0.821	1.168
0.40	0.425	0.514	0.699	0.943	1.124	1.112	0.991	0.915	1.124
0.50	0.357	0.432	0.599	0.828	1.038	1.084	1.012	0.963	1.084
0.75	0.263	0.306	0.431	0.611	0.809	0.905	0.930	0.926	0.905
1.0	0.203	0.230	0.328	0.474	0.648	0.773	0.848	0.890	0.773
1.5	0.130	0.144	0.204	0.299	0.422	0.547	0.682	0.783	0.547
2.0	0.096	0.106	0.144	0.210	0.300	0.411	0.561	0.687	0.411
3.0	0.063	0.069	0.089	0.130	0.187	0.262	0.369	0.461	0.262
4.0	0.045	0.049	0.061	0.089	0.126	0.175	0.243	0.303	0.175
5.0	0.034	0.037	0.045	0.064	0.090	0.123	0.168	0.208	0.123
7.5	0.018	0.020	0.023	0.032	0.043	0.056	0.074	0.090	0.056
10	0.012	0.012	0.014	0.019	0.024	0.031	0.040	0.047	0.031
$S_{a,amax}$ (g)	0.675	0.796	1.000	1.131	1.168	1.112	1.012	0.963	1.168
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.40	0.50	0.50	0.30
$S_{a,vmax}$ (g)	0.203	0.230	0.328	0.474	0.648	0.411	0.561	0.461	0.411
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	2.00	2.00	3.00	2.00

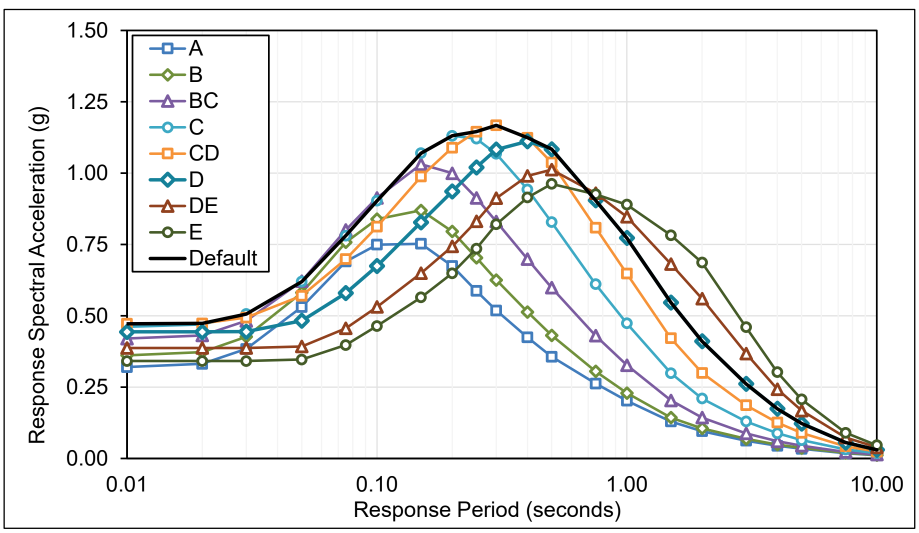


Figure C-3 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 1.5g/S_1 = 0.6g and earthquake magnitude 7.0.

Table C-4 Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 1.5g/S_1 = 0.6g and Earthquake Magnitude 6.5

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.318	0.359	0.417	0.458	0.465	0.434	0.380	0.343	0.465
0.01	0.319	0.361	0.419	0.461	0.472	0.445	0.387	0.343	0.472
0.02	0.332	0.373	0.431	0.469	0.474	0.445	0.387	0.343	0.474
0.03	0.385	0.428	0.484	0.508	0.496	0.447	0.387	0.343	0.508
0.05	0.537	0.588	0.629	0.628	0.578	0.491	0.396	0.351	0.628
0.08	0.701	0.769	0.813	0.794	0.712	0.592	0.468	0.408	0.794
0.10	0.761	0.852	0.928	0.918	0.828	0.690	0.545	0.478	0.918
0.15	0.760	0.878	1.041	1.082	1.003	0.844	0.666	0.581	1.082
0.20	0.675	0.796	**1.000**	1.132	1.096	0.947	0.758	0.665	1.132
0.25	0.582	0.698	0.905	1.111	1.142	1.025	0.843	0.750	1.142
0.30	0.509	0.613	0.814	1.047	1.149	1.075	0.916	0.829	1.149
0.40	0.409	0.494	0.673	0.909	1.084	1.082	0.977	0.909	1.084
0.50	0.338	0.409	0.567	0.785	0.985	1.038	0.983	0.943	1.038
0.75	0.243	0.283	0.398	0.565	0.748	0.844	0.881	0.885	0.844
1.0	0.183	0.207	0.295	0.427	0.585	0.702	0.780	0.827	0.702
1.5	0.111	0.123	0.174	0.255	0.360	0.469	0.589	0.680	0.469
2.0	0.079	0.087	0.118	0.173	0.247	0.338	0.462	0.568	0.338
3.0	0.048	0.052	0.067	0.098	0.142	0.198	0.279	0.349	0.198
4.0	0.032	0.035	0.043	0.063	0.089	0.123	0.172	0.214	0.123
5.0	0.023	0.025	0.030	0.043	0.060	0.082	0.112	0.138	0.082
7.5	0.011	0.012	0.014	0.019	0.026	0.034	0.045	0.055	0.034
10	0.007	0.007	0.009	0.011	0.015	0.018	0.023	0.028	0.018
$S_{a,amax}$ (g)	0.675	0.796	1.000	1.132	1.149	1.082	0.983	0.943	1.149
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.40	0.50	0.50	0.30
$S_{a,vmax}$ (g)	0.183	0.207	0.295	0.427	0.585	0.469	0.462	0.568	0.469
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

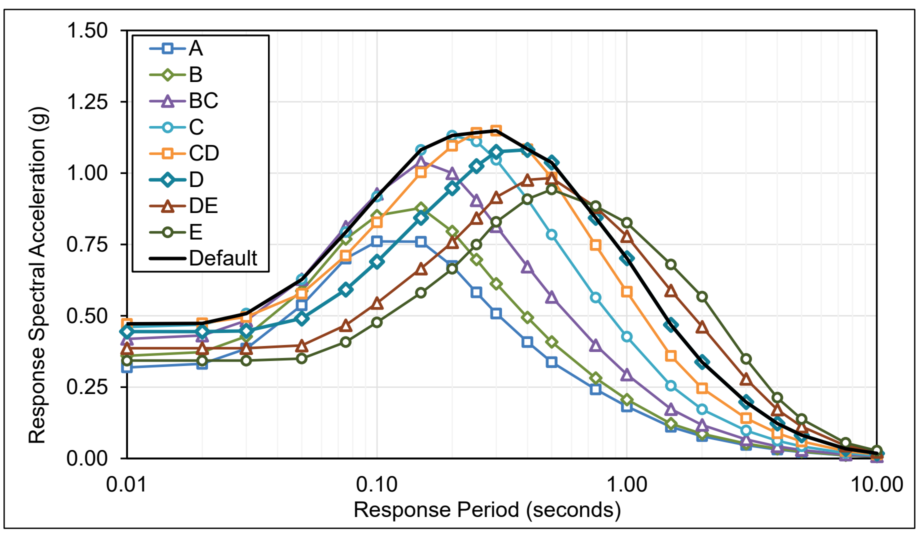


Figure C-4 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 1.5g/S_1 = 0.6g and earthquake magnitude 6.5.

Table C-5 Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 1.5g/S_1 = 0.6g and Earthquake Magnitude 6.0

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.318	0.358	0.418	0.462	0.475	0.448	0.397	0.358	0.475
0.01	0.319	0.360	0.420	0.465	0.479	0.457	0.399	0.358	0.479
0.02	0.332	0.374	0.433	0.475	0.484	0.458	0.399	0.358	0.484
0.03	0.386	0.429	0.486	0.516	0.510	0.462	0.399	0.358	0.516
0.05	0.537	0.588	0.633	0.638	0.595	0.512	0.414	0.372	0.638
0.08	0.704	0.772	0.823	0.813	0.739	0.622	0.497	0.437	0.813
0.10	0.769	0.860	0.944	0.947	0.866	0.731	0.586	0.516	0.947
0.15	0.765	0.884	1.052	1.109	1.046	0.896	0.719	0.632	1.109
0.20	0.674	0.796	**1.000**	1.146	1.132	1.000	0.816	0.723	1.146
0.25	0.572	0.685	0.889	1.098	1.152	1.059	0.892	0.804	1.152
0.30	0.486	0.586	0.779	1.006	1.123	1.079	0.944	0.867	1.123
0.40	0.373	0.451	0.614	0.830	1.002	1.026	0.954	0.904	1.026
0.50	0.302	0.365	0.506	0.701	0.887	0.958	0.936	0.915	0.958
0.75	0.207	0.241	0.339	0.482	0.642	0.739	0.798	0.814	0.739
1.0	0.148	0.167	0.238	0.345	0.475	0.580	0.661	0.713	0.580
1.5	0.082	0.091	0.128	0.189	0.267	0.351	0.448	0.523	0.351
2.0	0.054	0.060	0.081	0.119	0.170	0.234	0.322	0.397	0.234
3.0	0.030	0.033	0.042	0.061	0.088	0.124	0.174	0.217	0.124
4.0	0.018	0.020	0.025	0.036	0.052	0.072	0.100	0.125	0.072
5.0	0.013	0.014	0.017	0.024	0.034	0.046	0.063	0.077	0.046
7.5	0.006	0.006	0.007	0.010	0.013	0.017	0.023	0.028	0.017
10	0.003	0.004	0.004	0.005	0.007	0.009	0.011	0.013	0.009
$S_{a,amax}$ (g)	0.674	0.796	1.000	1.146	1.152	1.079	0.954	0.915	1.152
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.40	0.50	0.25
$S_{a,vmax}$ (g)	0.148	0.167	0.238	0.345	0.475	0.580	0.448	0.397	0.580
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.50	2.00	1.00

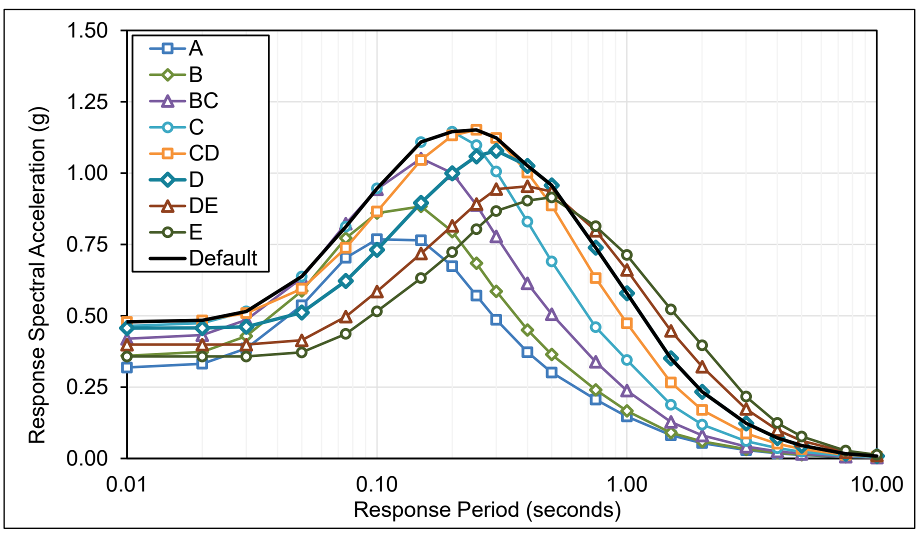


Figure C-5 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 1.5g/S_1 = 0.6g and earthquake magnitude 6.0.

Table C-6 Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 2.0g/S_1 = 0.8g and Earthquake Magnitude 8.0

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.328	0.371	0.431	0.468	0.465	0.420	0.353	0.310	0.468
0.01	0.330	0.373	0.433	0.470	0.473	0.427	0.353	0.310	0.473
0.02	0.342	0.384	0.444	0.478	0.473	0.427	0.353	0.310	0.478
0.03	0.394	0.438	0.494	0.512	0.489	0.427	0.353	0.310	0.512
0.05	0.540	0.591	0.628	0.617	0.554	0.455	0.373	0.321	0.617
0.08	0.695	0.762	0.799	0.765	0.666	0.536	0.410	0.353	0.765
0.10	0.748	0.837	0.905	0.877	0.765	0.614	0.467	0.400	0.877
0.15	0.748	0.865	1.022	1.037	0.925	0.744	0.559	0.474	1.037
0.20	0.676	0.797	**1.000**	1.113	1.032	0.846	0.639	0.542	1.113
0.25	0.598	0.716	0.928	1.128	1.111	0.940	0.724	0.620	1.128
0.30	0.538	0.648	0.860	1.097	1.164	1.024	0.812	0.706	1.164
0.40	0.457	0.553	0.752	1.010	1.180	1.108	0.925	0.822	1.180
0.50	0.397	0.480	0.666	0.916	1.128	1.125	0.984	0.898	1.128
0.75	0.306	0.356	0.502	0.709	0.928	0.997	0.960	0.923	0.997
1.0	0.246	0.279	0.397	0.574	0.778	0.899	0.935	0.948	0.899
1.5	0.173	0.191	0.271	0.397	0.556	0.709	0.858	0.965	0.709
2.0	0.136	0.150	0.203	0.296	0.422	0.574	0.775	0.943	0.574
3.0	0.099	0.109	0.140	0.205	0.295	0.413	0.581	0.726	0.413
4.0	0.078	0.086	0.106	0.155	0.220	0.306	0.425	0.529	0.306
5.0	0.065	0.071	0.085	0.122	0.170	0.232	0.318	0.392	0.232
7.5	0.039	0.043	0.050	0.069	0.093	0.122	0.161	0.195	0.122
10	0.026	0.028	0.032	0.043	0.056	0.070	0.090	0.106	0.070
$S_{a,amax}$ (g)	0.676	0.797	1.000	1.128	1.180	1.125	0.984	0.898	1.180
T_{amax} (s)	0.20	0.20	0.20	0.25	0.40	0.50	0.50	0.50	0.40
$S_{a,vmax}$ (g)	0.136	0.150	0.397	0.296	0.295	0.413	0.581	0.726	0.413
T_{vmax} (s)	2.00	2.00	1.00	2.00	3.00	3.00	3.00	3.00	3.00

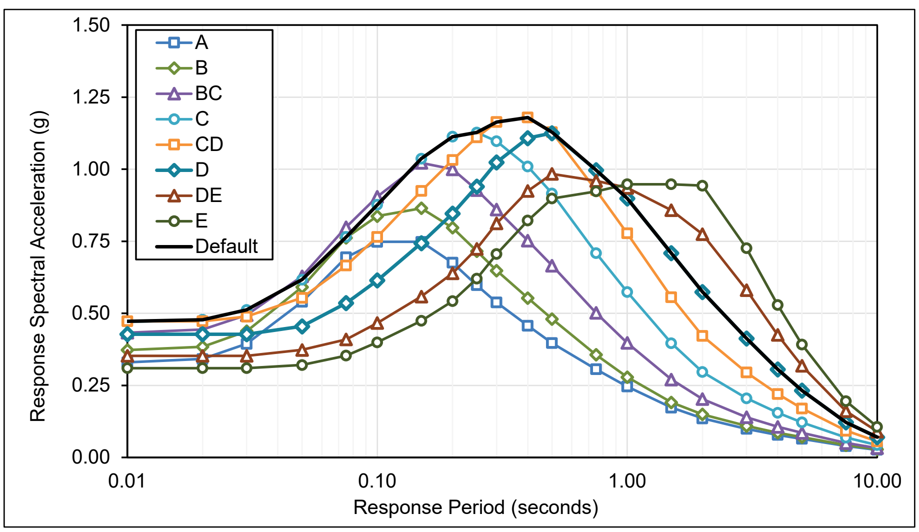


Figure C-6 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 2.0g/S_1 = 0.8g and earthquake magnitude 8.0.

Table C-7 **Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 2.0g/S_1 = 0.8g and Earthquake Magnitude 7.5**

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.323	0.364	0.423	0.459	0.454	0.410	0.344	0.301	0.459
0.01	0.325	0.367	0.426	0.462	0.463	0.418	0.344	0.301	0.463
0.02	0.337	0.379	0.437	0.469	0.464	0.418	0.344	0.301	0.469
0.03	0.390	0.433	0.488	0.505	0.480	0.418	0.344	0.301	0.505
0.05	0.538	0.589	0.625	0.612	0.547	0.448	0.365	0.313	0.612
0.08	0.696	0.764	0.798	0.761	0.660	0.529	0.402	0.347	0.761
0.10	0.752	0.841	0.907	0.875	0.760	0.608	0.460	0.393	0.875
0.15	0.752	0.869	1.026	1.036	0.920	0.736	0.551	0.466	1.036
0.20	0.676	0.797	**1.000**	1.109	1.023	0.835	0.628	0.532	1.109
0.25	0.594	0.712	0.923	1.119	1.097	0.925	0.710	0.607	1.119
0.30	0.531	0.640	0.849	1.081	1.143	1.002	0.792	0.687	1.143
0.40	0.443	0.536	0.730	0.979	1.141	1.069	0.891	0.791	1.141
0.50	0.379	0.459	0.636	0.876	1.077	1.072	0.937	0.856	1.077
0.75	0.288	0.336	0.472	0.668	0.873	0.938	0.903	0.869	0.938
1.0	0.228	0.258	0.368	0.531	0.720	0.832	0.868	0.881	0.832
1.5	0.153	0.169	0.239	0.350	0.491	0.627	0.760	0.856	0.627
2.0	0.116	0.128	0.173	0.253	0.361	0.491	0.663	0.808	0.491
3.0	0.080	0.089	0.113	0.166	0.239	0.335	0.471	0.588	0.335
4.0	0.060	0.066	0.082	0.119	0.170	0.235	0.327	0.407	0.235
5.0	0.048	0.052	0.063	0.090	0.126	0.172	0.235	0.290	0.172
7.5	0.027	0.030	0.035	0.048	0.064	0.084	0.111	0.135	0.084
10	0.018	0.019	0.022	0.029	0.038	0.048	0.061	0.073	0.048
$S_{a,amax}$ (g)	0.676	0.797	1.000	1.119	1.143	1.072	0.937	0.856	1.143
T_{amax} (s)	0.20	0.20	0.20	0.25	0.30	0.50	0.50	0.50	0.30
$S_{a,vmax}$ (g)	0.116	0.128	0.368	0.531	0.491	0.335	0.471	0.588	0.335
T_{vmax} (s)	2.00	2.00	1.00	1.00	1.50	3.00	3.00	3.00	3.00

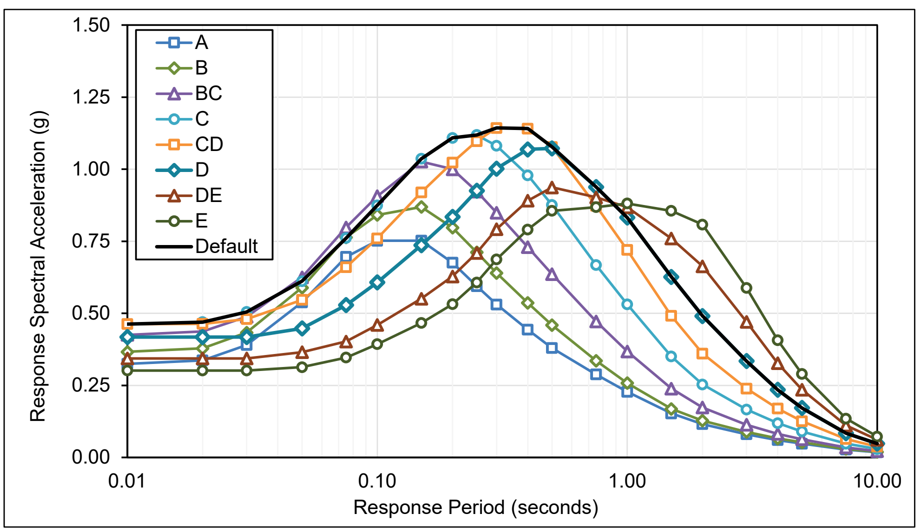


Figure C-7 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 2.0g/S_1 = 0.8g and earthquake magnitude 7.5.

Table C-8 Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 2.0g/S_1 = 0.8g and Earthquake Magnitude 7.0

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.320	0.361	0.419	0.454	0.450	0.406	0.341	0.299	0.454
0.01	0.322	0.363	0.422	0.457	0.458	0.414	0.341	0.299	0.458
0.02	0.335	0.376	0.434	0.465	0.460	0.414	0.341	0.299	0.465
0.03	0.389	0.432	0.486	0.502	0.477	0.414	0.341	0.299	0.502
0.05	0.539	0.591	0.626	0.611	0.546	0.447	0.364	0.313	0.611
0.08	0.700	0.769	0.802	0.764	0.662	0.531	0.404	0.347	0.764
0.10	0.758	0.848	0.913	0.879	0.764	0.611	0.463	0.396	0.879
0.15	0.757	0.875	1.032	1.041	0.924	0.740	0.555	0.470	1.041
0.20	0.676	0.797	**1.000**	1.108	1.022	0.836	0.630	0.535	1.108
0.25	0.590	0.707	0.917	1.111	1.091	0.922	0.710	0.608	1.111
0.30	0.523	0.630	0.836	1.065	1.127	0.991	0.787	0.685	1.127
0.40	0.428	0.518	0.704	0.946	1.102	1.037	0.870	0.776	1.102
0.50	0.360	0.436	0.604	0.832	1.024	1.024	0.903	0.829	1.024
0.75	0.268	0.312	0.439	0.622	0.814	0.879	0.853	0.825	0.879
1.0	0.207	0.235	0.335	0.484	0.657	0.763	0.803	0.821	0.763
1.5	0.132	0.146	0.207	0.304	0.426	0.545	0.665	0.752	0.545
2.0	0.097	0.107	0.145	0.212	0.301	0.411	0.556	0.679	0.411
3.0	0.063	0.070	0.089	0.130	0.187	0.263	0.369	0.462	0.263
4.0	0.044	0.049	0.060	0.088	0.125	0.174	0.242	0.301	0.174
5.0	0.034	0.037	0.045	0.064	0.089	0.121	0.166	0.205	0.121
7.5	0.018	0.019	0.022	0.031	0.041	0.054	0.072	0.087	0.054
10	0.011	0.012	0.014	0.018	0.024	0.030	0.039	0.046	0.030
$S_{a,amax}$ (g)	0.676	0.797	1.000	1.111	1.127	1.037	0.903	0.829	1.127
T_{amax} (s)	0.20	0.20	0.20	0.25	0.30	0.40	0.50	0.50	0.30
$S_{a,vmax}$ (g)	0.207	0.235	0.335	0.484	0.657	0.411	0.556	0.462	0.411
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	2.00	2.00	3.00	2.00

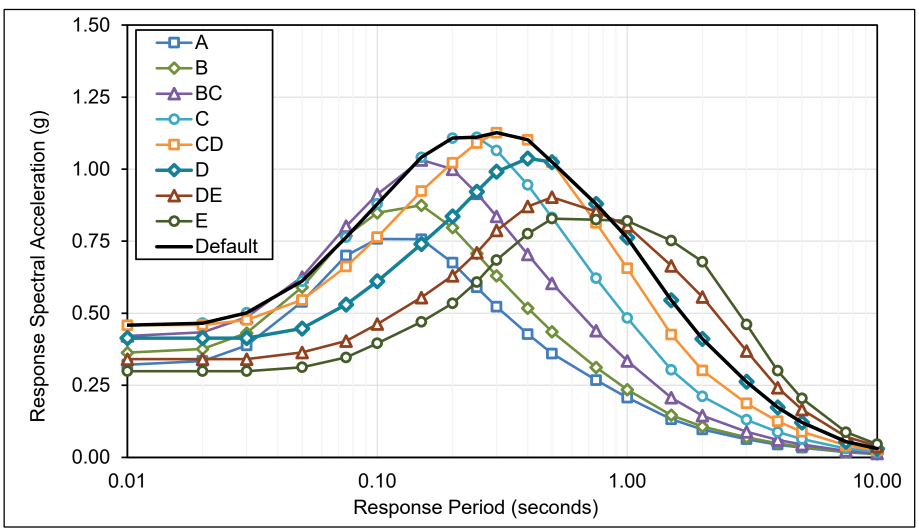


Figure C-8 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 2.0g/S_1 = 0.8g and earthquake magnitude 7.0.

Table C-9 Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 2.0g/S_1 = 0.8g and Earthquake Magnitude 6.5

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.320	0.361	0.419	0.455	0.453	0.411	0.348	0.307	0.455
0.01	0.322	0.363	0.422	0.459	0.462	0.420	0.348	0.307	0.462
0.02	0.335	0.377	0.435	0.468	0.464	0.420	0.348	0.307	0.468
0.03	0.391	0.434	0.489	0.506	0.483	0.420	0.348	0.307	0.506
0.05	0.547	0.599	0.635	0.623	0.559	0.461	0.373	0.322	0.623
0.08	0.712	0.781	0.817	0.781	0.681	0.549	0.419	0.360	0.781
0.10	0.770	0.862	0.929	0.899	0.786	0.633	0.482	0.414	0.899
0.15	0.764	0.883	1.042	1.057	0.945	0.764	0.578	0.492	1.057
0.20	0.675	0.797	**1.000**	1.112	1.037	0.857	0.653	0.558	1.112
0.25	0.585	0.700	0.908	1.103	1.094	0.937	0.732	0.632	1.103
0.30	0.512	0.617	0.819	1.045	1.115	0.996	0.804	0.706	1.115
0.40	0.411	0.497	0.677	0.910	1.065	1.019	0.872	0.786	1.065
0.50	0.340	0.412	0.571	0.787	0.973	0.988	0.889	0.826	0.988
0.75	0.247	0.287	0.404	0.573	0.752	0.824	0.817	0.799	0.824
1.0	0.186	0.211	0.300	0.434	0.590	0.693	0.745	0.771	0.693
1.5	0.112	0.124	0.176	0.258	0.363	0.467	0.576	0.657	0.467
2.0	0.079	0.087	0.118	0.173	0.247	0.337	0.458	0.561	0.337
3.0	0.048	0.052	0.067	0.098	0.142	0.198	0.279	0.349	0.198
4.0	0.031	0.034	0.043	0.062	0.088	0.122	0.170	0.211	0.122
5.0	0.023	0.025	0.030	0.042	0.059	0.081	0.111	0.136	0.081
7.5	0.011	0.012	0.014	0.019	0.025	0.033	0.044	0.053	0.033
10	0.007	0.007	0.008	0.011	0.014	0.018	0.023	0.027	0.018
$S_{a,amax}$ (g)	0.675	0.797	1.000	1.112	1.115	1.019	0.889	0.826	1.115
T_{amax} (s)	0.20	0.20	0.20	0.20	0.30	0.40	0.50	0.50	0.30
$S_{a,vmax}$ (g)	0.186	0.211	0.300	0.434	0.590	0.467	0.458	0.561	0.467
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

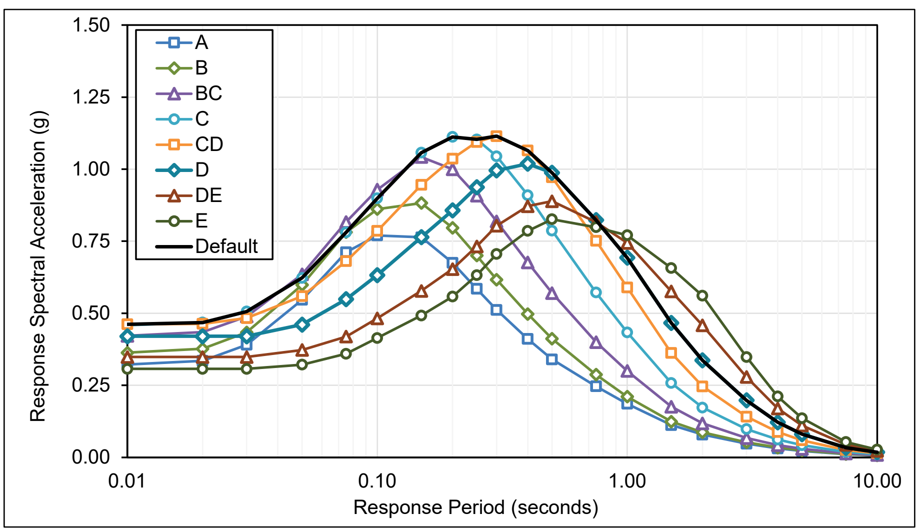


Figure C-9 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 2.0g/S_1 = 0.8g and earthquake magnitude 6.5.

Table C-10 Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 2.0g/S_1 = 0.8g and Earthquake Magnitude 6.0

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.323	0.365	0.424	0.461	0.458	0.413	0.346	0.304	0.461
0.01	0.325	0.367	0.426	0.464	0.464	0.423	0.350	0.304	0.464
0.02	0.340	0.382	0.441	0.476	0.468	0.423	0.350	0.304	0.476
0.03	0.397	0.441	0.497	0.516	0.491	0.426	0.350	0.304	0.516
0.05	0.555	0.608	0.647	0.635	0.568	0.464	0.363	0.314	0.635
0.08	0.726	0.797	0.836	0.799	0.693	0.554	0.420	0.360	0.799
0.10	0.786	0.880	0.952	0.921	0.800	0.638	0.481	0.410	0.921
0.15	0.772	0.892	1.055	1.071	0.954	0.764	0.571	0.483	1.071
0.20	0.676	0.797	**1.000**	1.115	1.037	0.850	0.642	0.545	1.115
0.25	0.575	0.689	0.893	1.085	1.076	0.917	0.710	0.610	1.085
0.30	0.492	0.593	0.786	1.002	1.069	0.953	0.764	0.668	1.069
0.40	0.376	0.455	0.619	0.830	0.971	0.929	0.793	0.714	0.971
0.50	0.305	0.369	0.511	0.703	0.867	0.883	0.795	0.739	0.883
0.75	0.213	0.248	0.349	0.493	0.647	0.712	0.705	0.690	0.712
1.0	0.152	0.172	0.245	0.354	0.481	0.568	0.615	0.640	0.568
1.5	0.083	0.092	0.131	0.192	0.269	0.348	0.432	0.495	0.348
2.0	0.054	0.060	0.081	0.119	0.170	0.232	0.317	0.388	0.232
3.0	0.029	0.032	0.042	0.061	0.088	0.123	0.173	0.216	0.123
4.0	0.018	0.020	0.025	0.036	0.051	0.071	0.098	0.122	0.071
5.0	0.012	0.014	0.016	0.023	0.033	0.045	0.061	0.075	0.045
7.5	0.005	0.006	0.007	0.009	0.013	0.017	0.022	0.027	0.017
10	0.003	0.003	0.004	0.005	0.007	0.009	0.011	0.013	0.009
$S_{a,amax}$ (g)	0.676	0.797	1.000	1.115	1.076	0.953	0.795	0.739	1.115
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.50	0.50	0.20
$S_{a,vmax}$ (g)	0.152	0.172	0.245	0.354	0.481	0.568	0.432	0.388	0.568
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.50	2.00	1.00

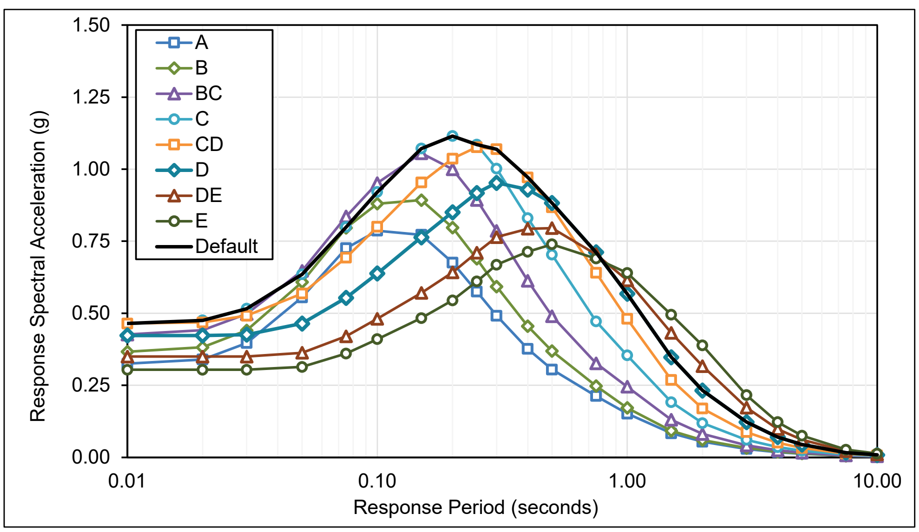


Figure C-10 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 2.0g/S_1 = 0.8g and earthquake magnitude 6.0.

Table C-11 Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 2.5g/S_1 = 1.0g and Earthquake Magnitude 8.0

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.326	0.368	0.427	0.458	0.445	0.391	0.318	0.274	0.458
0.01	0.328	0.370	0.429	0.463	0.452	0.395	0.318	0.274	0.463
0.02	0.341	0.383	0.442	0.469	0.452	0.395	0.318	0.274	0.469
0.03	0.395	0.439	0.493	0.503	0.469	0.401	0.318	0.274	0.503
0.05	0.544	0.596	0.627	0.605	0.529	0.422	0.318	0.274	0.605
0.08	0.700	0.768	0.796	0.745	0.631	0.492	0.371	0.314	0.745
0.10	0.753	0.843	0.901	0.852	0.721	0.560	0.411	0.345	0.852
0.15	0.751	0.868	1.022	1.010	0.869	0.672	0.484	0.402	1.010
0.20	0.676	0.798	**1.000**	1.091	0.973	0.763	0.550	0.455	1.091
0.25	0.600	0.719	0.931	1.118	1.061	0.856	0.627	0.522	1.118
0.30	0.542	0.653	0.865	1.095	1.125	0.943	0.709	0.598	1.125
0.40	0.462	0.558	0.759	1.014	1.160	1.040	0.821	0.707	1.160
0.50	0.402	0.486	0.673	0.923	1.117	1.069	0.885	0.783	1.117
0.75	0.314	0.365	0.514	0.725	0.938	0.974	0.890	0.833	0.974
1.0	0.254	0.287	0.409	0.590	0.794	0.893	0.894	0.883	0.893
1.5	0.177	0.196	0.277	0.406	0.566	0.711	0.843	0.934	0.711
2.0	0.137	0.152	0.205	0.300	0.426	0.577	0.774	0.938	0.577
3.0	0.100	0.111	0.141	0.207	0.298	0.417	0.586	0.732	0.417
4.0	0.078	0.086	0.106	0.155	0.220	0.305	0.425	0.528	0.305
5.0	0.064	0.070	0.085	0.121	0.169	0.230	0.315	0.389	0.230
7.5	0.038	0.041	0.049	0.067	0.090	0.118	0.155	0.189	0.118
10	0.026	0.027	0.032	0.042	0.054	0.068	0.087	0.103	0.068
$S_{a,amax}$ (g)	0.676	0.798	1.000	1.118	1.160	1.069	0.885	0.783	1.160
T_{amax} (s)	0.20	0.20	0.20	0.25	0.40	0.50	0.50	0.50	0.40
$S_{a,vmax}$ (g)	0.137	0.152	0.409	0.300	0.298	0.417	0.586	0.732	0.417
T_{vmax} (s)	2.00	2.00	1.00	2.00	3.00	3.00	3.00	3.00	3.00

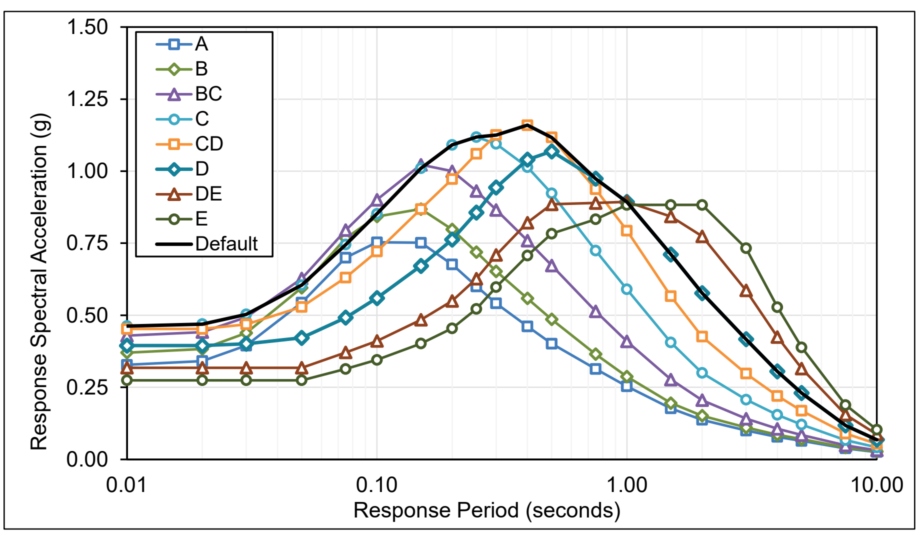


Figure C-11 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 2.5g/S_1 = 1.0g and earthquake magnitude 8.0.

Table C-12 Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 2.5g/S_1 = 1.0g and Earthquake Magnitude 7.5

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.323	0.365	0.423	0.452	0.438	0.383	0.311	0.268	0.452
0.01	0.325	0.367	0.425	0.458	0.446	0.388	0.311	0.268	0.458
0.02	0.339	0.381	0.439	0.465	0.446	0.388	0.311	0.268	0.465
0.03	0.394	0.437	0.491	0.499	0.463	0.394	0.313	0.268	0.499
0.05	0.546	0.598	0.628	0.603	0.525	0.417	0.313	0.269	0.603
0.08	0.705	0.774	0.799	0.746	0.628	0.487	0.367	0.309	0.746
0.10	0.760	0.850	0.906	0.853	0.718	0.554	0.405	0.339	0.853
0.15	0.756	0.874	1.028	1.010	0.863	0.663	0.475	0.393	1.010
0.20	0.676	0.798	**1.000**	1.087	0.963	0.751	0.538	0.443	1.087
0.25	0.597	0.715	0.926	1.110	1.047	0.840	0.611	0.507	1.110
0.30	0.535	0.645	0.855	1.080	1.105	0.921	0.688	0.579	1.105
0.40	0.447	0.541	0.736	0.983	1.120	1.000	0.787	0.675	1.120
0.50	0.383	0.464	0.642	0.881	1.065	1.015	0.839	0.741	1.065
0.75	0.295	0.344	0.484	0.682	0.882	0.916	0.832	0.778	0.916
1.0	0.234	0.265	0.378	0.545	0.733	0.824	0.826	0.816	0.824
1.5	0.156	0.172	0.244	0.357	0.498	0.626	0.743	0.824	0.626
2.0	0.117	0.129	0.175	0.255	0.362	0.491	0.659	0.799	0.491
3.0	0.081	0.089	0.114	0.167	0.240	0.336	0.472	0.590	0.336
4.0	0.060	0.066	0.081	0.118	0.168	0.233	0.325	0.404	0.233
5.0	0.047	0.052	0.062	0.089	0.124	0.169	0.232	0.286	0.169
7.5	0.026	0.029	0.034	0.046	0.062	0.081	0.107	0.130	0.081
10	0.017	0.019	0.022	0.028	0.037	0.047	0.059	0.071	0.047
$S_{a,amax}$ **(g)**	0.676	0.798	1.000	1.110	1.120	1.015	0.839	0.741	1.120
T_{amax} **(s)**	0.20	0.20	0.20	0.25	0.40	0.50	0.50	0.50	0.40
$S_{a,vmax}$ **(g)**	0.117	0.129	0.378	0.545	0.498	0.336	0.472	0.590	0.336
T_{vmax} **(s)**	2.00	2.00	1.00	1.00	1.50	3.00	3.00	3.00	3.00

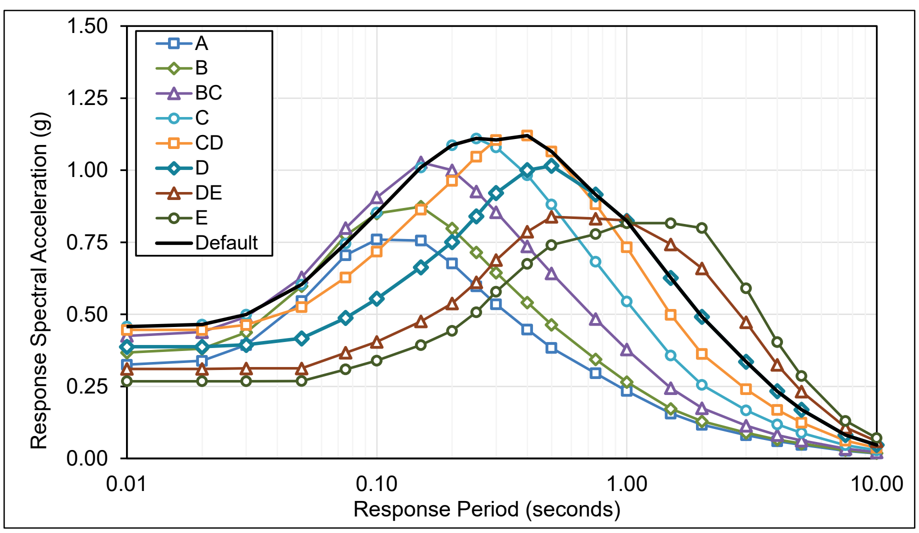


Figure C-12 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 2.5g/S_1 = 1.0g and earthquake magnitude 7.5.

Table C-13 **Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 2.5g/S_1 = 1.0g and Earthquake Magnitude 7.0**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.322	0.363	0.421	0.450	0.434	0.380	0.308	0.265	0.450
0.01	0.324	0.365	0.423	0.455	0.443	0.384	0.308	0.265	0.455
0.02	0.338	0.380	0.437	0.462	0.443	0.384	0.308	0.265	0.462
0.03	0.393	0.437	0.491	0.498	0.461	0.391	0.311	0.265	0.498
0.05	0.549	0.601	0.631	0.605	0.525	0.416	0.311	0.267	0.605
0.08	0.712	0.781	0.806	0.750	0.630	0.488	0.367	0.309	0.750
0.10	0.768	0.859	0.914	0.859	0.721	0.555	0.404	0.339	0.859
0.15	0.761	0.880	1.034	1.014	0.864	0.662	0.474	0.391	1.014
0.20	0.677	0.798	**1.000**	1.085	0.960	0.746	0.534	0.439	1.085
0.25	0.593	0.710	0.920	1.101	1.038	0.832	0.605	0.502	1.101
0.30	0.527	0.635	0.842	1.063	1.087	0.906	0.677	0.570	1.087
0.40	0.432	0.522	0.710	0.948	1.079	0.966	0.761	0.655	1.079
0.50	0.364	0.440	0.610	0.836	1.010	0.966	0.801	0.709	1.010
0.75	0.275	0.320	0.450	0.635	0.821	0.856	0.781	0.733	0.856
1.0	0.213	0.241	0.344	0.496	0.667	0.753	0.760	0.756	0.753
1.5	0.135	0.149	0.211	0.309	0.431	0.543	0.648	0.722	0.543
2.0	0.097	0.107	0.146	0.213	0.302	0.410	0.552	0.670	0.410
3.0	0.063	0.070	0.089	0.131	0.188	0.263	0.370	0.462	0.263
4.0	0.044	0.048	0.060	0.087	0.124	0.172	0.240	0.298	0.172
5.0	0.033	0.036	0.044	0.063	0.088	0.120	0.164	0.202	0.120
7.5	0.017	0.019	0.022	0.030	0.040	0.053	0.070	0.085	0.053
10	0.011	0.012	0.014	0.018	0.023	0.030	0.038	0.045	0.030
$S_{a,amax}$ (g)	0.677	0.798	1.000	1.101	1.087	0.966	0.801	0.709	1.101
T_{amax} (s)	0.20	0.20	0.20	0.25	0.30	0.50	0.50	0.50	0.25
$S_{a,vmax}$ (g)	0.213	0.241	0.344	0.496	0.667	0.410	0.370	0.462	0.410
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	2.00	3.00	3.00	2.00

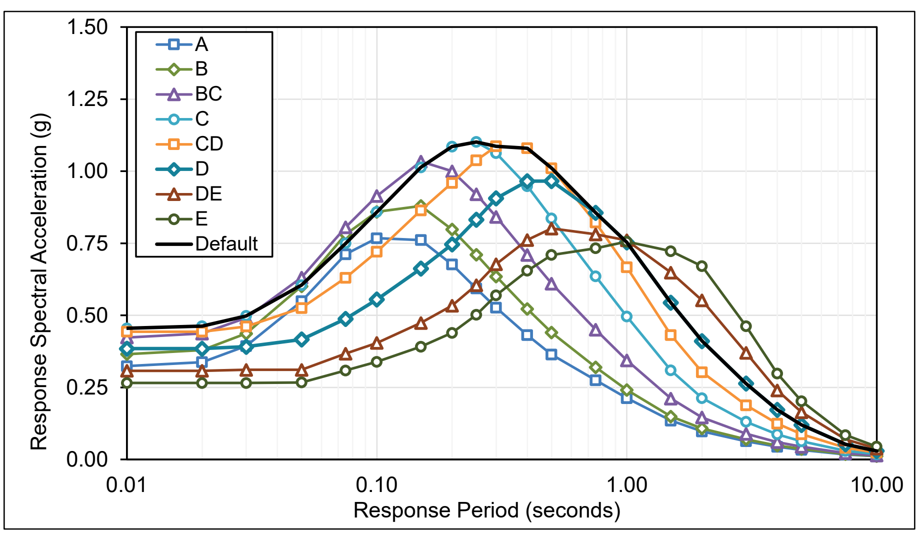


Figure C-13 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 2.5g/S_1 = 1.0g and earthquake magnitude 7.0.

Table C-14 Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 2.5g/S_1 = 1.0g and Earthquake Magnitude 6.5

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.323	0.364	0.422	0.452	0.439	0.386	0.314	0.273	0.452
0.01	0.325	0.367	0.425	0.457	0.449	0.391	0.315	0.273	0.457
0.02	0.339	0.381	0.439	0.466	0.449	0.391	0.315	0.273	0.466
0.03	0.396	0.440	0.495	0.504	0.469	0.399	0.319	0.273	0.504
0.05	0.558	0.611	0.642	0.618	0.539	0.429	0.321	0.276	0.618
0.08	0.725	0.796	0.823	0.769	0.649	0.505	0.378	0.320	0.769
0.10	0.781	0.874	0.932	0.879	0.742	0.574	0.420	0.353	0.879
0.15	0.768	0.888	1.044	1.030	0.884	0.682	0.491	0.408	1.030
0.20	0.676	0.798	**1.000**	1.090	0.972	0.764	0.551	0.456	1.090
0.25	0.588	0.704	0.912	1.093	1.041	0.844	0.621	0.519	1.093
0.30	0.516	0.622	0.824	1.042	1.074	0.909	0.690	0.585	1.074
0.40	0.414	0.501	0.681	0.911	1.042	0.947	0.761	0.661	1.042
0.50	0.343	0.416	0.576	0.790	0.958	0.930	0.788	0.706	0.958
0.75	0.253	0.294	0.414	0.584	0.757	0.801	0.746	0.708	0.801
1.0	0.190	0.216	0.307	0.444	0.598	0.683	0.705	0.710	0.683
1.5	0.114	0.126	0.179	0.262	0.366	0.464	0.561	0.631	0.464
2.0	0.079	0.088	0.119	0.174	0.247	0.336	0.454	0.553	0.336
3.0	0.048	0.053	0.067	0.098	0.142	0.198	0.279	0.348	0.198
4.0	0.031	0.034	0.042	0.061	0.087	0.121	0.168	0.210	0.121
5.0	0.022	0.024	0.029	0.042	0.058	0.080	0.109	0.134	0.080
7.5	0.011	0.011	0.013	0.018	0.025	0.032	0.043	0.052	0.032
10	0.007	0.007	0.008	0.011	0.014	0.018	0.022	0.027	0.018
$S_{a,amax}$ (g)	0.676	0.798	1.000	1.093	1.074	0.947	0.788	0.706	1.093
T_{amax} (s)	0.20	0.20	0.20	0.25	0.30	0.40	0.50	0.50	0.25
$S_{a,vmax}$ (g)	0.190	0.216	0.307	0.444	0.598	0.464	0.454	0.553	0.464
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.50	2.00	2.00	1.50

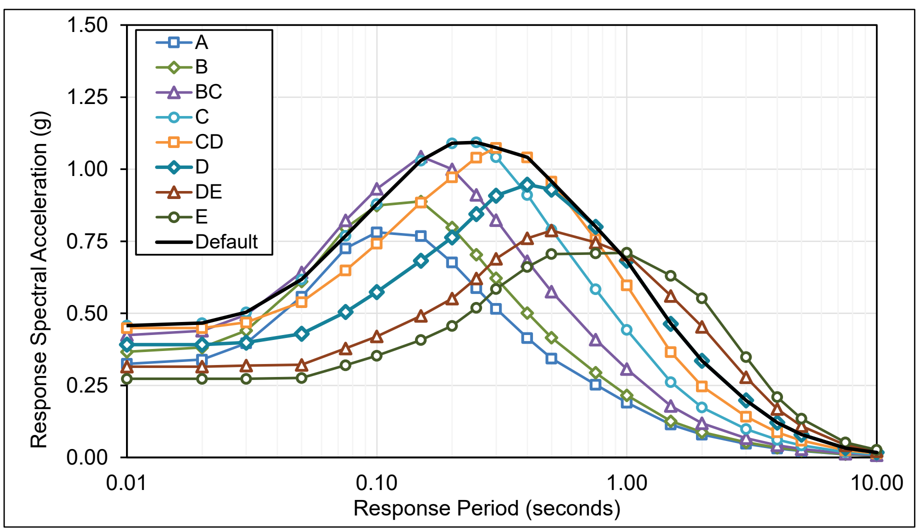


Figure C-14 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 2.5g/S_1 = 1.0g and earthquake magnitude 6.5.

Table C-15 **Deterministic Response Spectrum Shape Parameters (RSSPs) and Values of Period-Range Parameters, T_{amax} ($S_{a,Tamax}$) and T_{vmax} ($S_{a,Tvmax}$), by Site Class, for Ground Motion Level S_S = 2.5g/S_1 = 1.0g and Earthquake Magnitude 6.0**

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.324	0.365	0.424	0.461	0.455	0.408	0.340	0.298	0.461
0.01	0.325	0.367	0.427	0.463	0.462	0.415	0.341	0.298	0.463
0.02	0.340	0.383	0.442	0.475	0.466	0.415	0.341	0.298	0.475
0.03	0.397	0.441	0.498	0.515	0.489	0.423	0.345	0.298	0.515
0.05	0.557	0.610	0.648	0.634	0.565	0.459	0.349	0.303	0.634
0.08	0.728	0.799	0.837	0.797	0.688	0.546	0.413	0.353	0.797
0.10	0.788	0.882	0.952	0.918	0.792	0.627	0.469	0.398	0.918
0.15	0.773	0.893	1.056	1.067	0.943	0.749	0.554	0.467	1.067
0.20	0.676	0.798	**1.000**	1.111	1.026	0.834	0.623	0.526	1.111
0.25	0.576	0.690	0.894	1.083	1.067	0.901	0.690	0.590	1.083
0.30	0.492	0.593	0.787	1.001	1.062	0.938	0.744	0.647	1.062
0.40	0.377	0.456	0.620	0.830	0.967	0.918	0.775	0.693	0.967
0.50	0.305	0.369	0.512	0.704	0.865	0.874	0.779	0.720	0.874
0.75	0.214	0.249	0.350	0.495	0.647	0.708	0.694	0.677	0.708
1.0	0.152	0.173	0.246	0.355	0.482	0.566	0.609	0.632	0.566
1.5	0.084	0.092	0.131	0.192	0.269	0.347	0.430	0.492	0.347
2.0	0.054	0.060	0.081	0.119	0.170	0.232	0.316	0.388	0.232
3.0	0.029	0.033	0.042	0.061	0.088	0.123	0.173	0.216	0.123
4.0	0.018	0.020	0.025	0.036	0.051	0.071	0.098	0.122	0.071
5.0	0.012	0.014	0.016	0.023	0.033	0.045	0.061	0.075	0.045
7.5	0.005	0.006	0.007	0.009	0.013	0.017	0.022	0.026	0.017
10	0.003	0.003	0.004	0.005	0.007	0.009	0.011	0.013	0.009
$S_{a,amax}$ (g)	0.676	0.798	1.000	1.111	1.067	0.938	0.779	0.720	1.111
T_{amax} (s)	0.20	0.20	0.20	0.20	0.25	0.30	0.50	0.50	0.20
$S_{a,vmax}$ (g)	0.152	0.173	0.246	0.355	0.482	0.566	0.430	0.388	0.566
T_{vmax} (s)	1.00	1.00	1.00	1.00	1.00	1.00	1.50	2.00	1.00

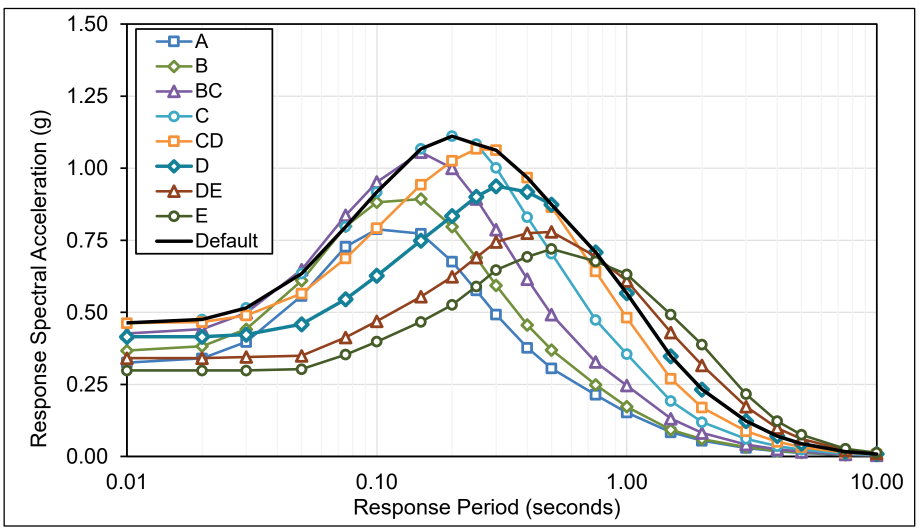


Figure C-15 Plots of deterministic response spectrum shape parameters (RSSPs) by site class, for ground motion level S_S = 2.5g/S_1 = 1.0g and earthquake magnitude 6.0.

Appendix D

Multi-Period Response Spectra of 34 U.S. City Sites Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22

This appendix provides tables and plots of multi-period response spectra (MPRS) of 34 U.S. city sites based on those proposed for the 2020 *NEHRP Provisions* and ASCE 7-22. Tables of proposed MPRS include corresponding values of design parameters S_{MS}, S_{M1}, S_{DS}, and S_{D1} for each site class. The proposed MCE_R ground motions of this appendix are expected to be very similar to, but not exactly the same as, those of the 2020 *NEHRP Provisions* and ASCE 7-22 since the U.S. Geological Survey (USGS) was in the process of refining their ground motion calculations at the time the MPRS tables and plots of MCE_R ground motions were compiled for this appendix.

Section D.1 provides MPRS tables and plots of proposed probabilistic MCE_R ground motions calculated in accordance with the requirements proposed for Section 21.2.1 of the 2020 *NEHRP Provisions* and ASCE 7-22. Note, values of design parameters S_{MS}, S_{M1}, S_{DS}, and S_{D1} shown in Section D.1 tables are provided for reference, but are only valid for sites where probabilistic MCE_R ground motions govern design. Section D.2 provides MPRS tables and plots of proposed deterministic MCE_R ground motions calculated in accordance with the requirements proposed for Section 21.2.2 of the 2020 *NEHRP Provisions* and ASCE 7-22 without the deterministic lower limit. Note, values of design parameters S_{MS}, S_{M1}, S_{DS}, and S_{D1} shown in Section D.2 tables are provided for reference, but are only valid for sites where proposed deterministic MCE_R ground motions (without the lower limit) govern design. Section D.3 provides MPRS tables and plots of proposed MCE_R ground motions calculated in accordance with the requirements of Section 21.2.3 of the 2020 *NEHRP Provisions* and ASCE 7-22 (i.e., the lesser of proposed probabilistic MCE_R and proposed deterministic MCE_R ground motions) where proposed deterministic MCE_R ground motions include the deterministic lower limit MCE_R ground motions of Table 5.5-2).

D.1 Proposed Probabilistic MCE_R Ground Motions

Table D.1-1 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Los Angeles Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.664	0.764	0.899	1.007	1.038	0.987	0.894	0.847	1.038
0.01	0.669	0.770	0.905	1.012	1.044	0.993	0.901	0.854	1.044
0.02	0.695	0.797	0.929	1.028	1.051	0.996	0.897	0.842	1.051
0.03	0.833	0.931	1.046	1.111	1.100	1.011	0.884	0.819	1.111
0.05	1.219	1.320	1.380	1.385	1.294	1.136	0.967	0.885	1.385
0.08	1.565	1.720	1.796	1.775	1.624	1.413	1.212	1.125	1.775
0.10	1.653	1.875	2.043	2.064	1.907	1.674	1.456	1.366	2.064
0.15	1.637	1.909	2.269	2.396	2.271	2.017	1.761	1.654	2.396
0.20	1.468	1.745	2.203	2.526	2.473	2.231	1.954	1.839	2.526
0.25	1.306	1.576	2.039	2.492	2.579	2.384	2.120	2.012	2.579
0.30	1.180	1.438	1.882	2.360	2.615	2.495	2.271	2.180	2.615
0.40	0.976	1.198	1.590	2.067	2.483	2.502	2.365	2.305	2.502
0.50	0.841	1.033	1.377	1.813	2.265	2.400	2.346	2.337	2.400
0.75	0.661	0.771	1.016	1.341	1.748	1.966	2.040	2.117	1.966
1.0	0.541	0.599	0.789	1.039	1.381	1.646	1.833	1.975	1.646
1.5	0.384	0.400	0.509	0.662	0.894	1.155	1.443	1.680	1.155
2.0	0.303	0.309	0.367	0.469	0.634	0.863	1.170	1.454	0.863
3.0	0.210	0.213	0.230	0.289	0.388	0.539	0.752	0.954	0.539
4.0	0.153	0.155	0.164	0.203	0.267	0.366	0.505	0.635	0.366
5.0	0.125	0.126	0.128	0.155	0.200	0.270	0.367	0.456	0.270
7.5	0.082	0.082	0.081	0.094	0.117	0.153	0.202	0.245	0.153
10	0.056	0.056	0.056	0.064	0.077	0.098	0.126	0.149	0.098
S_{MS} (g)	1.32	1.57	1.98	2.27	2.35	2.25	2.13	2.10	2.35
S_{M1} (g)	0.54	0.60	0.79	1.04	1.38	1.65	2.11	2.62	1.65
S_{DS} (g)	0.88	1.05	1.32	1.52	1.57	1.50	1.42	1.40	1.57
S_{D1} (g)	0.36	0.40	0.53	0.69	0.92	1.10	1.40	1.74	1.10

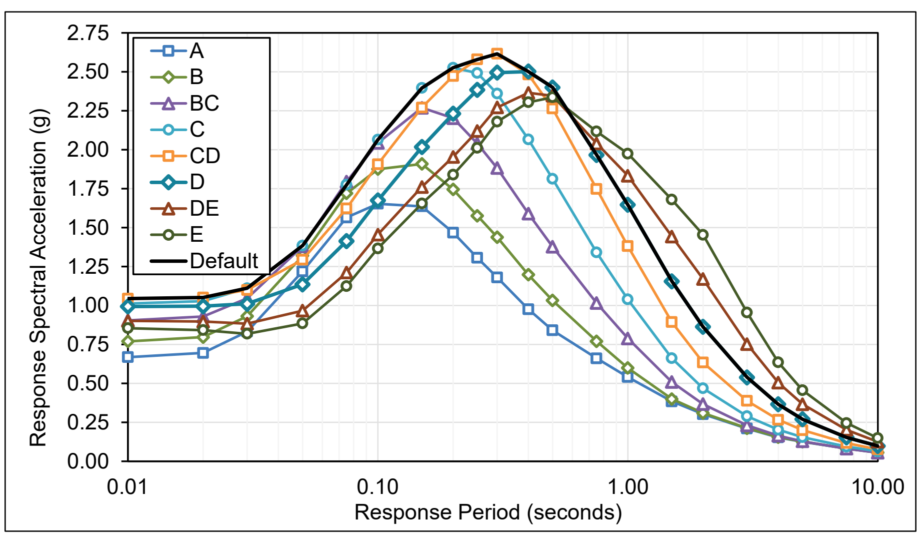


Figure D.1-1 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Los Angeles Site.

Table D.1-2 **Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Century City Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.720	0.829	0.970	1.082	1.110	1.045	0.937	0.876	1.110
0.01	0.725	0.835	0.976	1.087	1.116	1.052	0.944	0.885	1.116
0.02	0.755	0.866	1.004	1.107	1.125	1.055	0.940	0.872	1.125
0.03	0.903	1.012	1.133	1.199	1.179	1.072	0.929	0.846	1.199
0.05	1.319	1.427	1.490	1.493	1.385	1.202	1.010	0.915	1.493
0.08	1.686	1.850	1.929	1.908	1.732	1.491	1.264	1.162	1.908
0.10	1.789	2.032	2.202	2.213	2.028	1.762	1.515	1.406	2.213
0.15	1.777	2.072	2.446	2.564	2.407	2.115	1.826	1.696	2.564
0.20	1.584	1.884	2.370	2.703	2.620	2.335	2.022	1.883	2.703
0.25	1.416	1.714	2.211	2.685	2.743	2.503	2.198	2.058	2.743
0.30	1.285	1.573	2.056	2.568	2.803	2.631	2.362	2.231	2.803
0.40	1.066	1.316	1.745	2.264	2.685	2.658	2.472	2.365	2.685
0.50	0.926	1.148	1.526	2.008	2.475	2.574	2.471	2.404	2.574
0.75	0.746	0.879	1.156	1.527	1.964	2.162	2.201	2.210	2.162
1.0	0.623	0.696	0.920	1.219	1.588	1.843	2.011	2.097	1.843
1.5	0.447	0.467	0.600	0.797	1.049	1.313	1.611	1.820	1.313
2.0	0.353	0.362	0.434	0.578	0.758	0.995	1.328	1.601	0.995
3.0	0.249	0.252	0.278	0.368	0.474	0.631	0.866	1.067	0.631
4.0	0.186	0.189	0.204	0.263	0.328	0.428	0.580	0.710	0.428
5.0	0.159	0.160	0.167	0.203	0.244	0.313	0.419	0.508	0.313
7.5	0.107	0.107	0.106	0.122	0.140	0.173	0.225	0.267	0.173
10	0.070	0.070	0.069	0.079	0.089	0.108	0.137	0.160	0.108
S_{MS} (g)	1.43	1.70	2.13	2.43	2.52	2.39	2.22	2.16	2.52
S_{M1} (g)	0.63	0.70	0.92	1.22	1.59	1.84	2.39	2.88	1.84
S_{DS} (g)	0.95	1.13	1.42	1.62	1.68	1.59	1.48	1.44	1.68
S_{D1} (g)	0.42	0.46	0.61	0.81	1.06	1.23	1.59	1.92	1.23

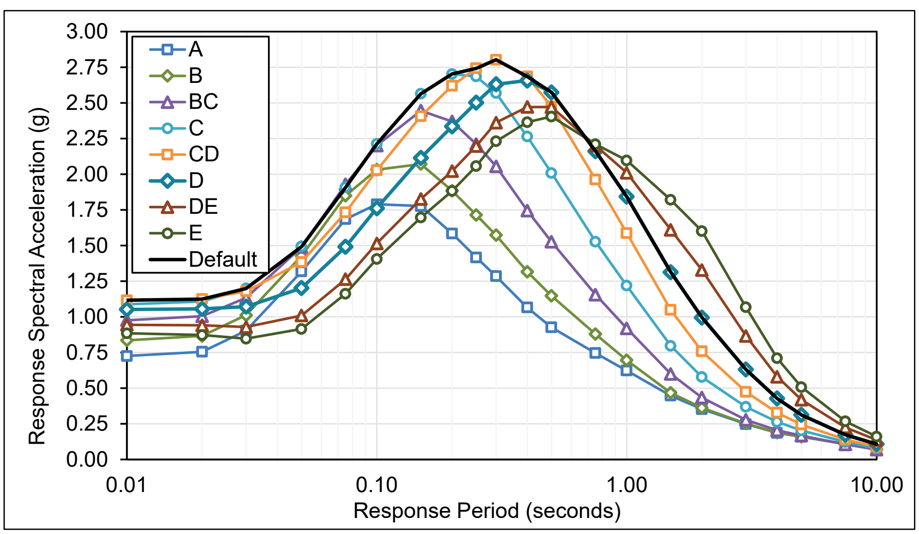


Figure D.1-2 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Century City Site.

Table D.1-3 **Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Northridge Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.664	0.764	0.905	1.029	1.083	1.045	0.958	0.911	1.083
0.01	0.668	0.769	0.910	1.035	1.090	1.052	0.966	0.920	1.090
0.02	0.693	0.795	0.933	1.050	1.096	1.055	0.963	0.907	1.096
0.03	0.827	0.925	1.048	1.137	1.151	1.075	0.952	0.884	1.151
0.05	1.208	1.310	1.394	1.430	1.367	1.220	1.048	0.963	1.430
0.08	1.566	1.722	1.833	1.853	1.735	1.535	1.330	1.237	1.853
0.10	1.671	1.893	2.096	2.164	2.046	1.825	1.600	1.502	2.164
0.15	1.662	1.929	2.304	2.489	2.417	2.183	1.916	1.795	2.489
0.20	1.484	1.752	2.212	2.577	2.599	2.392	2.107	1.979	2.599
0.25	1.315	1.573	2.037	2.508	2.672	2.531	2.276	2.163	2.672
0.30	1.183	1.430	1.874	2.363	2.676	2.625	2.428	2.333	2.676
0.40	0.974	1.182	1.574	2.051	2.495	2.584	2.505	2.451	2.584
0.50	0.836	1.016	1.359	1.796	2.264	2.455	2.458	2.469	2.455
0.75	0.651	0.752	0.995	1.318	1.726	1.974	2.093	2.197	1.974
1.0	0.534	0.585	0.772	1.019	1.358	1.641	1.857	2.020	1.641
1.5	0.381	0.392	0.500	0.650	0.878	1.142	1.439	1.683	1.142
2.0	0.302	0.306	0.363	0.463	0.625	0.853	1.161	1.443	0.853
3.0	0.212	0.213	0.230	0.289	0.387	0.537	0.749	0.950	0.537
4.0	0.157	0.158	0.167	0.205	0.269	0.370	0.510	0.641	0.370
5.0	0.129	0.130	0.132	0.158	0.203	0.275	0.374	0.464	0.275
7.5	0.085	0.085	0.084	0.098	0.121	0.158	0.208	0.253	0.158
10	0.058	0.058	0.058	0.066	0.079	0.101	0.129	0.153	0.101
S_{MS} (g)	1.34	1.58	1.99	2.32	2.41	2.36	2.25	2.22	2.41
S_{M1} (g)	0.54	0.59	0.77	1.02	1.36	1.64	2.09	2.60	1.64
S_{DS} (g)	0.89	1.05	1.33	1.55	1.61	1.57	1.50	1.48	1.61
S_{D1} (g)	0.36	0.39	0.51	0.68	0.91	1.09	1.39	1.73	1.09

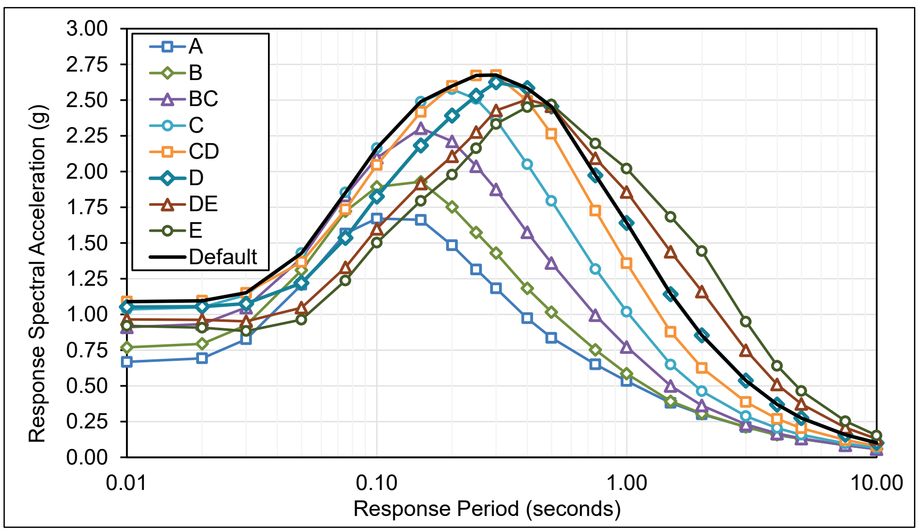


Figure D.1-3 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Northridge Site.

Table D.1-4 **Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Long Beach Site**

Period	5%-Damped Response Spectral Acceleration (g)								
***T* (s)**	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.587	0.677	0.796	0.897	0.932	0.892	0.816	0.773	0.932
0.01	0.591	0.681	0.801	0.902	0.937	0.898	0.822	0.779	0.937
0.02	0.614	0.705	0.822	0.917	0.944	0.900	0.819	0.769	0.944
0.03	0.728	0.817	0.924	0.990	0.988	0.915	0.808	0.747	0.990
0.05	1.047	1.141	1.210	1.231	1.161	1.028	0.883	0.811	1.231
0.08	1.345	1.482	1.569	1.576	1.458	1.280	1.108	1.028	1.576
0.10	1.439	1.637	1.794	1.831	1.709	1.517	1.334	1.249	1.831
0.15	1.428	1.670	1.986	2.112	2.026	1.824	1.618	1.524	2.112
0.20	1.273	1.519	1.918	2.211	2.193	2.011	1.799	1.703	2.211
0.25	1.137	1.383	1.787	2.186	2.281	2.147	1.954	1.866	2.281
0.30	1.033	1.272	1.662	2.088	2.320	2.244	2.092	2.017	2.320
0.40	0.860	1.068	1.415	1.840	2.213	2.252	2.173	2.125	2.252
0.50	0.752	0.939	1.245	1.637	2.043	2.176	2.160	2.143	2.176
0.75	0.615	0.724	0.946	1.245	1.612	1.812	1.897	1.936	1.812
1.0	0.518	0.576	0.754	1.003	1.314	1.546	1.720	1.814	1.546
1.5	0.381	0.396	0.503	0.674	0.893	1.126	1.395	1.580	1.126
2.0	0.304	0.312	0.371	0.496	0.662	0.873	1.168	1.405	0.873
3.0	0.219	0.222	0.243	0.328	0.431	0.575	0.792	0.973	0.575
4.0	0.165	0.168	0.182	0.246	0.308	0.404	0.550	0.671	0.404
5.0	0.141	0.143	0.149	0.194	0.234	0.300	0.405	0.491	0.300
7.5	0.096	0.097	0.099	0.119	0.136	0.169	0.221	0.264	0.169
10	0.063	0.063	0.065	0.077	0.087	0.105	0.135	0.158	0.105
S_{MS} (g)	1.15	1.37	1.73	1.99	2.09	2.03	1.96	1.93	2.09
S_{M1} (g)	0.55	0.58	0.75	1.00	1.31	1.57	2.14	2.63	1.57
S_{DS} (g)	0.76	0.91	1.15	1.33	1.39	1.35	1.30	1.29	1.39
S_{D1} (g)	0.37	0.38	0.50	0.67	0.88	1.05	1.43	1.75	1.05

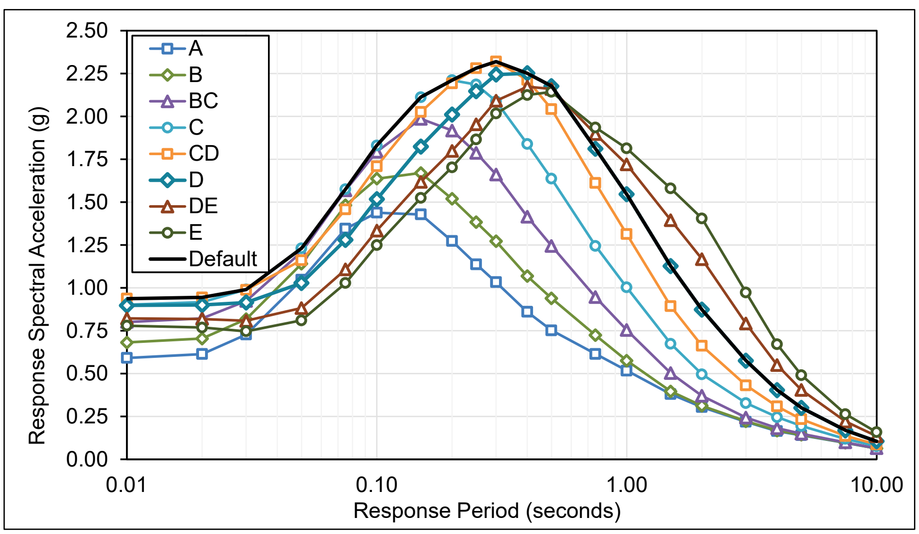


Figure D.1-4 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Long Beach Site.

Table D.1-5 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Irvine Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.449	0.516	0.603	0.678	0.726	0.725	0.697	0.683	0.726
0.01	0.452	0.519	0.606	0.682	0.730	0.729	0.703	0.689	0.730
0.02	0.468	0.535	0.621	0.691	0.734	0.731	0.700	0.682	0.734
0.03	0.550	0.615	0.694	0.747	0.771	0.748	0.696	0.669	0.771
0.05	0.783	0.852	0.910	0.936	0.918	0.853	0.771	0.731	0.936
0.08	1.009	1.112	1.187	1.207	1.166	1.076	0.975	0.935	1.207
0.10	1.079	1.226	1.357	1.409	1.379	1.288	1.188	1.149	1.409
0.15	1.073	1.255	1.497	1.625	1.643	1.568	1.465	1.423	1.643
0.20	0.953	1.137	1.430	1.679	1.766	1.725	1.632	1.595	1.766
0.25	0.830	1.005	1.303	1.627	1.805	1.818	1.761	1.744	1.818
0.30	0.730	0.894	1.183	1.525	1.794	1.867	1.861	1.875	1.867
0.40	0.587	0.724	0.983	1.318	1.663	1.821	1.893	1.947	1.821
0.50	0.491	0.608	0.841	1.152	1.508	1.720	1.843	1.939	1.720
0.75	0.358	0.431	0.603	0.842	1.144	1.368	1.539	1.682	1.368
1.0	0.277	0.323	0.455	0.642	0.892	1.115	1.325	1.490	1.115
1.5	0.185	0.207	0.288	0.411	0.585	0.776	1.003	1.194	0.776
2.0	0.143	0.158	0.208	0.294	0.421	0.576	0.788	0.981	0.576
3.0	0.099	0.108	0.131	0.185	0.265	0.368	0.514	0.650	0.368
4.0	0.075	0.081	0.095	0.133	0.188	0.259	0.357	0.448	0.259
5.0	0.062	0.067	0.075	0.103	0.144	0.195	0.265	0.329	0.195
7.5	0.045	0.047	0.051	0.067	0.091	0.119	0.157	0.191	0.119
10	0.034	0.035	0.037	0.048	0.063	0.080	0.103	0.122	0.080
S_{MS} (g)	0.86	1.02	1.29	1.51	1.62	1.68	1.70	1.75	1.68
S_{M1} (g)	0.28	0.32	0.45	0.64	0.89	1.12	1.42	1.77	1.12
S_{DS} (g)	0.57	0.68	0.86	1.01	1.08	1.12	1.14	1.17	1.12
S_{D1} (g)	0.18	0.22	0.30	0.43	0.59	0.74	0.95	1.18	0.74

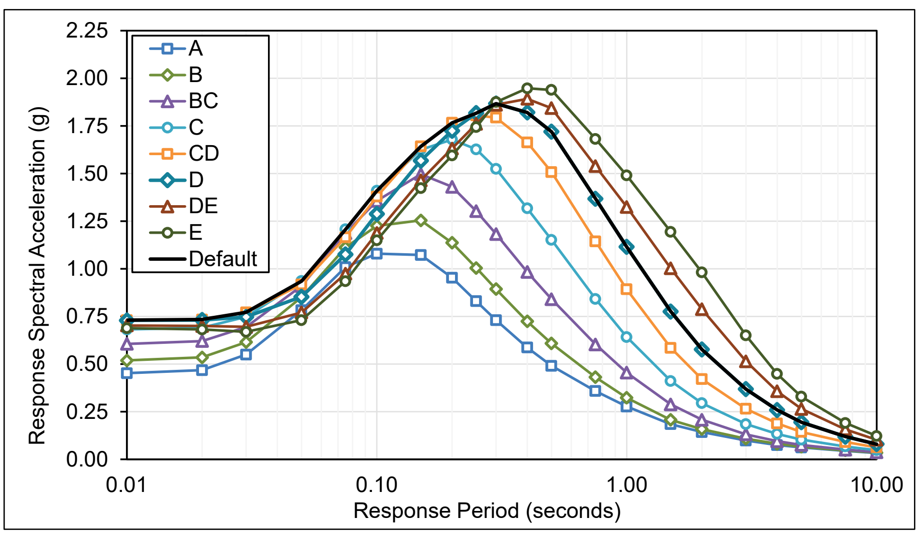


Figure D.1-5 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Irvine Site.

Table D.1-6 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Riverside Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.565	0.648	0.759	0.857	0.919	0.911	0.865	0.839	0.919
0.01	0.568	0.652	0.763	0.861	0.925	0.918	0.872	0.847	0.925
0.02	0.587	0.671	0.780	0.872	0.928	0.920	0.870	0.838	0.928
0.03	0.690	0.773	0.873	0.944	0.977	0.940	0.865	0.821	0.977
0.05	0.990	1.076	1.150	1.188	1.166	1.078	0.960	0.901	1.188
0.08	1.279	1.408	1.507	1.538	1.484	1.360	1.222	1.160	1.538
0.10	1.367	1.549	1.719	1.792	1.750	1.621	1.475	1.414	1.792
0.15	1.345	1.566	1.882	2.058	2.074	1.954	1.788	1.714	2.074
0.20	1.199	1.418	1.793	2.127	2.229	2.142	1.974	1.904	2.229
0.25	1.043	1.245	1.627	2.058	2.279	2.259	2.127	2.074	2.279
0.30	0.918	1.102	1.473	1.921	2.266	2.326	2.254	2.231	2.326
0.40	0.741	0.898	1.229	1.661	2.105	2.276	2.307	2.323	2.276
0.50	0.625	0.757	1.056	1.461	1.913	2.158	2.257	2.327	2.158
0.75	0.458	0.537	0.761	1.076	1.464	1.730	1.905	2.046	1.730
1.0	0.355	0.402	0.575	0.828	1.154	1.431	1.669	1.852	1.431
1.5	0.240	0.263	0.373	0.544	0.777	1.023	1.306	1.543	1.023
2.0	0.190	0.206	0.275	0.400	0.575	0.785	1.069	1.332	0.785
3.0	0.138	0.148	0.183	0.267	0.385	0.534	0.745	0.944	0.534
4.0	0.111	0.119	0.141	0.204	0.290	0.398	0.548	0.689	0.398
5.0	0.096	0.102	0.116	0.164	0.230	0.311	0.421	0.524	0.311
7.5	0.070	0.073	0.078	0.106	0.143	0.187	0.245	0.297	0.187
10	0.051	0.052	0.055	0.072	0.094	0.119	0.151	0.179	0.119
S_{MS} (g)	1.08	1.28	1.61	1.91	2.05	2.09	2.08	2.09	2.09
S_{M1} (g)	0.35	0.40	0.58	0.83	1.15	1.44	2.01	2.55	1.44
S_{DS} (g)	0.72	0.85	1.08	1.28	1.37	1.40	1.38	1.40	1.40
S_{D1} (g)	0.24	0.27	0.38	0.55	0.77	0.96	1.34	1.70	0.96

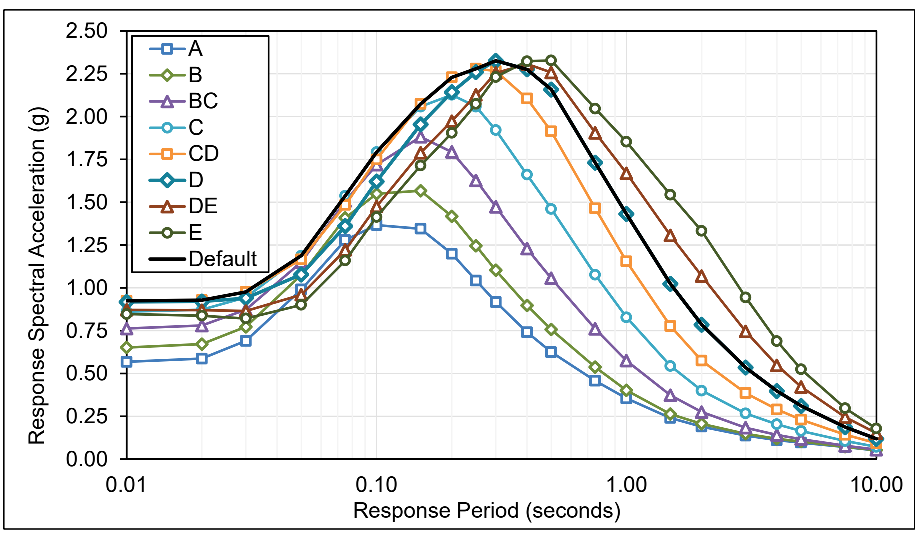


Figure D.1-6 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Riverside Site.

Table D.1-7 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Bernardino Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.920	1.054	1.227	1.346	1.369	1.270	1.114	1.032	1.369
0.01	0.925	1.061	1.233	1.353	1.378	1.279	1.124	1.042	1.378
0.02	0.962	1.099	1.268	1.375	1.386	1.283	1.118	1.026	1.386
0.03	1.143	1.279	1.426	1.484	1.451	1.302	1.099	0.993	1.484
0.05	1.671	1.815	1.881	1.855	1.707	1.462	1.204	1.079	1.855
0.08	2.142	2.356	2.434	2.363	2.126	1.806	1.506	1.374	2.363
0.10	2.255	2.556	2.754	2.720	2.461	2.106	1.777	1.640	2.720
0.15	2.206	2.566	3.048	3.137	2.894	2.486	2.094	1.927	3.137
0.20	1.972	2.322	2.927	3.325	3.157	2.736	2.295	2.117	3.325
0.25	1.731	2.056	2.678	3.298	3.321	2.937	2.489	2.308	3.321
0.30	1.540	1.836	2.445	3.119	3.406	3.102	2.679	2.498	3.406
0.40	1.280	1.531	2.093	2.783	3.330	3.198	2.845	2.679	3.330
0.50	1.101	1.314	1.832	2.498	3.107	3.147	2.885	2.766	3.147
0.75	0.829	0.962	1.364	1.914	2.506	2.706	2.631	2.617	2.706
1.0	0.652	0.739	1.061	1.522	2.066	2.380	2.506	2.599	2.380
1.5	0.444	0.493	0.703	1.023	1.438	1.816	2.186	2.485	1.816
2.0	0.347	0.384	0.521	0.758	1.088	1.462	1.963	2.426	1.462
3.0	0.256	0.282	0.357	0.521	0.752	1.047	1.454	1.848	1.047
4.0	0.209	0.227	0.274	0.395	0.563	0.772	1.068	1.341	0.772
5.0	0.180	0.194	0.223	0.316	0.442	0.596	0.808	1.008	0.596
7.5	0.118	0.123	0.135	0.182	0.245	0.320	0.419	0.510	0.320
10	0.082	0.085	0.090	0.118	0.152	0.192	0.244	0.288	0.192
S_{MS} (g)	1.77	2.09	2.63	2.99	3.07	2.88	2.60	2.49	3.07
S_{M1} (g)	0.65	0.74	1.06	1.52	2.07	2.83	3.93	4.99	2.83
S_{DS} (g)	1.18	1.39	1.76	1.99	2.04	1.92	1.73	1.66	2.04
S_{D1} (g)	0.43	0.49	0.71	1.01	1.38	1.88	2.62	3.33	1.88

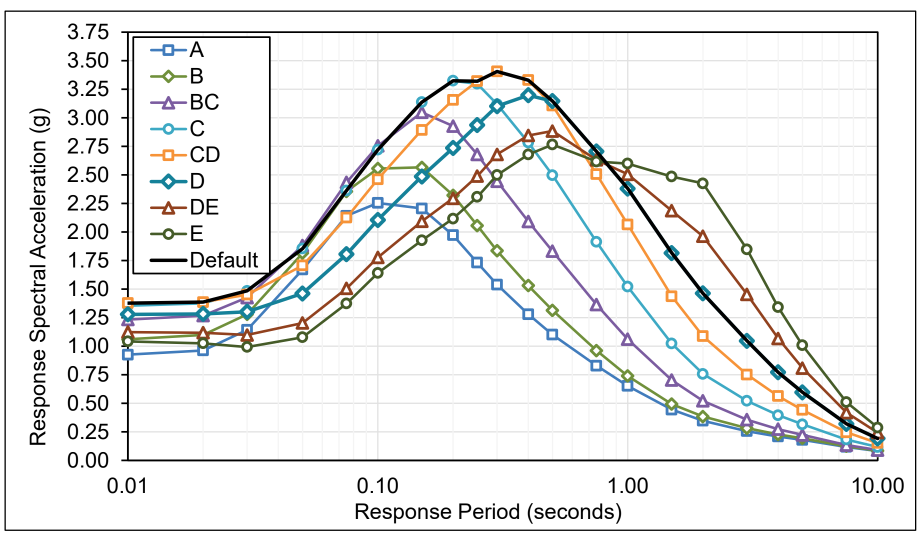


Figure D.1-7 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Bernardino Site.

Table D.1-8 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Luis Obispo Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.393	0.451	0.526	0.591	0.630	0.627	0.599	0.586	0.630
0.01	0.395	0.453	0.529	0.594	0.634	0.630	0.603	0.591	0.634
0.02	0.409	0.467	0.542	0.603	0.637	0.631	0.601	0.583	0.637
0.03	0.479	0.536	0.605	0.650	0.668	0.643	0.595	0.570	0.668
0.05	0.679	0.739	0.789	0.809	0.788	0.727	0.652	0.616	0.809
0.08	0.869	0.957	1.021	1.034	0.990	0.907	0.817	0.779	1.034
0.10	0.926	1.050	1.162	1.202	1.166	1.081	0.991	0.957	1.202
0.15	0.912	1.066	1.278	1.389	1.395	1.323	1.233	1.201	1.395
0.20	0.812	0.968	1.224	1.441	1.509	1.466	1.386	1.359	1.509
0.25	0.709	0.856	1.118	1.406	1.554	1.555	1.502	1.491	1.555
0.30	0.625	0.761	1.016	1.322	1.551	1.604	1.591	1.603	1.604
0.40	0.508	0.623	0.854	1.154	1.455	1.582	1.632	1.674	1.582
0.50	0.428	0.526	0.734	1.015	1.328	1.507	1.603	1.677	1.507
0.75	0.315	0.374	0.530	0.749	1.020	1.214	1.356	1.472	1.214
1.0	0.245	0.279	0.399	0.574	0.800	0.997	1.177	1.315	0.997
1.5	0.164	0.180	0.254	0.370	0.530	0.703	0.906	1.076	0.703
2.0	0.128	0.139	0.185	0.268	0.385	0.528	0.721	0.897	0.528
3.0	0.090	0.097	0.118	0.172	0.248	0.345	0.482	0.609	0.345
4.0	0.070	0.074	0.088	0.126	0.180	0.247	0.341	0.428	0.247
5.0	0.058	0.062	0.070	0.100	0.140	0.189	0.256	0.319	0.189
7.5	0.043	0.045	0.049	0.067	0.091	0.119	0.156	0.191	0.119
10	0.033	0.034	0.037	0.049	0.064	0.081	0.104	0.124	0.081
S_{MS} (g)	0.73	0.87	1.10	1.30	1.40	1.44	1.47	1.51	1.44
S_{M1} (g)	0.24	0.28	0.40	0.57	0.80	1.00	1.30	1.64	1.00
S_{DS} (g)	0.49	0.58	0.73	0.86	0.93	0.96	0.98	1.01	0.96
S_{D1} (g)	0.16	0.19	0.27	0.38	0.53	0.66	0.87	1.10	0.66

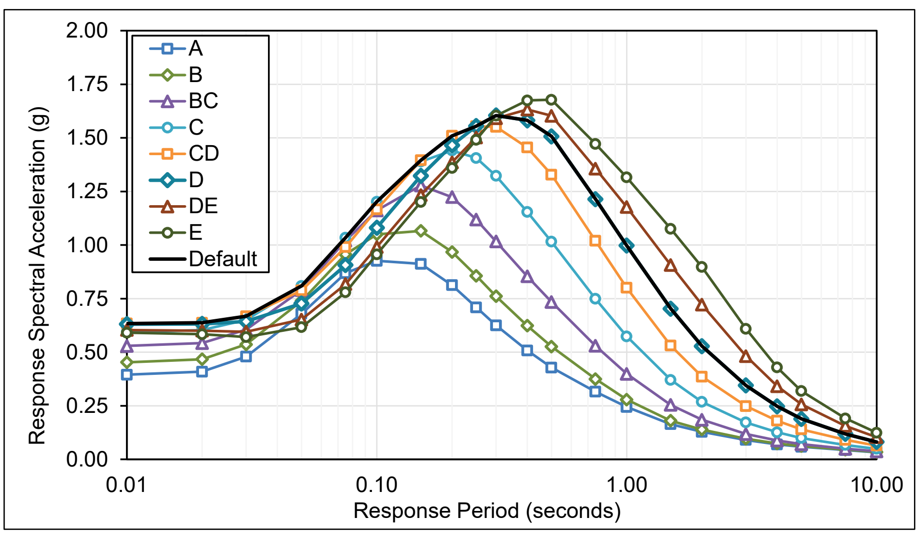


Figure D.1-8 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Luis Obispo Site.

Table D.1-9 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Diego Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.549	0.630	0.731	0.800	0.813	0.760	0.675	0.630	0.813
0.01	0.553	0.634	0.736	0.804	0.817	0.765	0.681	0.636	0.817
0.02	0.577	0.659	0.759	0.821	0.826	0.768	0.674	0.626	0.826
0.03	0.686	0.767	0.856	0.889	0.866	0.780	0.663	0.605	0.889
0.05	0.992	1.079	1.125	1.107	1.015	0.867	0.717	0.647	1.107
0.08	1.259	1.386	1.445	1.400	1.249	1.059	0.882	0.804	1.400
0.10	1.335	1.513	1.634	1.611	1.455	1.240	1.046	0.966	1.611
0.15	1.308	1.530	1.815	1.876	1.739	1.500	1.279	1.188	1.876
0.20	1.153	1.378	1.736	1.969	1.898	1.667	1.434	1.342	1.969
0.25	0.997	1.210	1.574	1.920	1.973	1.781	1.556	1.471	1.973
0.30	0.873	1.065	1.419	1.802	1.980	1.866	1.663	1.592	1.980
0.40	0.700	0.854	1.167	1.565	1.869	1.863	1.740	1.693	1.869
0.50	0.583	0.711	0.991	1.358	1.704	1.793	1.740	1.730	1.793
0.75	0.419	0.500	0.707	0.996	1.320	1.479	1.532	1.588	1.479
1.0	0.315	0.365	0.524	0.753	1.033	1.230	1.368	1.475	1.230
1.5	0.197	0.220	0.313	0.456	0.647	0.839	1.051	1.226	0.839
2.0	0.146	0.160	0.216	0.314	0.451	0.615	0.836	1.036	0.615
3.0	0.095	0.103	0.129	0.188	0.271	0.378	0.529	0.669	0.378
4.0	0.069	0.074	0.088	0.127	0.182	0.251	0.347	0.435	0.251
5.0	0.055	0.058	0.067	0.094	0.132	0.179	0.244	0.303	0.179
7.5	0.036	0.037	0.041	0.055	0.075	0.099	0.130	0.158	0.099
10	0.026	0.027	0.029	0.038	0.051	0.065	0.083	0.099	0.065
S_{MS} (g)	1.04	1.24	1.56	1.77	1.78	1.68	1.57	1.56	1.78
S_{M1} (g)	0.32	0.37	0.52	0.75	1.03	1.23	1.50	1.87	1.23
S_{DS} (g)	0.69	0.83	1.04	1.18	1.19	1.12	1.04	1.04	1.19
S_{D1} (g)	0.21	0.24	0.35	0.50	0.69	0.82	1.00	1.24	0.82

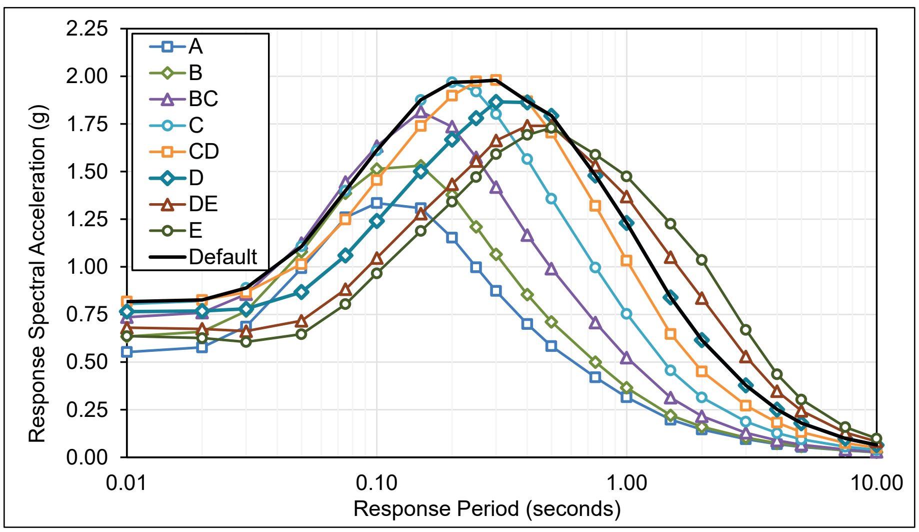


Figure D.1-9 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Diego Site.

Table D.1-10 **Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Barbara Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.765	0.880	1.016	1.095	1.092	1.007	0.882	0.811	1.095
0.01	0.770	0.885	1.022	1.101	1.099	1.014	0.889	0.818	1.101
0.02	0.801	0.918	1.052	1.121	1.108	1.017	0.883	0.804	1.121
0.03	0.952	1.066	1.178	1.207	1.158	1.028	0.864	0.775	1.207
0.05	1.368	1.490	1.538	1.495	1.345	1.137	0.926	0.823	1.495
0.08	1.747	1.932	1.977	1.895	1.671	1.397	1.145	1.028	1.895
0.10	1.877	2.137	2.267	2.201	1.956	1.647	1.368	1.240	2.201
0.15	1.860	2.181	2.544	2.560	2.323	1.978	1.651	1.502	2.560
0.20	1.645	1.971	2.458	2.714	2.546	2.198	1.843	1.683	2.714
0.25	1.441	1.756	2.259	2.713	2.694	2.378	2.021	1.855	2.713
0.30	1.284	1.583	2.082	2.605	2.784	2.533	2.196	2.030	2.784
0.40	1.049	1.306	1.763	2.320	2.717	2.610	2.340	2.185	2.717
0.50	0.887	1.111	1.527	2.062	2.533	2.568	2.383	2.262	2.568
0.75	0.655	0.814	1.133	1.565	2.043	2.213	2.192	2.146	2.213
1.0	0.504	0.616	0.864	1.210	1.632	1.887	2.017	2.057	1.887
1.5	0.323	0.385	0.537	0.760	1.061	1.346	1.637	1.821	1.346
2.0	0.240	0.284	0.380	0.535	0.756	1.020	1.365	1.629	1.020
3.0	0.156	0.182	0.229	0.321	0.458	0.632	0.877	1.073	0.632
4.0	0.115	0.132	0.160	0.221	0.311	0.424	0.580	0.705	0.424
5.0	0.092	0.104	0.122	0.166	0.229	0.307	0.414	0.498	0.307
7.5	0.061	0.067	0.074	0.098	0.131	0.170	0.221	0.260	0.170
10	0.043	0.047	0.051	0.065	0.084	0.106	0.135	0.156	0.106
S_{MS} (g)	1.48	1.77	2.21	2.44	2.51	2.35	2.14	2.04	2.51
S_{M1} (g)	0.50	0.62	0.86	1.21	1.63	1.89	2.46	2.93	1.89
S_{DS} (g)	0.99	1.18	1.47	1.63	1.67	1.57	1.43	1.36	1.67
S_{D1} (g)	0.34	0.41	0.58	0.81	1.09	1.26	1.64	1.96	1.26

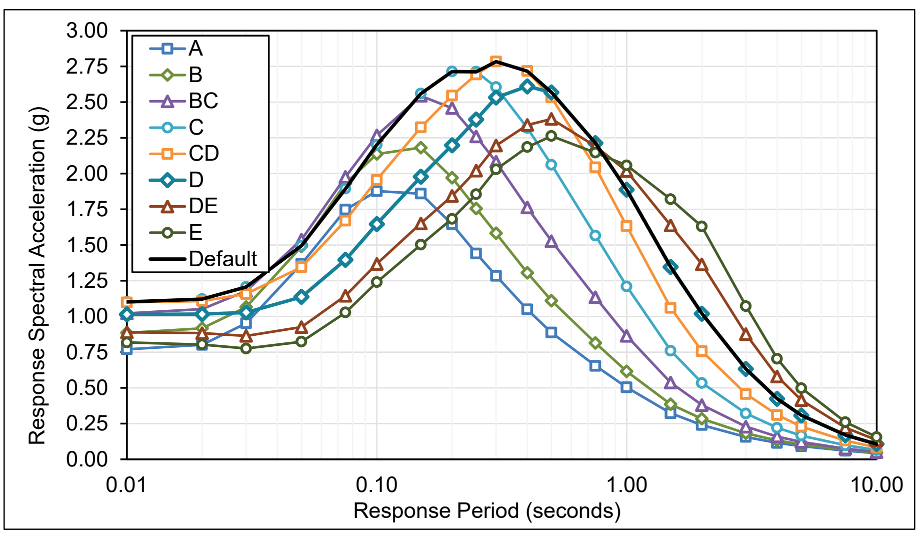


Figure D.1-10 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Barbara Site.

Table D.1-11 **Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Ventura Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.720	0.829	0.962	1.060	1.074	1.002	0.888	0.822	1.074
0.01	0.725	0.835	0.968	1.066	1.080	1.008	0.895	0.829	1.080
0.02	0.755	0.866	0.996	1.085	1.089	1.011	0.889	0.816	1.089
0.03	0.904	1.012	1.123	1.173	1.138	1.022	0.871	0.788	1.173
0.05	1.296	1.407	1.455	1.439	1.316	1.126	0.930	0.837	1.439
0.08	1.648	1.819	1.878	1.833	1.637	1.387	1.153	1.043	1.833
0.10	1.765	2.009	2.151	2.133	1.922	1.641	1.383	1.266	2.133
0.15	1.751	2.053	2.404	2.480	2.288	1.977	1.679	1.537	2.480
0.20	1.555	1.864	2.336	2.628	2.504	2.196	1.868	1.724	2.628
0.25	1.403	1.717	2.207	2.657	2.668	2.393	2.066	1.912	2.668
0.30	1.288	1.599	2.082	2.590	2.780	2.561	2.257	2.104	2.780
0.40	1.083	1.362	1.801	2.334	2.735	2.656	2.416	2.273	2.735
0.50	0.954	1.209	1.605	2.112	2.582	2.637	2.475	2.364	2.637
0.75	0.782	0.950	1.251	1.655	2.126	2.311	2.313	2.279	2.311
1.0	0.657	0.761	1.006	1.347	1.759	2.021	2.171	2.222	2.021
1.5	0.477	0.520	0.671	0.906	1.203	1.499	1.820	2.027	1.499
2.0	0.378	0.405	0.494	0.666	0.894	1.174	1.560	1.861	1.174
3.0	0.268	0.283	0.320	0.433	0.574	0.766	1.052	1.286	0.766
4.0	0.199	0.210	0.234	0.317	0.402	0.526	0.713	0.866	0.526
5.0	0.168	0.176	0.189	0.246	0.300	0.386	0.517	0.623	0.386
7.5	0.113	0.116	0.122	0.147	0.171	0.212	0.275	0.326	0.212
10	0.072	0.075	0.078	0.092	0.106	0.128	0.162	0.189	0.128
S_{MS} (g)	1.40	1.68	2.10	2.39	2.50	2.39	2.23	2.13	2.50
S_{M1} (g)	0.68	0.76	1.01	1.35	1.76	2.11	2.84	3.47	2.11
S_{DS} (g)	0.93	1.12	1.40	1.59	1.67	1.59	1.49	1.42	1.67
S_{D1} (g)	0.45	0.51	0.67	0.90	1.17	1.41	1.89	2.31	1.41

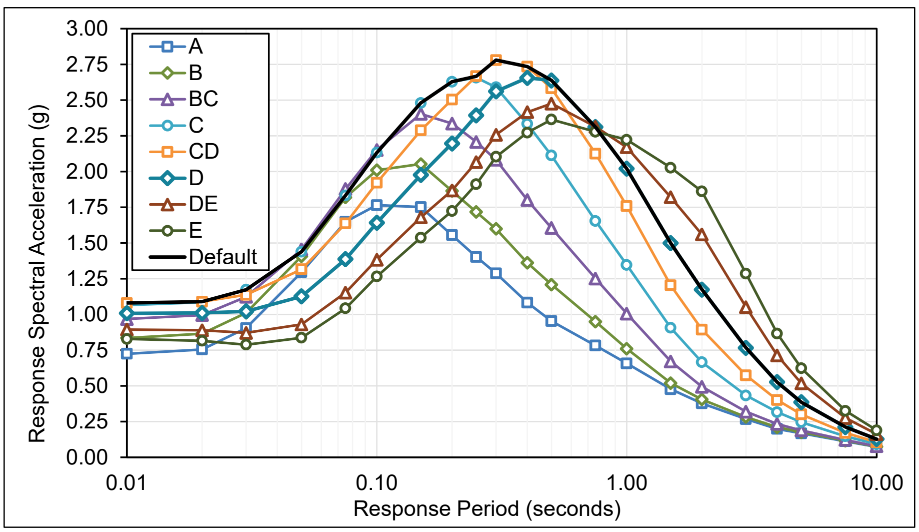


Figure D.1-11 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Ventura Site.

Table D.1-12 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Oakland Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.766	0.881	1.039	1.163	1.195	1.129	1.012	0.949	1.195
0.01	0.771	0.887	1.044	1.169	1.202	1.136	1.020	0.958	1.202
0.02	0.802	0.920	1.074	1.188	1.210	1.139	1.015	0.944	1.210
0.03	0.961	1.075	1.210	1.283	1.267	1.157	0.999	0.916	1.283
0.05	1.417	1.535	1.602	1.603	1.494	1.303	1.092	0.989	1.603
0.08	1.809	1.989	2.074	2.045	1.864	1.609	1.362	1.252	2.045
0.10	1.895	2.149	2.342	2.358	2.167	1.886	1.616	1.501	2.358
0.15	1.872	2.178	2.605	2.745	2.580	2.260	1.943	1.801	2.745
0.20	1.685	1.994	2.527	2.919	2.834	2.518	2.157	2.000	2.919
0.25	1.506	1.805	2.339	2.886	2.976	2.707	2.348	2.195	2.976
0.30	1.360	1.641	2.151	2.710	3.030	2.850	2.530	2.381	3.030
0.40	1.133	1.380	1.831	2.380	2.912	2.903	2.680	2.561	2.912
0.50	0.986	1.201	1.599	2.107	2.674	2.814	2.691	2.631	2.814
0.75	0.783	0.903	1.190	1.573	2.094	2.343	2.392	2.444	2.343
1.0	0.642	0.706	0.929	1.224	1.679	1.997	2.197	2.342	1.997
1.5	0.460	0.476	0.607	0.788	1.115	1.439	1.783	2.066	1.439
2.0	0.366	0.375	0.445	0.568	0.813	1.104	1.494	1.854	1.104
3.0	0.260	0.264	0.289	0.363	0.522	0.724	1.011	1.284	0.724
4.0	0.194	0.198	0.211	0.261	0.371	0.508	0.700	0.883	0.508
5.0	0.158	0.161	0.167	0.202	0.282	0.380	0.515	0.643	0.380
7.5	0.099	0.101	0.102	0.119	0.160	0.208	0.273	0.334	0.208
10	0.067	0.069	0.070	0.080	0.103	0.131	0.166	0.199	0.131
S_{MS} (g)	1.52	1.79	2.27	2.63	2.73	2.61	2.42	2.37	2.73
S_{M1} (g)	0.66	0.71	0.93	1.22	1.68	2.00	2.73	3.47	2.00
S_{DS} (g)	1.01	1.20	1.52	1.75	1.82	1.74	1.61	1.58	1.82
S_{D1} (g)	0.44	0.47	0.62	0.82	1.12	1.33	1.82	2.31	1.33

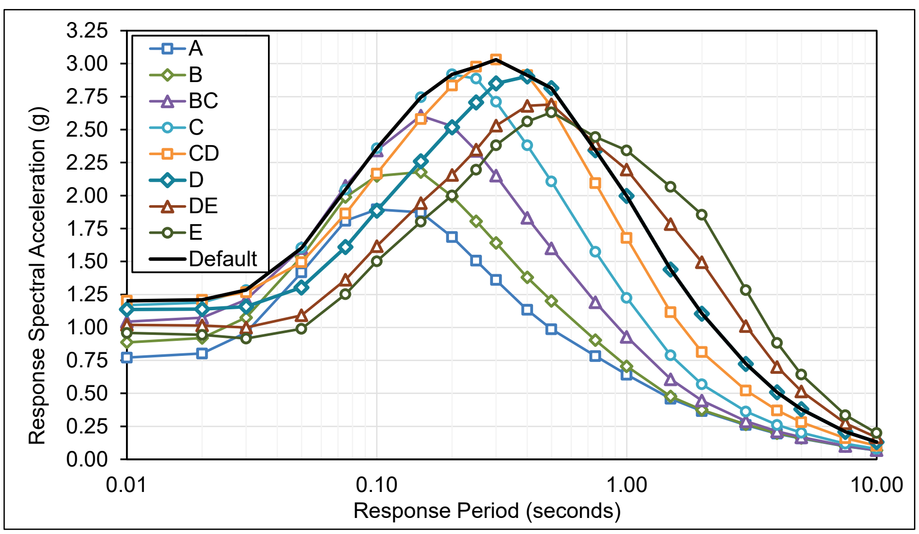


Figure D.1-12 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Oakland Site.

Table D.1-13 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Concord Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.882	1.015	1.190	1.315	1.318	1.211	1.058	0.977	1.318
0.01	0.888	1.022	1.197	1.322	1.325	1.219	1.067	0.986	1.325
0.02	0.925	1.061	1.234	1.346	1.336	1.224	1.060	0.971	1.346
0.03	1.107	1.243	1.392	1.451	1.396	1.241	1.044	0.941	1.451
0.05	1.629	1.765	1.820	1.798	1.634	1.389	1.137	1.018	1.798
0.08	2.082	2.287	2.349	2.287	2.033	1.712	1.418	1.289	2.287
0.10	2.191	2.493	2.680	2.644	2.363	2.005	1.683	1.543	2.644
0.15	2.174	2.541	3.016	3.092	2.811	2.396	2.010	1.840	3.092
0.20	1.947	2.316	2.930	3.317	3.089	2.652	2.219	2.033	3.317
0.25	1.741	2.107	2.723	3.315	3.267	2.856	2.411	2.224	3.315
0.30	1.569	1.920	2.506	3.128	3.348	3.018	2.600	2.416	3.348
0.40	1.287	1.583	2.097	2.715	3.206	3.075	2.748	2.581	3.206
0.50	1.108	1.367	1.816	2.382	2.917	2.974	2.761	2.646	2.974
0.75	0.872	1.024	1.350	1.782	2.274	2.484	2.478	2.470	2.484
1.0	0.710	0.796	1.050	1.391	1.802	2.102	2.270	2.364	2.102
1.5	0.497	0.521	0.666	0.874	1.143	1.462	1.796	2.041	1.462
2.0	0.388	0.398	0.477	0.616	0.802	1.086	1.463	1.782	1.086
3.0	0.264	0.269	0.295	0.375	0.480	0.665	0.924	1.152	0.665
4.0	0.191	0.194	0.207	0.258	0.321	0.439	0.603	0.745	0.439
5.0	0.152	0.155	0.160	0.195	0.236	0.317	0.428	0.524	0.317
7.5	0.093	0.095	0.097	0.113	0.132	0.172	0.225	0.270	0.172
10	0.062	0.064	0.066	0.076	0.088	0.110	0.140	0.165	0.110
S_{MS} (g)	1.75	2.08	2.64	2.99	3.01	2.77	2.48	2.38	3.01
S_{M1} (g)	0.71	0.80	1.05	1.39	1.80	2.10	2.63	3.21	2.10
S_{DS} (g)	1.17	1.39	1.76	1.99	2.01	1.84	1.66	1.59	2.01
S_{D1} (g)	0.47	0.53	0.70	0.93	1.20	1.40	1.76	2.14	1.40

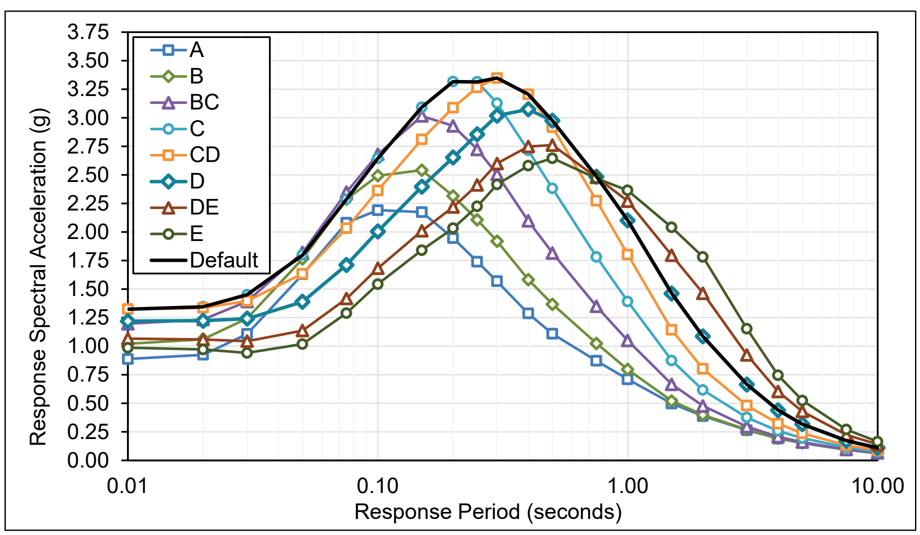


Figure D.1-13 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Concord Site.

Table D.1-14 **Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Monterey Site**

Period *T (s)*	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.478	0.550	0.643	0.721	0.768	0.760	0.727	0.709	0.768
0.01	0.481	0.553	0.646	0.725	0.772	0.765	0.730	0.715	0.772
0.02	0.498	0.570	0.662	0.736	0.776	0.767	0.730	0.707	0.776
0.03	0.585	0.656	0.740	0.795	0.815	0.783	0.724	0.694	0.815
0.05	0.835	0.910	0.971	0.994	0.968	0.893	0.803	0.761	0.994
0.08	1.070	1.181	1.259	1.274	1.221	1.120	1.016	0.975	1.274
0.10	1.139	1.293	1.430	1.478	1.435	1.335	1.233	1.197	1.478
0.15	1.120	1.309	1.570	1.703	1.709	1.624	1.520	1.484	1.709
0.20	0.998	1.187	1.502	1.768	1.846	1.790	1.693	1.665	1.846
0.25	0.870	1.047	1.369	1.722	1.896	1.891	1.825	1.814	1.896
0.30	0.766	0.930	1.242	1.615	1.891	1.947	1.928	1.940	1.947
0.40	0.623	0.761	1.042	1.407	1.770	1.913	1.969	2.013	1.913
0.50	0.526	0.643	0.897	1.239	1.615	1.819	1.922	2.008	1.819
0.75	0.388	0.459	0.649	0.917	1.243	1.466	1.621	1.754	1.466
1.0	0.301	0.343	0.490	0.705	0.980	1.211	1.415	1.575	1.211
1.5	0.202	0.221	0.313	0.456	0.652	0.858	1.097	1.297	0.858
2.0	0.158	0.171	0.228	0.331	0.476	0.650	0.886	1.102	0.650
3.0	0.111	0.120	0.147	0.215	0.310	0.430	0.600	0.759	0.430
4.0	0.087	0.093	0.110	0.159	0.226	0.310	0.428	0.538	0.310
5.0	0.073	0.078	0.089	0.126	0.176	0.238	0.322	0.401	0.238
7.5	0.053	0.055	0.060	0.082	0.110	0.144	0.189	0.231	0.144
10	0.039	0.041	0.044	0.058	0.076	0.096	0.122	0.146	0.096
S_{MS} (g)	0.90	1.07	1.35	1.59	1.71	1.75	1.77	1.81	1.75
S_{M1} (g)	0.30	0.34	0.49	0.70	0.98	1.21	1.62	2.05	1.21
S_{DS} (g)	0.60	0.71	0.90	1.06	1.14	1.17	1.18	1.21	1.17
S_{D1} (g)	0.20	0.23	0.33	0.47	0.65	0.81	1.08	1.37	0.81

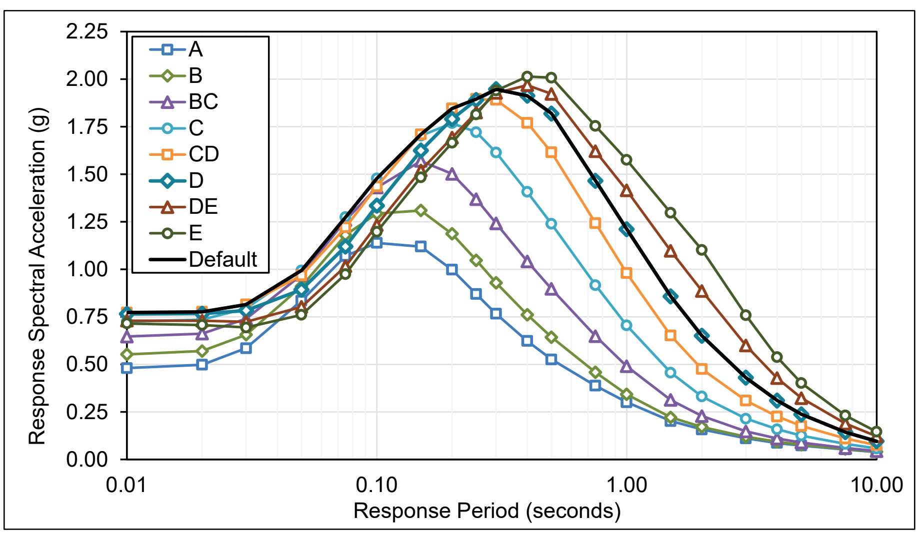


Figure D.1-14 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Monterey Site.

Table D.1-15 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Sacramento Site

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.214	0.246	0.289	0.332	0.373	0.398	0.412	0.425	0.398
0.01	0.215	0.248	0.290	0.334	0.375	0.400	0.415	0.427	0.400
0.02	0.222	0.254	0.295	0.337	0.376	0.400	0.414	0.423	0.400
0.03	0.256	0.287	0.326	0.362	0.394	0.410	0.414	0.418	0.410
0.05	0.352	0.383	0.418	0.448	0.467	0.468	0.457	0.452	0.468
0.08	0.447	0.494	0.542	0.577	0.597	0.594	0.580	0.576	0.597
0.10	0.482	0.549	0.622	0.680	0.717	0.725	0.720	0.724	0.725
0.15	0.478	0.562	0.680	0.785	0.866	0.907	0.927	0.944	0.907
0.20	0.429	0.516	0.655	0.805	0.931	1.007	1.055	1.091	1.007
0.25	0.378	0.461	0.605	0.782	0.947	1.061	1.147	1.208	1.061
0.30	0.336	0.416	0.556	0.740	0.936	1.083	1.209	1.300	1.083
0.40	0.277	0.347	0.476	0.653	0.870	1.052	1.225	1.350	1.052
0.50	0.238	0.300	0.418	0.585	0.800	0.997	1.194	1.344	0.997
0.75	0.181	0.220	0.310	0.441	0.618	0.794	0.986	1.154	0.794
1.0	0.143	0.167	0.238	0.344	0.489	0.646	0.832	0.999	0.646
1.5	0.100	0.114	0.160	0.235	0.339	0.461	0.622	0.776	0.461
2.0	0.081	0.091	0.122	0.178	0.256	0.351	0.483	0.616	0.351
3.0	0.057	0.065	0.081	0.119	0.171	0.234	0.324	0.417	0.234
4.0	0.044	0.050	0.061	0.089	0.126	0.171	0.233	0.299	0.171
5.0	0.037	0.042	0.050	0.072	0.099	0.132	0.178	0.226	0.132
7.5	0.029	0.033	0.038	0.053	0.071	0.091	0.119	0.151	0.091
10	0.024	0.027	0.031	0.042	0.055	0.069	0.088	0.108	0.069
S_{MS} (g)	0.39	0.46	0.59	0.72	0.85	0.97	1.10	1.22	0.97
S_{M1} (g)	0.15	0.17	0.24	0.34	0.49	0.65	0.88	1.13	0.65
S_{DS} (g)	0.26	0.31	0.39	0.48	0.57	0.65	0.74	0.81	0.65
S_{D1} (g)	0.10	0.11	0.16	0.23	0.33	0.43	0.58	0.75	0.43

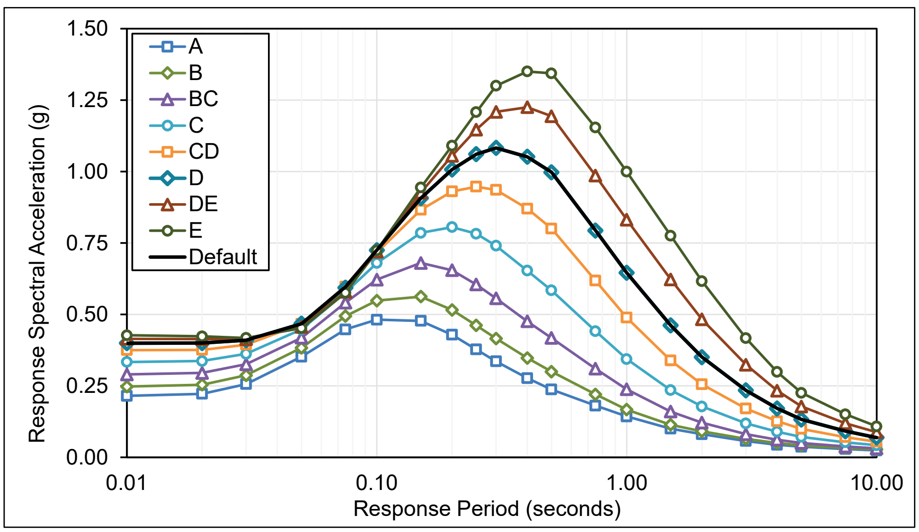


Figure D.1-15 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Sacramento Site.

Table D.1-16 **Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Francisco Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.622	0.712	0.831	0.930	0.982	0.956	0.886	0.847	0.982
0.01	0.625	0.716	0.835	0.935	0.988	0.962	0.892	0.854	0.988
0.02	0.646	0.737	0.855	0.947	0.992	0.964	0.888	0.842	0.992
0.03	0.761	0.850	0.956	1.022	1.039	0.981	0.877	0.819	1.039
0.05	1.094	1.187	1.256	1.278	1.229	1.108	0.960	0.886	1.278
0.08	1.402	1.540	1.628	1.635	1.542	1.377	1.199	1.122	1.635
0.10	1.486	1.680	1.847	1.892	1.801	1.623	1.435	1.355	1.892
0.15	1.480	1.718	2.049	2.192	2.149	1.963	1.745	1.646	2.192
0.20	1.335	1.574	1.982	2.312	2.350	2.189	1.949	1.842	2.350
0.25	1.175	1.402	1.820	2.273	2.448	2.340	2.123	2.021	2.448
0.30	1.043	1.254	1.663	2.141	2.474	2.447	2.277	2.194	2.474
0.40	0.860	1.041	1.416	1.891	2.365	2.468	2.394	2.347	2.468
0.50	0.734	0.892	1.235	1.686	2.182	2.386	2.390	2.396	2.386
0.75	0.550	0.646	0.908	1.268	1.709	1.973	2.091	2.185	1.973
1.0	0.433	0.497	0.702	0.993	1.376	1.673	1.896	2.059	1.673
1.5	0.298	0.334	0.466	0.666	0.947	1.234	1.550	1.813	1.234
2.0	0.236	0.264	0.350	0.496	0.711	0.969	1.314	1.635	0.969
3.0	0.173	0.192	0.238	0.335	0.484	0.671	0.935	1.187	0.671
4.0	0.140	0.155	0.184	0.256	0.365	0.499	0.687	0.867	0.499
5.0	0.121	0.132	0.151	0.206	0.288	0.388	0.526	0.657	0.388
7.5	0.084	0.089	0.097	0.128	0.172	0.224	0.293	0.359	0.224
10	0.060	0.063	0.067	0.086	0.112	0.141	0.179	0.213	0.141
S_{MS} (g)	1.20	1.42	1.78	2.08	2.23	2.22	2.15	2.16	2.23
S_{M1} (g)	0.43	0.50	0.70	0.99	1.38	1.81	2.52	3.21	1.81
S_{DS} (g)	0.80	0.94	1.19	1.39	1.48	1.48	1.44	1.44	1.48
S_{D1} (g)	0.29	0.33	0.47	0.66	0.92	1.21	1.68	2.14	1.21

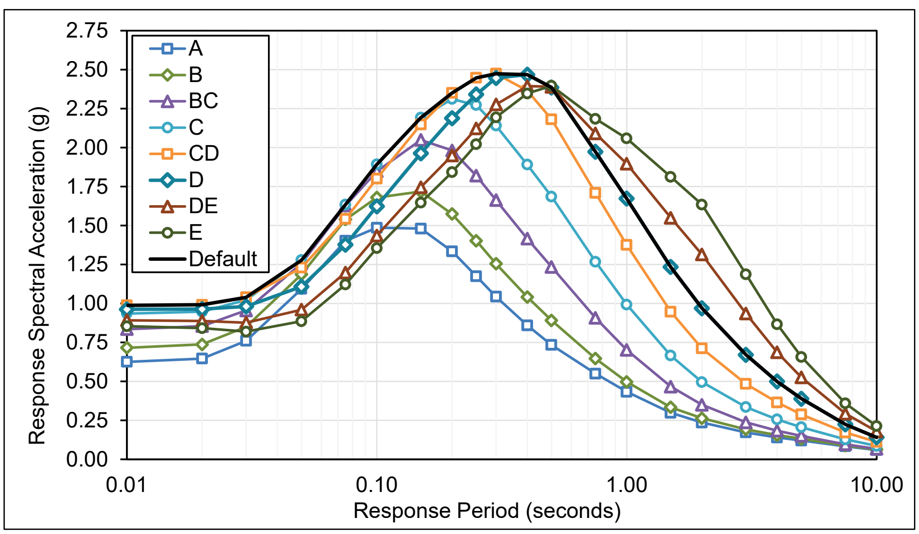


Figure D.1-16 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Francisco Site.

Table D.1-17 **Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Mateo Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.720	0.827	0.974	1.089	1.118	1.054	0.942	0.883	1.118
0.01	0.724	0.832	0.979	1.095	1.124	1.061	0.950	0.891	1.124
0.02	0.753	0.861	1.005	1.111	1.131	1.062	0.943	0.876	1.131
0.03	0.898	1.003	1.130	1.198	1.182	1.076	0.926	0.848	1.198
0.05	1.315	1.423	1.488	1.488	1.383	1.201	1.004	0.910	1.488
0.08	1.670	1.833	1.913	1.884	1.711	1.472	1.242	1.142	1.884
0.10	1.746	1.976	2.155	2.167	1.984	1.720	1.473	1.370	2.167
0.15	1.731	2.009	2.399	2.526	2.369	2.077	1.785	1.662	2.526
0.20	1.570	1.853	2.344	2.701	2.619	2.324	1.998	1.861	2.701
0.25	1.415	1.691	2.190	2.693	2.769	2.512	2.184	2.045	2.769
0.30	1.291	1.552	2.035	2.559	2.846	2.662	2.361	2.229	2.846
0.40	1.099	1.333	1.772	2.299	2.792	2.757	2.524	2.411	2.792
0.50	0.972	1.179	1.573	2.071	2.611	2.714	2.563	2.496	2.714
0.75	0.789	0.906	1.198	1.583	2.097	2.318	2.324	2.350	2.318
1.0	0.658	0.722	0.955	1.259	1.720	2.023	2.187	2.305	2.023
1.5	0.485	0.508	0.653	0.850	1.198	1.530	1.873	2.152	1.530
2.0	0.395	0.411	0.495	0.633	0.905	1.225	1.656	2.045	1.225
3.0	0.298	0.308	0.344	0.433	0.622	0.863	1.203	1.528	0.863
4.0	0.236	0.245	0.266	0.328	0.466	0.639	0.880	1.109	0.639
5.0	0.200	0.207	0.217	0.263	0.366	0.493	0.668	0.834	0.493
7.5	0.129	0.131	0.133	0.155	0.207	0.270	0.353	0.432	0.270
10	0.087	0.089	0.090	0.102	0.131	0.166	0.210	0.250	0.166
S_{MS} (g)	1.41	1.67	2.11	2.43	2.56	2.48	2.31	2.25	2.56
S_{M1} (g)	0.71	0.74	0.96	1.26	1.72	2.33	3.25	4.13	2.33
S_{DS} (g)	0.94	1.11	1.41	1.62	1.71	1.65	1.54	1.50	1.71
S_{D1} (g)	0.47	0.49	0.64	0.84	1.15	1.55	2.17	2.75	1.55

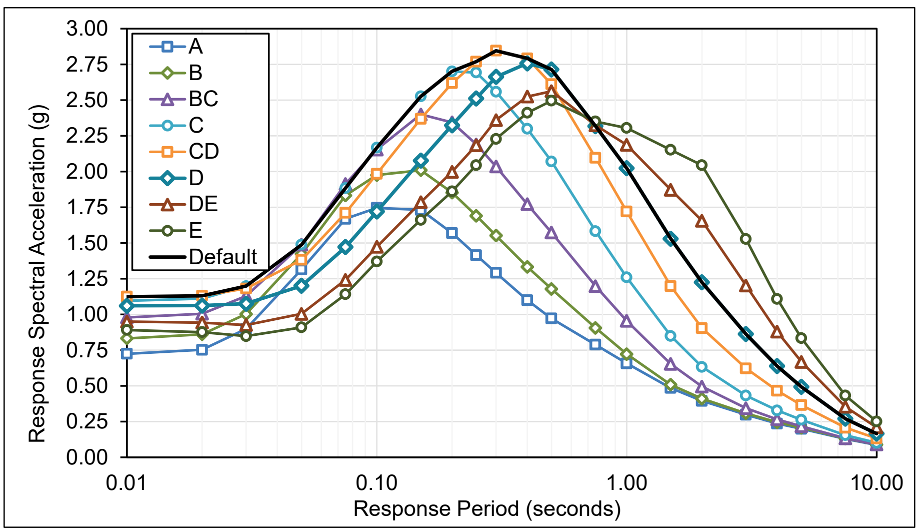


Figure D.1-17 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Mateo Site.

Table D.1-18 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Jose Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.710	0.816	0.961	1.096	1.158	1.121	1.030	0.979	1.158
0.01	0.715	0.822	0.967	1.101	1.165	1.129	1.038	0.989	1.165
0.02	0.741	0.849	0.991	1.117	1.171	1.132	1.035	0.976	1.171
0.03	0.891	0.994	1.118	1.210	1.230	1.155	1.024	0.952	1.230
0.05	1.318	1.423	1.495	1.527	1.468	1.312	1.129	1.037	1.527
0.08	1.692	1.857	1.954	1.970	1.853	1.644	1.426	1.328	1.970
0.10	1.778	2.014	2.213	2.287	2.171	1.944	1.707	1.605	2.287
0.15	1.761	2.043	2.437	2.646	2.586	2.342	2.058	1.929	2.646
0.20	1.583	1.867	2.362	2.783	2.817	2.588	2.278	2.138	2.817
0.25	1.414	1.691	2.193	2.732	2.925	2.763	2.470	2.333	2.925
0.30	1.282	1.549	2.029	2.577	2.949	2.882	2.639	2.526	2.949
0.40	1.071	1.309	1.733	2.263	2.794	2.889	2.768	2.686	2.889
0.50	0.940	1.154	1.527	2.013	2.557	2.771	2.751	2.739	2.771
0.75	0.771	0.886	1.151	1.514	1.982	2.263	2.391	2.491	2.263
1.0	0.653	0.705	0.917	1.206	1.591	1.900	2.149	2.337	1.900
1.5	0.490	0.494	0.622	0.809	1.070	1.356	1.698	1.991	1.356
2.0	0.398	0.398	0.468	0.604	0.791	1.037	1.397	1.740	1.037
3.0	0.295	0.293	0.320	0.404	0.517	0.682	0.942	1.196	0.682
4.0	0.235	0.235	0.247	0.305	0.377	0.487	0.664	0.836	0.487
5.0	0.201	0.201	0.203	0.243	0.292	0.370	0.495	0.618	0.370
7.5	0.134	0.134	0.131	0.150	0.171	0.209	0.271	0.331	0.209
10	0.087	0.088	0.087	0.097	0.109	0.131	0.165	0.196	0.131
S_{MS} (g)	1.42	1.68	2.13	2.50	2.65	2.60	2.49	2.46	2.65
S_{M1} (g)	0.72	0.72	0.92	1.21	1.59	1.90	2.54	3.23	1.90
S_{DS} (g)	0.95	1.12	1.42	1.67	1.77	1.73	1.66	1.64	1.77
S_{D1} (g)	0.48	0.48	0.61	0.80	1.06	1.27	1.70	2.15	1.27

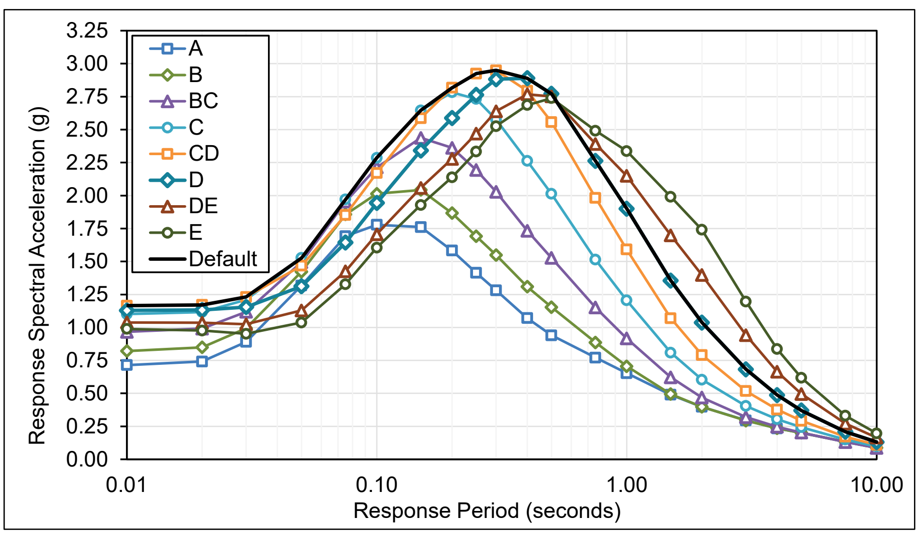


Figure D.1-18 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Jose Site.

Table D.1-19 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Cruz Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.555	0.638	0.745	0.838	0.895	0.883	0.833	0.806	0.895
0.01	0.558	0.642	0.749	0.843	0.900	0.889	0.839	0.813	0.900
0.02	0.578	0.661	0.766	0.853	0.903	0.890	0.836	0.803	0.903
0.03	0.680	0.762	0.858	0.923	0.949	0.909	0.829	0.785	0.949
0.05	0.979	1.064	1.131	1.159	1.128	1.034	0.915	0.856	1.159
0.08	1.256	1.383	1.470	1.490	1.425	1.295	1.155	1.093	1.490
0.10	1.333	1.511	1.669	1.728	1.673	1.538	1.391	1.332	1.728
0.15	1.315	1.532	1.837	1.996	1.995	1.865	1.702	1.632	1.996
0.20	1.178	1.396	1.765	2.082	2.164	2.061	1.895	1.827	2.164
0.25	1.030	1.233	1.610	2.030	2.230	2.190	2.050	1.994	2.230
0.30	0.911	1.096	1.465	1.907	2.233	2.269	2.181	2.144	2.269
0.40	0.745	0.903	1.237	1.669	2.103	2.250	2.248	2.257	2.250
0.50	0.632	0.767	1.069	1.477	1.926	2.152	2.225	2.277	2.152
0.75	0.469	0.549	0.777	1.098	1.489	1.747	1.903	2.027	1.747
1.0	0.365	0.413	0.591	0.851	1.183	1.459	1.687	1.861	1.459
1.5	0.248	0.271	0.383	0.559	0.798	1.047	1.333	1.571	1.047
2.0	0.195	0.211	0.283	0.411	0.590	0.806	1.097	1.367	0.806
3.0	0.140	0.151	0.187	0.272	0.392	0.544	0.759	0.962	0.544
4.0	0.112	0.120	0.142	0.205	0.292	0.401	0.552	0.694	0.401
5.0	0.096	0.102	0.116	0.165	0.230	0.311	0.421	0.525	0.311
7.5	0.069	0.071	0.077	0.105	0.141	0.184	0.242	0.295	0.184
10	0.049	0.051	0.055	0.072	0.094	0.119	0.151	0.180	0.119
S_{MS} (g)	1.06	1.26	1.59	1.87	2.01	2.04	2.02	2.05	2.04
S_{M1} (g)	0.37	0.41	0.59	0.85	1.18	1.47	2.05	2.60	1.47
S_{DS} (g)	0.71	0.84	1.06	1.25	1.34	1.36	1.35	1.37	1.36
S_{D1} (g)	0.24	0.28	0.39	0.57	0.79	0.98	1.37	1.73	0.98

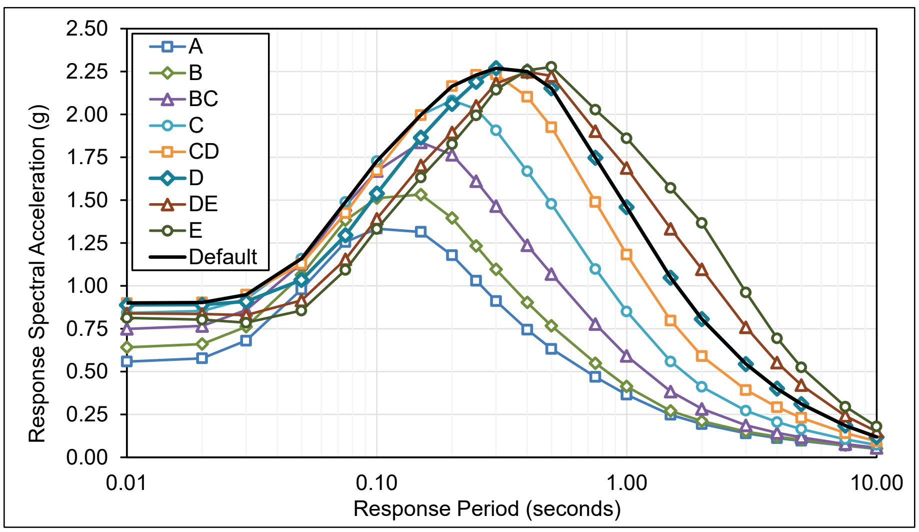


Figure D.1-19 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Cruz Site.

Table D.1-20 **Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Vallejo Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.711	0.821	0.965	1.088	1.132	1.077	0.973	0.914	1.132
0.01	0.716	0.827	0.971	1.094	1.139	1.085	0.981	0.922	1.139
0.02	0.745	0.856	0.997	1.112	1.146	1.088	0.976	0.909	1.146
0.03	0.890	0.998	1.124	1.205	1.203	1.107	0.963	0.882	1.205
0.05	1.315	1.425	1.491	1.512	1.424	1.249	1.053	0.955	1.512
0.08	1.681	1.849	1.935	1.936	1.783	1.550	1.315	1.209	1.936
0.10	1.768	2.011	2.199	2.240	2.082	1.824	1.568	1.453	2.240
0.15	1.761	2.054	2.441	2.601	2.483	2.202	1.898	1.756	2.601
0.20	1.578	1.874	2.366	2.744	2.712	2.441	2.111	1.958	2.744
0.25	1.411	1.703	2.204	2.710	2.828	2.614	2.294	2.145	2.828
0.30	1.280	1.560	2.043	2.572	2.872	2.742	2.468	2.325	2.872
0.40	1.066	1.312	1.739	2.261	2.736	2.765	2.600	2.491	2.765
0.50	0.933	1.151	1.527	2.010	2.513	2.669	2.599	2.547	2.669
0.75	0.761	0.885	1.157	1.524	1.974	2.214	2.295	2.346	2.214
1.0	0.642	0.704	0.925	1.220	1.595	1.880	2.089	2.225	1.880
1.5	0.468	0.478	0.609	0.806	1.059	1.338	1.658	1.908	1.338
2.0	0.372	0.376	0.446	0.594	0.775	1.019	1.365	1.667	1.019
3.0	0.267	0.268	0.294	0.389	0.496	0.658	0.903	1.124	0.658
4.0	0.204	0.206	0.223	0.287	0.353	0.459	0.621	0.768	0.459
5.0	0.178	0.179	0.187	0.225	0.269	0.342	0.457	0.560	0.342
7.5	0.120	0.121	0.120	0.137	0.156	0.192	0.249	0.300	0.192
10	0.077	0.079	0.079	0.089	0.101	0.122	0.153	0.182	0.122
S_{MS} (g)	1.42	1.69	2.13	2.47	2.58	2.49	2.34	2.29	2.58
S_{M1} (g)	0.67	0.70	0.92	1.22	1.59	1.88	2.46	3.04	1.88
S_{DS} (g)	0.95	1.12	1.42	1.65	1.72	1.66	1.56	1.53	1.72
S_{D1} (g)	0.45	0.47	0.62	0.81	1.06	1.25	1.64	2.02	1.25

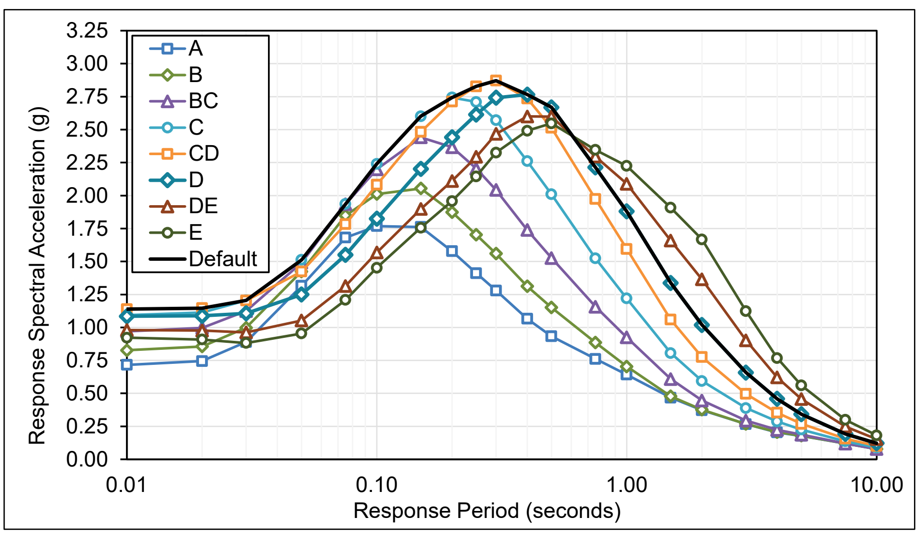


Figure D.1-20 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Vallejo Site.

Table D.1-21 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Rosa Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.859	0.987	1.155	1.283	1.291	1.181	1.021	0.941	1.291
0.01	0.865	0.993	1.161	1.290	1.298	1.188	1.030	0.951	1.298
0.02	0.903	1.034	1.198	1.313	1.309	1.192	1.023	0.933	1.313
0.03	1.090	1.211	1.355	1.417	1.367	1.206	1.002	0.895	1.417
0.05	1.608	1.740	1.794	1.764	1.595	1.341	1.082	0.961	1.764
0.08	2.039	2.235	2.309	2.224	1.962	1.630	1.332	1.202	2.224
0.10	2.126	2.400	2.586	2.551	2.263	1.893	1.566	1.431	2.551
0.15	2.104	2.443	2.892	2.979	2.694	2.263	1.873	1.712	2.979
0.20	1.905	2.238	2.829	3.210	2.981	2.524	2.083	1.905	3.210
0.25	1.722	2.053	2.657	3.229	3.171	2.736	2.274	2.088	3.229
0.30	1.573	1.891	2.474	3.085	3.289	2.914	2.462	2.278	3.289
0.40	1.331	1.609	2.136	2.757	3.246	3.041	2.647	2.468	3.246
0.50	1.175	1.422	1.894	2.479	3.024	3.004	2.701	2.564	3.024
0.75	0.967	1.110	1.462	1.925	2.448	2.607	2.510	2.483	2.607
1.0	0.818	0.894	1.183	1.564	2.023	2.290	2.397	2.481	2.290
1.5	0.597	0.615	0.791	1.050	1.376	1.699	2.041	2.319	1.699
2.0	0.476	0.484	0.584	0.778	1.018	1.330	1.769	2.176	1.330
3.0	0.347	0.350	0.390	0.518	0.667	0.887	1.223	1.544	0.887
4.0	0.266	0.269	0.293	0.379	0.472	0.617	0.841	1.053	0.617
5.0	0.228	0.230	0.241	0.294	0.355	0.454	0.610	0.758	0.454
7.5	0.145	0.146	0.145	0.169	0.194	0.240	0.311	0.380	0.240
10	0.092	0.094	0.094	0.108	0.122	0.147	0.186	0.223	0.147
S_{MS} (g)	1.71	2.01	2.55	2.91	2.96	2.74	2.43	2.31	2.96
S_{M1} (g)	0.86	0.89	1.18	1.56	2.02	2.39	3.30	4.17	2.39
S_{DS} (g)	1.14	1.34	1.70	1.94	1.97	1.82	1.62	1.54	1.97
S_{D1} (g)	0.57	0.60	0.79	1.04	1.35	1.60	2.20	2.78	1.60

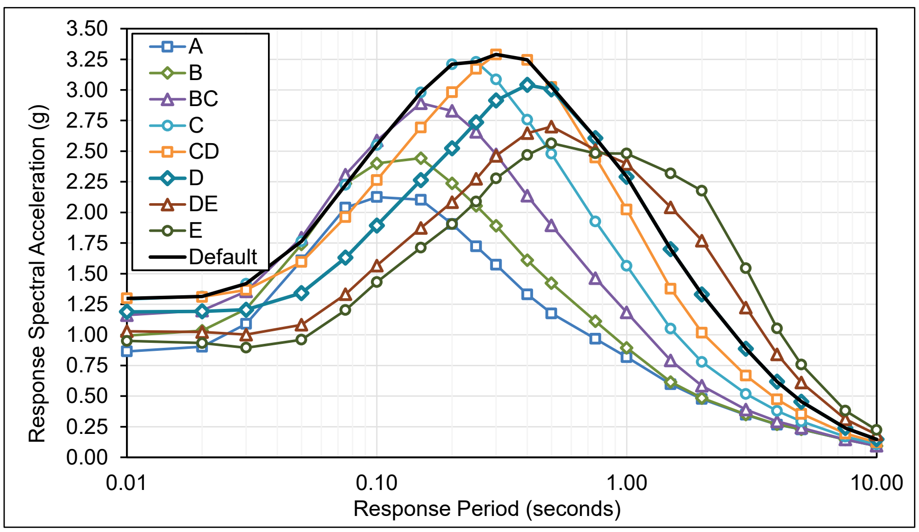


Figure D.1-21 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Rosa Site.

Table D.1-22 **Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Seattle Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.567	0.676	0.760	0.833	0.884	0.899	0.891	0.880	0.899
0.01	0.569	0.677	0.760	0.833	0.882	0.896	0.888	0.875	0.896
0.02	0.624	0.695	0.770	0.833	0.869	0.868	0.839	0.813	0.869
0.03	0.713	0.781	0.846	0.895	0.911	0.889	0.841	0.805	0.911
0.05	0.945	1.029	1.066	1.079	1.048	0.984	0.899	0.845	1.079
0.08	1.217	1.371	1.437	1.467	1.439	1.370	1.278	1.213	1.467
0.10	1.419	1.681	1.820	1.910	1.932	1.900	1.829	1.767	1.932
0.15	1.401	1.748	2.005	2.183	2.283	2.309	2.286	2.245	2.309
0.20	1.167	1.532	1.862	2.139	2.324	2.425	2.481	2.492	2.425
0.25	1.002	1.371	1.717	2.079	2.348	2.523	2.657	2.720	2.523
0.30	0.884	1.242	1.584	1.985	2.319	2.543	2.730	2.828	2.543
0.40	0.692	0.996	1.301	1.695	2.080	2.348	2.581	2.710	2.348
0.50	0.580	0.851	1.127	1.497	1.909	2.217	2.490	2.650	2.217
0.75	0.444	0.646	0.862	1.159	1.538	1.847	2.142	2.319	1.847
1.0	0.365	0.525	0.705	0.959	1.296	1.600	1.920	2.121	1.600
1.5	0.256	0.360	0.482	0.659	0.906	1.169	1.485	1.707	1.169
2.0	0.200	0.280	0.368	0.501	0.692	0.923	1.226	1.459	0.923
3.0	0.134	0.184	0.236	0.320	0.441	0.592	0.798	0.961	0.592
4.0	0.101	0.140	0.177	0.237	0.320	0.420	0.557	0.663	0.420
5.0	0.081	0.109	0.135	0.178	0.236	0.304	0.397	0.469	0.304
7.5	0.058	0.078	0.095	0.121	0.154	0.192	0.243	0.280	0.192
10	0.045	0.060	0.071	0.088	0.108	0.131	0.160	0.182	0.131
S_{MS} (g)	1.05	1.38	1.68	1.93	2.11	2.29	2.46	2.55	2.29
S_{M1} (g)	0.36	0.52	0.71	0.96	1.30	1.66	2.21	2.63	1.66
S_{DS} (g)	0.70	0.92	1.12	1.28	1.41	1.53	1.64	1.70	1.53
S_{D1} (g)	0.24	0.35	0.47	0.64	0.86	1.11	1.47	1.75	1.11

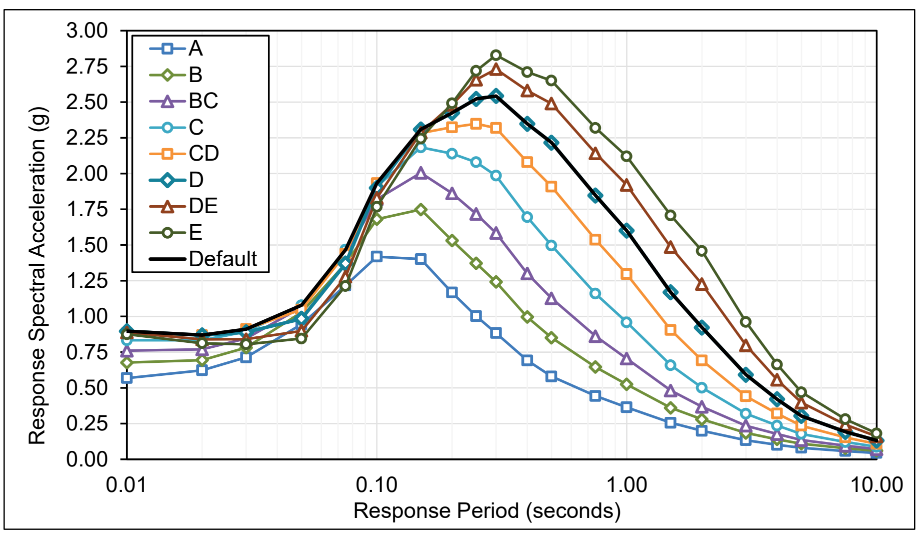


Figure D.1-22 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Seattle Site.

Table D.1-23 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Tacoma Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.483	0.577	0.648	0.712	0.761	0.782	0.785	0.817	0.782
0.01	0.485	0.578	0.649	0.712	0.761	0.781	0.783	0.814	0.781
0.02	0.585	0.639	0.703	0.761	0.800	0.808	0.792	0.791	0.808
0.03	0.668	0.720	0.775	0.820	0.843	0.834	0.800	0.788	0.843
0.05	0.861	0.927	0.951	0.954	0.937	0.891	0.826	0.807	0.954
0.08	1.095	1.223	1.274	1.293	1.281	1.233	1.161	1.153	1.293
0.10	1.235	1.459	1.578	1.658	1.693	1.676	1.622	1.652	1.693
0.15	1.182	1.478	1.698	1.867	1.975	2.010	1.997	2.076	2.010
0.20	0.985	1.299	1.576	1.825	2.012	2.116	2.174	2.305	2.116
0.25	0.821	1.126	1.411	1.716	1.968	2.135	2.260	2.463	2.135
0.30	0.704	0.989	1.262	1.587	1.880	2.087	2.257	2.510	2.087
0.40	0.544	0.783	1.022	1.335	1.655	1.899	2.116	2.393	1.899
0.50	0.438	0.639	0.847	1.125	1.447	1.705	1.949	2.263	1.705
0.75	0.317	0.453	0.603	0.811	1.079	1.311	1.548	1.871	1.311
1.0	0.259	0.366	0.490	0.663	0.893	1.113	1.362	1.682	1.113
1.5	0.182	0.252	0.336	0.455	0.619	0.801	1.033	1.327	0.801
2.0	0.141	0.194	0.253	0.341	0.465	0.616	0.826	1.101	0.616
3.0	0.095	0.129	0.165	0.220	0.298	0.397	0.537	0.719	0.397
4.0	0.071	0.097	0.121	0.159	0.211	0.276	0.367	0.490	0.276
5.0	0.056	0.075	0.091	0.118	0.153	0.197	0.259	0.342	0.197
7.5	0.038	0.049	0.059	0.074	0.093	0.116	0.148	0.198	0.116
10	0.030	0.040	0.047	0.057	0.070	0.085	0.105	0.136	0.085
S_{MS} (g)	0.89	1.17	1.42	1.64	1.81	1.92	2.03	2.26	1.92
S_{M1} (g)	0.26	0.37	0.49	0.66	0.89	1.11	1.49	1.98	1.11
S_{DS} (g)	0.59	0.78	0.95	1.09	1.21	1.28	1.36	1.51	1.28
S_{D1} (g)	0.17	0.24	0.33	0.44	0.60	0.74	0.99	1.32	0.74

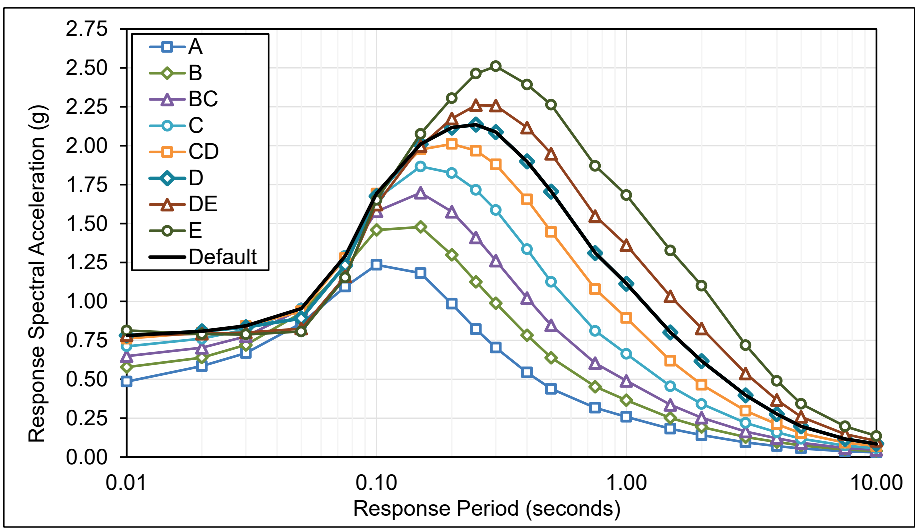


Figure D.1-23 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Tacoma Site.

Table D.1-24 **Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Everett Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.436	0.517	0.588	0.653	0.696	0.706	0.696	0.695	0.706
0.01	0.438	0.518	0.590	0.654	0.696	0.706	0.695	0.694	0.706
0.02	0.501	0.554	0.620	0.681	0.717	0.719	0.698	0.683	0.719
0.03	0.573	0.624	0.684	0.733	0.753	0.738	0.701	0.677	0.753
0.05	0.751	0.811	0.849	0.869	0.850	0.797	0.727	0.690	0.869
0.08	0.962	1.070	1.130	1.162	1.140	1.079	1.004	0.967	1.162
0.10	1.082	1.272	1.391	1.466	1.478	1.443	1.384	1.361	1.478
0.15	1.065	1.312	1.520	1.666	1.736	1.739	1.710	1.710	1.739
0.20	0.907	1.169	1.431	1.659	1.798	1.855	1.879	1.917	1.855
0.25	0.774	1.031	1.300	1.585	1.790	1.902	1.979	2.059	1.902
0.30	0.677	0.920	1.181	1.486	1.741	1.892	2.005	2.113	1.892
0.40	0.536	0.741	0.972	1.268	1.563	1.757	1.913	2.043	1.757
0.50	0.444	0.619	0.822	1.091	1.395	1.615	1.800	1.955	1.615
0.75	0.333	0.452	0.602	0.807	1.067	1.281	1.478	1.645	1.281
1.0	0.274	0.366	0.491	0.661	0.886	1.096	1.316	1.499	1.096
1.5	0.193	0.252	0.335	0.454	0.614	0.792	1.010	1.201	0.792
2.0	0.150	0.195	0.252	0.342	0.463	0.613	0.817	1.006	0.613
3.0	0.101	0.131	0.164	0.221	0.296	0.395	0.532	0.660	0.395
4.0	0.075	0.099	0.122	0.161	0.211	0.276	0.366	0.450	0.276
5.0	0.061	0.078	0.094	0.121	0.156	0.200	0.261	0.318	0.200
7.5	0.042	0.053	0.062	0.077	0.096	0.120	0.152	0.183	0.120
10	0.032	0.041	0.048	0.058	0.071	0.086	0.105	0.124	0.086
S_{MS} (g)	0.82	1.05	1.29	1.49	1.62	1.71	1.80	1.90	1.71
S_{M1} (g)	0.27	0.37	0.49	0.66	0.89	1.10	1.47	1.81	1.10
S_{DS} (g)	0.54	0.70	0.86	1.00	1.08	1.14	1.20	1.27	1.14
S_{D1} (g)	0.18	0.24	0.33	0.44	0.59	0.74	0.98	1.21	0.74

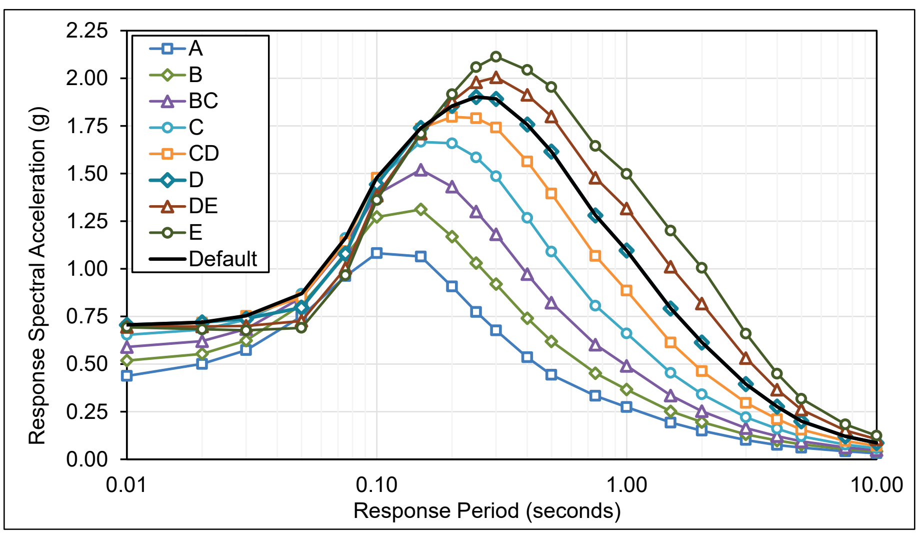


Figure D.1-24 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Everett Site.

Table D.1-25 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Portland Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.316	0.374	0.421	0.459	0.484	0.487	0.477	0.482	0.487
0.01	0.317	0.375	0.422	0.460	0.484	0.487	0.477	0.481	0.487
0.02	0.349	0.399	0.442	0.474	0.492	0.489	0.471	0.465	0.492
0.03	0.397	0.443	0.479	0.501	0.508	0.492	0.463	0.450	0.508
0.05	0.516	0.559	0.578	0.577	0.558	0.519	0.468	0.447	0.577
0.08	0.649	0.723	0.755	0.757	0.732	0.682	0.621	0.601	0.757
0.10	0.722	0.845	0.913	0.941	0.930	0.885	0.824	0.815	0.941
0.15	0.691	0.858	1.000	1.092	1.121	1.094	1.041	1.046	1.121
0.20	0.589	0.766	0.949	1.107	1.188	1.198	1.173	1.199	1.198
0.25	0.497	0.672	0.865	1.080	1.214	1.264	1.274	1.335	1.264
0.30	0.433	0.602	0.794	1.034	1.212	1.298	1.342	1.435	1.298
0.40	0.348	0.500	0.673	0.914	1.130	1.261	1.353	1.480	1.261
0.50	0.286	0.421	0.578	0.803	1.036	1.197	1.326	1.496	1.197
0.75	0.208	0.313	0.438	0.623	0.842	1.012	1.174	1.396	1.012
1.0	0.162	0.251	0.358	0.526	0.729	0.905	1.099	1.342	0.905
1.5	0.112	0.178	0.255	0.380	0.536	0.695	0.894	1.148	0.695
2.0	0.085	0.137	0.196	0.293	0.416	0.554	0.743	0.993	0.554
3.0	0.056	0.091	0.129	0.194	0.275	0.368	0.498	0.669	0.368
4.0	0.042	0.068	0.096	0.143	0.198	0.261	0.347	0.466	0.261
5.0	0.034	0.054	0.074	0.107	0.146	0.189	0.247	0.327	0.189
7.5	0.023	0.036	0.048	0.068	0.090	0.113	0.143	0.193	0.113
10	0.021	0.031	0.040	0.054	0.069	0.084	0.104	0.134	0.084
S_{MS} (g)	0.53	0.69	0.85	1.00	1.09	1.17	1.22	1.35	1.17
S_{M1} (g)	0.16	0.25	0.36	0.53	0.75	1.00	1.35	1.81	1.00
S_{DS} (g)	0.35	0.46	0.57	0.66	0.73	0.78	0.81	0.90	0.78
S_{D1} (g)	0.11	0.17	0.24	0.35	0.50	0.67	0.90	1.20	0.67

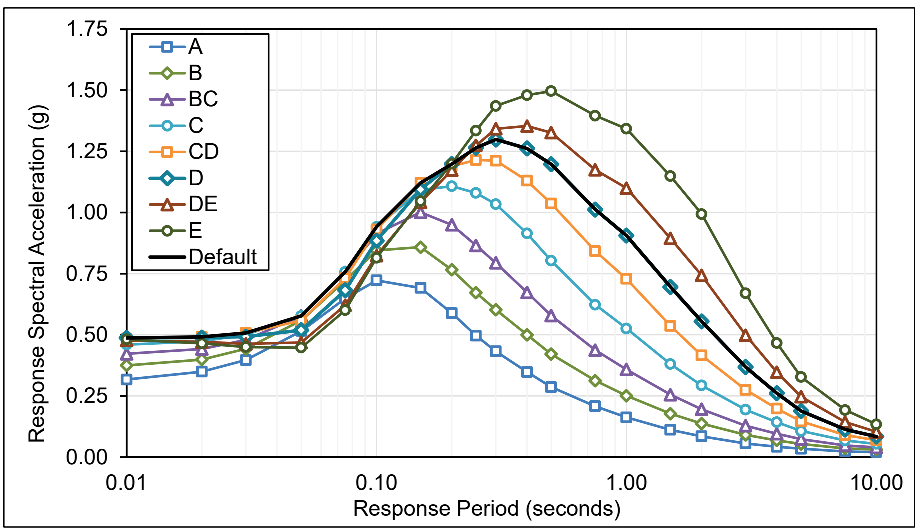


Figure D.1-25 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Portland Site.

Table D.1-26 **Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Salt Lake City Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.526	0.608	0.710	0.780	0.777	0.714	0.622	0.572	0.780
0.01	0.530	0.612	0.715	0.784	0.782	0.718	0.626	0.577	0.784
0.02	0.562	0.645	0.747	0.808	0.797	0.728	0.628	0.573	0.808
0.03	0.678	0.760	0.849	0.877	0.836	0.740	0.619	0.557	0.877
0.05	0.983	1.069	1.111	1.085	0.975	0.824	0.669	0.593	1.085
0.08	1.219	1.346	1.391	1.337	1.173	0.977	0.791	0.708	1.337
0.10	1.273	1.463	1.568	1.531	1.348	1.124	0.914	0.825	1.531
0.15	1.239	1.468	1.748	1.787	1.611	1.354	1.104	0.999	1.787
0.20	1.131	1.374	1.739	1.957	1.821	1.551	1.271	1.156	1.957
0.25	1.014	1.253	1.619	1.962	1.940	1.693	1.408	1.284	1.962
0.30	0.925	1.154	1.505	1.880	2.008	1.810	1.534	1.410	2.008
0.40	0.764	0.960	1.268	1.645	1.938	1.861	1.643	1.532	1.938
0.50	0.660	0.825	1.100	1.443	1.770	1.806	1.661	1.587	1.806
0.75	0.528	0.634	0.834	1.099	1.415	1.546	1.531	1.538	1.546
1.0	0.425	0.484	0.638	0.842	1.098	1.284	1.385	1.459	1.284
1.5	0.295	0.317	0.408	0.534	0.702	0.894	1.105	1.277	0.894
2.0	0.226	0.240	0.291	0.376	0.490	0.663	0.893	1.116	0.663
3.0	0.152	0.159	0.179	0.228	0.292	0.404	0.564	0.717	0.404
4.0	0.105	0.109	0.119	0.150	0.187	0.256	0.353	0.445	0.256
5.0	0.079	0.082	0.087	0.107	0.130	0.175	0.238	0.297	0.175
7.5	0.038	0.039	0.041	0.050	0.059	0.077	0.101	0.125	0.077
10	0.023	0.024	0.026	0.030	0.036	0.045	0.057	0.070	0.045
S_{MS} (g)	1.02	1.24	1.57	1.77	1.81	1.68	1.50	1.43	1.81
S_{M1} (g)	0.43	0.48	0.64	0.84	1.10	1.28	1.61	2.01	1.28
S_{DS} (g)	0.68	0.82	1.04	1.18	1.21	1.12	1.00	0.95	1.21
S_{D1} (g)	0.28	0.32	0.43	0.56	0.73	0.86	1.07	1.34	0.86

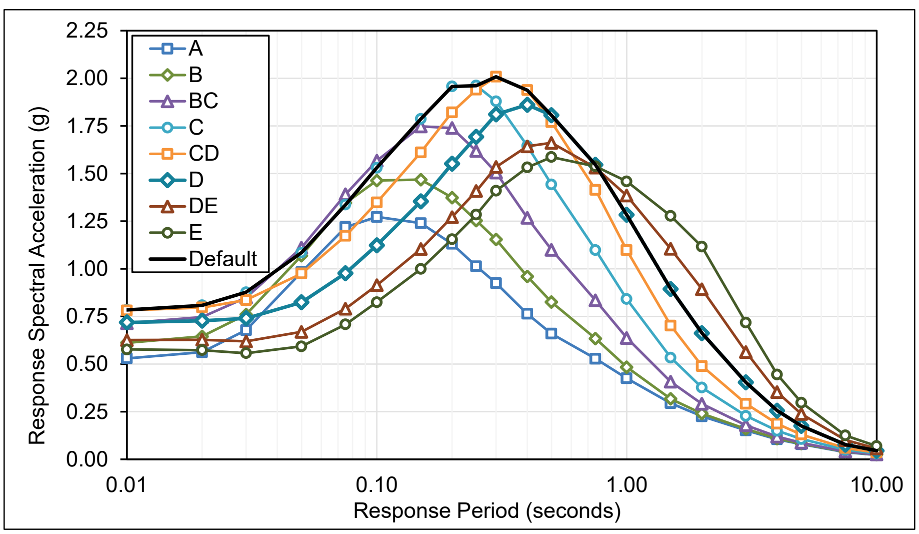


Figure D.1-26 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Salt Lake City Site.

Table D.1-27 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Boise Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.107	0.123	0.145	0.168	0.191	0.206	0.218	0.226	0.206
0.01	0.107	0.124	0.145	0.169	0.192	0.208	0.219	0.228	0.208
0.02	0.111	0.127	0.149	0.171	0.193	0.209	0.219	0.227	0.209
0.03	0.128	0.144	0.165	0.185	0.205	0.216	0.222	0.227	0.216
0.05	0.175	0.193	0.213	0.231	0.246	0.251	0.250	0.249	0.251
0.08	0.223	0.247	0.275	0.297	0.313	0.317	0.314	0.314	0.317
0.10	0.241	0.275	0.314	0.348	0.374	0.384	0.387	0.391	0.384
0.15	0.239	0.283	0.343	0.401	0.451	0.481	0.499	0.512	0.481
0.20	0.215	0.261	0.331	0.409	0.481	0.532	0.569	0.595	0.532
0.25	0.186	0.230	0.301	0.390	0.479	0.548	0.606	0.647	0.548
0.30	0.163	0.204	0.273	0.364	0.463	0.546	0.624	0.683	0.546
0.40	0.130	0.164	0.225	0.308	0.411	0.505	0.602	0.675	0.505
0.50	0.109	0.137	0.191	0.268	0.367	0.464	0.568	0.653	0.464
0.75	0.079	0.097	0.136	0.194	0.273	0.354	0.448	0.533	0.354
1.0	0.060	0.070	0.100	0.145	0.206	0.275	0.361	0.437	0.275
1.5	0.040	0.045	0.063	0.093	0.135	0.185	0.252	0.315	0.185
2.0	0.031	0.035	0.047	0.068	0.099	0.136	0.189	0.241	0.136
3.0	0.021	0.024	0.031	0.046	0.066	0.091	0.126	0.163	0.091
4.0	0.016	0.019	0.024	0.035	0.050	0.067	0.092	0.118	0.067
5.0	0.013	0.016	0.020	0.029	0.040	0.053	0.070	0.090	0.053
7.5	0.010	0.013	0.017	0.023	0.031	0.040	0.051	0.067	0.040
10	0.009	0.011	0.014	0.019	0.025	0.031	0.038	0.049	0.031
S_{MS} (g)	0.19	0.23	0.30	0.37	0.43	0.49	0.56	0.61	0.49
S_{M1} (g)	0.06	0.07	0.10	0.14	0.21	0.28	0.36	0.44	0.28
S_{DS} (g)	0.13	0.16	0.20	0.25	0.29	0.33	0.37	0.41	0.33
S_{D1} (g)	0.04	0.05	0.07	0.10	0.14	0.18	0.24	0.29	0.18

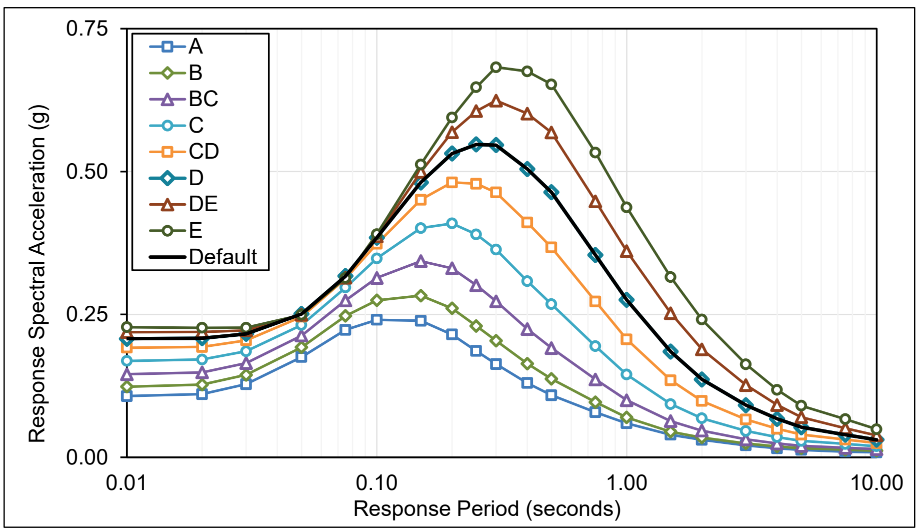


Figure D.1-27 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Boise Site.

Table D.1-28 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Reno Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.533	0.616	0.715	0.794	0.833	0.813	0.761	0.734	0.833
0.01	0.536	0.620	0.719	0.798	0.837	0.818	0.766	0.740	0.837
0.02	0.558	0.643	0.741	0.813	0.846	0.823	0.767	0.734	0.846
0.03	0.661	0.744	0.833	0.881	0.890	0.843	0.764	0.723	0.890
0.05	0.952	1.039	1.093	1.102	1.059	0.963	0.850	0.793	1.102
0.08	1.215	1.344	1.411	1.406	1.326	1.196	1.061	1.003	1.406
0.10	1.291	1.476	1.608	1.632	1.555	1.415	1.270	1.212	1.632
0.15	1.263	1.496	1.791	1.909	1.872	1.729	1.564	1.495	1.909
0.20	1.133	1.370	1.735	2.028	2.060	1.935	1.761	1.690	2.060
0.25	0.982	1.202	1.571	1.979	2.130	2.055	1.903	1.846	2.130
0.30	0.862	1.063	1.420	1.849	2.137	2.130	2.021	1.986	2.137
0.40	0.692	0.858	1.173	1.586	1.988	2.094	2.070	2.068	2.094
0.50	0.579	0.717	0.999	1.382	1.793	1.981	2.027	2.069	1.981
0.75	0.423	0.509	0.719	1.018	1.375	1.599	1.731	1.853	1.599
1.0	0.323	0.375	0.537	0.774	1.074	1.315	1.517	1.682	1.315
1.5	0.207	0.233	0.331	0.484	0.690	0.904	1.151	1.366	0.904
2.0	0.155	0.174	0.235	0.343	0.492	0.670	0.911	1.144	0.670
3.0	0.102	0.113	0.143	0.209	0.301	0.417	0.580	0.740	0.417
4.0	0.072	0.080	0.098	0.143	0.202	0.276	0.379	0.481	0.276
5.0	0.057	0.063	0.074	0.106	0.148	0.198	0.267	0.336	0.198
7.5	0.033	0.037	0.043	0.059	0.079	0.103	0.134	0.168	0.103
10	0.023	0.027	0.031	0.041	0.054	0.067	0.085	0.105	0.067
S_{MS} (g)	1.02	1.23	1.56	1.82	1.92	1.92	1.86	1.86	1.92
S_{M1} (g)	0.32	0.38	0.54	0.77	1.07	1.32	1.64	2.06	1.32
S_{DS} (g)	0.68	0.82	1.04	1.22	1.28	1.28	1.24	1.24	1.28
S_{D1} (g)	0.22	0.25	0.36	0.52	0.72	0.88	1.09	1.37	0.88

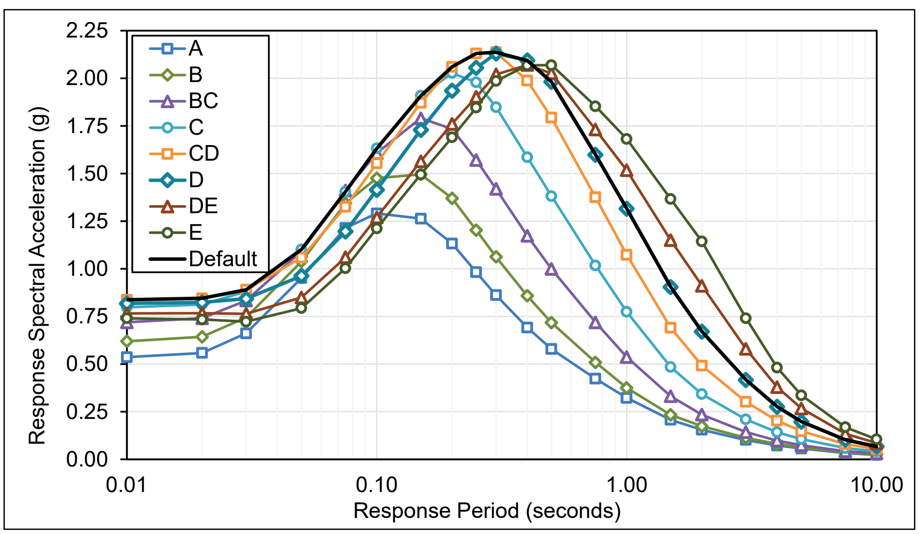


Figure D.1-28 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Reno Site.

Table D.1-29 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Las Vegas Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.220	0.254	0.296	0.332	0.354	0.354	0.341	0.335	0.354
0.01	0.221	0.255	0.298	0.334	0.356	0.356	0.343	0.337	0.356
0.02	0.231	0.264	0.307	0.341	0.361	0.359	0.343	0.334	0.361
0.03	0.271	0.304	0.345	0.371	0.381	0.368	0.342	0.329	0.381
0.05	0.380	0.417	0.450	0.463	0.452	0.419	0.376	0.356	0.463
0.08	0.483	0.534	0.575	0.584	0.560	0.514	0.462	0.438	0.584
0.10	0.517	0.589	0.654	0.677	0.657	0.609	0.554	0.532	0.677
0.15	0.506	0.599	0.717	0.782	0.788	0.749	0.697	0.678	0.788
0.20	0.454	0.551	0.696	0.817	0.861	0.842	0.801	0.789	0.861
0.25	0.389	0.481	0.628	0.787	0.875	0.886	0.867	0.869	0.886
0.30	0.339	0.424	0.566	0.736	0.864	0.907	0.915	0.935	0.907
0.40	0.267	0.335	0.459	0.622	0.782	0.868	0.922	0.967	0.868
0.50	0.220	0.277	0.386	0.535	0.702	0.815	0.900	0.968	0.815
0.75	0.159	0.194	0.275	0.389	0.532	0.648	0.754	0.845	0.648
1.0	0.119	0.138	0.198	0.285	0.399	0.508	0.624	0.720	0.508
1.5	0.077	0.086	0.121	0.177	0.255	0.343	0.454	0.551	0.343
2.0	0.059	0.065	0.086	0.125	0.180	0.248	0.342	0.429	0.248
3.0	0.040	0.043	0.052	0.076	0.110	0.154	0.215	0.271	0.154
4.0	0.030	0.032	0.037	0.054	0.077	0.106	0.146	0.183	0.106
5.0	0.024	0.026	0.029	0.041	0.058	0.078	0.106	0.132	0.078
7.5	0.018	0.020	0.022	0.031	0.041	0.054	0.071	0.088	0.054
10	0.015	0.017	0.019	0.025	0.032	0.041	0.052	0.064	0.041
S_{MS} (g)	0.41	0.50	0.63	0.74	0.79	0.82	0.83	0.87	0.82
S_{M1} (g)	0.12	0.14	0.20	0.28	0.40	0.51	0.62	0.77	0.51
S_{DS} (g)	0.27	0.33	0.42	0.49	0.53	0.54	0.55	0.58	0.54
S_{D1} (g)	0.08	0.09	0.13	0.19	0.27	0.34	0.42	0.51	0.34

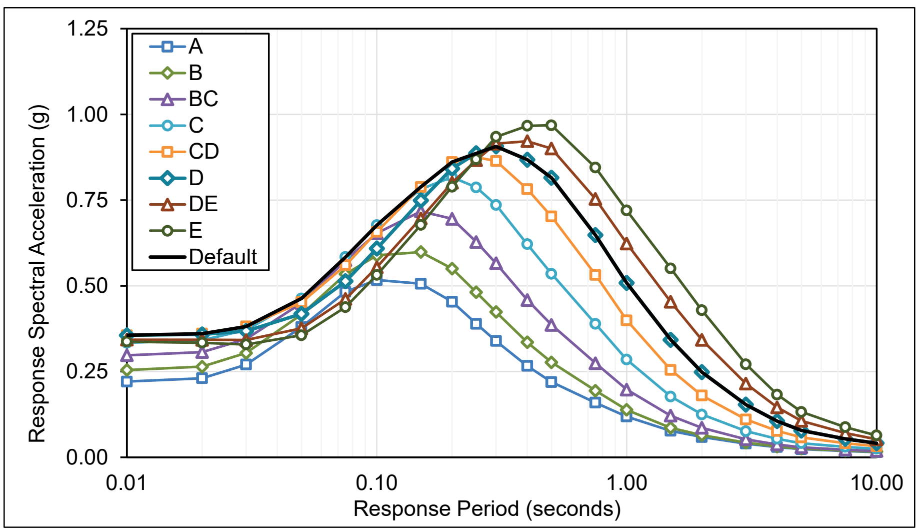


Figure D.1-29 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Las Vegas Site.

Table D.1-30 **Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, St. Louis Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.380	0.368	0.368	0.364	0.357	0.349	0.336	0.336	0.364
0.01	0.411	0.399	0.398	0.394	0.386	0.376	0.362	0.362	0.394
0.02	0.606	0.586	0.586	0.577	0.553	0.546	0.530	0.530	0.577
0.03	0.713	0.688	0.701	0.683	0.634	0.624	0.604	0.604	0.683
0.05	0.818	0.784	0.863	0.838	0.759	0.740	0.707	0.707	0.838
0.08	0.783	0.826	0.932	0.912	0.824	0.791	0.745	0.745	0.912
0.10	0.754	0.910	1.034	1.008	0.880	0.833	0.771	0.771	1.008
0.15	0.640	0.725	0.829	0.860	0.836	0.799	0.731	0.731	0.860
0.20	0.542	0.550	0.632	0.698	0.756	0.744	0.679	0.679	0.756
0.25	0.482	0.490	0.537	0.613	0.697	0.705	0.643	0.643	0.705
0.30	0.429	0.433	0.458	0.538	0.636	0.645	0.610	0.610	0.645
0.40	0.345	0.348	0.363	0.443	0.555	0.571	0.546	0.546	0.571
0.50	0.290	0.294	0.305	0.380	0.494	0.525	0.512	0.512	0.525
0.75	0.221	0.224	0.232	0.293	0.394	0.443	0.434	0.434	0.443
1.0	0.177	0.178	0.182	0.234	0.321	0.378	0.363	0.363	0.378
1.5	0.123	0.124	0.128	0.165	0.224	0.260	0.253	0.253	0.260
2.0	0.096	0.097	0.100	0.128	0.172	0.190	0.186	0.186	0.190
3.0	0.063	0.062	0.064	0.082	0.109	0.116	0.113	0.113	0.116
4.0	0.044	0.043	0.045	0.057	0.075	0.079	0.076	0.076	0.079
5.0	0.033	0.033	0.034	0.043	0.057	0.059	0.057	0.057	0.059
7.5	0.021	0.020	0.021	0.027	0.035	0.037	0.036	0.036	0.037
10	0.014	0.014	0.014	0.018	0.023	0.024	0.024	0.024	0.024
S_{MS} (g)	0.49	0.49	0.57	0.63	0.68	0.67	0.61	0.61	0.68
S_{M1} (g)	0.18	0.18	0.18	0.23	0.32	0.38	0.36	0.36	0.38
S_{DS} (g)	0.33	0.33	0.38	0.42	0.45	0.45	0.41	0.41	0.45
S_{D1} (g)	0.12	0.12	0.12	0.16	0.21	0.25	0.24	0.24	0.25

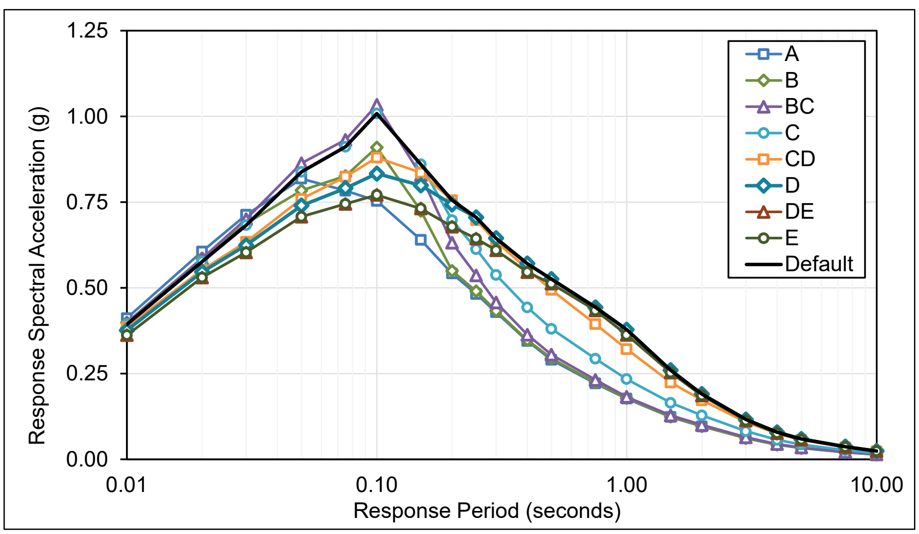


Figure D.1-30 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, St. Louis Site.

Table D.1-31 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Memphis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.795	0.773	0.772	0.729	0.685	0.648	0.611	0.611	0.729
0.01	0.905	0.878	0.878	0.823	0.770	0.725	0.682	0.682	0.823
0.02	1.342	1.302	1.301	1.230	1.141	1.100	1.050	1.050	1.230
0.03	1.580	1.529	1.556	1.450	1.294	1.234	1.169	1.169	1.450
0.05	1.795	1.731	1.898	1.753	1.510	1.407	1.300	1.300	1.753
0.08	1.690	1.776	1.990	1.853	1.582	1.435	1.301	1.301	1.853
0.10	1.619	1.930	2.163	2.018	1.660	1.469	1.293	1.293	2.018
0.15	1.353	1.519	1.731	1.709	1.542	1.359	1.169	1.169	1.709
0.20	1.126	1.139	1.304	1.374	1.380	1.241	1.048	1.048	1.380
0.25	0.992	1.005	1.099	1.204	1.261	1.152	0.964	0.964	1.261
0.30	0.870	0.876	0.926	1.051	1.152	1.049	0.900	0.900	1.152
0.40	0.688	0.691	0.721	0.867	1.030	0.966	0.826	0.826	1.030
0.50	0.569	0.576	0.597	0.739	0.925	0.903	0.792	0.792	0.925
0.75	0.430	0.435	0.450	0.570	0.760	0.818	0.740	0.740	0.818
1.0	0.344	0.346	0.353	0.454	0.623	0.718	0.656	0.656	0.718
1.5	0.242	0.243	0.251	0.322	0.438	0.506	0.485	0.485	0.506
2.0	0.185	0.186	0.193	0.247	0.331	0.364	0.351	0.351	0.364
3.0	0.121	0.119	0.124	0.158	0.208	0.220	0.210	0.210	0.220
4.0	0.081	0.080	0.083	0.106	0.140	0.145	0.139	0.139	0.145
5.0	0.062	0.061	0.063	0.080	0.105	0.108	0.103	0.103	0.108
7.5	0.038	0.037	0.039	0.049	0.064	0.066	0.062	0.062	0.066
10	0.026	0.025	0.026	0.032	0.041	0.042	0.040	0.040	0.042
S_{MS} (g)	1.01	1.03	1.17	1.24	1.24	1.12	0.94	0.94	1.24
S_{M1} (g)	0.34	0.35	0.35	0.45	0.62	0.72	0.66	0.66	0.72
S_{DS} (g)	0.68	0.68	0.78	0.82	0.83	0.74	0.63	0.63	0.83
S_{D1} (g)	0.23	0.23	0.24	0.30	0.42	0.48	0.44	0.44	0.48

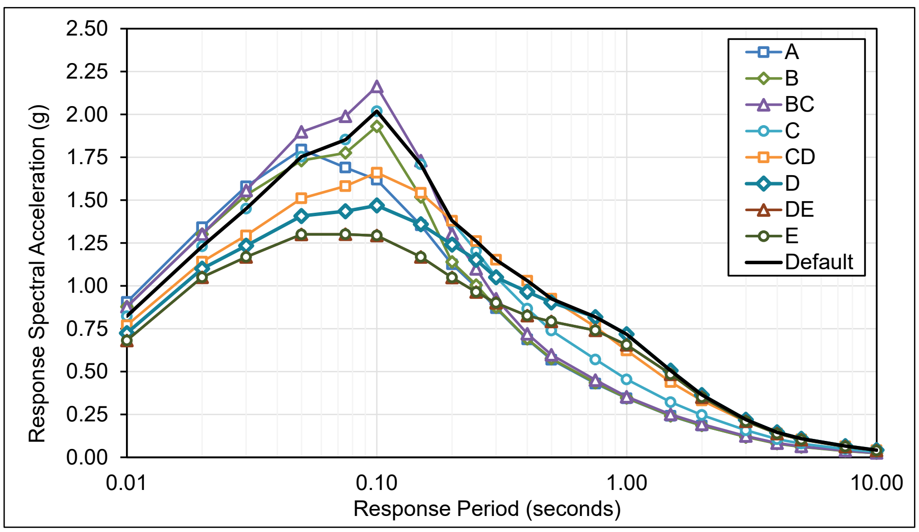


Figure D.1-31 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Memphis Site.

Table D.1-32 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Charleston Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	1.102	1.076	1.076	0.989	0.907	0.835	0.777	0.777	0.989
0.01	1.288	1.254	1.253	1.134	1.027	0.943	0.873	0.873	1.134
0.02	1.841	1.795	1.794	1.665	1.519	1.446	1.369	1.369	1.665
0.03	2.128	2.073	2.106	1.919	1.670	1.562	1.461	1.461	1.919
0.05	2.310	2.247	2.424	2.183	1.831	1.655	1.506	1.506	2.183
0.08	2.182	2.280	2.504	2.262	1.861	1.617	1.419	1.419	2.262
0.10	2.061	2.387	2.632	2.393	1.900	1.595	1.347	1.347	2.393
0.15	1.717	1.908	2.133	2.029	1.731	1.423	1.155	1.155	2.029
0.20	1.417	1.422	1.612	1.635	1.532	1.274	1.009	1.009	1.635
0.25	1.229	1.234	1.344	1.419	1.387	1.154	0.889	0.889	1.419
0.30	1.065	1.065	1.124	1.240	1.271	1.047	0.818	0.818	1.271
0.40	0.833	0.831	0.865	1.025	1.165	1.000	0.773	0.773	1.165
0.50	0.678	0.682	0.706	0.868	1.050	0.952	0.750	0.750	1.050
0.75	0.488	0.490	0.508	0.644	0.852	0.886	0.750	0.750	0.886
1.0	0.375	0.375	0.383	0.492	0.674	0.764	0.672	0.672	0.764
1.5	0.246	0.245	0.254	0.326	0.444	0.511	0.484	0.484	0.511
2.0	0.176	0.175	0.182	0.233	0.313	0.342	0.328	0.328	0.342
3.0	0.105	0.102	0.107	0.136	0.179	0.187	0.177	0.177	0.187
4.0	0.066	0.065	0.067	0.086	0.113	0.117	0.111	0.111	0.117
5.0	0.048	0.047	0.049	0.062	0.081	0.083	0.079	0.079	0.083
7.5	0.027	0.026	0.028	0.035	0.045	0.046	0.043	0.043	0.046
10	0.017	0.017	0.017	0.022	0.028	0.028	0.026	0.026	0.028
S_{MS} (g)	1.28	1.28	1.45	1.47	1.38	1.15	0.91	0.91	1.47
S_{M1} (g)	0.37	0.37	0.38	0.49	0.67	0.76	0.67	0.67	0.76
S_{DS} (g)	0.85	0.85	0.97	0.98	0.92	0.76	0.61	0.61	0.98
S_{D1} (g)	0.25	0.25	0.26	0.33	0.45	0.51	0.45	0.45	0.51

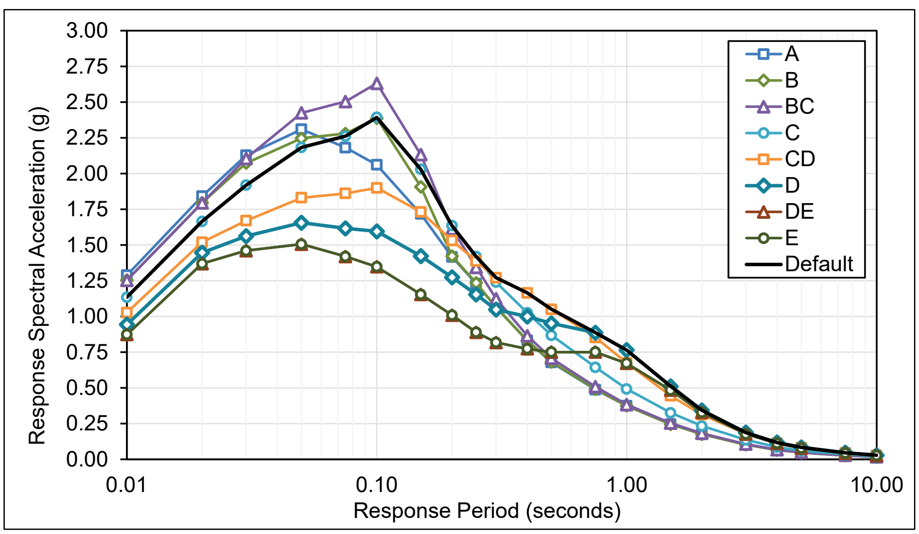


Figure D.1-32 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Charleston Site.

Table D.1-33 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Chicago Site

Period *T (s)*	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.084	0.082	0.082	0.086	0.089	0.090	0.089	0.089	0.090
0.01	0.091	0.088	0.088	0.092	0.095	0.096	0.095	0.095	0.096
0.02	0.124	0.120	0.120	0.124	0.124	0.127	0.125	0.125	0.127
0.03	0.145	0.140	0.143	0.147	0.143	0.146	0.144	0.144	0.147
0.05	0.170	0.163	0.180	0.185	0.177	0.180	0.177	0.177	0.185
0.08	0.165	0.174	0.197	0.204	0.196	0.198	0.194	0.194	0.204
0.10	0.163	0.197	0.225	0.231	0.215	0.217	0.210	0.210	0.231
0.15	0.146	0.165	0.189	0.206	0.215	0.220	0.213	0.213	0.220
0.20	0.132	0.134	0.154	0.176	0.205	0.217	0.210	0.210	0.217
0.25	0.123	0.124	0.136	0.161	0.196	0.215	0.211	0.211	0.215
0.30	0.117	0.118	0.125	0.151	0.190	0.209	0.214	0.214	0.209
0.40	0.106	0.107	0.112	0.138	0.181	0.201	0.209	0.209	0.201
0.50	0.098	0.099	0.103	0.129	0.172	0.196	0.207	0.207	0.196
0.75	0.081	0.082	0.085	0.108	0.146	0.171	0.179	0.179	0.171
1.0	0.068	0.069	0.070	0.090	0.124	0.149	0.150	0.150	0.149
1.5	0.050	0.050	0.052	0.066	0.090	0.105	0.105	0.105	0.105
2.0	0.041	0.041	0.042	0.054	0.073	0.082	0.081	0.081	0.082
3.0	0.027	0.027	0.028	0.035	0.047	0.051	0.051	0.051	0.051
4.0	0.020	0.020	0.020	0.026	0.034	0.037	0.036	0.036	0.037
5.0	0.015	0.015	0.016	0.020	0.026	0.028	0.027	0.027	0.028
7.5	0.010	0.010	0.010	0.013	0.017	0.018	0.018	0.018	0.018
10	0.007	0.007	0.007	0.009	0.011	0.012	0.012	0.012	0.012
S_{MS} (g)	0.12	0.12	0.14	0.16	0.18	0.20	0.19	0.19	0.20
S_{M1} (g)	0.07	0.07	0.08	0.10	0.13	0.15	0.15	0.15	0.15
S_{DS} (g)	0.08	0.08	0.09	0.11	0.12	0.13	0.13	0.13	0.13
S_{D1} (g)	0.05	0.05	0.05	0.07	0.09	0.10	0.10	0.10	0.10

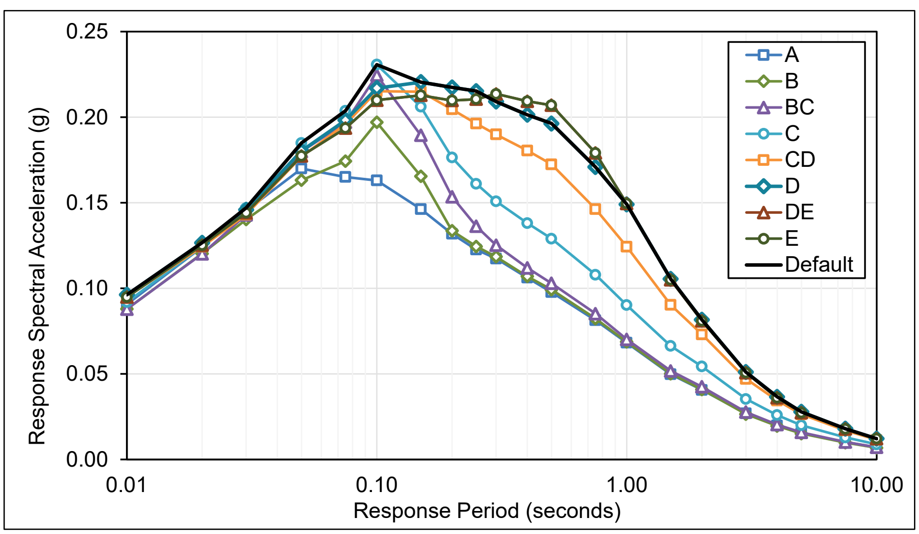


Figure D.1-33 Plots of probabilistic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Chicago Site.

Table D.1-34 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, New York Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.199	0.193	0.193	0.194	0.194	0.191	0.186	0.186	0.194
0.01	0.221	0.214	0.214	0.216	0.215	0.212	0.206	0.206	0.216
0.02	0.331	0.321	0.321	0.321	0.312	0.311	0.304	0.304	0.321
0.03	0.395	0.382	0.389	0.386	0.364	0.363	0.353	0.353	0.386
0.05	0.447	0.430	0.474	0.470	0.433	0.429	0.413	0.413	0.470
0.08	0.413	0.436	0.492	0.490	0.452	0.440	0.419	0.419	0.490
0.10	0.379	0.457	0.521	0.516	0.459	0.443	0.416	0.416	0.516
0.15	0.296	0.334	0.382	0.402	0.399	0.389	0.362	0.362	0.402
0.20	0.233	0.235	0.270	0.302	0.334	0.337	0.312	0.312	0.337
0.25	0.190	0.192	0.210	0.243	0.283	0.293	0.274	0.274	0.293
0.30	0.163	0.163	0.172	0.204	0.247	0.257	0.249	0.249	0.257
0.40	0.123	0.123	0.129	0.158	0.201	0.213	0.209	0.209	0.213
0.50	0.099	0.100	0.104	0.130	0.171	0.186	0.187	0.187	0.186
0.75	0.067	0.067	0.069	0.088	0.119	0.136	0.138	0.138	0.136
1.0	0.049	0.049	0.050	0.064	0.088	0.105	0.103	0.103	0.105
1.5	0.030	0.030	0.031	0.039	0.054	0.063	0.062	0.062	0.063
2.0	0.021	0.021	0.022	0.028	0.038	0.042	0.042	0.042	0.042
3.0	0.012	0.012	0.012	0.016	0.021	0.022	0.022	0.022	0.022
4.0	0.008	0.008	0.008	0.010	0.014	0.015	0.015	0.015	0.015
5.0	0.006	0.006	0.006	0.008	0.010	0.011	0.010	0.010	0.011
7.5	0.003	0.003	0.003	0.004	0.006	0.006	0.006	0.006	0.006
10	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.004
S_{MS} (g)	0.21	0.21	0.24	0.27	0.30	0.30	0.28	0.28	0.30
S_{M1} (g)	0.05	0.05	0.05	0.06	0.09	0.11	0.10	0.10	0.11
S_{DS} (g)	0.14	0.14	0.16	0.18	0.20	0.20	0.19	0.19	0.20
S_{D1} (g)	0.03	0.03	0.03	0.04	0.06	0.07	0.07	0.07	0.07

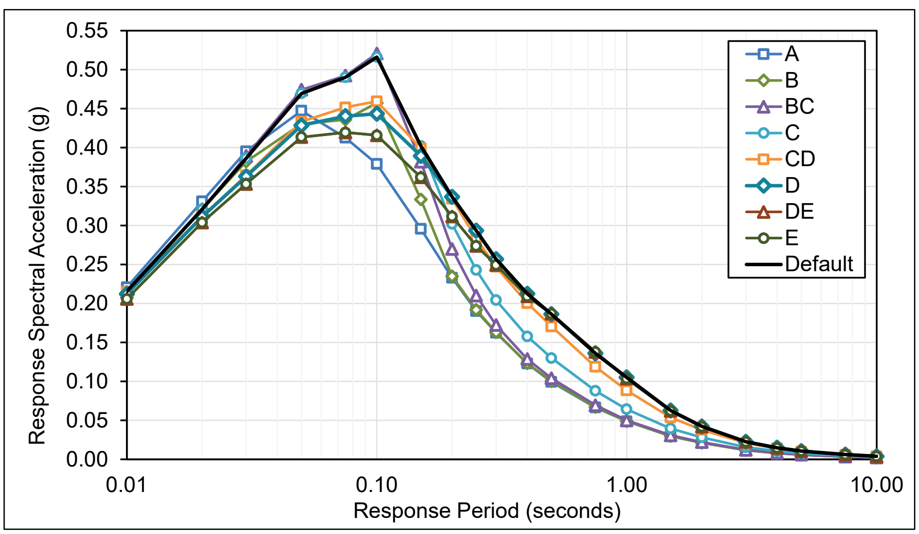


Figure D.1-34 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, New York Site.

D.2 Proposed Deterministic MCE$_R$ Ground Motions (without the Lower Limit)

Table D.2-1 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Los Angeles Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.825	0.947	1.088	1.174	1.169	1.051	0.860	0.744	1.174
0.01	0.832	0.955	1.095	1.179	1.175	1.057	0.869	0.755	1.179
0.02	0.873	1.000	1.135	1.202	1.181	1.055	0.854	0.726	1.202
0.03	1.082	1.199	1.291	1.289	1.226	1.059	0.823	0.679	1.289
0.05	1.645	1.748	1.701	1.608	1.422	1.149	0.858	0.713	1.608
0.08	2.010	2.168	2.153	2.032	1.745	1.379	1.063	0.953	2.032
0.10	2.053	2.293	2.404	2.327	2.009	1.590	1.256	1.154	2.327
0.15	1.987	2.271	2.633	2.676	2.363	1.880	1.485	1.361	2.676
0.20	1.776	2.087	2.607	2.904	2.644	2.103	1.581	1.400	2.904
0.25	1.567	1.865	2.406	2.929	2.849	2.319	1.687	1.428	2.929
0.30	1.411	1.705	2.226	2.767	2.950	2.513	1.844	1.536	2.950
0.40	1.164	1.424	1.884	2.435	2.859	2.631	2.053	1.671	2.859
0.50	0.993	1.220	1.614	2.126	2.593	2.563	2.141	1.845	2.593
0.75	0.783	0.906	1.188	1.578	2.018	2.163	2.039	1.973	2.163
1.0	0.641	0.699	0.913	1.210	1.588	1.837	1.924	1.967	1.837
1.5	0.456	0.459	0.586	0.767	1.030	1.306	1.594	1.819	1.306
2.0	0.357	0.353	0.419	0.541	0.731	0.991	1.339	1.663	0.991
3.0	0.252	0.244	0.264	0.333	0.448	0.621	0.868	1.107	0.621
4.0	0.185	0.180	0.189	0.233	0.306	0.418	0.577	0.728	0.418
5.0	0.161	0.156	0.151	0.178	0.228	0.307	0.417	0.519	0.307
7.5	0.111	0.108	0.101	0.110	0.132	0.172	0.226	0.269	0.172
10	0.068	0.066	0.063	0.085	0.083	0.105	0.134	0.157	0.105
S_{MS} (g)	1.60	1.88	2.35	2.64	2.65	2.37	1.93	1.66	2.65
S_{M1} (g)	0.71	0.71	0.91	1.21	1.59	1.98	2.68	3.33	1.98
S_{DS} (g)	1.07	1.25	1.56	1.76	1.77	1.58	1.28	1.11	1.77
S_{D1} (g)	0.48	0.47	0.61	0.81	1.06	1.32	1.78	2.22	1.32

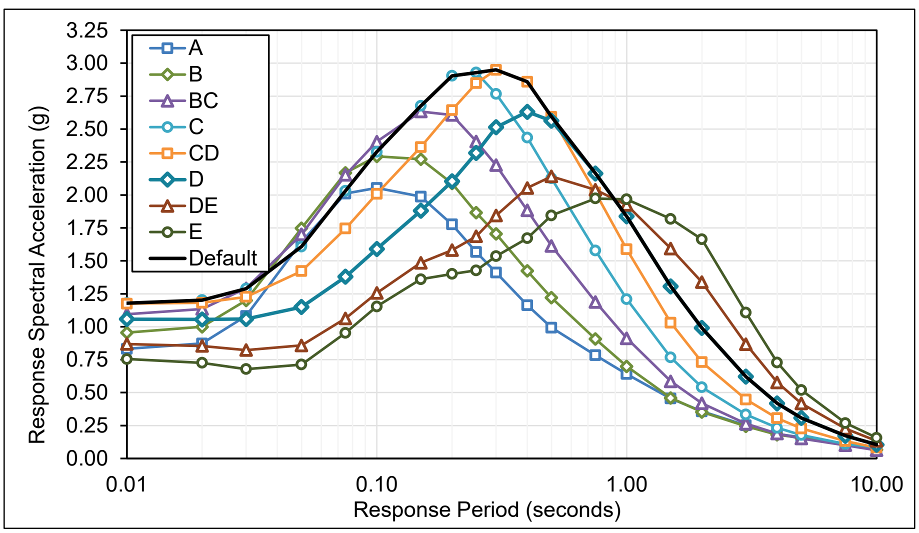


Figure D.2-1 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Los Angeles Site.

Table D.2-2 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Century City Site

Period	5%-Damped Response Spectral Acceleration (g)								
***T* (s)**	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.864	0.990	1.126	1.211	1.196	1.064	0.863	0.747	1.211
0.01	0.871	0.999	1.133	1.217	1.203	1.072	0.873	0.760	1.217
0.02	0.908	1.038	1.167	1.237	1.210	1.069	0.857	0.730	1.237
0.03	1.123	1.245	1.331	1.340	1.261	1.075	0.828	0.684	1.340
0.05	1.714	1.815	1.773	1.674	1.462	1.170	0.869	0.730	1.674
0.08	2.103	2.270	2.242	2.104	1.788	1.404	1.087	0.998	2.104
0.10	2.161	2.436	2.519	2.408	2.055	1.615	1.281	1.198	2.408
0.15	2.095	2.417	2.758	2.755	2.403	1.894	1.514	1.408	2.755
0.20	1.855	2.200	2.732	2.990	2.689	2.116	1.595	1.443	2.990
0.25	1.632	1.970	2.527	3.014	2.901	2.330	1.676	1.422	3.014
0.30	1.477	1.815	2.362	2.911	3.038	2.542	1.839	1.529	3.038
0.40	1.230	1.522	2.016	2.606	2.977	2.714	2.089	1.675	2.977
0.50	1.077	1.314	1.749	2.301	2.750	2.705	2.242	1.892	2.750
0.75	0.876	1.007	1.327	1.761	2.234	2.395	2.281	2.149	2.395
1.0	0.734	0.796	1.058	1.418	1.845	2.104	2.214	2.238	2.104
1.5	0.541	0.546	0.706	0.951	1.255	1.558	1.884	2.106	1.558
2.0	0.433	0.428	0.519	0.702	0.927	1.220	1.631	1.972	1.220
3.0	0.319	0.310	0.343	0.460	0.598	0.798	1.099	1.358	0.798
4.0	0.262	0.252	0.271	0.343	0.415	0.543	0.738	0.904	0.543
5.0	0.248	0.240	0.243	0.277	0.308	0.395	0.529	0.642	0.395
7.5	0.174	0.169	0.159	0.169	0.173	0.206	0.267	0.318	0.206
10	0.110	0.109	0.104	0.108	0.110	0.126	0.156	0.182	0.126
S_{MS} (g)	1.67	1.98	2.46	2.71	2.73	2.44	2.02	1.70	2.73
S_{M1} (g)	0.87	0.86	1.06	1.43	1.88	2.44	3.30	4.07	2.44
S_{DS} (g)	1.11	1.32	1.64	1.81	1.82	1.63	1.34	1.14	1.82
S_{D1} (g)	0.58	0.57	0.71	0.95	1.25	1.63	2.20	2.72	1.63

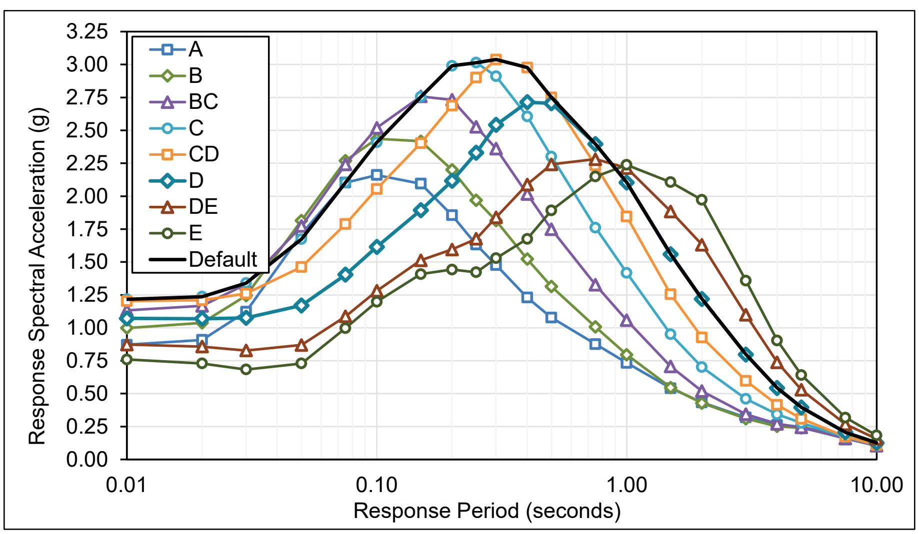


Figure D.2-2 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Century City Site.

Table D.2-3 **Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Northridge Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.643	0.714	0.836	0.941	0.956	0.871	0.736	0.668	0.956
0.01	0.646	0.718	0.839	0.943	0.959	0.875	0.751	0.686	0.959
0.02	0.668	0.742	0.859	0.954	0.963	0.875	0.736	0.656	0.963
0.03	0.817	0.883	0.967	1.018	0.997	0.879	0.718	0.624	1.018
0.05	1.229	1.286	1.278	1.258	1.149	0.975	0.797	0.705	1.258
0.08	1.526	1.624	1.651	1.603	1.419	1.234	1.063	0.985	1.603
0.10	1.590	1.737	1.861	1.847	1.669	1.465	1.283	1.179	1.847
0.15	1.598	1.762	2.080	2.167	1.966	1.726	1.493	1.386	2.167
0.20	1.463	1.636	2.064	2.406	2.211	1.822	1.515	1.394	2.406
0.25	1.316	1.493	1.937	2.425	2.424	1.984	1.537	1.375	2.425
0.30	1.192	1.369	1.792	2.261	2.512	2.174	1.641	1.451	2.512
0.40	0.998	1.142	1.526	1.977	2.404	2.303	1.846	1.533	2.404
0.50	0.869	0.999	1.344	1.776	2.191	2.249	1.963	1.720	2.249
0.75	0.688	0.759	1.006	1.344	1.743	1.947	1.933	1.880	1.947
1.0	0.568	0.600	0.795	1.062	1.410	1.677	1.831	1.914	1.677
1.5	0.420	0.417	0.536	0.707	0.954	1.229	1.524	1.763	1.229
2.0	0.340	0.333	0.400	0.519	0.703	0.958	1.305	1.629	0.958
3.0	0.253	0.246	0.268	0.340	0.458	0.635	0.887	1.134	0.635
4.0	0.201	0.192	0.201	0.250	0.328	0.448	0.615	0.780	0.448
5.0	0.168	0.165	0.162	0.195	0.250	0.336	0.454	0.569	0.336
7.5	0.115	0.112	0.105	0.117	0.143	0.187	0.245	0.298	0.187
10	0.077	0.074	0.070	0.077	0.091	0.116	0.148	0.174	0.116
S_{MS} (g)	1.32	1.47	1.86	2.18	2.26	2.07	1.77	1.55	2.26
S_{M1} (g)	0.68	0.67	0.80	1.06	1.43	1.92	2.66	3.40	1.92
S_{DS} (g)	0.88	0.98	1.24	1.45	1.51	1.38	1.18	1.03	1.51
S_{D1} (g)	0.45	0.44	0.54	0.71	0.95	1.28	1.77	2.27	1.28

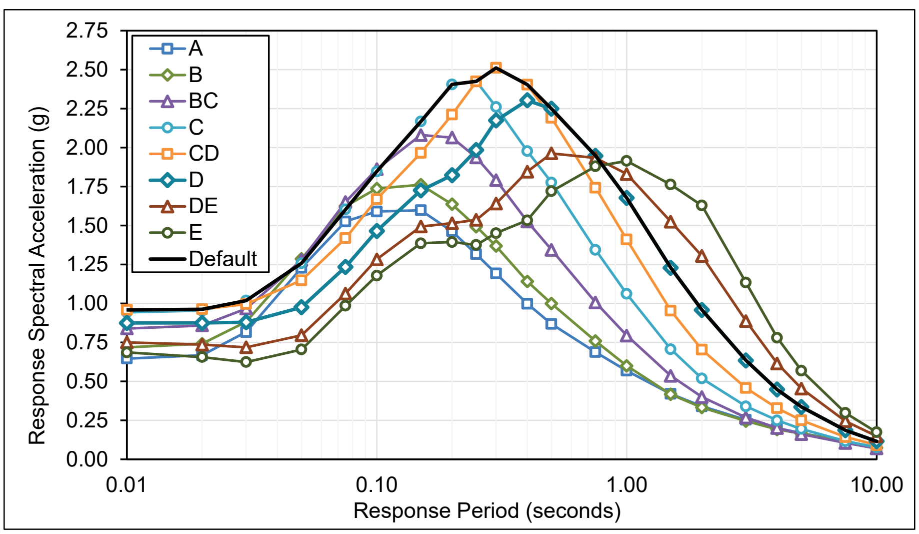


Figure D.2-3 Plots of deterministic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Northridge Site.

Table D.2-4 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Long Beach Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.880	1.009	1.159	1.259	1.239	1.105	0.900	0.772	1.259
0.01	0.887	1.017	1.167	1.265	1.244	1.110	0.906	0.780	1.265
0.02	0.924	1.056	1.203	1.287	1.253	1.107	0.889	0.751	1.287
0.03	1.121	1.246	1.357	1.381	1.290	1.104	0.850	0.698	1.381
0.05	1.644	1.753	1.754	1.675	1.466	1.178	0.869	0.704	1.675
0.08	2.013	2.186	2.200	2.080	1.766	1.379	1.034	0.907	2.080
0.10	2.082	2.356	2.477	2.386	2.035	1.588	1.212	1.092	2.386
0.15	2.054	2.394	2.785	2.811	2.445	1.899	1.432	1.296	2.811
0.20	1.833	2.194	2.755	3.090	2.798	2.188	1.577	1.375	3.090
0.25	1.646	2.008	2.587	3.130	3.050	2.461	1.722	1.428	3.130
0.30	1.506	1.857	2.420	3.009	3.194	2.708	1.926	1.557	3.194
0.40	1.272	1.562	2.066	2.673	3.114	2.888	2.240	1.756	3.114
0.50	1.119	1.353	1.802	2.371	2.886	2.877	2.404	1.959	2.886
0.75	0.913	1.050	1.385	1.838	2.352	2.542	2.431	2.272	2.542
1.0	0.768	0.843	1.120	1.508	1.962	2.245	2.365	2.376	2.245
1.5	0.567	0.583	0.756	1.029	1.360	1.690	2.044	2.274	1.690
2.0	0.455	0.458	0.558	0.760	1.019	1.341	1.793	2.158	1.341
3.0	0.340	0.336	0.376	0.514	0.678	0.905	1.249	1.537	0.905
4.0	0.267	0.263	0.283	0.386	0.483	0.632	0.860	1.051	0.632
5.0	0.234	0.228	0.233	0.303	0.362	0.463	0.623	0.756	0.463
7.5	0.155	0.150	0.148	0.175	0.195	0.239	0.312	0.372	0.239
10	0.098	0.095	0.094	0.109	0.119	0.142	0.180	0.210	0.142
S_{MS} (g)	1.65	1.97	2.48	2.82	2.87	2.60	2.16	1.76	2.87
S_{M1} (g)	0.91	0.92	1.13	1.54	2.04	2.72	3.75	4.61	2.72
S_{DS} (g)	1.10	1.32	1.65	1.88	1.92	1.73	1.44	1.18	1.92
S_{D1} (g)	0.61	0.61	0.76	1.03	1.36	1.81	2.50	3.07	1.81

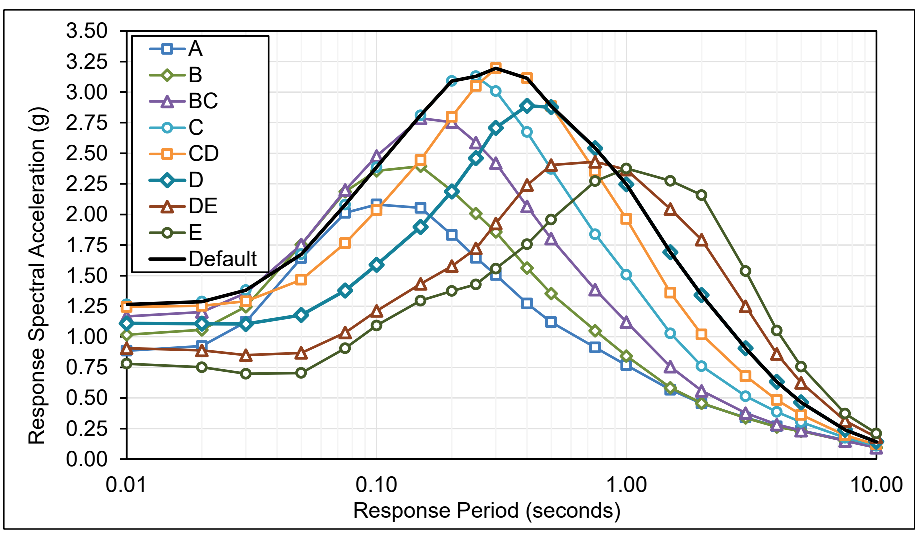


Figure D.2-4 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Long Beach Site.

Table D.2-5 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Irvine Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.941	1.069	1.230	1.326	1.310	1.173	0.949	0.806	1.326
0.01	0.947	1.076	1.237	1.332	1.315	1.178	0.954	0.812	1.332
0.02	0.988	1.119	1.277	1.360	1.329	1.175	0.935	0.784	1.360
0.03	1.172	1.297	1.431	1.456	1.367	1.161	0.887	0.725	1.456
0.05	1.670	1.789	1.836	1.760	1.541	1.229	0.892	0.722	1.760
0.08	2.048	2.231	2.280	2.151	1.833	1.426	1.039	0.885	2.151
0.10	2.114	2.382	2.540	2.445	2.095	1.623	1.197	1.056	2.445
0.15	2.085	2.430	2.859	2.888	2.533	1.956	1.426	1.267	2.888
0.20	1.871	2.226	2.788	3.135	2.906	2.295	1.618	1.375	3.135
0.25	1.651	1.994	2.577	3.132	3.138	2.588	1.799	1.454	3.138
0.30	1.467	1.782	2.354	2.968	3.228	2.827	2.018	1.595	3.228
0.40	1.199	1.465	1.985	2.620	3.103	2.972	2.334	1.824	3.103
0.50	1.003	1.220	1.686	2.283	2.835	2.900	2.470	2.060	2.900
0.75	0.720	0.854	1.198	1.665	2.192	2.433	2.377	2.261	2.433
1.0	0.552	0.642	0.908	1.280	1.741	2.056	2.220	2.290	2.056
1.5	0.356	0.405	0.568	0.810	1.139	1.465	1.812	2.084	1.465
2.0	0.264	0.298	0.401	0.569	0.812	1.106	1.501	1.865	1.106
3.0	0.175	0.197	0.248	0.350	0.502	0.699	0.978	1.245	0.699
4.0	0.129	0.143	0.172	0.240	0.340	0.467	0.646	0.815	0.467
5.0	0.103	0.113	0.130	0.178	0.248	0.335	0.455	0.568	0.335
7.5	0.066	0.069	0.075	0.100	0.134	0.175	0.230	0.281	0.175
10	0.046	0.048	0.051	0.065	0.085	0.108	0.138	0.164	0.108
S_{MS} (g)	1.68	2.00	2.51	2.82	2.91	2.67	2.22	1.85	2.91
S_{M1} (g)	0.55	0.64	0.91	1.28	1.74	2.21	3.00	3.73	2.21
S_{DS} (g)	1.12	1.34	1.67	1.88	1.94	1.78	1.48	1.24	1.94
S_{D1} (g)	0.37	0.43	0.61	0.85	1.16	1.47	2.00	2.49	1.47

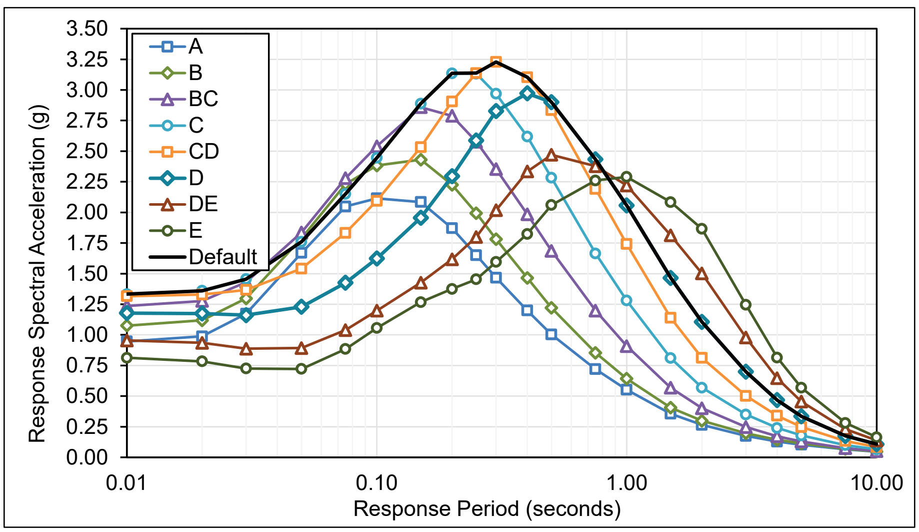


Figure D.2-5 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Irvine Site.

Table D.2-6 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Riverside Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.446	0.500	0.584	0.659	0.697	0.664	0.587	0.543	0.697
0.01	0.448	0.503	0.587	0.662	0.700	0.669	0.594	0.553	0.700
0.02	0.461	0.517	0.598	0.666	0.698	0.664	0.585	0.534	0.698
0.03	0.546	0.601	0.667	0.711	0.724	0.670	0.573	0.513	0.724
0.05	0.804	0.853	0.875	0.882	0.841	0.741	0.627	0.577	0.882
0.08	0.999	1.077	1.119	1.117	1.035	0.904	0.801	0.779	1.117
0.10	1.049	1.153	1.259	1.281	1.188	1.036	0.930	0.912	1.281
0.15	1.073	1.182	1.423	1.513	1.424	1.217	1.048	1.015	1.513
0.20	1.010	1.118	1.419	1.690	1.646	1.397	1.105	1.013	1.690
0.25	0.911	1.013	1.327	1.701	1.796	1.582	1.220	1.058	1.796
0.30	0.815	0.909	1.216	1.587	1.859	1.731	1.372	1.153	1.859
0.40	0.672	0.755	1.038	1.395	1.791	1.826	1.585	1.337	1.826
0.50	0.577	0.651	0.911	1.254	1.640	1.776	1.637	1.462	1.776
0.75	0.431	0.476	0.676	0.953	1.292	1.499	1.539	1.516	1.499
1.0	0.341	0.364	0.521	0.747	1.039	1.269	1.418	1.495	1.269
1.5	0.238	0.248	0.351	0.512	0.728	0.950	1.191	1.383	0.950
2.0	0.194	0.201	0.268	0.389	0.558	0.759	1.031	1.285	0.759
3.0	0.152	0.156	0.190	0.277	0.399	0.551	0.768	0.976	0.551
4.0	0.133	0.135	0.156	0.226	0.320	0.435	0.597	0.753	0.435
5.0	0.123	0.123	0.135	0.190	0.265	0.356	0.481	0.599	0.356
7.5	0.100	0.097	0.098	0.131	0.175	0.229	0.299	0.358	0.229
10	0.076	0.074	0.074	0.094	0.121	0.154	0.195	0.224	0.154
S_{MS} (g)	0.91	1.01	1.28	1.53	1.67	1.64	1.47	1.32	1.67
S_{M1} (g)	0.39	0.40	0.54	0.78	1.33	1.78	2.41	3.01	1.78
S_{DS} (g)	0.61	0.67	0.85	1.02	1.12	1.10	0.98	0.88	1.12
S_{D1} (g)	0.26	0.27	0.36	0.52	0.88	1.19	1.60	2.01	1.19

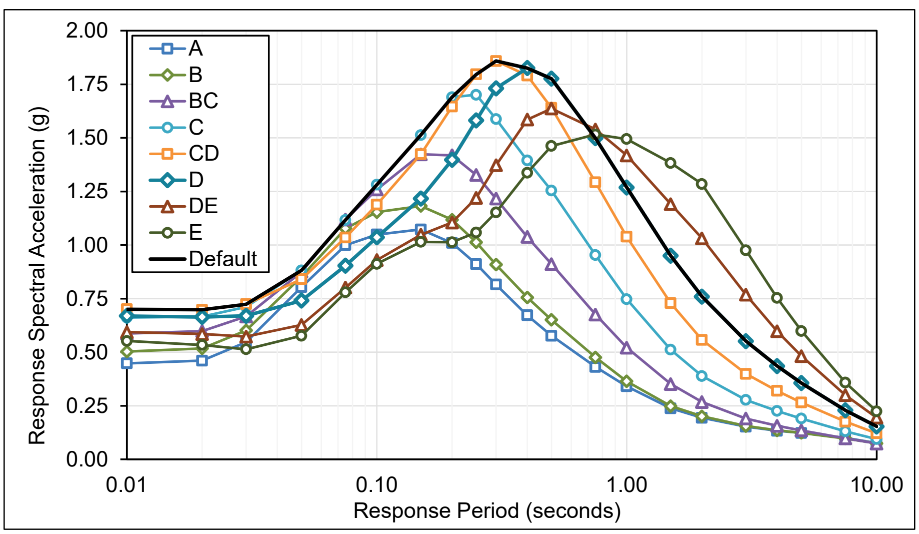


Figure D.2-6 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Riverside Site.

Table D.2-7 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Bernardino Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.881	0.988	1.141	1.248	1.254	1.114	0.896	0.771	1.254
0.01	0.885	0.995	1.147	1.253	1.260	1.123	0.908	0.787	1.260
0.02	0.921	1.039	1.182	1.267	1.261	1.117	0.891	0.754	1.267
0.03	1.123	1.240	1.336	1.358	1.309	1.126	0.864	0.712	1.358
0.05	1.718	1.826	1.775	1.687	1.506	1.218	0.917	0.777	1.687
0.08	2.087	2.260	2.228	2.105	1.818	1.448	1.156	1.055	2.105
0.10	2.123	2.361	2.475	2.394	2.068	1.643	1.337	1.236	2.394
0.15	2.125	2.375	2.808	2.821	2.461	1.933	1.535	1.397	2.821
0.20	1.991	2.215	2.784	3.171	2.816	2.174	1.607	1.418	3.171
0.25	1.808	2.008	2.609	3.229	3.095	2.408	1.691	1.420	3.229
0.30	1.643	1.818	2.418	3.052	3.282	2.663	1.861	1.525	3.282
0.40	1.404	1.550	2.121	2.774	3.296	2.935	2.145	1.692	3.296
0.50	1.237	1.354	1.894	2.549	3.104	2.985	2.363	1.976	3.104
0.75	0.928	1.007	1.435	2.003	2.578	2.717	2.490	2.338	2.717
1.0	0.724	0.779	1.123	1.607	2.156	2.446	2.505	2.540	2.446
1.5	0.493	0.526	0.754	1.096	1.528	1.910	2.275	2.579	1.910
2.0	0.388	0.410	0.561	0.818	1.168	1.575	2.121	2.636	1.575
3.0	0.299	0.314	0.398	0.583	0.840	1.163	1.621	2.069	1.163
4.0	0.260	0.266	0.313	0.453	0.643	0.877	1.208	1.523	0.877
5.0	0.234	0.237	0.262	0.370	0.516	0.693	0.937	1.168	0.693
7.5	0.165	0.161	0.164	0.220	0.294	0.382	0.499	0.601	0.382
10	0.120	0.117	0.116	0.149	0.191	0.240	0.302	0.351	0.240
S_{MS} (g)	1.79	1.99	2.51	2.91	2.97	2.69	2.13	1.78	2.97
S_{M1} (g)	0.78	0.82	1.13	1.64	2.58	3.51	4.86	6.21	3.51
S_{DS} (g)	1.19	1.33	1.67	1.94	1.98	1.79	1.42	1.19	1.98
S_{D1} (g)	0.52	0.55	0.75	1.10	1.72	2.34	3.24	4.14	2.34

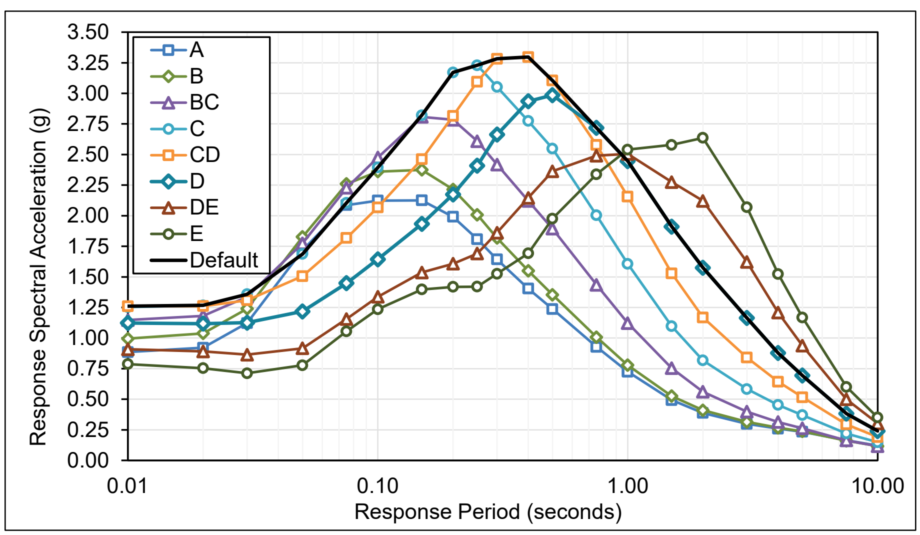


Figure D.2-7 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Bernardino Site.

Table D.2-8 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Luis Obispo Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.658	0.749	0.865	0.950	0.975	0.913	0.784	0.694	0.975
0.01	0.662	0.754	0.869	0.954	0.980	0.918	0.790	0.700	0.980
0.02	0.690	0.784	0.897	0.973	0.989	0.915	0.774	0.677	0.989
0.03	0.824	0.912	1.007	1.047	1.026	0.915	0.742	0.634	1.047
0.05	1.190	1.272	1.313	1.289	1.180	0.988	0.765	0.645	1.289
0.08	1.457	1.586	1.642	1.602	1.428	1.173	0.910	0.798	1.602
0.10	1.504	1.690	1.830	1.831	1.647	1.355	1.062	0.951	1.831
0.15	1.480	1.713	2.033	2.137	1.994	1.654	1.286	1.153	2.137
0.20	1.333	1.561	1.968	2.269	2.238	1.914	1.471	1.284	2.269
0.25	1.178	1.392	1.813	2.236	2.355	2.099	1.621	1.371	2.355
0.30	1.044	1.235	1.646	2.105	2.373	2.224	1.783	1.480	2.373
0.40	0.859	1.012	1.391	1.856	2.242	2.257	1.968	1.670	2.257
0.50	0.722	0.848	1.185	1.623	2.045	2.176	2.020	1.808	2.176
0.75	0.516	0.594	0.843	1.188	1.580	1.801	1.857	1.844	1.801
1.0	0.393	0.440	0.633	0.912	1.254	1.510	1.688	1.793	1.510
1.5	0.255	0.276	0.394	0.575	0.817	1.064	1.339	1.556	1.064
2.0	0.193	0.207	0.282	0.411	0.591	0.808	1.102	1.372	0.808
3.0	0.132	0.141	0.178	0.260	0.377	0.525	0.736	0.936	0.525
4.0	0.102	0.108	0.129	0.187	0.267	0.365	0.504	0.637	0.365
5.0	0.083	0.090	0.103	0.146	0.203	0.274	0.371	0.464	0.274
7.5	0.058	0.058	0.063	0.086	0.116	0.152	0.200	0.244	0.152
10	0.037	0.042	0.044	0.058	0.075	0.096	0.123	0.147	0.096
S_{MS} (g)	1.20	1.40	1.77	2.04	2.14	2.03	1.82	1.63	2.14
S_{M1} (g)	0.39	0.44	0.63	0.91	1.25	1.62	2.21	2.81	1.62
S_{DS} (g)	0.80	0.94	1.18	1.36	1.42	1.35	1.21	1.08	1.42
S_{D1} (g)	0.26	0.29	0.42	0.61	0.84	1.08	1.47	1.87	1.08

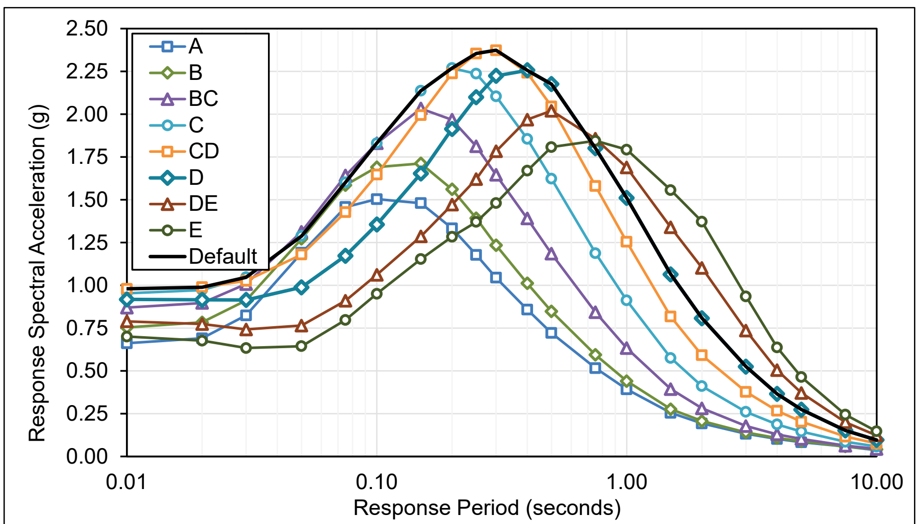


Figure D.2-8 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Luis Obispo Site.

Table D.2-9 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Diego Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.714	0.813	0.936	1.019	1.028	0.944	0.798	0.704	1.028
0.01	0.719	0.818	0.941	1.023	1.033	0.949	0.805	0.712	1.033
0.02	0.753	0.857	0.975	1.045	1.042	0.947	0.789	0.687	1.045
0.03	0.913	1.012	1.105	1.130	1.086	0.952	0.763	0.648	1.130
0.05	1.350	1.443	1.457	1.404	1.260	1.041	0.802	0.676	1.404
0.08	1.645	1.790	1.822	1.743	1.526	1.240	0.964	0.840	1.743
0.10	1.687	1.894	2.025	1.982	1.749	1.422	1.113	0.983	1.982
0.15	1.659	1.905	2.255	2.323	2.107	1.722	1.338	1.180	2.323
0.20	1.499	1.731	2.179	2.487	2.361	1.969	1.511	1.307	2.487
0.25	1.320	1.532	1.993	2.439	2.472	2.125	1.620	1.359	2.472
0.30	1.166	1.354	1.803	2.282	2.496	2.247	1.761	1.462	2.496
0.40	0.948	1.099	1.503	1.994	2.365	2.296	1.945	1.645	2.365
0.50	0.796	0.916	1.278	1.742	2.158	2.225	2.003	1.780	2.225
0.75	0.564	0.645	0.916	1.288	1.690	1.872	1.875	1.847	1.872
1.0	0.430	0.477	0.687	0.982	1.338	1.576	1.719	1.804	1.576
1.5	0.269	0.291	0.417	0.609	0.863	1.113	1.387	1.600	1.113
2.0	0.198	0.212	0.289	0.422	0.608	0.830	1.132	1.404	0.830
3.0	0.130	0.138	0.176	0.257	0.374	0.522	0.734	0.932	0.522
4.0	0.096	0.101	0.122	0.176	0.252	0.348	0.484	0.608	0.348
5.0	0.077	0.080	0.093	0.132	0.185	0.251	0.342	0.425	0.251
7.5	0.050	0.050	0.054	0.074	0.100	0.131	0.174	0.211	0.131
10	0.034	0.034	0.036	0.048	0.063	0.080	0.103	0.123	0.080
S_{MS} (g)	1.35	1.56	1.96	2.24	2.25	2.07	1.80	1.60	2.25
S_{M1} (g)	0.43	0.48	0.69	0.98	1.34	1.67	2.26	2.81	1.67
S_{DS} (g)	0.90	1.04	1.31	1.49	1.50	1.38	1.20	1.07	1.50
S_{D1} (g)	0.29	0.32	0.46	0.65	0.89	1.11	1.51	1.87	1.11

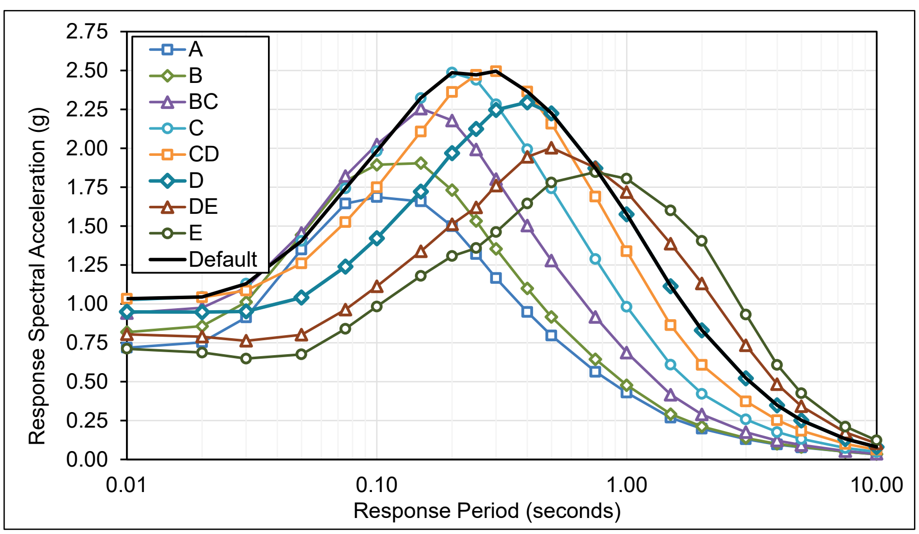


Figure D.2-9 Plots of deterministic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Diego Site.

Table D.2-10 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Barbara Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	1.050	1.195	1.341	1.386	1.317	1.142	0.906	0.771	1.386
0.01	1.057	1.204	1.349	1.392	1.323	1.147	0.913	0.778	1.392
0.02	1.102	1.252	1.393	1.420	1.336	1.149	0.901	0.754	1.420
0.03	1.346	1.490	1.583	1.538	1.392	1.153	0.867	0.708	1.538
0.05	1.976	2.114	2.051	1.885	1.588	1.231	0.879	0.713	1.885
0.08	2.418	2.637	2.561	2.330	1.907	1.435	1.055	0.910	2.330
0.10	2.510	2.833	2.871	2.645	2.168	1.631	1.231	1.088	2.645
0.15	2.429	2.823	3.196	3.031	2.512	1.899	1.437	1.288	3.031
0.20	2.154	2.569	3.168	3.336	2.852	2.141	1.572	1.369	3.336
0.25	1.871	2.276	2.903	3.397	3.123	2.407	1.702	1.427	3.397
0.30	1.667	2.064	2.691	3.311	3.328	2.676	1.880	1.553	3.328
0.40	1.362	1.712	2.291	3.001	3.357	2.945	2.174	1.729	3.357
0.50	1.148	1.457	1.990	2.671	3.167	2.979	2.363	1.971	3.167
0.75	0.842	1.085	1.500	2.062	2.646	2.720	2.466	2.253	2.720
1.0	0.651	0.840	1.168	1.626	2.163	2.392	2.410	2.356	2.392
1.5	0.418	0.533	0.739	1.037	1.427	1.761	2.078	2.267	1.761
2.0	0.305	0.385	0.518	0.723	1.013	1.350	1.788	2.136	1.350
3.0	0.203	0.244	0.315	0.441	0.628	0.868	1.207	1.480	0.868
4.0	0.154	0.182	0.224	0.309	0.432	0.589	0.806	0.980	0.589
5.0	0.125	0.145	0.171	0.232	0.319	0.427	0.574	0.690	0.427
7.5	0.083	0.089	0.100	0.131	0.174	0.226	0.294	0.346	0.226
10	0.058	0.060	0.066	0.083	0.107	0.135	0.170	0.197	0.135
S_{MS} (g)	1.94	2.31	2.85	3.06	3.02	2.68	2.13	1.77	3.06
S_{M1} (g)	0.65	0.84	1.17	1.63	2.16	2.70	3.62	4.44	2.70
S_{DS} (g)	1.29	1.54	1.90	2.04	2.01	1.79	1.42	1.18	2.04
S_{D1} (g)	0.43	0.56	0.78	1.08	1.44	1.80	2.41	2.96	1.80

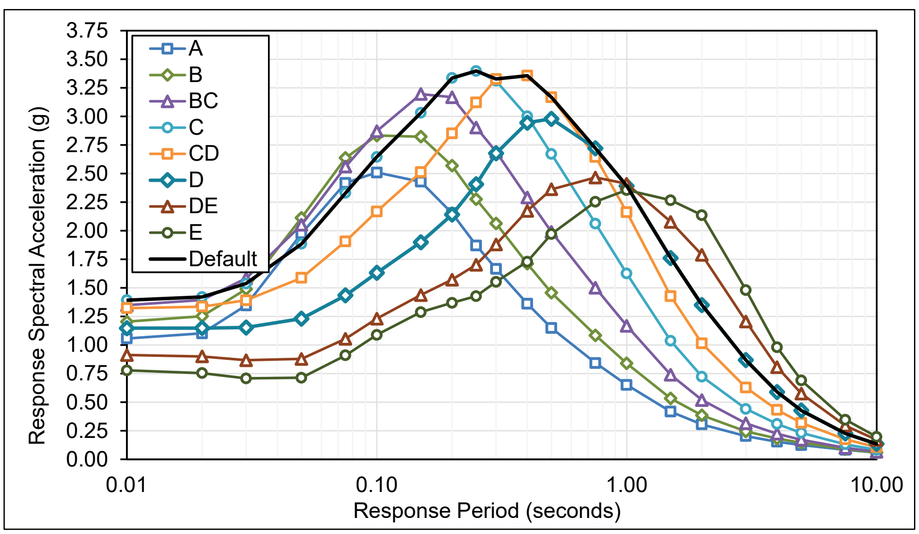


Figure D.2-10 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Barbara Site.

Table D.2-11 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Ventura Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	1.021	1.162	1.312	1.391	1.340	1.168	0.926	0.781	1.391
0.01	1.029	1.172	1.321	1.398	1.346	1.174	0.932	0.789	1.398
0.02	1.081	1.229	1.373	1.431	1.363	1.177	0.920	0.764	1.431
0.03	1.339	1.478	1.569	1.552	1.416	1.177	0.881	0.697	1.552
0.05	1.957	2.081	2.020	1.878	1.596	1.243	0.887	0.703	1.878
0.08	2.343	2.548	2.496	2.304	1.907	1.447	1.018	0.864	2.304
0.10	2.407	2.712	2.782	2.618	2.175	1.606	1.173	1.029	2.618
0.15	2.349	2.716	3.097	3.042	2.569	1.881	1.360	1.208	3.042
0.20	2.072	2.448	3.047	3.347	2.934	2.168	1.502	1.293	3.347
0.25	1.877	2.276	2.911	3.461	3.248	2.523	1.661	1.368	3.461
0.30	1.727	2.131	2.762	3.398	3.479	2.819	1.881	1.522	3.479
0.40	1.459	1.826	2.409	3.112	3.528	3.129	2.244	1.770	3.528
0.50	1.284	1.621	2.150	2.827	3.360	3.192	2.529	2.032	3.360
0.75	1.051	1.283	1.687	2.242	2.848	2.961	2.717	2.493	2.961
1.0	0.894	1.046	1.385	1.867	2.431	2.653	2.704	2.663	2.653
1.5	0.652	0.716	0.931	1.269	1.686	2.067	2.454	2.691	2.067
2.0	0.514	0.552	0.683	0.931	1.257	1.648	2.183	2.603	1.648
3.0	0.373	0.391	0.448	0.613	0.816	1.090	1.495	1.827	1.090
4.0	0.284	0.295	0.329	0.449	0.567	0.740	1.000	1.211	0.740
5.0	0.247	0.250	0.266	0.346	0.419	0.535	0.713	0.857	0.535
7.5	0.166	0.163	0.166	0.198	0.224	0.276	0.356	0.421	0.276
10	0.104	0.102	0.103	0.121	0.133	0.159	0.200	0.233	0.159
S_{MS} (g)	1.87	2.20	2.74	3.11	3.18	2.87	2.28	1.83	3.18
S_{M1} (g)	1.03	1.10	1.40	1.90	2.53	3.30	4.49	5.48	3.30
S_{DS} (g)	1.24	1.47	1.83	2.08	2.12	1.92	1.52	1.22	2.12
S_{D1} (g)	0.69	0.74	0.93	1.27	1.69	2.20	2.99	3.65	2.20

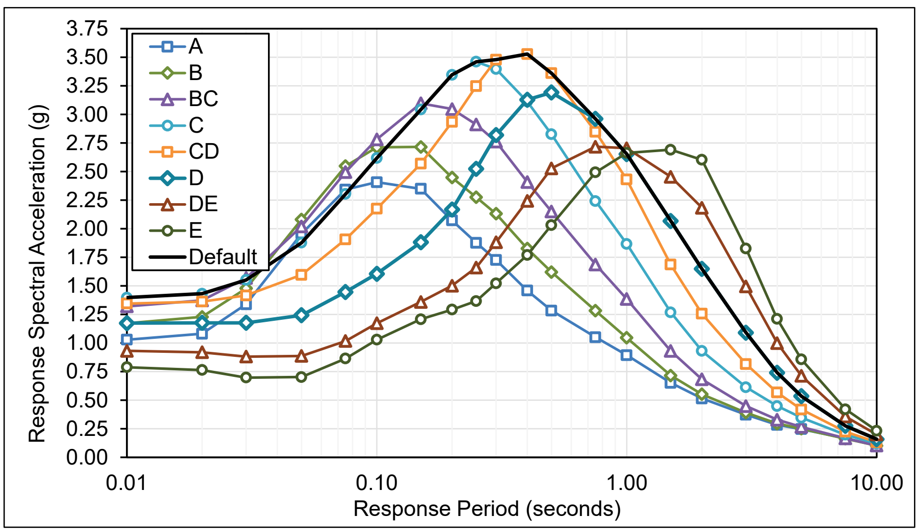


Figure D.2-11 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Ventura Site.

Table D.2-12 **Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Oakland Site**

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.639	0.727	0.840	0.929	0.938	0.841	0.704	0.628	0.938
0.01	0.644	0.734	0.845	0.932	0.942	0.847	0.713	0.640	0.942
0.02	0.675	0.769	0.874	0.945	0.944	0.845	0.705	0.621	0.945
0.03	0.844	0.933	0.997	1.017	0.984	0.856	0.692	0.597	1.017
0.05	1.305	1.384	1.346	1.276	1.136	0.950	0.759	0.673	1.276
0.08	1.585	1.719	1.681	1.588	1.397	1.161	0.977	0.903	1.588
0.10	1.581	1.773	1.856	1.812	1.603	1.338	1.151	1.072	1.812
0.15	1.558	1.761	2.071	2.131	1.912	1.586	1.330	1.256	2.131
0.20	1.432	1.610	2.052	2.373	2.172	1.762	1.380	1.275	2.373
0.25	1.304	1.489	1.932	2.402	2.360	1.929	1.444	1.251	2.402
0.30	1.182	1.359	1.782	2.246	2.460	2.104	1.567	1.314	2.460
0.40	0.988	1.146	1.524	1.972	2.387	2.242	1.768	1.428	2.387
0.50	0.862	1.003	1.338	1.759	2.194	2.199	1.857	1.604	2.199
0.75	0.685	0.760	0.999	1.328	1.745	1.884	1.815	1.745	1.884
1.0	0.566	0.596	0.781	1.038	1.412	1.651	1.733	1.789	1.651
1.5	0.417	0.407	0.513	0.671	0.945	1.208	1.478	1.691	1.208
2.0	0.339	0.324	0.378	0.485	0.694	0.942	1.277	1.587	0.942
3.0	0.250	0.237	0.249	0.314	0.452	0.627	0.877	1.118	0.627
4.0	0.190	0.182	0.185	0.228	0.323	0.442	0.610	0.768	0.442
5.0	0.157	0.151	0.148	0.178	0.247	0.333	0.451	0.561	0.333
7.5	0.102	0.100	0.096	0.105	0.141	0.184	0.241	0.291	0.184
10	0.073	0.073	0.071	0.077	0.099	0.125	0.158	0.187	0.125
S_{MS} (g)	1.29	1.45	1.85	2.16	2.21	2.02	1.67	1.44	2.21
S_{M1} (g)	0.68	0.65	0.78	1.04	1.42	1.88	2.63	3.35	1.88
S_{DS} (g)	0.86	0.97	1.23	1.44	1.48	1.35	1.11	0.96	1.48
S_{D1} (g)	0.45	0.43	0.52	0.69	0.95	1.26	1.75	2.24	1.26

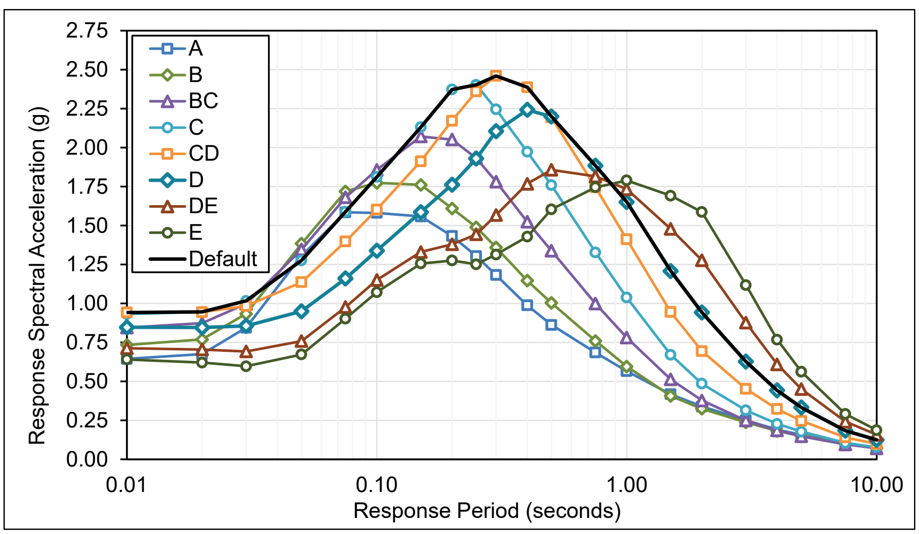


Figure D.2-12 Plots of deterministic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Oakland Site.

Table D.2-13 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Concord Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.850	0.967	1.112	1.211	1.179	1.033	0.829	0.718	1.211
0.01	0.856	0.976	1.119	1.215	1.183	1.038	0.837	0.729	1.215
0.02	0.898	1.024	1.161	1.235	1.189	1.038	0.827	0.707	1.235
0.03	1.112	1.234	1.322	1.322	1.232	1.046	0.808	0.673	1.322
0.05	1.696	1.795	1.727	1.630	1.431	1.155	0.876	0.748	1.630
0.08	2.059	2.227	2.175	2.048	1.751	1.399	1.124	1.039	2.048
0.10	2.088	2.346	2.442	2.342	2.007	1.607	1.326	1.243	2.342
0.15	2.068	2.359	2.767	2.773	2.396	1.903	1.554	1.449	2.773
0.20	1.870	2.151	2.722	3.125	2.730	2.111	1.611	1.466	3.125
0.25	1.684	1.973	2.551	3.160	2.978	2.300	1.637	1.413	3.160
0.30	1.517	1.800	2.345	2.926	3.102	2.506	1.757	1.466	3.102
0.40	1.243	1.479	1.956	2.522	2.987	2.686	1.995	1.584	2.987
0.50	1.070	1.275	1.690	2.212	2.678	2.617	2.116	1.780	2.678
0.75	0.826	0.950	1.250	1.664	2.106	2.246	2.128	2.020	2.246
1.0	0.666	0.732	0.967	1.299	1.684	1.927	2.027	2.067	1.927
1.5	0.474	0.475	0.609	0.812	1.069	1.355	1.653	1.865	1.355
2.0	0.373	0.362	0.433	0.570	0.749	1.016	1.377	1.683	1.016
3.0	0.260	0.249	0.267	0.344	0.446	0.617	0.862	1.078	0.617
4.0	0.190	0.183	0.189	0.235	0.295	0.403	0.555	0.687	0.403
5.0	0.161	0.155	0.152	0.181	0.216	0.290	0.392	0.480	0.290
7.5	0.104	0.101	0.096	0.107	0.124	0.158	0.204	0.245	0.158
10	0.068	0.067	0.067	0.080	0.097	0.120	0.148	0.177	0.120
S_{MS} (g)	1.68	1.94	2.45	2.84	2.79	2.42	1.90	1.60	2.84
S_{M1} (g)	0.75	0.73	0.97	1.30	1.68	2.03	2.75	3.37	2.03
S_{DS} (g)	1.12	1.29	1.63	1.90	1.86	1.61	1.27	1.07	1.90
S_{D1} (g)	0.50	0.49	0.64	0.87	1.12	1.36	1.84	2.24	1.36

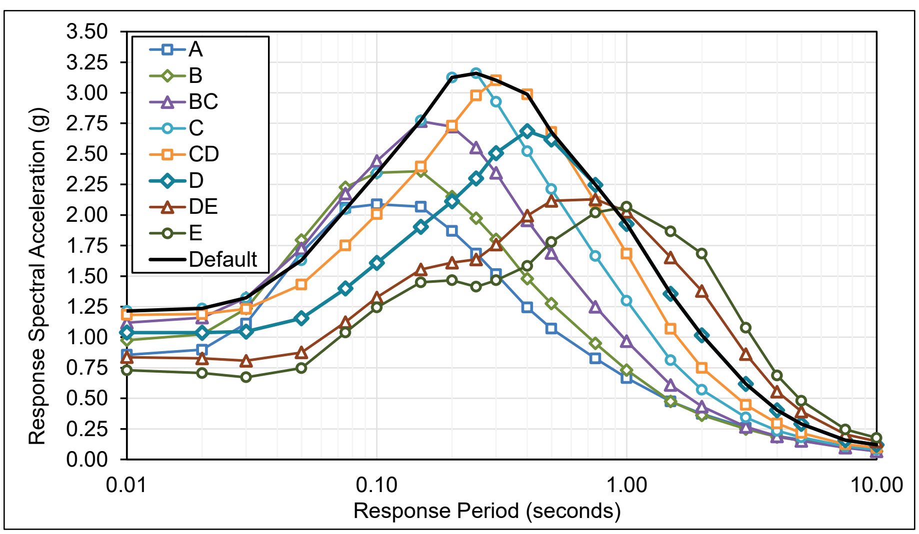


Figure D.2-13 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Concord Site.

Table D.2-14 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Monterey Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.745	0.851	0.979	1.064	1.082	0.989	0.831	0.730	1.082
0.01	0.750	0.856	0.985	1.069	1.087	0.995	0.838	0.738	1.087
0.02	0.784	0.894	1.019	1.091	1.097	0.992	0.820	0.710	1.097
0.03	0.933	1.047	1.149	1.177	1.140	0.993	0.790	0.668	1.177
0.05	1.361	1.459	1.503	1.452	1.313	1.086	0.833	0.701	1.452
0.08	1.660	1.829	1.871	1.790	1.581	1.285	1.009	0.901	1.790
0.10	1.718	1.936	2.074	2.031	1.808	1.472	1.171	1.075	2.031
0.15	1.684	1.951	2.314	2.390	2.187	1.780	1.404	1.289	2.390
0.20	1.520	1.760	2.244	2.575	2.482	2.058	1.559	1.372	2.575
0.25	1.340	1.580	2.059	2.540	2.629	2.259	1.672	1.389	2.629
0.30	1.186	1.398	1.864	2.380	2.638	2.422	1.838	1.488	2.638
0.40	0.969	1.144	1.564	2.083	2.503	2.475	2.074	1.675	2.503
0.50	0.816	0.956	1.334	1.824	2.283	2.400	2.143	1.863	2.400
0.75	0.587	0.674	0.956	1.346	1.778	2.010	2.028	2.000	2.010
1.0	0.451	0.500	0.718	1.034	1.415	1.697	1.875	1.964	1.697
1.5	0.292	0.316	0.451	0.659	0.933	1.204	1.497	1.729	1.204
2.0	0.222	0.234	0.317	0.463	0.665	0.907	1.234	1.534	0.907
3.0	0.151	0.157	0.199	0.291	0.422	0.588	0.824	1.048	0.588
4.0	0.127	0.130	0.151	0.217	0.309	0.422	0.581	0.731	0.422
5.0	0.112	0.114	0.125	0.176	0.246	0.331	0.448	0.558	0.331
7.5	0.083	0.082	0.083	0.112	0.150	0.196	0.257	0.309	0.196
10	0.062	0.061	0.061	0.078	0.102	0.129	0.163	0.190	0.129
S_{MS} (g)	1.37	1.58	2.02	2.32	2.37	2.23	1.93	1.68	2.37
S_{M1} (g)	0.45	0.50	0.72	1.03	1.41	1.81	2.47	3.14	1.81
S_{DS} (g)	0.91	1.06	1.35	1.54	1.58	1.48	1.29	1.12	1.58
S_{D1} (g)	0.30	0.33	0.48	0.69	0.94	1.21	1.65	2.10	1.21

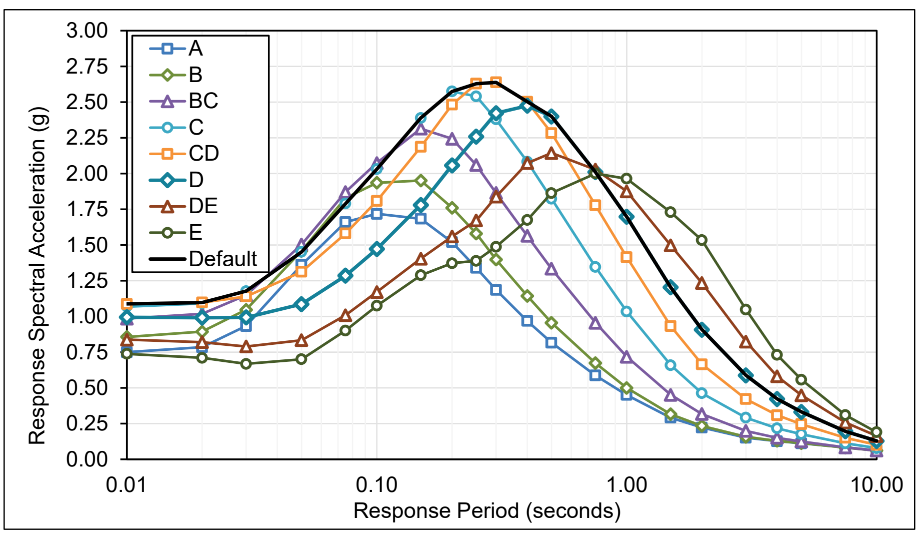


Figure D.2-14 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Monterey Site.

Table D.2-15 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Sacramento Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.168	0.188	0.220	0.254	0.282	0.296	0.295	0.289	0.296
0.01	0.168	0.189	0.221	0.254	0.283	0.297	0.296	0.291	0.297
0.02	0.173	0.193	0.225	0.257	0.284	0.297	0.295	0.287	0.297
0.03	0.198	0.217	0.246	0.273	0.294	0.300	0.290	0.277	0.300
0.05	0.272	0.290	0.312	0.331	0.341	0.333	0.311	0.296	0.341
0.08	0.340	0.367	0.399	0.422	0.427	0.411	0.386	0.378	0.427
0.10	0.363	0.403	0.456	0.495	0.511	0.499	0.477	0.464	0.511
0.15	0.370	0.420	0.514	0.592	0.642	0.646	0.619	0.590	0.646
0.20	0.346	0.399	0.513	0.640	0.727	0.754	0.720	0.685	0.754
0.25	0.312	0.364	0.482	0.634	0.760	0.820	0.806	0.763	0.820
0.30	0.276	0.325	0.437	0.586	0.745	0.836	0.861	0.833	0.836
0.40	0.224	0.267	0.367	0.505	0.684	0.812	0.892	0.899	0.812
0.50	0.190	0.227	0.318	0.445	0.614	0.756	0.859	0.893	0.756
0.75	0.141	0.162	0.228	0.324	0.455	0.582	0.701	0.776	0.582
1.0	0.117	0.127	0.181	0.261	0.371	0.488	0.615	0.761	0.488
1.5	0.082	0.093	0.133	0.197	0.280	0.374	0.500	0.656	0.374
2.0	0.065	0.079	0.111	0.166	0.236	0.318	0.431	0.576	0.318
3.0	0.048	0.062	0.086	0.128	0.182	0.245	0.332	0.444	0.245
4.0	0.037	0.054	0.073	0.108	0.151	0.200	0.268	0.354	0.200
5.0	0.034	0.050	0.065	0.094	0.129	0.169	0.224	0.291	0.169
7.5	0.029	0.041	0.052	0.073	0.097	0.123	0.159	0.209	0.123
10	0.027	0.036	0.045	0.061	0.078	0.097	0.121	0.154	0.097
S_{MS} (g)	0.31	0.36	0.46	0.58	0.68	0.75	0.80	0.81	0.75
S_{M1} (g)	0.13	0.16	0.22	0.33	0.65	0.84	1.12	1.46	0.84
S_{DS} (g)	0.21	0.24	0.31	0.38	0.46	0.50	0.54	0.54	0.50
S_{D1} (g)	0.09	0.11	0.15	0.22	0.43	0.56	0.75	0.97	0.56

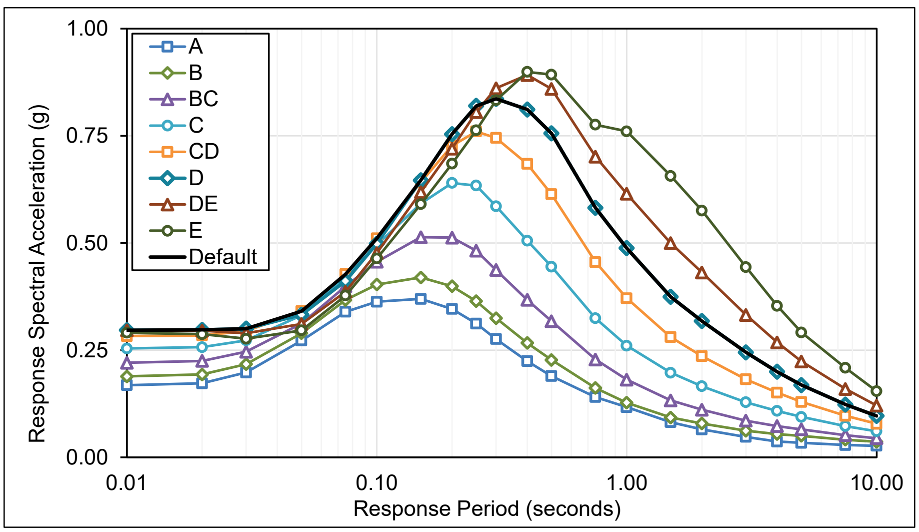


Figure D.2-15 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Sacramento Site.

Table D.2-16 **Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Francisco Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.495	0.557	0.647	0.724	0.758	0.715	0.625	0.573	0.758
0.01	0.498	0.560	0.650	0.726	0.762	0.720	0.632	0.583	0.762
0.02	0.514	0.579	0.664	0.732	0.760	0.716	0.624	0.563	0.760
0.03	0.616	0.679	0.745	0.785	0.791	0.724	0.611	0.540	0.791
0.05	0.925	0.981	0.989	0.980	0.921	0.800	0.663	0.598	0.980
0.08	1.145	1.236	1.263	1.241	1.134	0.972	0.836	0.795	1.241
0.10	1.185	1.311	1.412	1.419	1.301	1.115	0.970	0.933	1.419
0.15	1.202	1.337	1.588	1.666	1.552	1.316	1.115	1.065	1.666
0.20	1.120	1.248	1.573	1.848	1.776	1.498	1.186	1.089	1.848
0.25	1.009	1.127	1.468	1.861	1.932	1.675	1.291	1.123	1.932
0.30	0.906	1.014	1.350	1.744	2.005	1.830	1.438	1.218	2.005
0.40	0.753	0.850	1.161	1.544	1.946	1.935	1.644	1.386	1.946
0.50	0.649	0.735	1.023	1.394	1.794	1.897	1.709	1.523	1.897
0.75	0.484	0.538	0.761	1.065	1.427	1.622	1.630	1.594	1.622
1.0	0.380	0.417	0.592	0.839	1.157	1.392	1.528	1.598	1.392
1.5	0.265	0.288	0.402	0.574	0.813	1.051	1.302	1.503	1.051
2.0	0.214	0.233	0.308	0.436	0.624	0.848	1.149	1.432	0.848
3.0	0.168	0.180	0.221	0.310	0.446	0.617	0.860	1.094	0.617
4.0	0.147	0.156	0.182	0.251	0.356	0.485	0.665	0.839	0.485
5.0	0.134	0.141	0.156	0.212	0.295	0.396	0.534	0.666	0.396
7.5	0.104	0.103	0.106	0.140	0.188	0.244	0.319	0.383	0.244
10	0.078	0.077	0.078	0.099	0.128	0.161	0.204	0.236	0.161
S_{MS} (g)	1.01	1.12	1.42	1.67	1.80	1.74	1.54	1.37	1.80
S_{M1} (g)	0.43	0.47	0.62	0.87	1.47	1.98	2.67	3.36	1.98
S_{DS} (g)	0.67	0.75	0.94	1.12	1.20	1.16	1.03	0.91	1.20
S_{D1} (g)	0.29	0.31	0.41	0.58	0.98	1.32	1.78	2.24	1.32

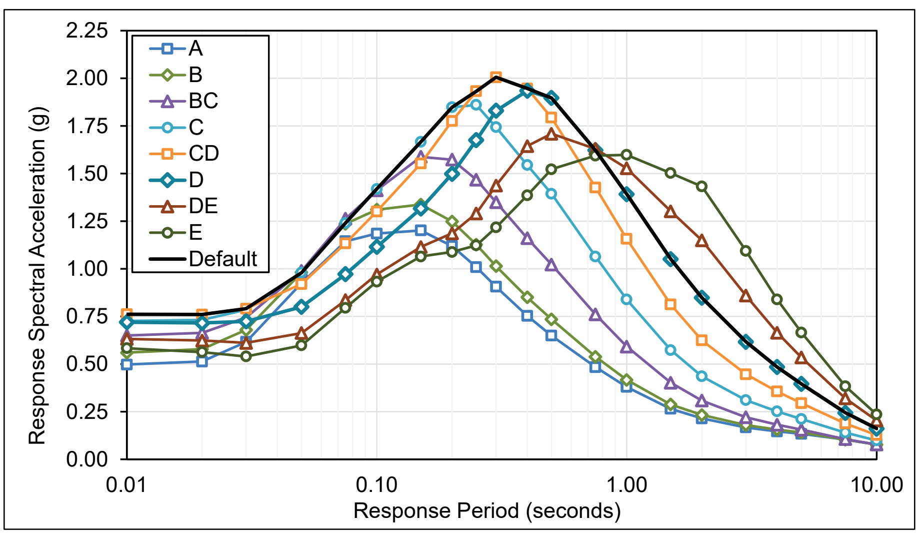


Figure D.2-16 Plots of deterministic MCE_R multi-period response spectra (MPRS) propose deterministic d for the 2020 *NEHRP Provisions* and ASCE 7-22, San Francisco Site.

Table D.2-17 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Mateo Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.654	0.737	0.855	0.953	0.975	0.893	0.751	0.667	0.975
0.01	0.658	0.742	0.860	0.957	0.979	0.900	0.760	0.679	0.979
0.02	0.685	0.774	0.884	0.968	0.979	0.895	0.747	0.653	0.979
0.03	0.845	0.930	1.004	1.040	1.018	0.902	0.727	0.619	1.040
0.05	1.304	1.380	1.349	1.297	1.178	0.982	0.771	0.669	1.297
0.08	1.588	1.713	1.702	1.628	1.434	1.175	0.955	0.878	1.628
0.10	1.602	1.777	1.881	1.852	1.638	1.341	1.104	1.029	1.852
0.15	1.597	1.780	2.095	2.174	1.956	1.593	1.289	1.195	2.174
0.20	1.473	1.645	2.077	2.418	2.238	1.813	1.388	1.245	2.418
0.25	1.343	1.512	1.962	2.445	2.442	2.017	1.491	1.271	2.445
0.30	1.229	1.394	1.831	2.304	2.558	2.212	1.649	1.375	2.558
0.40	1.047	1.200	1.601	2.071	2.524	2.378	1.887	1.545	2.524
0.50	0.928	1.067	1.431	1.883	2.352	2.371	2.009	1.740	2.371
0.75	0.756	0.830	1.096	1.456	1.909	2.085	1.998	1.914	2.085
1.0	0.635	0.664	0.875	1.160	1.575	1.835	1.940	1.996	1.835
1.5	0.482	0.476	0.607	0.793	1.112	1.410	1.709	1.953	1.410
2.0	0.402	0.392	0.467	0.599	0.854	1.155	1.560	1.942	1.155
3.0	0.321	0.311	0.339	0.427	0.613	0.847	1.180	1.505	0.847
4.0	0.268	0.262	0.276	0.339	0.478	0.651	0.893	1.129	0.651
5.0	0.239	0.234	0.235	0.281	0.389	0.521	0.704	0.878	0.521
7.5	0.168	0.164	0.156	0.174	0.231	0.301	0.392	0.473	0.301
10	0.120	0.117	0.111	0.119	0.152	0.192	0.242	0.281	0.192
S_{MS} (g)	1.33	1.48	1.87	2.20	2.30	2.14	1.81	1.57	2.30
S_{M1} (g)	0.80	0.78	0.93	1.20	1.94	2.61	3.57	4.51	2.61
S_{DS} (g)	0.88	0.99	1.25	1.47	1.53	1.43	1.21	1.04	1.53
S_{D1} (g)	0.54	0.52	0.62	0.80	1.30	1.74	2.38	3.01	1.74

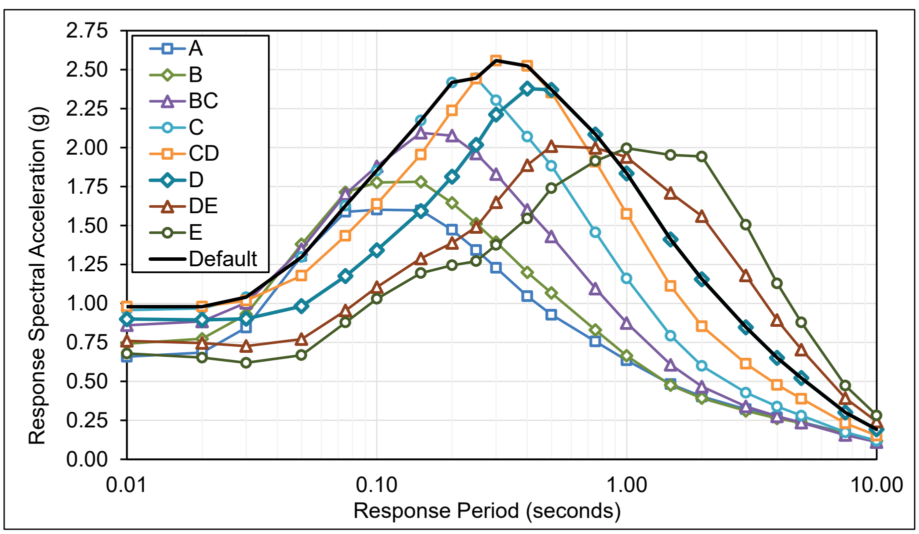


Figure D.2-17 Plots of deterministic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Mateo Site.

Table D.2-18 **Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Jose Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.438	0.500	0.570	0.639	0.662	0.618	0.542	0.508	0.662
0.01	0.442	0.505	0.574	0.642	0.665	0.622	0.549	0.518	0.665
0.02	0.462	0.525	0.592	0.650	0.666	0.622	0.549	0.510	0.666
0.03	0.579	0.640	0.677	0.702	0.692	0.635	0.548	0.504	0.702
0.05	0.917	0.972	0.926	0.884	0.825	0.728	0.635	0.599	0.884
0.08	1.126	1.227	1.191	1.137	1.040	0.925	0.851	0.825	1.137
0.10	1.118	1.263	1.313	1.302	1.204	1.083	1.019	0.991	1.302
0.15	1.096	1.239	1.433	1.508	1.418	1.264	1.190	1.160	1.508
0.20	1.002	1.118	1.405	1.680	1.603	1.362	1.173	1.154	1.680
0.25	0.912	1.019	1.329	1.708	1.759	1.506	1.188	1.115	1.759
0.30	0.832	0.949	1.245	1.596	1.835	1.650	1.294	1.145	1.835
0.40	0.696	0.814	1.071	1.389	1.763	1.742	1.472	1.245	1.763
0.50	0.617	0.738	0.957	1.246	1.590	1.678	1.508	1.346	1.678
0.75	0.546	0.606	0.733	0.946	1.232	1.393	1.408	1.391	1.393
1.0	0.487	0.491	0.588	0.755	0.993	1.177	1.299	1.372	1.177
1.5	0.392	0.360	0.416	0.524	0.687	0.864	1.067	1.236	0.864
2.0	0.330	0.304	0.327	0.409	0.526	0.686	0.920	1.142	0.686
3.0	0.260	0.244	0.253	0.309	0.381	0.497	0.684	0.868	0.497
4.0	0.230	0.223	0.226	0.265	0.310	0.394	0.534	0.671	0.394
5.0	0.219	0.213	0.206	0.234	0.262	0.325	0.434	0.537	0.325
7.5	0.174	0.172	0.163	0.174	0.179	0.212	0.273	0.325	0.212
10	0.120	0.119	0.115	0.121	0.124	0.143	0.178	0.206	0.143
S_{MS} (g)	0.90	1.01	1.26	1.54	1.65	1.57	1.36	1.21	1.65
S_{M1} (g)	0.66	0.61	0.65	0.82	1.31	1.62	2.17	2.69	1.62
S_{DS} (g)	0.60	0.67	0.84	1.03	1.10	1.05	0.90	0.81	1.10
S_{D1} (g)	0.44	0.41	0.44	0.55	0.87	1.08	1.45	1.79	1.08

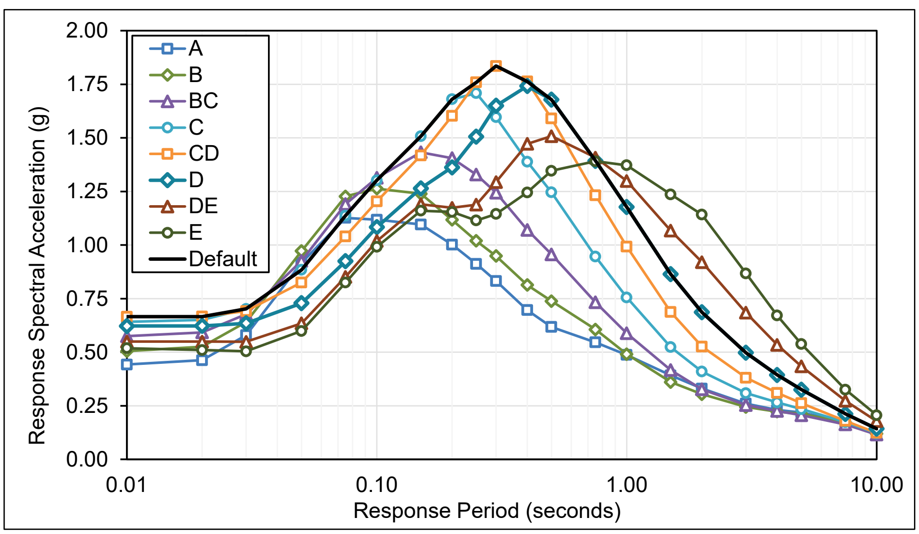


Figure D.2-18 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Jose Site.

Table D.2-19 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Cruz Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.532	0.612	0.698	0.760	0.780	0.754	0.651	0.554	0.780
0.01	0.536	0.617	0.702	0.763	0.785	0.759	0.658	0.563	0.785
0.02	0.561	0.644	0.726	0.777	0.788	0.734	0.649	0.548	0.788
0.03	0.690	0.768	0.825	0.842	0.825	0.744	0.636	0.531	0.842
0.05	1.048	1.118	1.105	1.061	0.971	0.831	0.663	0.603	1.061
0.08	1.279	1.397	1.398	1.340	1.204	1.045	0.860	0.824	1.340
0.10	1.288	1.461	1.547	1.529	1.391	1.194	1.028	0.997	1.529
0.15	1.251	1.448	1.704	1.777	1.663	1.433	1.258	1.195	1.777
0.20	1.127	1.307	1.645	1.897	1.850	1.595	1.319	1.231	1.897
0.25	0.999	1.157	1.506	1.870	1.948	1.717	1.388	1.209	1.948
0.30	0.890	1.029	1.371	1.756	1.979	1.887	1.504	1.265	1.979
0.40	0.736	0.853	1.166	1.556	1.969	1.951	1.562	1.364	1.969
0.50	0.655	0.753	1.051	1.438	1.813	2.022	1.589	1.457	2.022
0.75	0.511	0.574	0.815	1.147	1.521	1.710	1.453	1.467	1.710
1.0	0.395	0.433	0.623	0.896	1.229	1.464	1.326	1.422	1.464
1.5	0.215	0.223	0.315	0.458	0.651	0.847	1.062	1.231	0.847
2.0	0.174	0.178	0.237	0.345	0.494	0.673	0.915	1.139	0.673
3.0	0.134	0.135	0.164	0.239	0.345	0.477	0.666	0.844	0.477
4.0	0.114	0.115	0.131	0.189	0.269	0.367	0.504	0.634	0.367
5.0	0.105	0.105	0.113	0.159	0.221	0.299	0.405	0.501	0.299
7.5	0.085	0.084	0.085	0.114	0.153	0.200	0.261	0.311	0.200
10	0.065	0.065	0.066	0.084	0.109	0.137	0.173	0.201	0.137
S_{MS} (g)	1.01	1.18	1.48	1.71	1.78	1.82	1.43	1.31	1.82
S_{M1} (g)	0.39	0.43	0.62	0.90	1.23	1.49	2.03	2.54	1.49
S_{DS} (g)	0.68	0.78	0.99	1.14	1.19	1.21	0.95	0.87	1.21
S_{D1} (g)	0.26	0.29	0.42	0.60	0.82	1.00	1.35	1.69	1.00

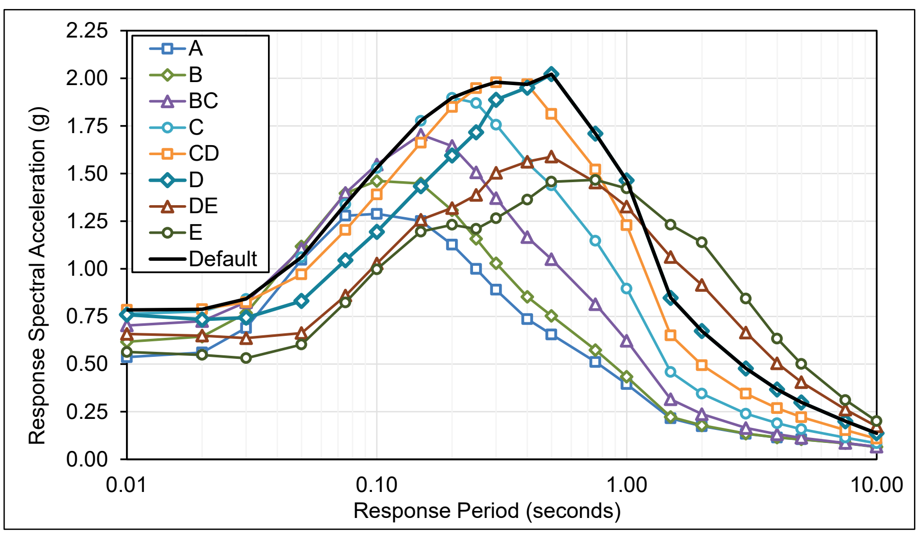


Figure D.2-19 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Cruz Site.

Table D.2-20 **Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Vallejo Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.730	0.830	0.955	1.051	1.057	0.952	0.784	0.698	1.057
0.01	0.735	0.837	0.961	1.055	1.062	0.959	0.793	0.709	1.062
0.02	0.772	0.880	0.997	1.076	1.069	0.957	0.793	0.685	1.076
0.03	0.955	1.057	1.140	1.167	1.117	0.969	0.775	0.653	1.167
0.05	1.469	1.564	1.524	1.465	1.311	1.095	0.860	0.740	1.465
0.08	1.776	1.927	1.918	1.840	1.610	1.335	1.104	1.017	1.840
0.10	1.796	2.012	2.133	2.097	1.847	1.538	1.301	1.216	2.097
0.15	1.785	2.024	2.365	2.445	2.200	1.831	1.537	1.427	2.445
0.20	1.612	1.835	2.307	2.656	2.464	1.993	1.575	1.453	2.656
0.25	1.446	1.673	2.161	2.646	2.620	2.143	1.603	1.406	2.646
0.30	1.307	1.529	2.001	2.496	2.701	2.303	1.718	1.461	2.701
0.40	1.086	1.278	1.699	2.196	2.603	2.427	1.898	1.557	2.603
0.50	0.945	1.115	1.485	1.952	2.385	2.381	2.001	1.708	2.385
0.75	0.753	0.853	1.121	1.490	1.904	2.055	1.980	1.894	2.055
1.0	0.630	0.674	0.890	1.188	1.546	1.772	1.879	1.925	1.772
1.5	0.471	0.461	0.586	0.782	1.023	1.276	1.554	1.757	1.276
2.0	0.382	0.366	0.431	0.578	0.755	0.990	1.323	1.615	0.990
3.0	0.286	0.272	0.292	0.389	0.495	0.657	0.904	1.128	0.657
4.0	0.227	0.219	0.230	0.294	0.358	0.464	0.629	0.777	0.464
5.0	0.205	0.199	0.201	0.236	0.275	0.349	0.466	0.570	0.349
7.5	0.142	0.139	0.131	0.144	0.160	0.197	0.255	0.306	0.197
10	0.093	0.091	0.087	0.093	0.104	0.127	0.156	0.189	0.127
S_{MS} (g)	1.45	1.65	2.08	2.39	2.43	2.18	1.80	1.54	2.43
S_{M1} (g)	0.76	0.73	0.89	1.19	1.55	1.98	2.71	3.38	1.98
S_{DS} (g)	0.97	1.10	1.38	1.59	1.62	1.46	1.20	1.02	1.62
S_{D1} (g)	0.51	0.49	0.59	0.79	1.03	1.32	1.81	2.26	1.32

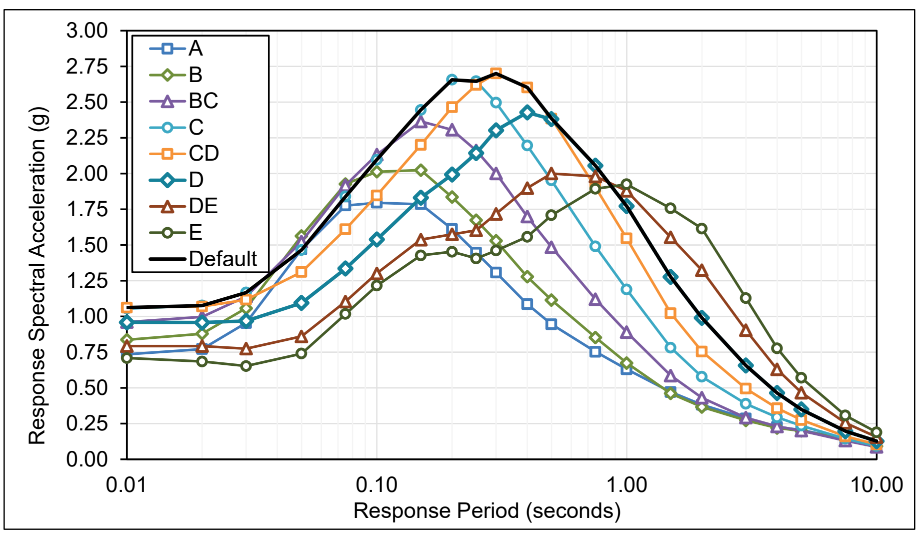


Figure D.2-20 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Vallejo Site.

Table D.2-21 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Rosa Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.859	0.954	1.109	1.234	1.237	1.098	0.884	0.757	1.237
0.01	0.863	0.961	1.114	1.238	1.241	1.104	0.892	0.769	1.241
0.02	0.902	1.007	1.151	1.254	1.245	1.101	0.878	0.740	1.254
0.03	1.116	1.218	1.312	1.347	1.291	1.108	0.850	0.698	1.347
0.05	1.727	1.820	1.768	1.684	1.495	1.203	0.896	0.749	1.684
0.08	2.092	2.244	2.226	2.111	1.813	1.430	1.111	0.998	2.111
0.10	2.121	2.331	2.464	2.405	2.071	1.629	1.288	1.179	2.405
0.15	2.130	2.350	2.764	2.839	2.483	1.940	1.510	1.374	2.839
0.20	1.975	2.182	2.750	3.186	2.843	2.199	1.615	1.422	3.186
0.25	1.801	2.017	2.613	3.238	3.104	2.429	1.703	1.415	3.238
0.30	1.649	1.864	2.444	3.057	3.276	2.664	1.866	1.508	3.276
0.40	1.396	1.589	2.116	2.718	3.247	2.899	2.147	1.680	3.247
0.50	1.235	1.414	1.886	2.464	3.002	2.899	2.316	1.923	3.002
0.75	1.007	1.103	1.447	1.917	2.431	2.576	2.396	2.254	2.576
1.0	0.847	0.879	1.160	1.549	2.006	2.271	2.352	2.385	2.271
1.5	0.633	0.611	0.778	1.043	1.370	1.695	2.035	2.292	1.695
2.0	0.512	0.486	0.575	0.775	1.018	1.339	1.797	2.206	1.339
3.0	0.383	0.361	0.387	0.518	0.667	0.891	1.237	1.560	0.891
4.0	0.301	0.286	0.297	0.382	0.470	0.615	0.842	1.048	0.615
5.0	0.264	0.254	0.252	0.297	0.351	0.448	0.603	0.743	0.448
7.5	0.166	0.162	0.151	0.167	0.184	0.227	0.297	0.357	0.227
10	0.103	0.101	0.096	0.103	0.115	0.139	0.173	0.219	0.139
S_{MS} (g)	1.78	1.96	2.47	2.91	2.95	2.61	2.08	1.73	2.95
S_{M1} (g)	1.02	0.97	1.17	1.56	2.06	2.68	3.71	4.68	2.68
S_{DS} (g)	1.19	1.31	1.65	1.94	1.97	1.74	1.39	1.15	1.97
S_{D1} (g)	0.68	0.65	0.78	1.04	1.37	1.79	2.47	3.12	1.79

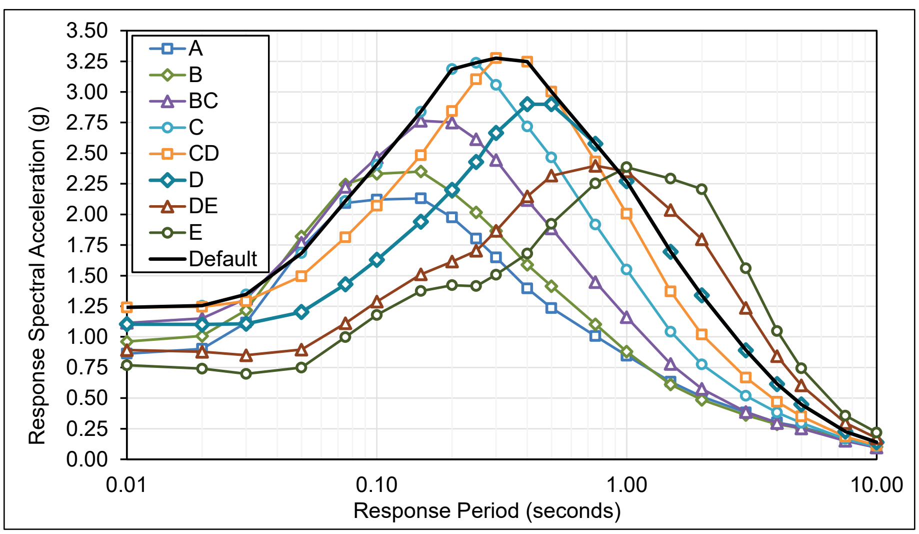


Figure D.2-21 Plots of deterministic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Rosa Site.

Table D.2-22 **Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Seattle Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.720	0.832	0.928	0.988	0.981	0.887	0.755	0.678	0.988
0.01	0.726	0.839	0.934	0.993	0.986	0.892	0.763	0.673	0.993
0.02	0.772	0.879	0.968	1.018	1.000	0.898	0.731	0.637	1.018
0.03	0.951	1.048	1.104	1.111	1.049	0.906	0.706	0.564	1.111
0.05	1.359	1.449	1.428	1.361	1.203	0.977	0.733	0.627	1.361
0.08	1.635	1.795	1.790	1.701	1.472	1.175	0.961	0.904	1.701
0.10	1.718	1.968	2.036	1.969	1.714	1.447	1.381	1.316	1.969
0.15	1.675	1.974	2.222	2.246	1.999	1.785	1.753	1.700	2.246
0.20	1.433	1.726	2.120	2.350	2.207	1.894	1.932	1.919	2.350
0.25	1.272	1.583	2.008	2.382	2.377	1.972	2.081	2.113	2.382
0.30	1.147	1.458	1.882	2.325	2.479	2.176	2.136	2.201	2.479
0.40	0.944	1.227	1.617	2.099	2.429	2.336	1.981	2.082	2.429
0.50	0.811	1.073	1.426	1.887	2.299	2.349	2.038	2.050	2.349
0.75	0.640	0.832	1.102	1.478	1.915	2.116	2.108	2.077	2.116
1.0	0.529	0.666	0.888	1.208	1.607	1.867	2.021	2.068	1.867
1.5	0.377	0.448	0.585	0.799	1.096	1.378	1.685	1.883	1.378
2.0	0.295	0.347	0.434	0.592	0.822	1.097	1.461	1.746	1.097
3.0	0.205	0.236	0.287	0.390	0.536	0.717	0.982	1.197	0.717
4.0	0.151	0.175	0.228	0.304	0.410	0.536	0.705	0.835	0.536
5.0	0.121	0.145	0.185	0.242	0.321	0.413	0.536	0.630	0.413
7.5	0.081	0.116	0.144	0.183	0.234	0.293	0.370	0.427	0.293
10	0.068	0.094	0.114	0.141	0.175	0.213	0.261	0.296	0.213
S_{MS} (g)	1.29	1.55	1.91	2.14	2.23	2.11	1.92	1.98	2.23
S_{M1} (g)	0.59	0.69	0.89	1.21	1.64	2.19	2.95	3.59	2.19
S_{DS} (g)	0.86	1.04	1.27	1.43	1.49	1.41	1.28	1.32	1.49
S_{D1} (g)	0.39	0.46	0.59	0.81	1.10	1.46	1.96	2.39	1.46

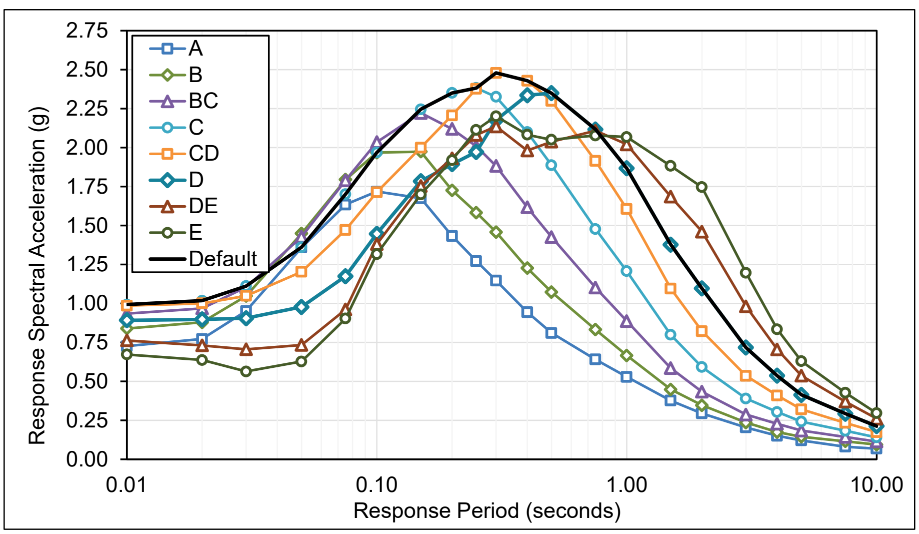


Figure D.2-22 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Seattle Site.

Table D.2-23 **Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Tacoma Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.410	0.494	0.544	0.575	0.590	0.595	0.599	0.626	0.595
0.01	0.412	0.495	0.544	0.574	0.589	0.593	0.596	0.622	0.593
0.02	0.462	0.532	0.572	0.592	0.596	0.600	0.592	0.603	0.600
0.03	0.522	0.583	0.610	0.615	0.616	0.601	0.566	0.550	0.616
0.05	0.666	0.717	0.727	0.712	0.695	0.660	0.614	0.598	0.712
0.08	0.842	0.941	0.962	0.967	0.956	0.927	0.860	0.848	0.967
0.10	0.941	1.119	1.202	1.257	1.281	1.265	1.203	1.214	1.281
0.15	0.914	1.160	1.305	1.425	1.509	1.535	1.512	1.549	1.535
0.20	0.753	1.019	1.225	1.400	1.548	1.636	1.674	1.763	1.636
0.25	0.646	0.921	1.144	1.350	1.508	1.649	1.747	1.898	1.649
0.30	0.569	0.838	1.063	1.316	1.482	1.599	1.738	1.935	1.599
0.40	0.452	0.693	0.900	1.174	1.366	1.500	1.598	1.821	1.500
0.50	0.371	0.573	0.758	1.008	1.263	1.430	1.558	1.763	1.430
0.75	0.285	0.441	0.591	0.797	1.055	1.246	1.424	1.703	1.246
1.0	0.240	0.380	0.513	0.698	0.941	1.149	1.371	1.689	1.149
1.5	0.179	0.287	0.388	0.530	0.724	0.922	1.172	1.512	0.922
2.0	0.143	0.227	0.303	0.412	0.566	0.749	0.999	1.343	0.749
3.0	0.100	0.157	0.207	0.280	0.383	0.511	0.689	0.931	0.511
4.0	0.080	0.123	0.160	0.212	0.284	0.371	0.491	0.660	0.371
5.0	0.068	0.100	0.127	0.165	0.217	0.280	0.365	0.486	0.280
7.5	0.051	0.072	0.089	0.112	0.143	0.179	0.228	0.307	0.179
10	0.045	0.062	0.075	0.091	0.113	0.137	0.169	0.221	0.137
S_{MS} (g)	0.68	0.92	1.10	1.26	1.39	1.48	1.57	1.74	1.48
S_{M1} (g)	0.29	0.45	0.61	0.82	1.15	1.53	2.07	2.79	1.53
S_{DS} (g)	0.45	0.61	0.74	0.84	0.93	0.99	1.05	1.16	0.99
S_{D1} (g)	0.19	0.30	0.40	0.55	0.77	1.02	1.38	1.86	1.02

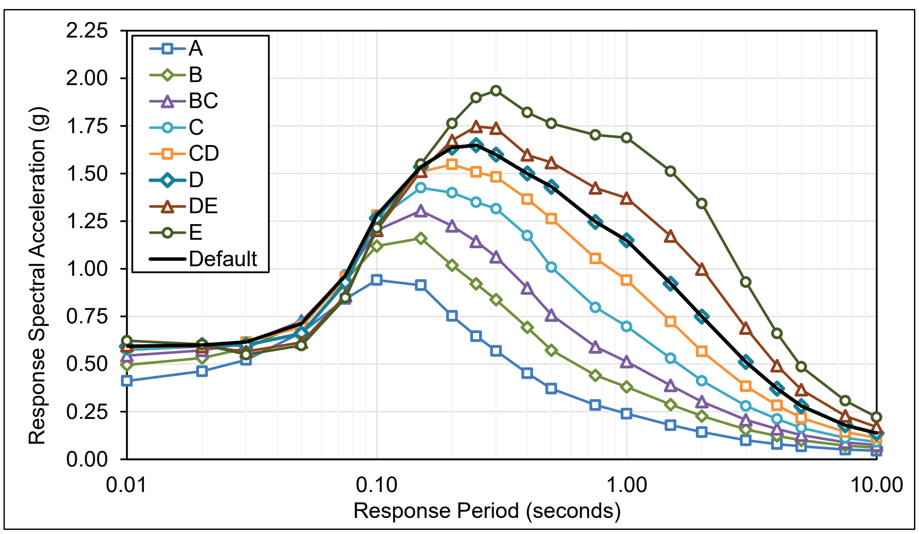


Figure D.2-23 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Tacoma Site.

Table D.2-24 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Everett Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.584	0.669	0.772	0.852	0.873	0.803	0.697	0.532	0.873
0.01	0.588	0.674	0.776	0.856	0.880	0.822	0.696	0.529	0.880
0.02	0.622	0.702	0.800	0.873	0.888	0.819	0.681	0.516	0.888
0.03	0.745	0.820	0.897	0.942	0.920	0.808	0.683	0.473	0.942
0.05	1.087	1.153	1.177	1.164	1.062	0.880	0.696	0.505	1.164
0.08	1.340	1.449	1.496	1.465	1.293	1.079	0.747	0.714	1.465
0.10	1.404	1.592	1.706	1.679	1.519	1.100	1.048	1.019	1.679
0.15	1.388	1.617	1.867	1.959	1.795	1.341	1.314	1.301	1.959
0.20	1.226	1.459	1.809	2.051	1.976	1.438	1.461	1.480	2.051
0.25	1.075	1.309	1.679	2.027	2.101	1.858	1.541	1.598	2.101
0.30	0.968	1.188	1.551	1.936	2.131	1.919	1.553	1.638	2.131
0.40	0.796	0.990	1.317	1.712	2.022	2.012	1.732	1.553	2.022
0.50	0.673	0.844	1.131	1.499	1.843	1.945	1.728	1.504	1.945
0.75	0.517	0.625	0.830	1.108	1.424	1.598	1.592	1.569	1.598
1.0	0.432	0.498	0.668	0.888	1.156	1.355	1.450	1.476	1.355
1.5	0.307	0.334	0.438	0.589	0.771	0.965	1.187	1.311	0.965
2.0	0.238	0.256	0.318	0.431	0.564	0.739	0.986	1.202	0.739
3.0	0.166	0.176	0.203	0.273	0.356	0.475	0.635	0.790	0.475
4.0	0.126	0.135	0.153	0.203	0.270	0.354	0.465	0.572	0.354
5.0	0.108	0.116	0.126	0.163	0.213	0.275	0.356	0.434	0.275
7.5	0.072	0.077	0.092	0.116	0.146	0.183	0.231	0.280	0.183
10	0.049	0.063	0.076	0.093	0.114	0.139	0.170	0.202	0.139
S_{MS} (g)	1.10	1.31	1.63	1.85	1.92	1.81	1.56	1.47	1.92
S_{M1} (g)	0.48	0.51	0.67	0.89	1.16	1.48	1.97	2.40	1.48
S_{DS} (g)	0.74	0.88	1.09	1.23	1.28	1.21	1.04	0.98	1.28
S_{D1} (g)	0.32	0.34	0.45	0.59	0.77	0.99	1.32	1.60	0.99

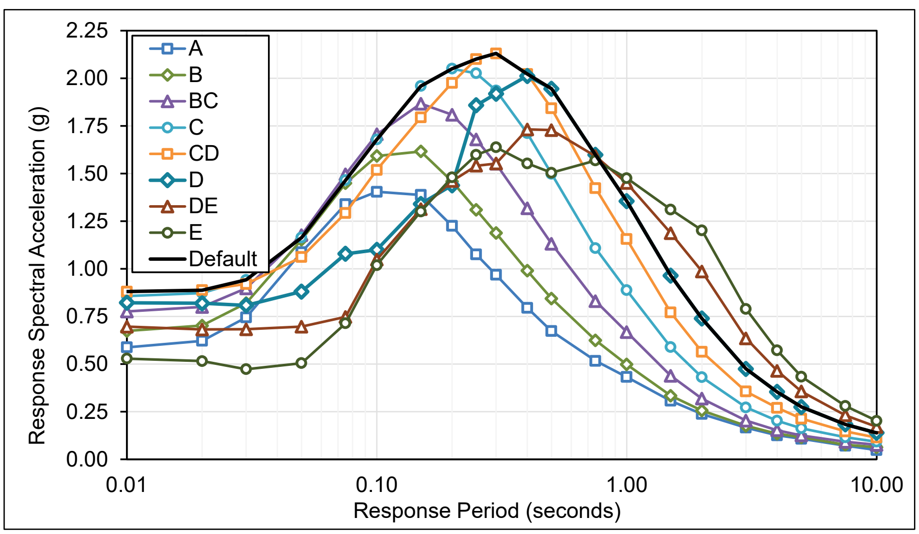


Figure D.2-24 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Everett Site.

Table D.2-25 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Portland Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.767	0.874	1.012	1.113	1.139	1.068	0.913	0.802	1.139
0.01	0.771	0.879	1.016	1.118	1.144	1.074	0.919	0.809	1.144
0.02	0.808	0.914	1.049	1.142	1.158	1.073	0.904	0.788	1.158
0.03	0.948	1.049	1.166	1.224	1.198	1.069	0.862	0.735	1.224
0.05	1.314	1.411	1.484	1.477	1.360	1.148	0.884	0.734	1.477
0.08	1.608	1.757	1.843	1.806	1.617	1.325	1.002	0.831	1.806
0.10	1.684	1.903	2.068	2.064	1.856	1.510	1.135	0.957	2.064
0.15	1.652	1.941	2.300	2.424	2.252	1.843	1.363	1.097	2.424
0.20	1.472	1.770	2.225	2.559	2.523	2.153	1.603	1.244	2.559
0.25	1.289	1.581	2.055	2.529	2.655	2.378	1.806	1.392	2.655
0.30	1.137	1.403	1.868	2.389	2.670	2.522	2.013	1.453	2.670
0.40	0.920	1.145	1.563	2.088	2.504	2.537	2.229	1.467	2.537
0.50	0.755	0.944	1.314	1.803	2.265	2.425	2.276	1.513	2.425
0.75	0.532	0.658	0.931	1.315	1.745	1.993	2.073	1.508	1.993
1.0	0.402	0.492	0.707	1.023	1.403	1.683	1.893	1.511	1.683
1.5	0.255	0.308	0.442	0.650	0.920	1.189	1.493	1.383	1.189
2.0	0.186	0.224	0.248	0.372	0.527	0.698	0.931	1.244	0.698
3.0	0.118	0.117	0.168	0.253	0.358	0.479	0.646	0.873	0.479
4.0	0.084	0.091	0.128	0.191	0.266	0.350	0.465	0.621	0.350
5.0	0.065	0.075	0.103	0.150	0.204	0.263	0.343	0.458	0.263
7.5	0.034	0.053	0.071	0.102	0.135	0.169	0.215	0.291	0.169
10	0.031	0.047	0.061	0.084	0.107	0.130	0.161	0.211	0.130
S_{MS} (g)	1.32	1.59	2.00	2.30	2.40	2.28	2.05	1.36	2.40
S_{M1} (g)	0.40	0.49	0.71	1.02	1.40	1.78	2.24	2.62	1.78
S_{DS} (g)	0.88	1.06	1.34	1.54	1.60	1.52	1.37	0.91	1.60
S_{D1} (g)	0.27	0.33	0.47	0.68	0.94	1.19	1.49	1.75	1.19

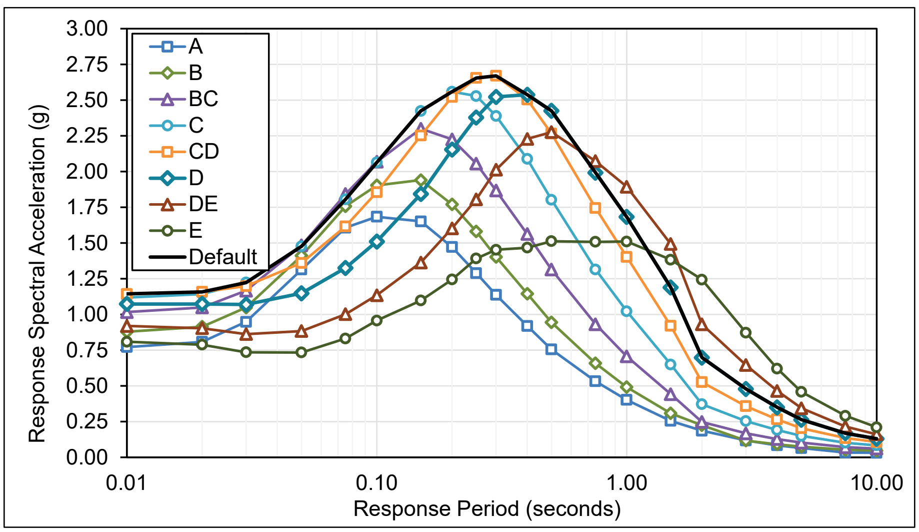


Figure D.2-25 Plots of deterministic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Portland Site.

Table D.2-26 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Salt Lake City Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.739	0.852	0.980	1.060	1.039	0.921	0.768	0.674	1.060
0.01	0.745	0.858	0.985	1.065	1.043	0.925	0.772	0.679	1.065
0.02	0.792	0.910	1.034	1.098	1.061	0.937	0.764	0.664	1.098
0.03	0.983	1.094	1.184	1.186	1.102	0.931	0.737	0.633	1.186
0.05	1.473	1.572	1.549	1.454	1.264	1.010	0.778	0.666	1.454
0.08	1.730	1.889	1.875	1.749	1.488	1.174	0.914	0.795	1.749
0.10	1.750	1.995	2.082	1.989	1.682	1.341	1.038	0.901	1.989
0.15	1.665	1.960	2.312	2.336	2.012	1.597	1.221	1.053	2.336
0.20	1.509	1.824	2.307	2.613	2.340	1.884	1.426	1.232	2.613
0.25	1.356	1.671	2.156	2.631	2.537	2.113	1.568	1.343	2.631
0.30	1.237	1.544	2.007	2.507	2.637	2.300	1.720	1.470	2.637
0.40	1.022	1.286	1.690	2.190	2.543	2.411	1.971	1.657	2.543
0.50	0.878	1.100	1.449	1.897	2.302	2.332	2.026	1.752	2.332
0.75	0.701	0.840	1.091	1.446	1.838	1.999	1.944	1.872	1.999
1.0	0.566	0.632	0.823	1.088	1.419	1.649	1.763	1.830	1.649
1.5	0.399	0.414	0.523	0.687	0.907	1.155	1.418	1.635	1.155
2.0	0.307	0.312	0.371	0.482	0.633	0.855	1.152	1.442	0.855
3.0	0.208	0.206	0.227	0.290	0.375	0.518	0.723	0.926	0.518
4.0	0.143	0.141	0.150	0.189	0.236	0.326	0.449	0.569	0.326
5.0	0.110	0.108	0.109	0.134	0.164	0.220	0.298	0.374	0.220
7.5	0.050	0.050	0.051	0.061	0.073	0.095	0.124	0.154	0.095
10	0.030	0.030	0.031	0.038	0.046	0.057	0.070	0.090	0.057
S_{MS} (g)	1.36	1.64	2.08	2.37	2.37	2.17	1.82	1.58	2.37
S_{M1} (g)	0.61	0.63	0.82	1.09	1.42	1.73	2.30	2.88	1.73
S_{DS} (g)	0.91	1.09	1.38	1.58	1.58	1.45	1.22	1.05	1.58
S_{D1} (g)	0.41	0.42	0.55	0.73	0.95	1.15	1.54	1.92	1.15

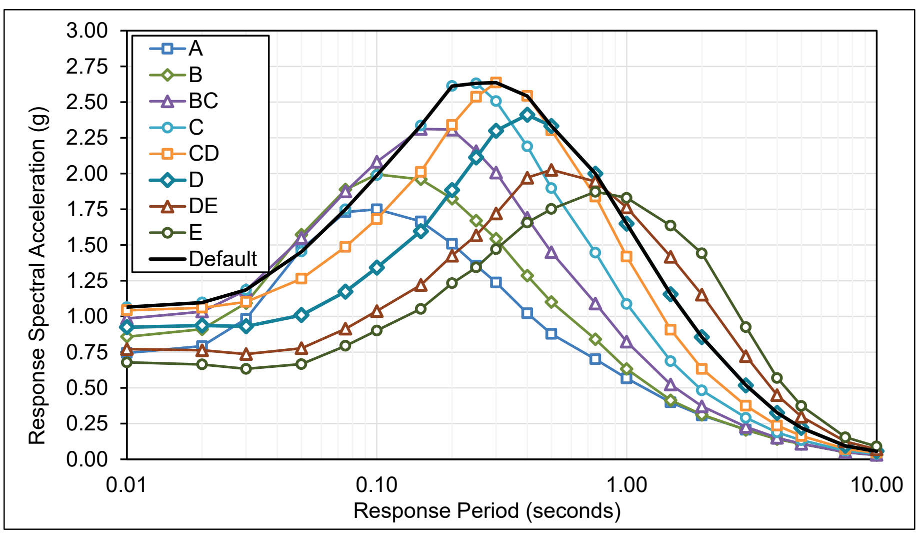


Figure D.2-26 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Salt Lake City Site.

Table D.2-27 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Boise Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.113	0.131	0.153	0.178	0.203	0.222	0.236	0.244	0.222
0.01	0.113	0.132	0.154	0.179	0.204	0.223	0.238	0.246	0.223
0.02	0.117	0.136	0.158	0.181	0.205	0.223	0.236	0.242	0.223
0.03	0.138	0.155	0.175	0.195	0.216	0.230	0.238	0.240	0.230
0.05	0.191	0.208	0.225	0.242	0.257	0.264	0.250	0.249	0.264
0.08	0.231	0.255	0.280	0.302	0.313	0.317	0.314	0.314	0.317
0.10	0.243	0.277	0.314	0.348	0.374	0.384	0.387	0.391	0.384
0.15	0.243	0.285	0.347	0.408	0.451	0.481	0.499	0.512	0.481
0.20	0.227	0.272	0.347	0.433	0.516	0.576	0.614	0.595	0.576
0.25	0.203	0.247	0.324	0.422	0.523	0.603	0.664	0.691	0.603
0.30	0.181	0.223	0.298	0.399	0.512	0.607	0.691	0.737	0.607
0.40	0.148	0.184	0.252	0.346	0.464	0.571	0.678	0.748	0.571
0.50	0.126	0.156	0.218	0.305	0.418	0.529	0.645	0.729	0.529
0.75	0.094	0.113	0.159	0.227	0.318	0.412	0.519	0.611	0.412
1.0	0.073	0.083	0.119	0.171	0.244	0.325	0.422	0.506	0.325
1.5	0.050	0.055	0.077	0.113	0.164	0.224	0.304	0.378	0.224
2.0	0.039	0.043	0.057	0.083	0.120	0.165	0.228	0.291	0.165
3.0	0.028	0.022	0.031	0.047	0.067	0.090	0.121	0.163	0.090
4.0	0.022	0.023	0.031	0.046	0.064	0.085	0.114	0.151	0.085
5.0	0.014	0.021	0.028	0.041	0.056	0.073	0.096	0.126	0.073
7.5	0.014	0.020	0.027	0.038	0.050	0.063	0.080	0.108	0.063
10	0.013	0.018	0.023	0.032	0.041	0.050	0.062	0.081	0.050
S_{MS} **(g)**	0.20	0.24	0.31	0.39	0.47	0.55	0.62	0.67	0.55
S_{M1} **(g)**	0.08	0.09	0.12	0.17	0.28	0.36	0.48	0.63	0.36
S_{DS} **(g)**	0.14	0.16	0.21	0.26	0.31	0.36	0.41	0.45	0.36
S_{D1} **(g)**	0.05	0.06	0.08	0.11	0.19	0.24	0.32	0.42	0.24

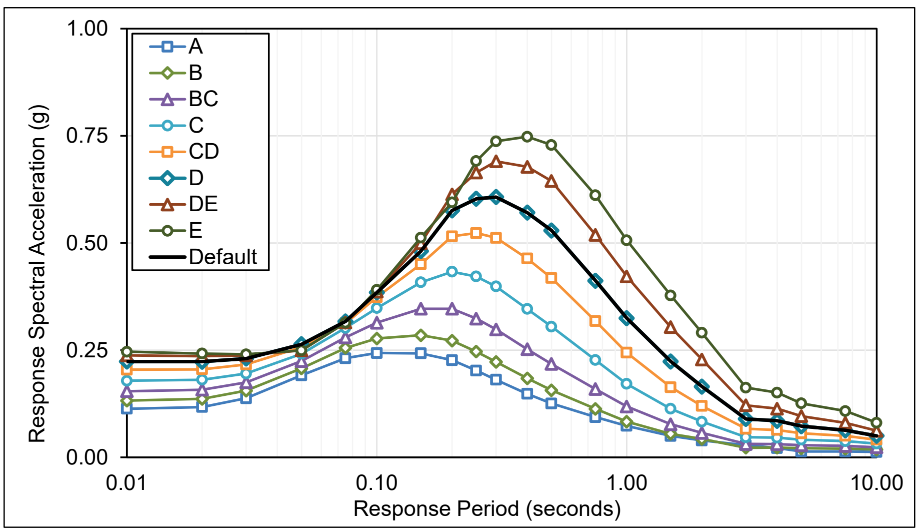


Figure D.2-27 Plots of deterministic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Boise Site.

Table D.2-28 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Reno Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.477	0.556	0.639	0.693	0.698	0.650	0.560	0.506	0.698
0.01	0.479	0.559	0.641	0.695	0.700	0.653	0.564	0.513	0.700
0.02	0.500	0.583	0.664	0.707	0.704	0.652	0.560	0.504	0.707
0.03	0.596	0.677	0.738	0.745	0.719	0.649	0.550	0.492	0.745
0.05	0.873	0.947	0.942	0.900	0.828	0.723	0.612	0.563	0.900
0.08	1.064	1.183	1.181	1.122	1.012	0.871	0.760	0.732	1.122
0.10	1.108	1.287	1.352	1.304	1.171	0.998	0.865	0.838	1.304
0.15	1.070	1.290	1.563	1.593	1.455	1.229	1.034	0.993	1.593
0.20	0.979	1.197	1.537	1.822	1.718	1.445	1.154	1.080	1.822
0.25	0.860	1.054	1.391	1.808	1.874	1.623	1.247	1.109	1.874
0.30	0.755	0.928	1.246	1.652	1.928	1.764	1.391	1.193	1.928
0.40	0.605	0.745	1.019	1.388	1.802	1.823	1.574	1.342	1.823
0.50	0.510	0.622	0.866	1.201	1.587	1.715	1.578	1.424	1.715
0.75	0.374	0.444	0.626	0.885	1.199	1.377	1.413	1.426	1.377
1.0	0.291	0.327	0.467	0.672	0.932	1.128	1.258	1.348	1.128
1.5	0.190	0.205	0.289	0.423	0.602	0.784	0.985	1.157	0.784
2.0	0.144	0.154	0.205	0.301	0.430	0.582	0.787	0.991	0.582
3.0	0.095	0.100	0.125	0.184	0.263	0.362	0.502	0.646	0.362
4.0	0.068	0.071	0.085	0.123	0.174	0.236	0.323	0.411	0.236
5.0	0.053	0.055	0.068	0.098	0.134	0.174	0.229	0.302	0.174
7.5	0.028	0.039	0.051	0.072	0.096	0.121	0.155	0.205	0.121
10	0.025	0.034	0.042	0.057	0.073	0.090	0.112	0.143	0.090
S_{MS} (g)	0.88	1.08	1.38	1.64	1.74	1.64	1.42	1.28	1.74
S_{M1} (g)	0.29	0.33	0.47	0.67	0.93	1.18	1.57	1.98	1.18
S_{DS} (g)	0.59	0.72	0.92	1.09	1.16	1.09	0.95	0.85	1.16
S_{D1} (g)	0.19	0.22	0.31	0.45	0.62	0.78	1.05	1.32	0.78

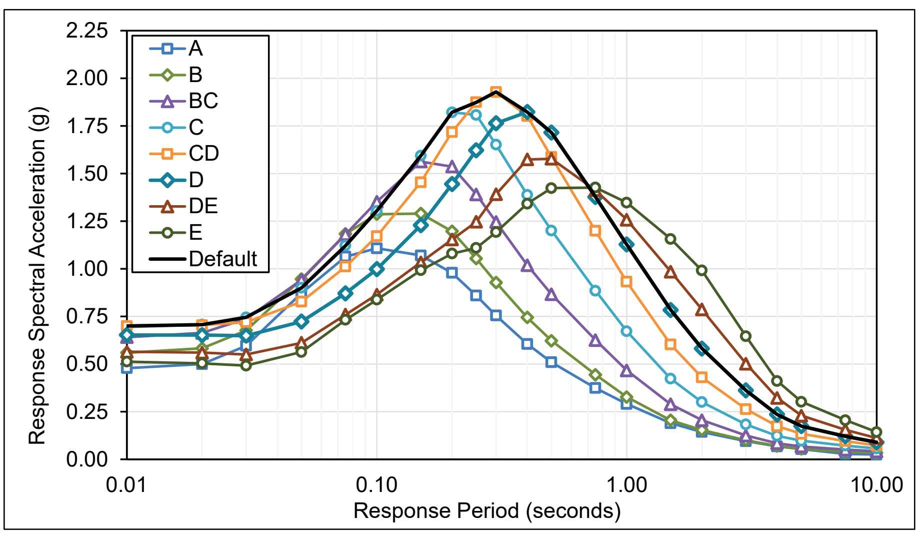


Figure D.2-28 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Reno Site.

Table D.2-29 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Las Vegas Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.580	0.668	0.777	0.866	0.908	0.886	0.804	0.740	0.908
0.01	0.583	0.671	0.780	0.870	0.912	0.890	0.808	0.744	0.912
0.02	0.611	0.700	0.809	0.894	0.930	0.896	0.798	0.727	0.930
0.03	0.720	0.806	0.907	0.970	0.977	0.908	0.775	0.691	0.977
0.05	1.005	1.093	1.171	1.191	1.128	0.991	0.805	0.699	1.191
0.08	1.230	1.352	1.445	1.449	1.343	1.155	0.927	0.800	1.449
0.10	1.295	1.469	1.622	1.660	1.554	1.339	1.068	0.920	1.660
0.15	1.264	1.491	1.779	1.921	1.869	1.636	1.293	1.093	1.921
0.20	1.145	1.388	1.749	2.034	2.084	1.903	1.542	1.307	2.084
0.25	0.986	1.219	1.588	1.967	2.132	2.040	1.719	1.469	2.132
0.30	0.857	1.069	1.424	1.835	2.097	2.096	1.859	1.627	2.097
0.40	0.663	0.829	1.133	1.523	1.859	1.972	1.898	1.766	1.972
0.50	0.531	0.662	0.923	1.272	1.625	1.807	1.832	1.787	1.807
0.75	0.363	0.445	0.630	0.891	1.195	1.404	1.533	1.624	1.404
1.0	0.258	0.301	0.432	0.624	0.863	1.062	1.239	1.372	1.062
1.5	0.152	0.171	0.243	0.356	0.508	0.668	0.859	1.023	0.668
2.0	0.106	0.118	0.160	0.234	0.337	0.462	0.633	0.795	0.462
3.0	0.063	0.068	0.086	0.126	0.182	0.253	0.354	0.451	0.253
4.0	0.043	0.045	0.054	0.078	0.111	0.152	0.210	0.265	0.152
5.0	0.032	0.033	0.038	0.053	0.075	0.100	0.136	0.170	0.100
7.5	0.018	0.021	0.027	0.038	0.050	0.063	0.081	0.107	0.063
10	0.016	0.019	0.024	0.032	0.042	0.052	0.065	0.083	0.052
S_{MS} (g)	1.03	1.25	1.57	1.83	1.92	1.89	1.71	1.61	1.92
S_{M1} (g)	0.26	0.30	0.43	0.62	0.86	1.06	1.29	1.59	1.06
S_{DS} (g)	0.69	0.83	1.05	1.22	1.28	1.26	1.14	1.07	1.28
S_{D1} (g)	0.17	0.20	0.29	0.42	0.58	0.71	0.86	1.06	0.71

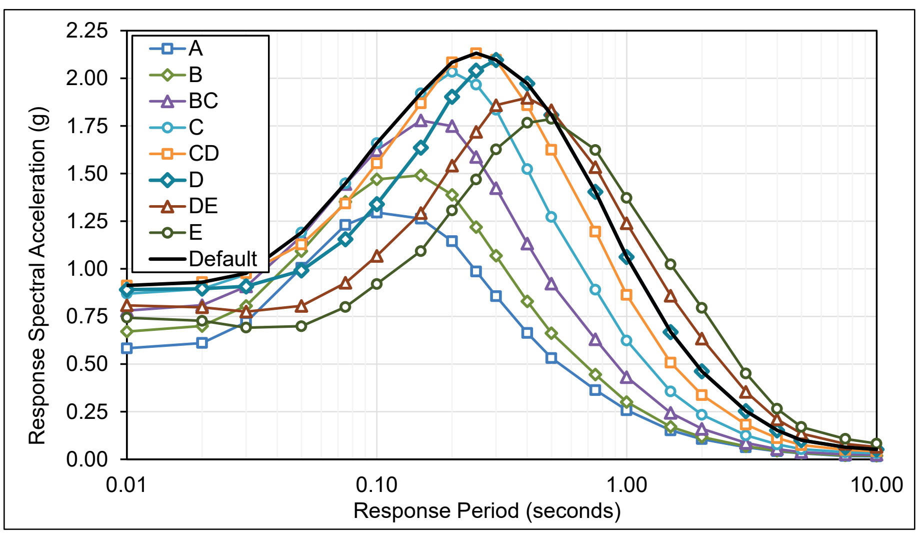


Figure D.2-29 Plots of deterministic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Las Vegas Site.

Table D.2-30 **Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, St. Louis Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.223	0.216	0.216	0.218	0.216	0.213	0.206	0.206	0.218
0.01	0.234	0.227	0.227	0.227	0.225	0.221	0.213	0.213	0.227
0.02	0.342	0.330	0.330	0.327	0.315	0.312	0.304	0.304	0.327
0.03	0.405	0.390	0.397	0.391	0.365	0.363	0.352	0.352	0.391
0.05	0.482	0.457	0.504	0.498	0.455	0.447	0.429	0.429	0.498
0.08	0.489	0.517	0.584	0.577	0.528	0.511	0.485	0.485	0.577
0.10	0.498	0.602	0.685	0.674	0.594	0.568	0.529	0.529	0.674
0.15	0.458	0.518	0.593	0.621	0.610	0.589	0.543	0.543	0.621
0.20	0.404	0.409	0.470	0.522	0.571	0.567	0.518	0.518	0.571
0.25	0.375	0.379	0.415	0.476	0.546	0.554	0.508	0.508	0.554
0.30	0.338	0.340	0.360	0.424	0.505	0.513	0.487	0.487	0.513
0.40	0.279	0.280	0.293	0.358	0.450	0.465	0.445	0.445	0.465
0.50	0.238	0.241	0.250	0.312	0.406	0.434	0.423	0.423	0.434
0.75	0.188	0.190	0.197	0.249	0.335	0.377	0.370	0.370	0.377
1.0	0.155	0.155	0.159	0.204	0.280	0.329	0.316	0.316	0.329
1.5	0.113	0.113	0.117	0.150	0.204	0.237	0.230	0.230	0.237
2.0	0.090	0.091	0.094	0.120	0.161	0.178	0.174	0.174	0.178
3.0	0.060	0.059	0.062	0.079	0.104	0.111	0.108	0.108	0.111
4.0	0.043	0.042	0.044	0.055	0.073	0.077	0.074	0.074	0.077
5.0	0.033	0.033	0.034	0.043	0.056	0.059	0.057	0.057	0.059
7.5	0.022	0.021	0.022	0.028	0.036	0.038	0.037	0.037	0.038
10	0.015	0.015	0.015	0.019	0.025	0.026	0.025	0.025	0.026
S_{MS} (g)	0.36	0.37	0.42	0.47	0.51	0.51	0.47	0.47	0.51
S_{M1} (g)	0.18	0.18	0.19	0.24	0.32	0.36	0.35	0.35	0.36
S_{DS} (g)	0.24	0.25	0.28	0.31	0.34	0.34	0.31	0.31	0.34
S_{D1} (g)	0.12	0.12	0.13	0.16	0.22	0.24	0.23	0.23	0.24

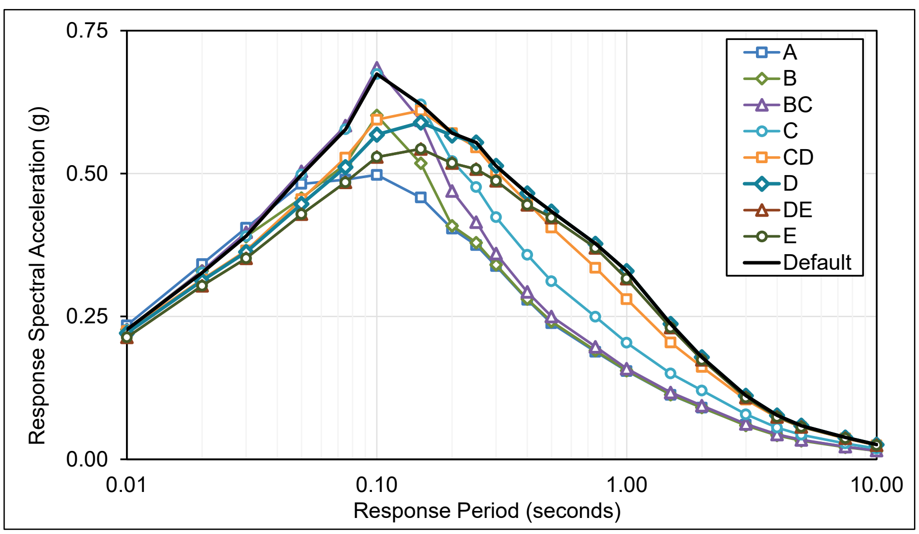


Figure D.2-30 Plots of deterministic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, St. Louis Site.

Table D.2-31 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Memphis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.729	0.710	0.709	0.657	0.602	0.562	0.525	0.525	0.657
0.01	1.397	1.363	1.363	0.768	0.707	0.652	0.608	0.608	0.768
0.02	1.258	1.223	1.222	1.136	1.031	0.984	0.933	0.933	1.136
0.03	1.499	1.454	1.481	1.339	1.171	1.101	1.033	1.033	1.339
0.05	1.693	1.638	1.802	1.603	1.341	1.223	1.118	1.118	1.603
0.08	1.548	1.633	1.839	1.653	1.367	1.212	1.081	1.081	1.653
0.10	1.489	1.784	2.020	1.818	1.439	1.237	1.067	1.067	1.818
0.15	1.243	1.394	1.593	1.542	1.343	1.149	0.969	0.969	1.542
0.20	1.032	1.036	1.189	1.237	1.201	1.051	0.870	0.870	1.237
0.25	0.919	0.921	1.008	1.091	1.117	0.984	0.806	0.806	1.117
0.30	0.802	0.800	0.846	0.952	1.023	0.900	0.754	0.754	1.023
0.40	0.634	0.632	0.658	0.790	0.928	0.847	0.705	0.705	0.928
0.50	0.522	0.525	0.544	0.672	0.835	0.800	0.682	0.682	0.835
0.75	0.400	0.402	0.417	0.527	0.701	0.747	0.666	0.666	0.747
1.0	0.324	0.324	0.331	0.426	0.583	0.669	0.605	0.605	0.669
1.5	0.236	0.236	0.244	0.313	0.427	0.491	0.469	0.469	0.491
2.0	0.185	0.185	0.192	0.245	0.329	0.361	0.347	0.347	0.361
3.0	0.124	0.121	0.126	0.161	0.212	0.223	0.213	0.213	0.223
4.0	0.085	0.082	0.086	0.109	0.144	0.150	0.142	0.142	0.150
5.0	0.066	0.064	0.066	0.084	0.110	0.114	0.108	0.108	0.114
7.5	0.042	0.041	0.043	0.054	0.070	0.072	0.068	0.068	0.072
10	0.029	0.028	0.029	0.036	0.046	0.047	0.045	0.045	0.047
S_{MS} (g)	0.93	0.93	1.07	1.11	1.08	0.95	0.78	0.78	1.11
S_{M1} (g)	0.37	0.37	0.38	0.49	0.66	0.74	0.70	0.70	0.74
S_{DS} (g)	0.62	0.62	0.71	0.74	0.72	0.63	0.52	0.52	0.74
S_{D1} (g)	0.25	0.25	0.26	0.33	0.44	0.49	0.47	0.47	0.49

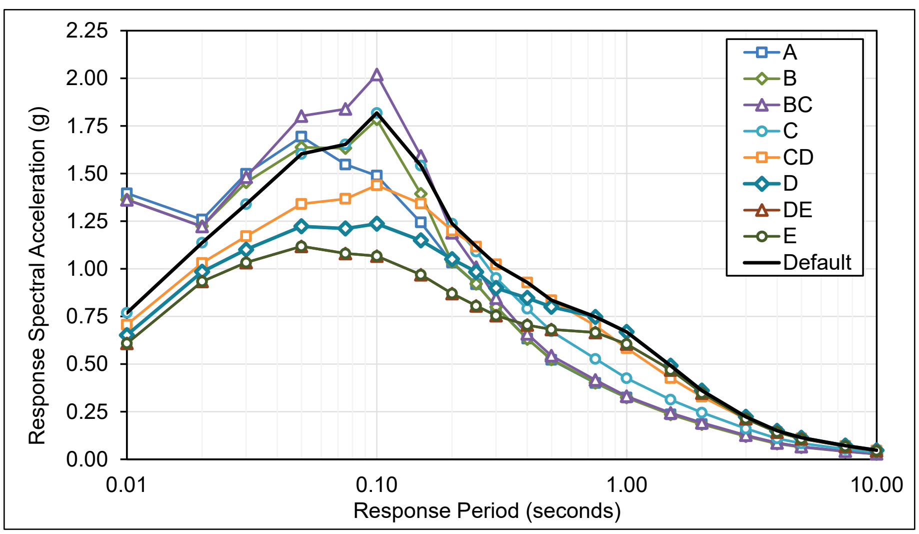


Figure D.2-31 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Memphis Site.

Table D.2-32 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Charleston Site

Period	5%-Damped Response Spectral Acceleration (g)								
***T* (s)**	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	1.836	1.798	1.797	1.566	1.369	1.221	1.108	1.108	1.566
0.01	2.112	2.064	2.063	1.785	1.551	1.380	1.250	1.250	1.785
0.02	2.918	2.853	2.852	2.541	2.242	2.083	1.940	1.940	2.541
0.03	3.398	3.323	3.383	2.910	2.409	2.172	1.982	1.982	2.910
0.05	3.672	3.588	3.916	3.261	2.523	2.152	1.882	1.882	3.261
0.08	3.462	3.647	4.065	3.389	2.536	2.043	1.703	1.703	3.389
0.10	3.278	3.859	4.332	3.654	2.614	2.014	1.599	1.599	3.654
0.15	2.760	3.056	3.460	3.120	2.438	1.834	1.392	1.392	3.120
0.20	2.289	2.265	2.587	2.533	2.215	1.692	1.248	1.248	2.533
0.25	2.015	1.984	2.168	2.229	2.047	1.562	1.118	1.118	2.229
0.30	1.739	1.707	1.805	1.955	1.901	1.442	1.043	1.043	1.955
0.40	1.361	1.336	1.389	1.640	1.812	1.457	1.048	1.048	1.812
0.50	1.104	1.092	1.132	1.387	1.650	1.419	1.046	1.046	1.650
0.75	0.795	0.788	0.817	1.035	1.366	1.391	1.132	1.132	1.391
1.0	0.615	0.606	0.619	0.797	1.089	1.224	1.053	1.053	1.224
1.5	0.412	0.405	0.419	0.539	0.735	0.843	0.795	0.795	0.843
2.0	0.298	0.293	0.304	0.390	0.522	0.570	0.544	0.544	0.570
3.0	0.181	0.174	0.181	0.231	0.303	0.316	0.297	0.297	0.316
4.0	0.115	0.110	0.115	0.146	0.192	0.199	0.187	0.187	0.199
5.0	0.084	0.080	0.084	0.105	0.138	0.142	0.134	0.134	0.142
7.5	0.049	0.046	0.048	0.061	0.079	0.080	0.074	0.074	0.080
10	0.031	0.030	0.031	0.038	0.049	0.050	0.046	0.046	0.050
S_{MS} (g)	2.06	2.04	2.33	2.28	1.99	1.52	1.12	1.12	2.28
S_{M1} (g)	0.62	0.61	0.63	0.81	1.10	1.26	1.19	1.19	1.26
S_{DS} (g)	1.37	1.36	1.55	1.52	1.33	1.02	0.75	0.75	1.52
S_{D1} (g)	0.41	0.41	0.42	0.54	0.73	0.84	0.79	0.79	0.84

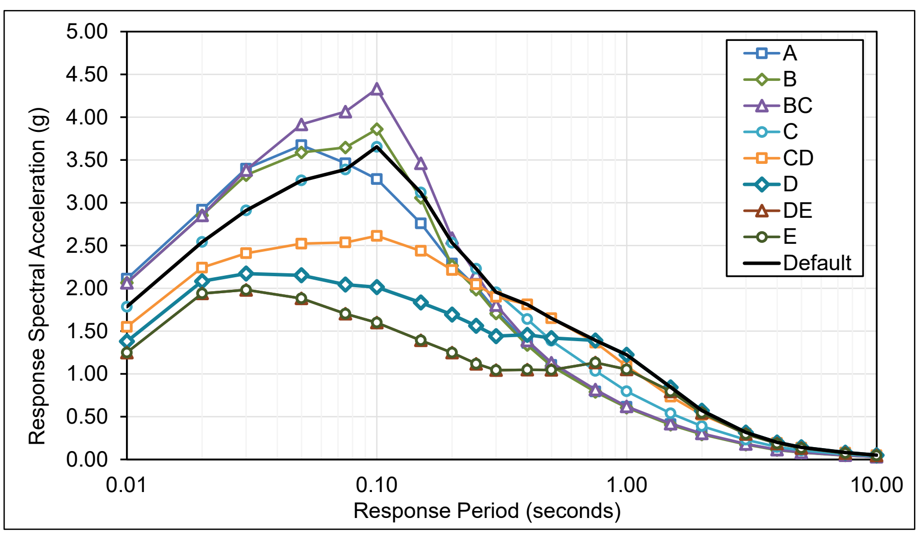


Figure D.2-32 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Charleston Site.

Table D.2-33 **Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Chicago Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.100	0.097	0.097	0.101	0.103	0.104	0.102	0.102	0.104
0.01	0.104	0.102	0.101	0.105	0.107	0.108	0.106	0.106	0.108
0.02	0.136	0.132	0.132	0.135	0.134	0.135	0.133	0.133	0.135
0.03	0.159	0.154	0.157	0.160	0.154	0.156	0.153	0.153	0.160
0.05	0.187	0.181	0.199	0.203	0.193	0.195	0.190	0.190	0.203
0.08	0.194	0.205	0.232	0.238	0.227	0.228	0.221	0.221	0.238
0.10	0.203	0.244	0.278	0.283	0.262	0.261	0.251	0.251	0.283
0.15	0.197	0.220	0.252	0.272	0.281	0.286	0.273	0.273	0.286
0.20	0.183	0.183	0.210	0.240	0.275	0.289	0.276	0.276	0.289
0.25	0.175	0.174	0.190	0.224	0.269	0.290	0.280	0.280	0.290
0.30	0.164	0.162	0.172	0.206	0.256	0.277	0.278	0.278	0.277
0.40	0.141	0.140	0.147	0.181	0.234	0.256	0.260	0.260	0.256
0.50	0.124	0.124	0.129	0.161	0.214	0.240	0.248	0.248	0.240
0.75	0.064	0.065	0.068	0.085	0.116	0.136	0.143	0.143	0.136
1.0	0.056	0.056	0.058	0.074	0.102	0.123	0.123	0.123	0.123
1.5	0.043	0.043	0.045	0.057	0.078	0.091	0.091	0.091	0.091
2.0	0.036	0.037	0.038	0.049	0.065	0.073	0.072	0.072	0.073
3.0	0.025	0.025	0.026	0.033	0.044	0.047	0.047	0.047	0.047
4.0	0.019	0.018	0.019	0.025	0.033	0.035	0.034	0.034	0.035
5.0	0.015	0.015	0.015	0.019	0.025	0.027	0.026	0.026	0.027
7.5	0.010	0.010	0.010	0.013	0.017	0.018	0.018	0.018	0.018
10	0.007	0.007	0.007	0.009	0.012	0.012	0.012	0.012	0.012
S_{MS} (g)	0.17	0.16	0.19	0.22	0.25	0.26	0.25	0.25	0.26
S_{M1} (g)	0.07	0.07	0.08	0.10	0.13	0.15	0.14	0.14	0.15
S_{DS} (g)	0.11	0.11	0.13	0.14	0.17	0.17	0.17	0.17	0.17
S_{D1} (g)	0.05	0.05	0.05	0.06	0.09	0.10	0.10	0.10	0.10

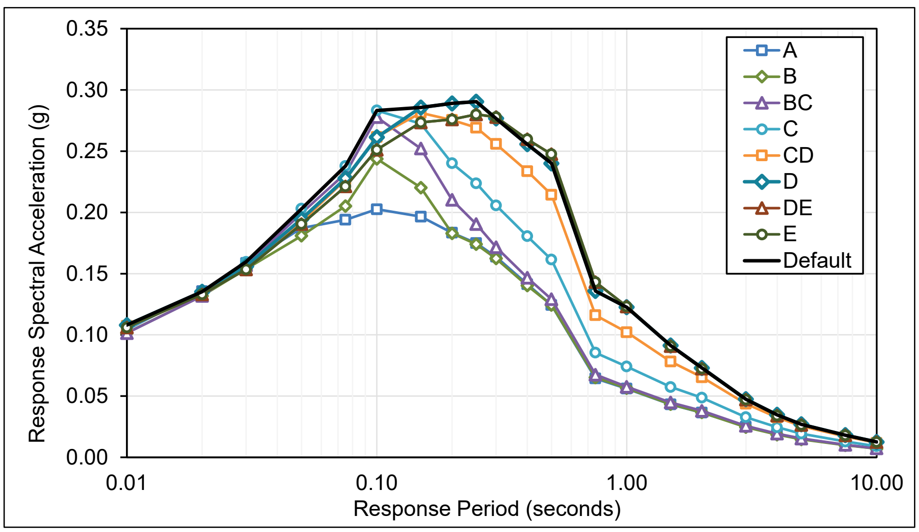


Figure D.2-33 Plots of deterministic MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Chicago Site.

Table D.2-34 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, New York Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.199	0.193	0.193	0.194	0.194	0.191	0.186	0.186	0.194
0.01	0.221	0.214	0.214	0.216	0.215	0.212	0.206	0.206	0.216
0.02	0.331	0.321	0.321	0.321	0.312	0.311	0.304	0.304	0.321
0.03	0.395	0.382	0.389	0.386	0.364	0.363	0.353	0.353	0.386
0.05	0.447	0.430	0.474	0.470	0.433	0.429	0.413	0.413	0.470
0.08	0.413	0.436	0.492	0.490	0.452	0.440	0.419	0.419	0.490
0.10	0.379	0.457	0.521	0.516	0.459	0.443	0.416	0.416	0.516
0.15	0.296	0.334	0.382	0.402	0.399	0.389	0.362	0.362	0.402
0.20	0.233	0.235	0.270	0.302	0.334	0.337	0.312	0.312	0.337
0.25	0.190	0.192	0.210	0.243	0.283	0.293	0.274	0.274	0.293
0.30	0.163	0.163	0.172	0.204	0.247	0.257	0.249	0.249	0.257
0.40	0.123	0.123	0.129	0.158	0.201	0.213	0.209	0.209	0.213
0.50	0.099	0.100	0.104	0.130	0.171	0.186	0.187	0.187	0.186
0.75	0.034	0.034	0.035	0.045	0.060	0.070	0.074	0.074	0.070
1.0	0.028	0.028	0.029	0.037	0.051	0.061	0.061	0.061	0.061
1.5	0.020	0.020	0.021	0.027	0.037	0.043	0.043	0.043	0.043
2.0	0.016	0.016	0.017	0.022	0.029	0.033	0.032	0.032	0.033
3.0	0.010	0.010	0.010	0.013	0.018	0.019	0.019	0.019	0.019
4.0	0.008	0.007	0.008	0.010	0.013	0.014	0.014	0.014	0.014
5.0	0.006	0.006	0.006	0.007	0.010	0.010	0.010	0.010	0.010
7.5	0.004	0.004	0.004	0.005	0.006	0.006	0.006	0.006	0.006
10	0.003	0.002	0.003	0.003	0.004	0.004	0.004	0.004	0.004
S_{MS} (g)	0.21	0.21	0.24	0.27	0.30	0.30	0.28	0.28	0.30
S_{M1} (g)	0.03	0.03	0.03	0.04	0.06	0.07	0.06	0.06	0.07
S_{DS} (g)	0.14	0.14	0.16	0.18	0.20	0.20	0.19	0.19	0.20
S_{D1} (g)	0.02	0.02	0.02	0.03	0.04	0.04	0.04	0.04	0.04

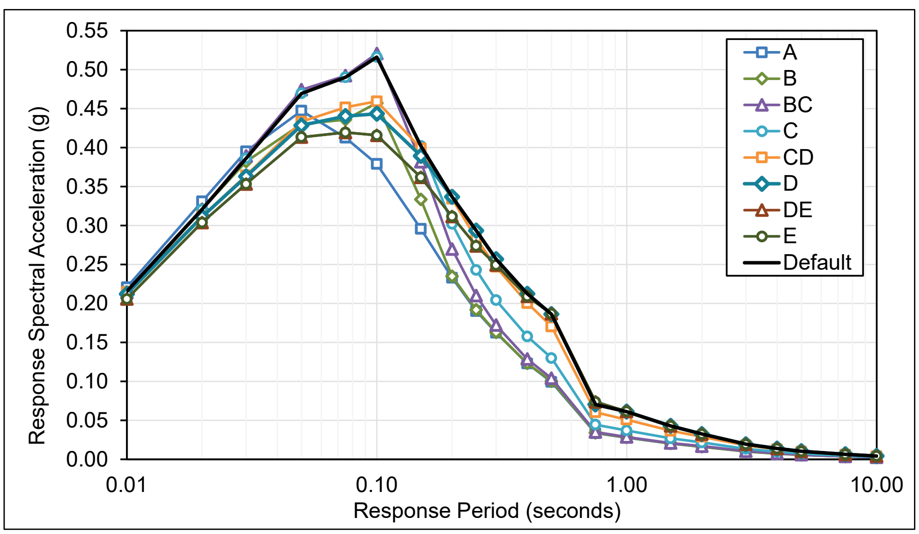


Figure D.2-34 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, New York Site.

D.3 Proposed MCE_R Ground Motions

Table D.3-1 MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Los Angeles Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.664	0.764	0.899	1.007	1.038	0.987	0.860	0.744	1.038
0.01	0.669	0.770	0.905	1.012	1.044	0.993	0.869	0.755	1.044
0.02	0.695	0.797	0.929	1.028	1.051	0.996	0.854	0.726	1.051
0.03	0.833	0.931	1.046	1.111	1.100	1.011	0.823	0.679	1.111
0.05	1.219	1.320	1.380	1.385	1.294	1.136	0.858	0.713	1.385
0.08	1.565	1.720	1.796	1.775	1.624	1.379	1.063	0.953	1.775
0.10	1.653	1.875	2.043	2.064	1.907	1.590	1.256	1.154	2.064
0.15	1.637	1.909	2.269	2.396	2.271	1.880	1.485	1.361	2.396
0.20	1.468	1.745	2.203	2.526	2.473	2.103	1.581	1.400	2.526
0.25	1.306	1.576	2.039	2.492	2.579	2.319	1.687	1.428	2.579
0.30	1.180	1.438	1.882	2.360	2.615	2.495	1.844	1.536	2.615
0.40	0.976	1.198	1.590	2.067	2.483	2.502	2.053	1.671	2.502
0.50	0.841	1.033	1.377	1.813	2.265	2.400	2.141	1.845	2.400
0.75	0.661	0.771	1.016	1.341	1.748	1.966	2.039	1.973	1.966
1.0	0.541	0.599	0.789	1.039	1.381	1.646	1.833	1.967	1.646
1.5	0.384	0.400	0.509	0.662	0.894	1.155	1.443	1.680	1.155
2.0	0.303	0.309	0.367	0.469	0.634	0.863	1.170	1.454	0.863
3.0	0.210	0.213	0.230	0.289	0.388	0.539	0.752	0.954	0.539
4.0	0.153	0.155	0.164	0.203	0.267	0.366	0.505	0.635	0.366
5.0	0.125	0.126	0.128	0.155	0.200	0.270	0.367	0.456	0.270
7.5	0.082	0.082	0.081	0.094	0.117	0.153	0.202	0.245	0.153
10	0.056	0.056	0.056	0.064	0.077	0.098	0.126	0.149	0.098
S_{MS} (g)	1.32	1.57	1.98	2.27	2.35	2.25	1.93	1.66	2.35
S_{M1} (g)	0.54	0.60	0.79	1.04	1.38	1.65	2.11	2.62	1.65
S_{DS} (g)	0.88	1.05	1.32	1.52	1.57	1.50	1.28	1.11	1.57
S_{D1} (g)	0.36	0.40	0.53	0.69	0.92	1.10	1.40	1.74	1.10

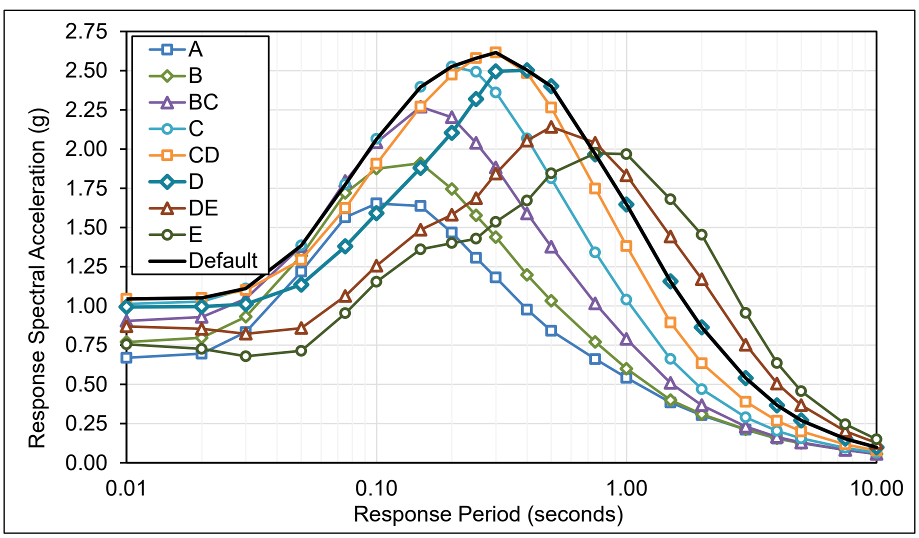


Figure D.3-1 Plots of MCE_R multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Los Angeles Site.

Table D.3-2 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Century City Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.720	0.829	0.970	1.082	1.110	1.045	0.863	0.747	1.110
0.01	0.725	0.835	0.976	1.087	1.116	1.052	0.873	0.760	1.116
0.02	0.755	0.866	1.004	1.107	1.125	1.055	0.857	0.730	1.125
0.03	0.903	1.012	1.133	1.199	1.179	1.072	0.828	0.684	1.199
0.05	1.319	1.427	1.490	1.493	1.385	1.170	0.869	0.730	1.493
0.08	1.686	1.850	1.929	1.908	1.732	1.404	1.087	0.998	1.908
0.10	1.789	2.032	2.202	2.213	2.028	1.615	1.281	1.198	2.213
0.15	1.777	2.072	2.446	2.564	2.403	1.894	1.514	1.408	2.564
0.20	1.584	1.884	2.370	2.703	2.620	2.116	1.595	1.443	2.703
0.25	1.416	1.714	2.211	2.685	2.743	2.330	1.676	1.422	2.743
0.30	1.285	1.573	2.056	2.568	2.803	2.542	1.839	1.529	2.803
0.40	1.066	1.316	1.745	2.264	2.685	2.658	2.089	1.675	2.685
0.50	0.926	1.148	1.526	2.008	2.475	2.574	2.242	1.892	2.574
0.75	0.746	0.879	1.156	1.527	1.964	2.162	2.201	2.149	2.162
1.0	0.623	0.696	0.920	1.219	1.588	1.843	2.011	2.097	1.843
1.5	0.447	0.467	0.600	0.797	1.049	1.313	1.611	1.820	1.313
2.0	0.353	0.362	0.434	0.578	0.758	0.995	1.328	1.601	0.995
3.0	0.249	0.252	0.278	0.368	0.474	0.631	0.866	1.067	0.631
4.0	0.186	0.189	0.204	0.263	0.328	0.428	0.580	0.710	0.428
5.0	0.159	0.160	0.167	0.203	0.244	0.313	0.419	0.508	0.313
7.5	0.107	0.107	0.106	0.122	0.140	0.173	0.225	0.267	0.173
10	0.070	0.070	0.069	0.079	0.089	0.108	0.137	0.160	0.108
S_{MS} (g)	1.43	1.70	2.13	2.43	2.52	2.39	2.02	1.70	2.52
S_{M1} (g)	0.63	0.70	0.92	1.22	1.59	1.84	2.39	2.88	1.84
S_{DS} (g)	0.95	1.13	1.42	1.62	1.68	1.59	1.34	1.14	1.68
S_{D1} (g)	0.42	0.46	0.61	0.81	1.06	1.23	1.59	1.92	1.23

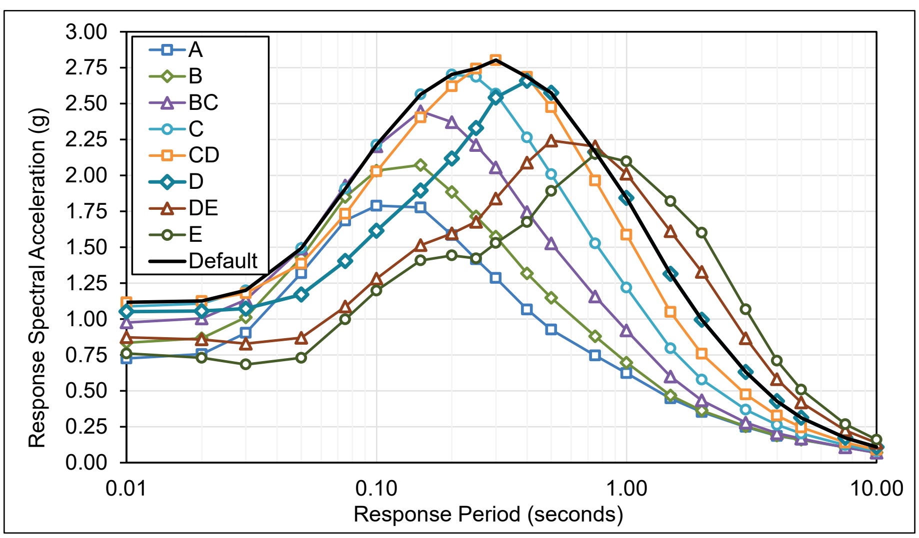


Figure D.3-2 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Century City Site.

Table D.3-3	MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Northridge Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.643	0.714	0.836	0.941	0.956	0.871	0.736	0.668	0.956
0.01	0.646	0.718	0.839	0.943	0.959	0.875	0.751	0.686	0.959
0.02	0.668	0.742	0.859	0.954	0.963	0.875	0.736	0.656	0.963
0.03	0.817	0.883	0.967	1.018	0.997	0.879	0.718	0.624	1.018
0.05	1.208	1.286	1.278	1.258	1.149	0.975	0.797	0.705	1.258
0.08	1.526	1.624	1.651	1.603	1.419	1.234	1.063	0.985	1.603
0.10	1.590	1.737	1.861	1.847	1.669	1.465	1.283	1.179	1.847
0.15	1.598	1.762	2.080	2.167	1.966	1.726	1.493	1.386	2.167
0.20	1.463	1.636	2.064	2.406	2.211	1.822	1.515	1.394	2.406
0.25	1.315	1.493	1.937	2.425	2.424	1.984	1.537	1.375	2.425
0.30	1.183	1.369	1.792	2.261	2.512	2.174	1.641	1.451	2.512
0.40	0.974	1.142	1.526	1.977	2.404	2.303	1.846	1.533	2.404
0.50	0.836	0.999	1.344	1.776	2.191	2.249	1.963	1.720	2.249
0.75	0.651	0.752	0.995	1.318	1.726	1.947	1.933	1.880	1.947
1.0	0.534	0.585	0.772	1.019	1.358	1.641	1.831	1.914	1.641
1.5	0.381	0.392	0.500	0.650	0.878	1.142	1.439	1.683	1.142
2.0	0.302	0.306	0.363	0.463	0.625	0.853	1.161	1.443	0.853
3.0	0.212	0.213	0.230	0.289	0.387	0.537	0.749	0.950	0.537
4.0	0.157	0.158	0.167	0.205	0.269	0.370	0.510	0.641	0.370
5.0	0.129	0.130	0.132	0.158	0.203	0.275	0.374	0.464	0.275
7.5	0.085	0.085	0.084	0.098	0.121	0.158	0.208	0.253	0.158
10	0.058	0.058	0.058	0.066	0.079	0.101	0.129	0.153	0.101
S_{MS} (g)	1.32	1.47	1.86	2.18	2.26	2.07	1.77	1.55	2.26
S_{M1} (g)	0.54	0.59	0.77	1.02	1.36	1.64	2.09	2.60	1.64
S_{DS} (g)	0.88	0.98	1.24	1.45	1.51	1.38	1.18	1.03	1.51
S_{D1} (g)	0.36	0.39	0.51	0.68	0.91	1.09	1.39	1.73	1.09

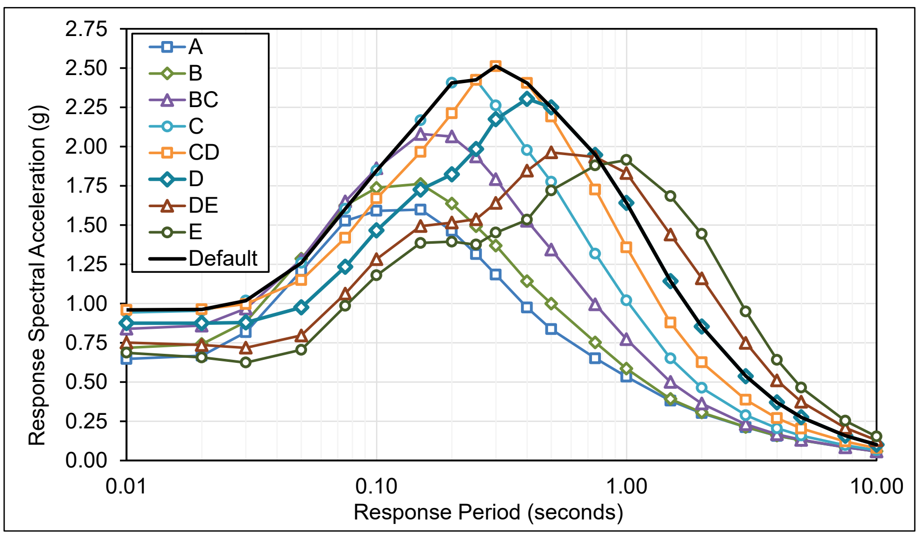


Figure D.3-3 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Northridge Site.

Table D.3-4 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Long Beach Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.587	0.677	0.796	0.897	0.932	0.892	0.816	0.772	0.932
0.01	0.591	0.681	0.801	0.902	0.937	0.898	0.822	0.779	0.937
0.02	0.614	0.705	0.822	0.917	0.944	0.900	0.819	0.751	0.944
0.03	0.728	0.817	0.924	0.990	0.988	0.915	0.808	0.698	0.990
0.05	1.047	1.141	1.210	1.231	1.161	1.028	0.869	0.704	1.231
0.08	1.345	1.482	1.569	1.576	1.458	1.280	1.034	0.907	1.576
0.10	1.439	1.637	1.794	1.831	1.709	1.517	1.212	1.092	1.831
0.15	1.428	1.670	1.986	2.112	2.026	1.824	1.432	1.296	2.112
0.20	1.273	1.519	1.918	2.211	2.193	2.011	1.577	1.375	2.211
0.25	1.137	1.383	1.787	2.186	2.281	2.147	1.722	1.428	2.281
0.30	1.033	1.272	1.662	2.088	2.320	2.244	1.926	1.557	2.320
0.40	0.860	1.068	1.415	1.840	2.213	2.252	2.173	1.756	2.252
0.50	0.752	0.939	1.245	1.637	2.043	2.176	2.160	1.959	2.176
0.75	0.615	0.724	0.946	1.245	1.612	1.812	1.897	1.936	1.812
1.0	0.518	0.576	0.754	1.003	1.314	1.546	1.720	1.814	1.546
1.5	0.381	0.396	0.503	0.674	0.893	1.126	1.395	1.580	1.126
2.0	0.304	0.312	0.371	0.496	0.662	0.873	1.168	1.405	0.873
3.0	0.219	0.222	0.243	0.328	0.431	0.575	0.792	0.973	0.575
4.0	0.165	0.168	0.182	0.246	0.308	0.404	0.550	0.671	0.404
5.0	0.141	0.143	0.149	0.194	0.234	0.300	0.405	0.491	0.300
7.5	0.096	0.097	0.099	0.119	0.136	0.169	0.221	0.264	0.169
10	0.063	0.063	0.065	0.077	0.087	0.105	0.135	0.158	0.105
S_{MS} (g)	1.15	1.37	1.73	1.99	2.09	2.03	1.96	1.76	2.09
S_{M1} (g)	0.55	0.58	0.75	1.00	1.31	1.57	2.14	2.63	1.57
S_{DS} (g)	0.76	0.91	1.15	1.33	1.39	1.35	1.30	1.18	1.39
S_{D1} (g)	0.37	0.38	0.50	0.67	0.88	1.05	1.43	1.75	1.05

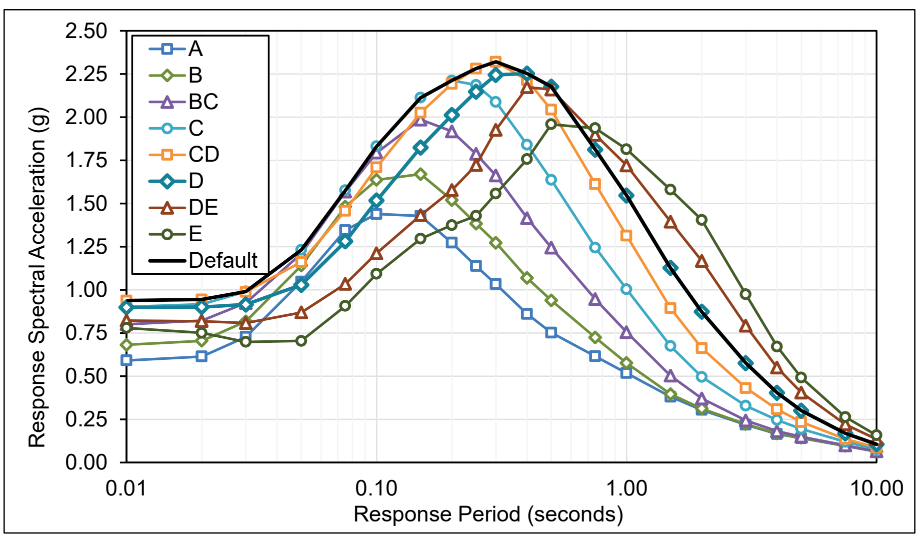


Figure D.3-4 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Long Beach Site.

Table D.3-5 **MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Irvine Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.449	0.516	0.603	0.678	0.726	0.725	0.697	0.683	0.726
0.01	0.452	0.519	0.606	0.682	0.730	0.729	0.703	0.689	0.730
0.02	0.468	0.535	0.621	0.691	0.734	0.731	0.700	0.682	0.734
0.03	0.550	0.615	0.694	0.747	0.771	0.748	0.696	0.669	0.771
0.05	0.783	0.852	0.910	0.936	0.918	0.853	0.771	0.722	0.936
0.08	1.009	1.112	1.187	1.207	1.166	1.076	0.975	0.885	1.207
0.10	1.079	1.226	1.357	1.409	1.379	1.288	1.188	1.056	1.409
0.15	1.073	1.255	1.497	1.625	1.643	1.568	1.426	1.267	1.643
0.20	0.953	1.137	1.430	1.679	1.766	1.725	1.618	1.375	1.766
0.25	0.830	1.005	1.303	1.627	1.805	1.818	1.761	1.454	1.818
0.30	0.730	0.894	1.183	1.525	1.794	1.867	1.861	1.595	1.867
0.40	0.587	0.724	0.983	1.318	1.663	1.821	1.893	1.824	1.821
0.50	0.491	0.608	0.841	1.152	1.508	1.720	1.843	1.939	1.720
0.75	0.358	0.431	0.603	0.842	1.144	1.368	1.539	1.682	1.368
1.0	0.277	0.323	0.455	0.642	0.892	1.115	1.325	1.490	1.115
1.5	0.185	0.207	0.288	0.411	0.585	0.776	1.003	1.194	0.776
2.0	0.143	0.158	0.208	0.294	0.421	0.576	0.788	0.981	0.576
3.0	0.099	0.108	0.131	0.185	0.265	0.368	0.514	0.650	0.368
4.0	0.075	0.081	0.095	0.133	0.188	0.259	0.357	0.448	0.259
5.0	0.062	0.067	0.075	0.103	0.144	0.195	0.265	0.329	0.195
7.5	0.045	0.047	0.051	0.067	0.091	0.119	0.157	0.191	0.119
10	0.034	0.035	0.037	0.048	0.063	0.080	0.103	0.122	0.080
S_{MS} (g)	0.86	1.02	1.29	1.51	1.62	1.68	1.70	1.74	1.68
S_{M1} (g)	0.28	0.32	0.45	0.64	0.89	1.12	1.42	1.77	1.12
S_{DS} (g)	0.57	0.68	0.86	1.01	1.08	1.12	1.14	1.16	1.12
S_{D1} (g)	0.18	0.22	0.30	0.43	0.59	0.74	0.95	1.18	0.74

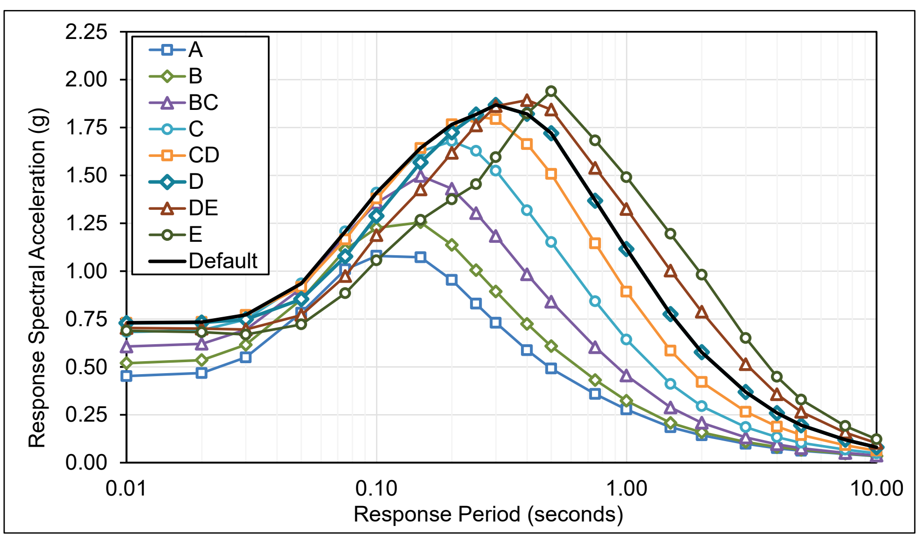


Figure D.3-5 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Irvine Site.

Table D.3-6 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Riverside Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.553	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.811	0.888	0.955	0.958	0.888	0.758	0.627	0.577	0.958
0.08	1.040	1.142	1.214	1.193	1.076	0.904	0.801	0.779	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.930	0.912	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.048	1.015	1.606
0.20	1.012	1.194	1.500	1.710	1.662	1.440	1.153	1.013	1.710
0.25	0.911	1.075	1.397	1.714	1.796	1.584	1.299	1.153	1.796
0.30	0.815	0.976	1.299	1.665	1.859	1.731	1.443	1.301	1.859
0.40	0.689	0.833	1.138	1.525	1.823	1.826	1.607	1.484	1.826
0.50	0.598	0.724	1.009	1.385	1.734	1.803	1.681	1.596	1.803
0.75	0.458	0.536	0.760	1.067	1.407	1.566	1.598	1.589	1.566
1.0	0.355	0.402	0.575	0.828	1.154	1.388	1.512	1.578	1.388
1.5	0.240	0.263	0.373	0.544	0.777	1.023	1.306	1.540	1.023
2.0	0.190	0.206	0.275	0.400	0.575	0.785	1.069	1.332	0.785
3.0	0.138	0.148	0.183	0.267	0.385	0.534	0.745	0.944	0.534
4.0	0.111	0.119	0.141	0.204	0.290	0.398	0.548	0.689	0.398
5.0	0.096	0.102	0.116	0.164	0.230	0.311	0.421	0.524	0.311
7.5	0.070	0.073	0.078	0.106	0.143	0.187	0.245	0.297	0.187
10	0.051	0.052	0.055	0.072	0.094	0.119	0.151	0.179	0.119
S_{MS} (g)	0.91	1.07	1.35	1.54	1.67	1.64	1.51	1.44	1.67
S_{M1} (g)	0.35	0.40	0.58	0.83	1.15	1.44	2.01	2.55	1.44
S_{DS} (g)	0.61	0.72	0.90	1.03	1.12	1.10	1.01	0.96	1.12
S_{D1} (g)	0.24	0.27	0.38	0.55	0.77	0.96	1.34	1.70	0.96

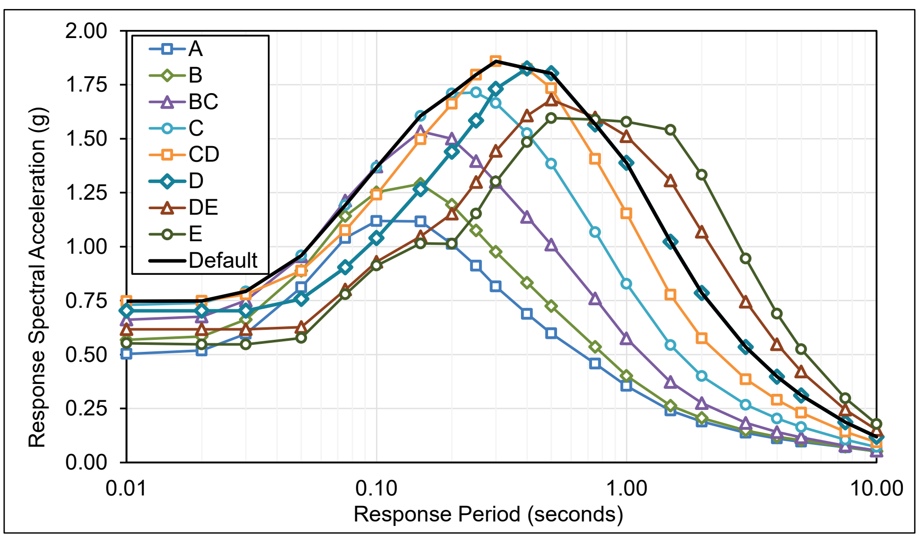


Figure D.3-6 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Riverside Site.

Table D.3-7 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Bernardino Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.881	0.988	1.141	1.248	1.254	1.114	0.896	0.771	1.254
0.01	0.885	0.995	1.147	1.253	1.260	1.123	0.908	0.787	1.260
0.02	0.921	1.039	1.182	1.267	1.261	1.117	0.891	0.754	1.267
0.03	1.123	1.240	1.336	1.358	1.309	1.126	0.864	0.712	1.358
0.05	1.671	1.815	1.775	1.687	1.506	1.218	0.917	0.777	1.687
0.08	2.087	2.260	2.228	2.105	1.818	1.448	1.156	1.055	2.105
0.10	2.123	2.361	2.475	2.394	2.068	1.643	1.337	1.236	2.394
0.15	2.125	2.375	2.808	2.821	2.461	1.933	1.535	1.397	2.821
0.20	1.972	2.215	2.784	3.171	2.816	2.174	1.607	1.418	3.171
0.25	1.731	2.008	2.609	3.229	3.095	2.408	1.691	1.420	3.229
0.30	1.540	1.818	2.418	3.052	3.282	2.663	1.861	1.525	3.282
0.40	1.280	1.531	2.093	2.774	3.296	2.935	2.145	1.692	3.296
0.50	1.101	1.314	1.832	2.498	3.104	2.985	2.363	1.976	3.104
0.75	0.829	0.962	1.364	1.914	2.506	2.706	2.490	2.338	2.706
1.0	0.652	0.739	1.061	1.522	2.066	2.380	2.505	2.540	2.380
1.5	0.444	0.493	0.703	1.023	1.438	1.816	2.186	2.485	1.816
2.0	0.347	0.384	0.521	0.758	1.088	1.462	1.963	2.426	1.462
3.0	0.256	0.282	0.357	0.521	0.752	1.047	1.454	1.848	1.047
4.0	0.209	0.227	0.274	0.395	0.563	0.772	1.068	1.341	0.772
5.0	0.180	0.194	0.223	0.316	0.442	0.596	0.808	1.008	0.596
7.5	0.118	0.123	0.135	0.182	0.245	0.320	0.419	0.510	0.320
10	0.082	0.085	0.090	0.118	0.152	0.192	0.244	0.288	0.192
S_{MS} (g)	1.77	1.99	2.51	2.91	2.97	2.69	2.13	1.78	2.97
S_{M1} (g)	0.65	0.74	1.06	1.52	2.07	2.83	3.93	4.99	2.83
S_{DS} (g)	1.18	1.33	1.67	1.94	1.98	1.79	1.42	1.19	1.98
S_{D1} (g)	0.43	0.49	0.71	1.01	1.38	1.88	2.62	3.33	1.88

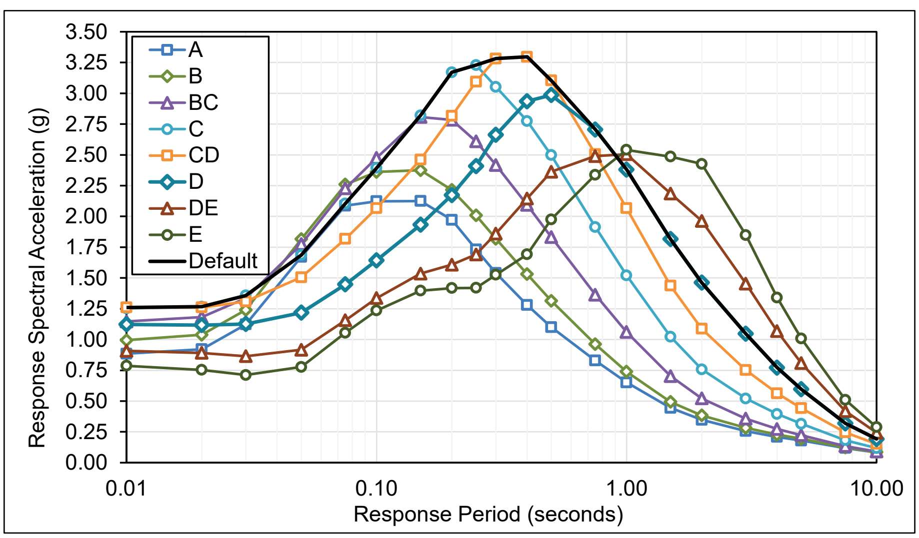


Figure D.3-7 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Bernardino Site.

Table D.3-8 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Luis Obispo Site

Period	5%-Damped Response Spectral Acceleration (g)								
***T* (s)**	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.393	0.451	0.526	0.591	0.630	0.627	0.599	0.586	0.630
0.01	0.395	0.453	0.529	0.594	0.634	0.630	0.603	0.591	0.634
0.02	0.409	0.467	0.542	0.603	0.637	0.631	0.601	0.583	0.637
0.03	0.479	0.536	0.605	0.650	0.668	0.643	0.595	0.570	0.668
0.05	0.679	0.739	0.789	0.809	0.788	0.727	0.652	0.616	0.809
0.08	0.869	0.957	1.021	1.034	0.990	0.907	0.817	0.779	1.034
0.10	0.926	1.050	1.162	1.202	1.166	1.081	0.991	0.951	1.202
0.15	0.912	1.066	1.278	1.389	1.395	1.323	1.233	1.153	1.395
0.20	0.812	0.968	1.224	1.441	1.509	1.466	1.386	1.284	1.509
0.25	0.709	0.856	1.118	1.406	1.554	1.555	1.502	1.371	1.555
0.30	0.625	0.761	1.016	1.322	1.551	1.604	1.591	1.480	1.604
0.40	0.508	0.623	0.854	1.154	1.455	1.582	1.632	1.670	1.582
0.50	0.428	0.526	0.734	1.015	1.328	1.507	1.603	1.677	1.507
0.75	0.315	0.374	0.530	0.749	1.020	1.214	1.356	1.472	1.214
1.0	0.245	0.279	0.399	0.574	0.800	0.997	1.177	1.315	0.997
1.5	0.164	0.180	0.254	0.370	0.530	0.703	0.906	1.076	0.703
2.0	0.128	0.139	0.185	0.268	0.385	0.528	0.721	0.897	0.528
3.0	0.090	0.097	0.118	0.172	0.248	0.345	0.482	0.609	0.345
4.0	0.070	0.074	0.088	0.126	0.180	0.247	0.341	0.428	0.247
5.0	0.058	0.062	0.070	0.100	0.140	0.189	0.256	0.319	0.189
7.5	0.043	0.045	0.049	0.067	0.091	0.119	0.156	0.191	0.119
10	0.033	0.034	0.037	0.049	0.064	0.081	0.104	0.124	0.081
S_{MS} (g)	0.73	0.87	1.10	1.30	1.40	1.44	1.47	1.51	1.44
S_{M1} (g)	0.24	0.28	0.40	0.57	0.80	1.00	1.30	1.64	1.00
S_{DS} (g)	0.49	0.58	0.73	0.86	0.93	0.96	0.98	1.01	0.96
S_{D1} (g)	0.16	0.19	0.27	0.38	0.53	0.66	0.87	1.10	0.66

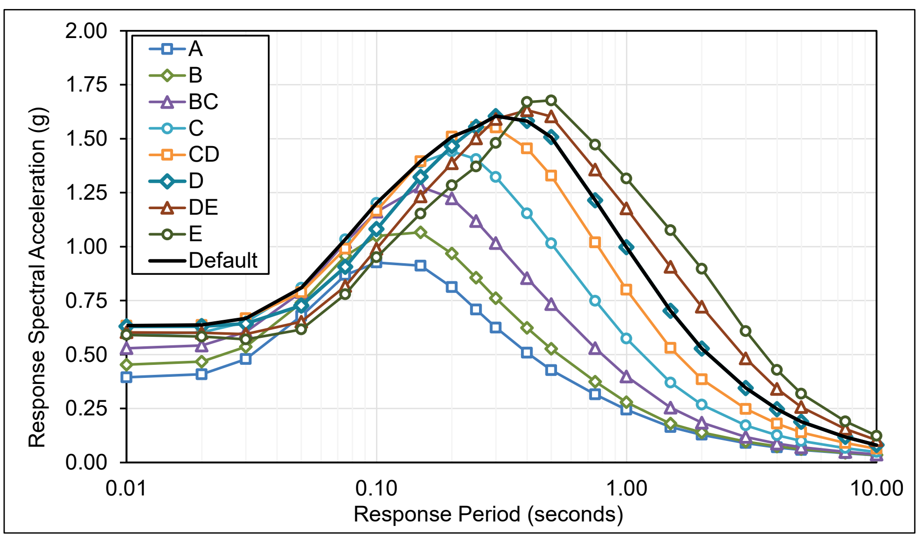


Figure D.3-8 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Luis Obispo Site.

Table D.3-9 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Diego Site

Period *T (s)*	5% -Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.549	0.630	0.731	0.800	0.813	0.760	0.675	0.630	0.813
0.01	0.553	0.634	0.736	0.804	0.817	0.765	0.681	0.636	0.817
0.02	0.577	0.659	0.759	0.821	0.826	0.768	0.674	0.626	0.826
0.03	0.686	0.767	0.856	0.889	0.866	0.780	0.663	0.605	0.889
0.05	0.992	1.079	1.125	1.107	1.015	0.867	0.717	0.647	1.107
0.08	1.259	1.386	1.445	1.400	1.249	1.059	0.882	0.804	1.400
0.10	1.335	1.513	1.634	1.611	1.455	1.240	1.046	0.966	1.611
0.15	1.308	1.530	1.815	1.876	1.739	1.500	1.279	1.180	1.876
0.20	1.153	1.378	1.736	1.969	1.898	1.667	1.434	1.307	1.969
0.25	0.997	1.210	1.574	1.920	1.973	1.781	1.556	1.359	1.973
0.30	0.873	1.065	1.419	1.802	1.980	1.866	1.663	1.462	1.980
0.40	0.700	0.854	1.167	1.565	1.869	1.863	1.740	1.645	1.869
0.50	0.583	0.711	0.991	1.358	1.704	1.793	1.740	1.730	1.793
0.75	0.419	0.500	0.707	0.996	1.320	1.479	1.532	1.588	1.479
1.0	0.315	0.365	0.524	0.753	1.033	1.230	1.368	1.475	1.230
1.5	0.197	0.220	0.313	0.456	0.647	0.839	1.051	1.226	0.839
2.0	0.146	0.160	0.216	0.314	0.451	0.615	0.836	1.036	0.615
3.0	0.095	0.103	0.129	0.188	0.271	0.378	0.529	0.669	0.378
4.0	0.069	0.074	0.088	0.127	0.182	0.251	0.347	0.435	0.251
5.0	0.055	0.058	0.067	0.094	0.132	0.179	0.244	0.303	0.179
7.5	0.036	0.037	0.041	0.055	0.075	0.099	0.130	0.158	0.099
10	0.026	0.027	0.029	0.038	0.051	0.065	0.083	0.099	0.065
S_{MS} (g)	1.04	1.24	1.56	1.77	1.78	1.68	1.57	1.56	1.78
S_{M1} (g)	0.32	0.37	0.52	0.75	1.03	1.23	1.50	1.87	1.23
S_{DS} (g)	0.69	0.83	1.04	1.18	1.19	1.12	1.04	1.04	1.19
S_{D1} (g)	0.21	0.24	0.35	0.50	0.69	0.82	1.00	1.24	0.82

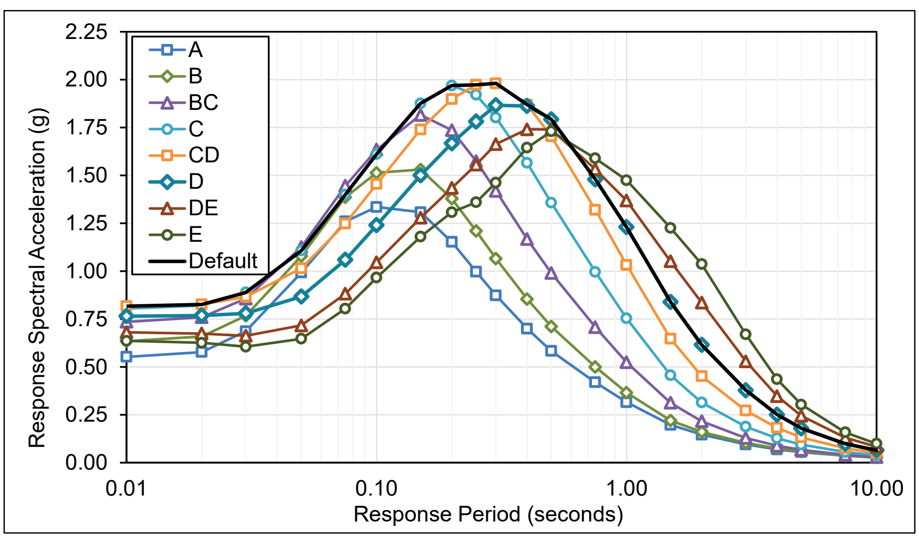


Figure D.3-9 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Diego Site.

Table D.3-10 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Barbara Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.765	0.880	1.016	1.095	1.092	1.007	0.882	0.771	1.095
0.01	0.770	0.885	1.022	1.101	1.099	1.014	0.889	0.778	1.101
0.02	0.801	0.918	1.052	1.121	1.108	1.017	0.883	0.754	1.121
0.03	0.952	1.066	1.178	1.207	1.158	1.028	0.864	0.708	1.207
0.05	1.368	1.490	1.538	1.495	1.345	1.137	0.879	0.713	1.495
0.08	1.747	1.932	1.977	1.895	1.671	1.397	1.055	0.910	1.895
0.10	1.877	2.137	2.267	2.201	1.956	1.631	1.231	1.088	2.201
0.15	1.860	2.181	2.544	2.560	2.323	1.899	1.437	1.288	2.560
0.20	1.645	1.971	2.458	2.714	2.546	2.141	1.572	1.369	2.714
0.25	1.441	1.756	2.259	2.713	2.694	2.378	1.702	1.427	2.713
0.30	1.284	1.583	2.082	2.605	2.784	2.533	1.880	1.553	2.784
0.40	1.049	1.306	1.763	2.320	2.717	2.610	2.174	1.729	2.717
0.50	0.887	1.111	1.527	2.062	2.533	2.568	2.363	1.971	2.568
0.75	0.655	0.814	1.133	1.565	2.043	2.213	2.192	2.146	2.213
1.0	0.504	0.616	0.864	1.210	1.632	1.887	2.017	2.057	1.887
1.5	0.323	0.385	0.537	0.760	1.061	1.346	1.637	1.821	1.346
2.0	0.240	0.284	0.380	0.535	0.756	1.020	1.365	1.629	1.020
3.0	0.156	0.182	0.229	0.321	0.458	0.632	0.877	1.073	0.632
4.0	0.115	0.132	0.160	0.221	0.311	0.424	0.580	0.705	0.424
5.0	0.092	0.104	0.122	0.166	0.229	0.307	0.414	0.498	0.307
7.5	0.061	0.067	0.074	0.098	0.131	0.170	0.221	0.260	0.170
10	0.043	0.047	0.051	0.065	0.084	0.106	0.135	0.156	0.106
S_{MS} (g)	1.48	1.77	2.21	2.44	2.51	2.35	2.13	1.77	2.51
S_{M1} (g)	0.50	0.62	0.86	1.21	1.63	1.89	2.46	2.93	1.89
S_{DS} (g)	0.99	1.18	1.47	1.63	1.67	1.57	1.42	1.18	1.67
S_{D1} (g)	0.34	0.41	0.58	0.81	1.09	1.26	1.64	1.96	1.26

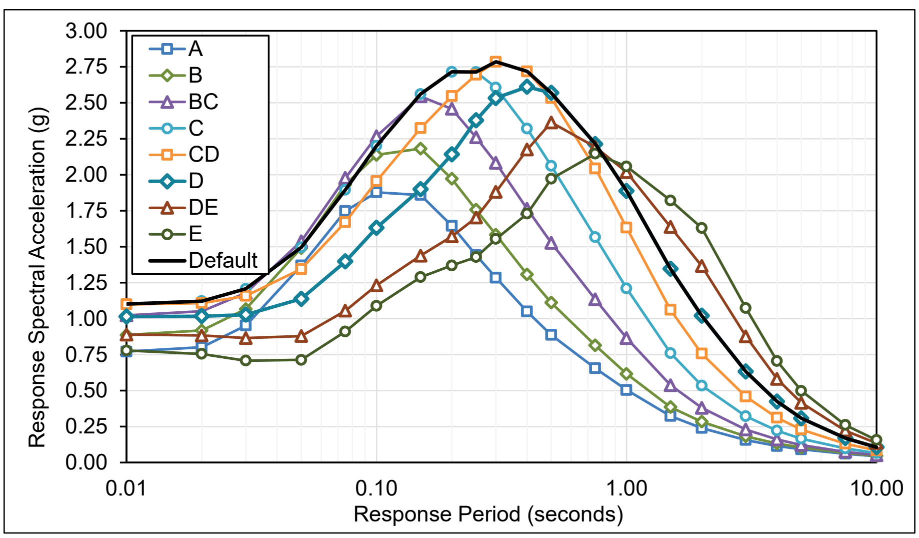


Figure D.3-10 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Barbara Site.

Table D.3-11 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Ventura Site

Period *T (s)*	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.720	0.829	0.962	1.060	1.074	1.002	0.888	0.781	1.074
0.01	0.725	0.835	0.968	1.066	1.080	1.008	0.895	0.789	1.080
0.02	0.755	0.866	0.996	1.085	1.089	1.011	0.889	0.764	1.089
0.03	0.904	1.012	1.123	1.173	1.138	1.022	0.871	0.697	1.173
0.05	1.296	1.407	1.455	1.439	1.316	1.126	0.887	0.703	1.439
0.08	1.648	1.819	1.878	1.833	1.637	1.387	1.018	0.864	1.833
0.10	1.765	2.009	2.151	2.133	1.922	1.606	1.173	1.029	2.133
0.15	1.751	2.053	2.404	2.480	2.288	1.881	1.360	1.208	2.480
0.20	1.555	1.864	2.336	2.628	2.504	2.168	1.502	1.293	2.628
0.25	1.403	1.717	2.207	2.657	2.668	2.393	1.661	1.368	2.668
0.30	1.288	1.599	2.082	2.590	2.780	2.561	1.881	1.522	2.780
0.40	1.083	1.362	1.801	2.334	2.735	2.656	2.244	1.770	2.735
0.50	0.954	1.209	1.605	2.112	2.582	2.637	2.475	2.032	2.637
0.75	0.782	0.950	1.251	1.655	2.126	2.311	2.313	2.279	2.311
1.0	0.657	0.761	1.006	1.347	1.759	2.021	2.171	2.222	2.021
1.5	0.477	0.520	0.671	0.906	1.203	1.499	1.820	2.027	1.499
2.0	0.378	0.405	0.494	0.666	0.894	1.174	1.560	1.861	1.174
3.0	0.268	0.283	0.320	0.433	0.574	0.766	1.052	1.286	0.766
4.0	0.199	0.210	0.234	0.317	0.402	0.526	0.713	0.866	0.526
5.0	0.168	0.176	0.189	0.246	0.300	0.386	0.517	0.623	0.386
7.5	0.113	0.116	0.122	0.147	0.171	0.212	0.275	0.326	0.212
10	0.072	0.075	0.078	0.092	0.106	0.128	0.162	0.189	0.128
S_{MS} (g)	1.40	1.68	2.10	2.39	2.50	2.39	2.23	1.83	2.50
S_{M1} (g)	0.68	0.76	1.01	1.35	1.76	2.11	2.84	3.47	2.11
S_{DS} (g)	0.93	1.12	1.40	1.59	1.67	1.59	1.49	1.22	1.67
S_{D1} (g)	0.45	0.51	0.67	0.90	1.17	1.41	1.89	2.31	1.41

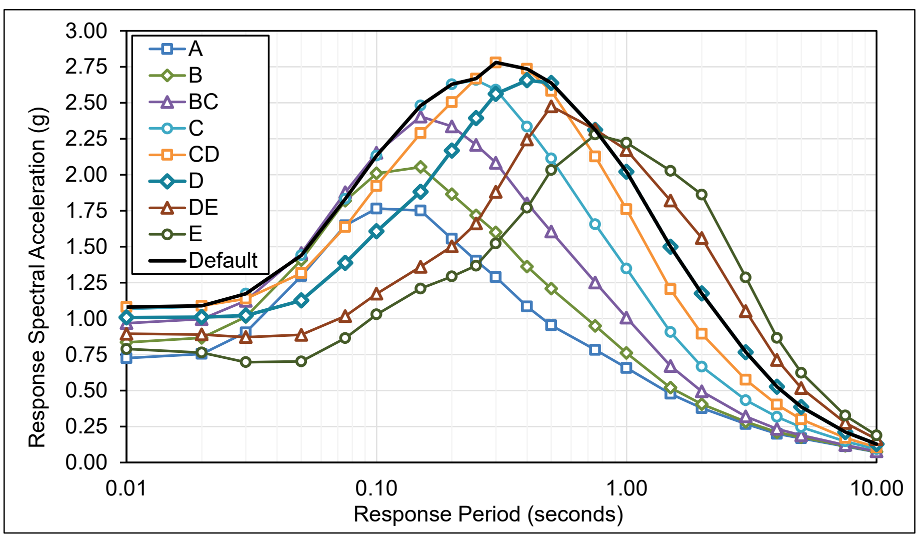


Figure D.3-11 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Ventura Site.

Table D.3-12 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Oakland Site

Period *T (s)*	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.639	0.727	0.840	0.929	0.938	0.841	0.704	0.628	0.938
0.01	0.644	0.734	0.845	0.932	0.942	0.847	0.713	0.640	0.942
0.02	0.675	0.769	0.874	0.945	0.944	0.845	0.705	0.621	0.945
0.03	0.844	0.933	0.997	1.017	0.984	0.856	0.692	0.597	1.017
0.05	1.305	1.384	1.346	1.276	1.136	0.950	0.759	0.673	1.276
0.08	1.585	1.719	1.681	1.588	1.397	1.161	0.977	0.903	1.588
0.10	1.581	1.773	1.856	1.812	1.603	1.338	1.151	1.072	1.812
0.15	1.558	1.761	2.071	2.131	1.912	1.586	1.330	1.256	2.131
0.20	1.432	1.610	2.052	2.373	2.172	1.762	1.380	1.275	2.373
0.25	1.304	1.489	1.932	2.402	2.360	1.929	1.444	1.251	2.402
0.30	1.182	1.359	1.782	2.246	2.460	2.104	1.567	1.314	2.460
0.40	0.988	1.146	1.524	1.972	2.387	2.242	1.768	1.484	2.387
0.50	0.862	1.003	1.338	1.759	2.194	2.199	1.857	1.604	2.199
0.75	0.685	0.760	0.999	1.328	1.745	1.884	1.815	1.745	1.884
1.0	0.566	0.596	0.781	1.038	1.412	1.651	1.733	1.789	1.651
1.5	0.417	0.407	0.513	0.671	0.945	1.208	1.478	1.691	1.208
2.0	0.339	0.324	0.378	0.485	0.694	0.942	1.277	1.587	0.942
3.0	0.250	0.237	0.249	0.314	0.452	0.632	0.889	1.118	0.632
4.0	0.190	0.182	0.185	0.238	0.339	0.471	0.655	0.815	0.471
5.0	0.157	0.151	0.148	0.188	0.263	0.359	0.492	0.607	0.359
7.5	0.099	0.100	0.096	0.110	0.148	0.194	0.256	0.311	0.194
10	0.067	0.069	0.070	0.077	0.099	0.125	0.158	0.187	0.125
S_{MS} (g)	1.29	1.45	1.85	2.16	2.21	2.02	1.67	1.44	2.21
S_{M1} (g)	0.61	0.60	0.78	1.04	1.41	1.71	2.40	3.02	1.71
S_{DS} (g)	0.86	0.97	1.23	1.44	1.48	1.35	1.11	0.96	1.48
S_{D1} (g)	0.41	0.40	0.52	0.69	0.94	1.14	1.60	2.01	1.14

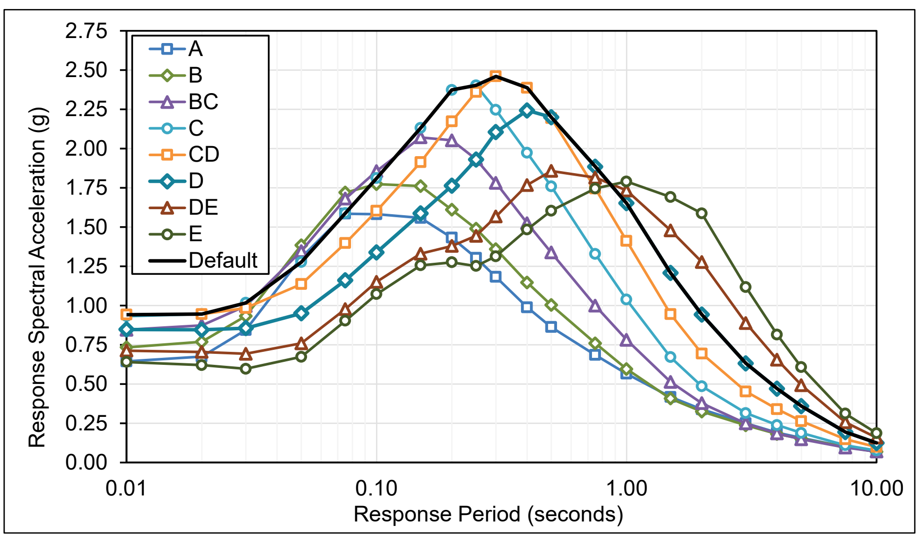


Figure D.3-12 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Oakland Site.

Table D.3-13 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Concord Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.850	0.967	1.112	1.211	1.179	1.033	0.829	0.718	1.211
0.01	0.856	0.976	1.119	1.215	1.183	1.038	0.837	0.729	1.215
0.02	0.898	1.024	1.161	1.235	1.189	1.038	0.827	0.707	1.235
0.03	1.107	1.234	1.322	1.322	1.232	1.046	0.808	0.673	1.322
0.05	1.629	1.765	1.727	1.630	1.431	1.155	0.876	0.748	1.630
0.08	2.059	2.227	2.175	2.048	1.751	1.399	1.124	1.039	2.048
0.10	2.088	2.346	2.442	2.342	2.007	1.607	1.326	1.243	2.342
0.15	2.068	2.359	2.767	2.773	2.396	1.903	1.554	1.449	2.773
0.20	1.870	2.151	2.722	3.125	2.730	2.111	1.611	1.466	3.125
0.25	1.684	1.973	2.551	3.160	2.978	2.300	1.637	1.413	3.160
0.30	1.517	1.800	2.345	2.926	3.102	2.506	1.757	1.466	3.102
0.40	1.243	1.479	1.956	2.522	2.987	2.686	1.995	1.584	2.987
0.50	1.070	1.275	1.690	2.212	2.678	2.617	2.116	1.780	2.678
0.75	0.826	0.950	1.250	1.664	2.106	2.246	2.128	2.020	2.246
1.0	0.666	0.732	0.967	1.299	1.684	1.927	2.027	2.067	1.927
1.5	0.474	0.475	0.609	0.812	1.069	1.355	1.653	1.865	1.355
2.0	0.373	0.362	0.433	0.570	0.749	1.016	1.377	1.683	1.016
3.0	0.260	0.249	0.267	0.344	0.449	0.632	0.889	1.111	0.632
4.0	0.190	0.183	0.189	0.238	0.321	0.439	0.603	0.745	0.439
5.0	0.152	0.155	0.152	0.188	0.236	0.317	0.428	0.524	0.317
7.5	0.093	0.095	0.096	0.110	0.132	0.172	0.225	0.270	0.172
10	0.062	0.064	0.066	0.076	0.088	0.110	0.140	0.165	0.110
S_{MS} (g)	1.68	1.94	2.45	2.84	2.79	2.42	1.90	1.60	2.84
S_{M1} (g)	0.67	0.73	0.97	1.30	1.68	1.93	2.48	3.03	1.93
S_{DS} (g)	1.12	1.29	1.63	1.90	1.86	1.61	1.27	1.07	1.90
S_{D1} (g)	0.45	0.49	0.64	0.87	1.12	1.28	1.65	2.02	1.28

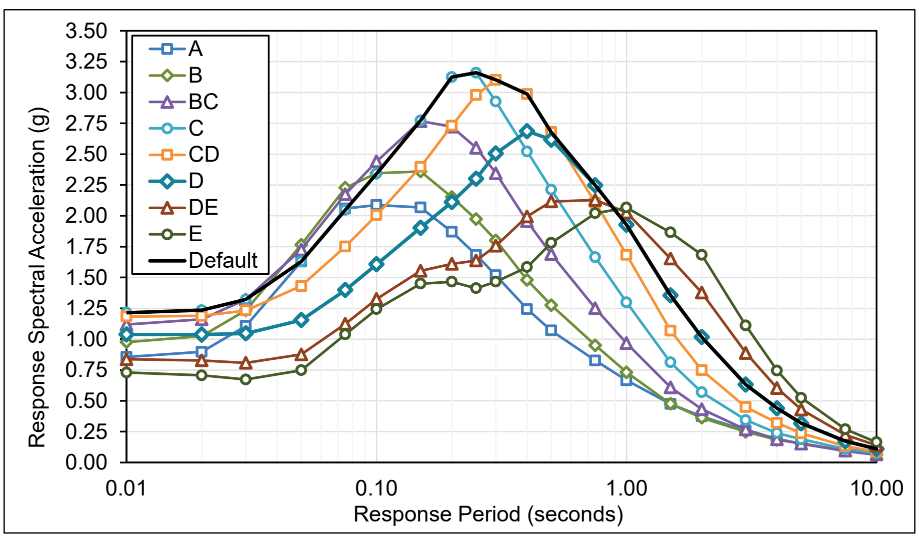


Figure D.3-13 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Concord Site.

Table D.3-14 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Monterey Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.478	0.550	0.643	0.721	0.768	0.760	0.727	0.709	0.768
0.01	0.481	0.553	0.646	0.725	0.772	0.765	0.730	0.715	0.772
0.02	0.498	0.570	0.662	0.736	0.776	0.767	0.730	0.707	0.776
0.03	0.585	0.656	0.740	0.795	0.815	0.783	0.724	0.668	0.815
0.05	0.835	0.910	0.971	0.994	0.968	0.893	0.803	0.701	0.994
0.08	1.070	1.181	1.259	1.274	1.221	1.120	1.009	0.901	1.274
0.10	1.139	1.293	1.430	1.478	1.435	1.335	1.171	1.075	1.478
0.15	1.120	1.309	1.570	1.703	1.709	1.624	1.404	1.289	1.709
0.20	0.998	1.187	1.502	1.768	1.846	1.790	1.559	1.372	1.846
0.25	0.870	1.047	1.369	1.722	1.896	1.891	1.672	1.389	1.896
0.30	0.766	0.930	1.242	1.615	1.891	1.947	1.838	1.488	1.947
0.40	0.623	0.761	1.042	1.407	1.770	1.913	1.969	1.675	1.913
0.50	0.526	0.643	0.897	1.239	1.615	1.819	1.922	1.863	1.819
0.75	0.388	0.459	0.649	0.917	1.243	1.466	1.621	1.754	1.466
1.0	0.301	0.343	0.490	0.705	0.980	1.211	1.415	1.575	1.211
1.5	0.202	0.221	0.313	0.456	0.652	0.858	1.097	1.297	0.858
2.0	0.158	0.171	0.228	0.331	0.476	0.650	0.886	1.102	0.650
3.0	0.111	0.120	0.147	0.215	0.310	0.430	0.600	0.759	0.430
4.0	0.087	0.093	0.110	0.159	0.226	0.310	0.428	0.538	0.310
5.0	0.073	0.078	0.089	0.126	0.176	0.238	0.322	0.401	0.238
7.5	0.053	0.055	0.060	0.082	0.110	0.144	0.189	0.231	0.144
10	0.039	0.041	0.044	0.058	0.076	0.096	0.122	0.146	0.096
S_{MS} (g)	0.90	1.07	1.35	1.59	1.71	1.75	1.77	1.68	1.75
S_{M1} (g)	0.30	0.34	0.49	0.70	0.98	1.21	1.62	2.05	1.21
S_{DS} (g)	0.60	0.71	0.90	1.06	1.14	1.17	1.18	1.12	1.17
S_{D1} (g)	0.20	0.23	0.33	0.47	0.65	0.81	1.08	1.37	0.81

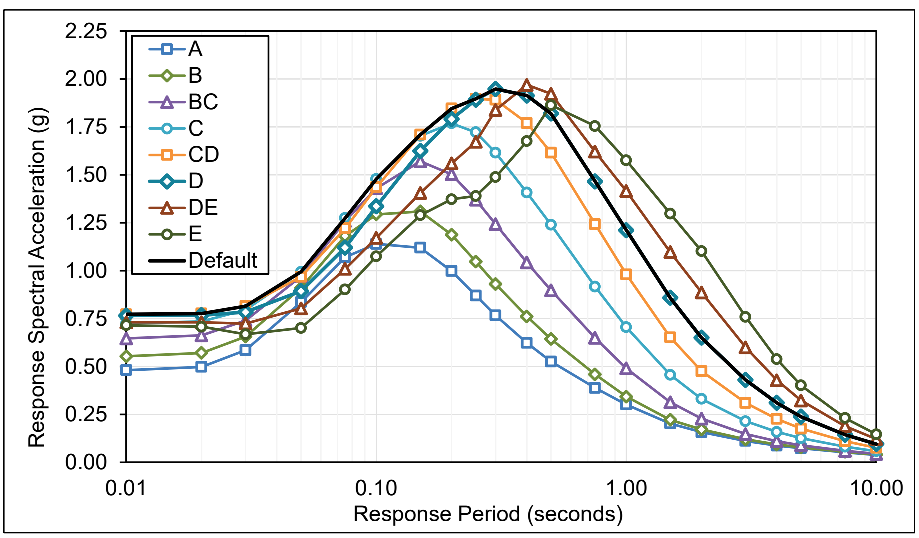


Figure D.3-14 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Monterey Site.

Table D.3-15 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Sacramento Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.214	0.246	0.289	0.332	0.373	0.398	0.412	0.425	0.398
0.01	0.215	0.248	0.290	0.334	0.375	0.400	0.415	0.427	0.400
0.02	0.222	0.254	0.295	0.337	0.376	0.400	0.414	0.423	0.400
0.03	0.256	0.287	0.326	0.362	0.394	0.410	0.414	0.418	0.410
0.05	0.352	0.383	0.418	0.448	0.467	0.468	0.457	0.452	0.468
0.08	0.447	0.494	0.542	0.577	0.597	0.594	0.580	0.576	0.597
0.10	0.482	0.549	0.622	0.680	0.717	0.725	0.720	0.724	0.725
0.15	0.478	0.562	0.680	0.785	0.866	0.907	0.927	0.875	0.907
0.20	0.429	0.516	0.655	0.805	0.931	1.007	1.055	1.010	1.007
0.25	0.378	0.461	0.605	0.782	0.947	1.061	1.147	1.153	1.061
0.30	0.336	0.416	0.556	0.740	0.936	1.083	1.209	1.300	1.083
0.40	0.277	0.347	0.476	0.653	0.870	1.052	1.225	1.350	1.052
0.50	0.238	0.300	0.418	0.585	0.800	0.997	1.194	1.344	0.997
0.75	0.181	0.220	0.310	0.441	0.618	0.794	0.986	1.154	0.794
1.0	0.143	0.167	0.238	0.344	0.489	0.646	0.832	0.999	0.646
1.5	0.100	0.114	0.160	0.235	0.339	0.461	0.622	0.776	0.461
2.0	0.081	0.091	0.122	0.178	0.256	0.351	0.483	0.616	0.351
3.0	0.057	0.065	0.081	0.119	0.171	0.234	0.324	0.417	0.234
4.0	0.044	0.050	0.061	0.089	0.126	0.171	0.233	0.299	0.171
5.0	0.037	0.042	0.050	0.072	0.099	0.132	0.178	0.226	0.132
7.5	0.029	0.033	0.038	0.053	0.071	0.091	0.119	0.151	0.091
10	0.024	0.027	0.031	0.042	0.055	0.069	0.088	0.108	0.069
S_{MS} (g)	0.39	0.46	0.59	0.72	0.85	0.97	1.10	1.22	0.97
S_{M1} (g)	0.15	0.17	0.24	0.34	0.49	0.65	0.88	1.13	0.65
S_{DS} (g)	0.26	0.31	0.39	0.48	0.57	0.65	0.74	0.81	0.65
S_{D1} (g)	0.10	0.11	0.16	0.23	0.33	0.43	0.58	0.75	0.43

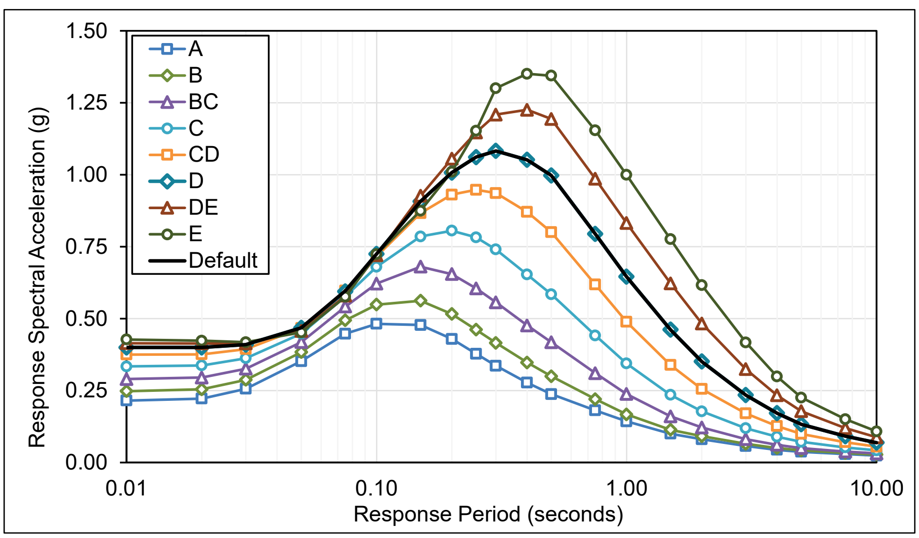


Figure D.3-15 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Sacramento Site.

Table D.3-16 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Francisco Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.758	0.715	0.625	0.573	0.758
0.01	0.503	0.568	0.662	0.730	0.762	0.720	0.632	0.583	0.762
0.02	0.519	0.583	0.676	0.739	0.760	0.716	0.624	0.563	0.760
0.03	0.616	0.679	0.750	0.792	0.791	0.724	0.617	0.547	0.792
0.05	0.925	0.981	0.989	0.980	0.921	0.800	0.663	0.598	0.980
0.08	1.145	1.236	1.263	1.241	1.134	0.972	0.836	0.795	1.241
0.10	1.185	1.311	1.412	1.419	1.301	1.115	0.970	0.933	1.419
0.15	1.202	1.337	1.588	1.666	1.552	1.316	1.115	1.065	1.666
0.20	1.120	1.248	1.573	1.848	1.776	1.498	1.186	1.089	1.848
0.25	1.009	1.127	1.468	1.861	1.932	1.675	1.299	1.153	1.932
0.30	0.906	1.014	1.350	1.744	2.005	1.830	1.443	1.301	2.005
0.40	0.753	0.850	1.161	1.544	1.946	1.935	1.644	1.484	1.946
0.50	0.649	0.735	1.023	1.394	1.794	1.897	1.709	1.596	1.897
0.75	0.484	0.538	0.761	1.067	1.427	1.622	1.630	1.594	1.622
1.0	0.380	0.417	0.600	0.859	1.168	1.392	1.528	1.598	1.392
1.5	0.265	0.288	0.410	0.600	0.839	1.086	1.348	1.540	1.086
2.0	0.214	0.233	0.309	0.452	0.640	0.877	1.192	1.458	0.877
3.0	0.168	0.180	0.221	0.314	0.449	0.632	0.889	1.111	0.632
4.0	0.140	0.155	0.182	0.251	0.356	0.485	0.665	0.839	0.485
5.0	0.121	0.132	0.151	0.206	0.288	0.388	0.526	0.657	0.388
7.5	0.084	0.089	0.097	0.128	0.172	0.224	0.293	0.359	0.224
10	0.060	0.063	0.067	0.086	0.112	0.141	0.179	0.213	0.141
S_{MS} (g)	1.01	1.12	1.42	1.67	1.80	1.74	1.54	1.44	1.80
S_{M1} (g)	0.39	0.42	0.60	0.86	1.30	1.75	2.40	3.02	1.75
S_{DS} (g)	0.67	0.75	0.94	1.12	1.20	1.16	1.03	0.96	1.20
S_{D1} (g)	0.26	0.28	0.40	0.57	0.86	1.17	1.60	2.01	1.17

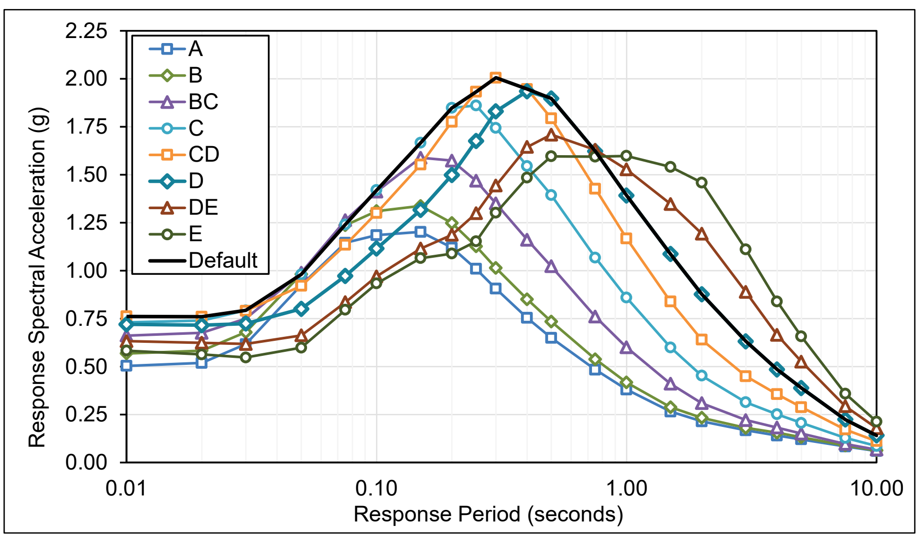


Figure D.3-16 Plots of MCE$_R$ multi-period response spectra (MPRS) propose deterministic d for the 2020 *NEHRP Provisions* and ASCE 7-22, San Francisco Site.

Table D.3-17 **MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Mateo Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.654	0.737	0.855	0.953	0.975	0.893	0.751	0.667	0.975
0.01	0.658	0.742	0.860	0.957	0.979	0.900	0.760	0.679	0.979
0.02	0.685	0.774	0.884	0.968	0.979	0.895	0.747	0.653	0.979
0.03	0.845	0.930	1.004	1.040	1.018	0.902	0.727	0.619	1.040
0.05	1.304	1.380	1.349	1.297	1.178	0.982	0.771	0.669	1.297
0.08	1.588	1.713	1.702	1.628	1.434	1.175	0.955	0.878	1.628
0.10	1.602	1.777	1.881	1.852	1.638	1.341	1.104	1.029	1.852
0.15	1.597	1.780	2.095	2.174	1.956	1.593	1.289	1.195	2.174
0.20	1.473	1.645	2.077	2.418	2.238	1.813	1.388	1.245	2.418
0.25	1.343	1.512	1.962	2.445	2.442	2.017	1.491	1.271	2.445
0.30	1.229	1.394	1.831	2.304	2.558	2.212	1.649	1.375	2.558
0.40	1.047	1.200	1.601	2.071	2.524	2.378	1.887	1.545	2.524
0.50	0.928	1.067	1.431	1.883	2.352	2.371	2.009	1.740	2.371
0.75	0.756	0.830	1.096	1.456	1.909	2.085	1.998	1.914	2.085
1.0	0.635	0.664	0.875	1.160	1.575	1.835	1.940	1.996	1.835
1.5	0.482	0.476	0.607	0.793	1.112	1.410	1.709	1.953	1.410
2.0	0.395	0.392	0.467	0.599	0.854	1.155	1.560	1.942	1.155
3.0	0.298	0.308	0.339	0.427	0.613	0.847	1.180	1.505	0.847
4.0	0.236	0.245	0.266	0.328	0.466	0.639	0.880	1.109	0.639
5.0	0.200	0.207	0.217	0.263	0.366	0.493	0.668	0.834	0.493
7.5	0.129	0.131	0.133	0.155	0.207	0.270	0.353	0.432	0.270
10	0.087	0.089	0.090	0.102	0.131	0.166	0.210	0.250	0.166
S_{MS} (g)	1.33	1.48	1.87	2.20	2.30	2.14	1.81	1.57	2.30
S_{M1} (g)	0.71	0.71	0.87	1.16	1.68	2.30	3.18	4.06	2.30
S_{DS} (g)	0.88	0.99	1.25	1.47	1.53	1.43	1.21	1.04	1.53
S_{D1} (g)	0.47	0.47	0.58	0.77	1.12	1.53	2.12	2.71	1.53

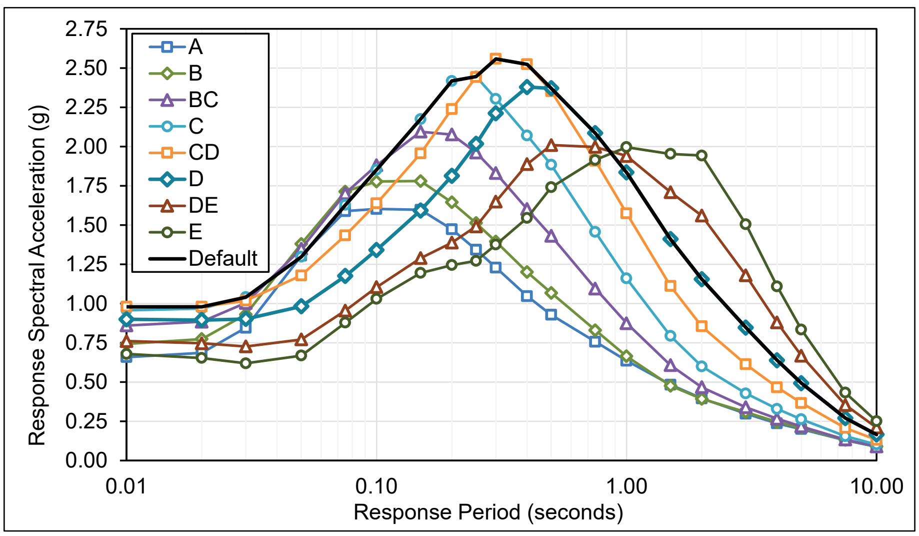


Figure D.3-17 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Mateo Site.

Table D.3-18 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Jose Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.917	0.972	0.955	0.958	0.888	0.758	0.635	0.599	0.958
0.08	1.126	1.227	1.214	1.193	1.076	0.925	0.851	0.825	1.193
0.10	1.119	1.263	1.371	1.368	1.241	1.083	1.019	0.991	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.190	1.160	1.606
0.20	1.012	1.194	1.500	1.710	1.662	1.440	1.173	1.154	1.710
0.25	0.912	1.075	1.397	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.832	0.976	1.299	1.665	1.835	1.705	1.443	1.301	1.835
0.40	0.696	0.833	1.138	1.525	1.823	1.802	1.607	1.484	1.823
0.50	0.617	0.738	1.009	1.385	1.734	1.803	1.681	1.596	1.803
0.75	0.546	0.606	0.760	1.067	1.407	1.566	1.598	1.589	1.566
1.0	0.487	0.491	0.600	0.859	1.168	1.388	1.512	1.578	1.388
1.5	0.392	0.360	0.416	0.600	0.839	1.086	1.348	1.540	1.086
2.0	0.330	0.304	0.327	0.452	0.640	0.877	1.192	1.458	0.877
3.0	0.260	0.244	0.253	0.314	0.449	0.632	0.889	1.111	0.632
4.0	0.230	0.223	0.226	0.265	0.339	0.471	0.655	0.815	0.471
5.0	0.201	0.201	0.203	0.234	0.263	0.359	0.492	0.607	0.359
7.5	0.134	0.134	0.131	0.150	0.171	0.209	0.271	0.325	0.209
10	0.087	0.088	0.087	0.097	0.109	0.131	0.165	0.196	0.131
S_{MS} (g)	0.91	1.07	1.35	1.54	1.65	1.62	1.51	1.44	1.65
S_{M1} (g)	0.59	0.55	0.60	0.86	1.22	1.71	2.40	3.00	1.71
S_{DS} (g)	0.61	0.72	0.90	1.03	1.10	1.08	1.01	0.96	1.10
S_{D1} (g)	0.40	0.36	0.40	0.57	0.81	1.14	1.60	2.00	1.14

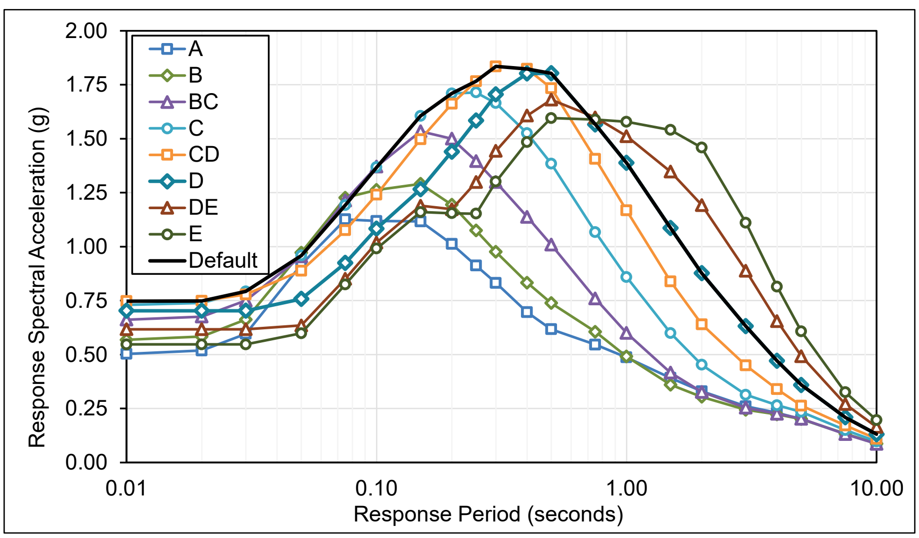


Figure D.3-18 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, San Jose Site.

Table D.3-19 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Cruz Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.532	0.612	0.698	0.760	0.780	0.754	0.651	0.554	0.780
0.01	0.536	0.617	0.702	0.763	0.785	0.759	0.658	0.563	0.785
0.02	0.561	0.644	0.726	0.777	0.788	0.734	0.649	0.548	0.788
0.03	0.680	0.762	0.825	0.842	0.825	0.744	0.636	0.547	0.842
0.05	0.979	1.064	1.105	1.061	0.971	0.831	0.663	0.603	1.061
0.08	1.256	1.383	1.398	1.340	1.204	1.045	0.860	0.824	1.340
0.10	1.288	1.461	1.547	1.529	1.391	1.194	1.028	0.997	1.529
0.15	1.251	1.448	1.704	1.777	1.663	1.433	1.258	1.195	1.777
0.20	1.127	1.307	1.645	1.897	1.850	1.595	1.319	1.231	1.897
0.25	0.999	1.157	1.506	1.870	1.948	1.717	1.388	1.209	1.948
0.30	0.890	1.029	1.371	1.756	1.979	1.887	1.504	1.301	1.979
0.40	0.736	0.853	1.166	1.556	1.969	1.951	1.607	1.484	1.969
0.50	0.632	0.753	1.051	1.438	1.813	2.022	1.681	1.596	2.022
0.75	0.469	0.549	0.777	1.098	1.489	1.710	1.598	1.589	1.710
1.0	0.365	0.413	0.591	0.851	1.183	1.459	1.512	1.578	1.459
1.5	0.248	0.271	0.383	0.559	0.798	1.047	1.333	1.540	1.047
2.0	0.195	0.211	0.283	0.411	0.590	0.806	1.097	1.367	0.806
3.0	0.140	0.151	0.187	0.272	0.392	0.544	0.759	0.962	0.544
4.0	0.112	0.120	0.142	0.205	0.292	0.401	0.552	0.694	0.401
5.0	0.096	0.102	0.116	0.165	0.230	0.311	0.421	0.525	0.311
7.5	0.069	0.071	0.077	0.105	0.141	0.184	0.242	0.295	0.184
10	0.049	0.051	0.055	0.072	0.094	0.119	0.151	0.180	0.119
S_{MS} (g)	1.01	1.18	1.48	1.71	1.78	1.82	1.51	1.44	1.82
S_{M1} (g)	0.37	0.41	0.59	0.85	1.18	1.47	2.05	2.60	1.47
S_{DS} (g)	0.68	0.78	0.99	1.14	1.19	1.21	1.01	0.96	1.21
S_{D1} (g)	0.24	0.28	0.39	0.57	0.79	0.98	1.37	1.73	0.98

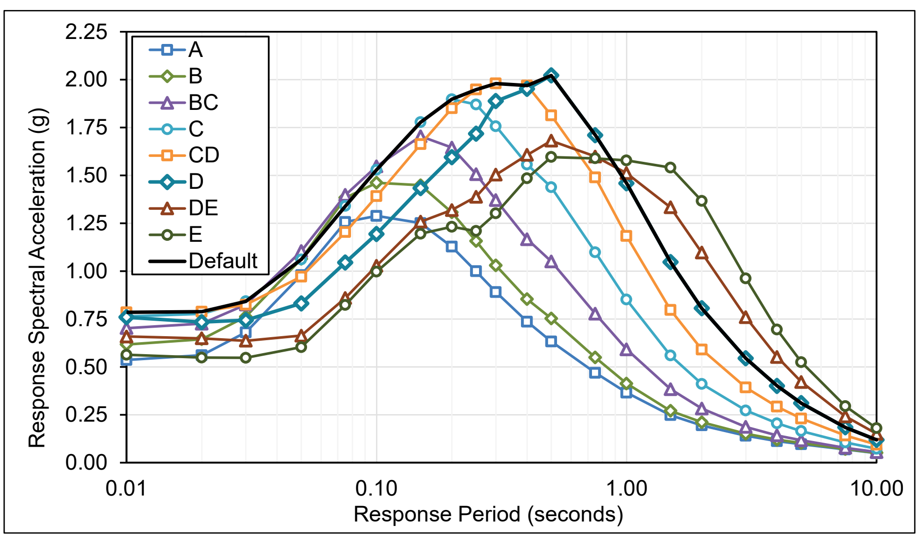


Figure D.3-19 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Cruz Site.

Table D.3-20 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Vallejo Site

Period	5%-Damped Response Spectral Acceleration (g)								
***T* (s)**	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.711	0.821	0.955	1.051	1.057	0.952	0.784	0.698	1.057
0.01	0.716	0.827	0.961	1.055	1.062	0.959	0.793	0.709	1.062
0.02	0.745	0.856	0.997	1.076	1.069	0.957	0.793	0.685	1.076
0.03	0.890	0.998	1.124	1.167	1.117	0.969	0.775	0.653	1.167
0.05	1.315	1.425	1.491	1.465	1.311	1.095	0.860	0.740	1.465
0.08	1.681	1.849	1.918	1.840	1.610	1.335	1.104	1.017	1.840
0.10	1.768	2.011	2.133	2.097	1.847	1.538	1.301	1.216	2.097
0.15	1.761	2.024	2.365	2.445	2.200	1.831	1.537	1.427	2.445
0.20	1.578	1.835	2.307	2.656	2.464	1.993	1.575	1.453	2.656
0.25	1.411	1.673	2.161	2.646	2.620	2.143	1.603	1.406	2.646
0.30	1.280	1.529	2.001	2.496	2.701	2.303	1.718	1.461	2.701
0.40	1.066	1.278	1.699	2.196	2.603	2.427	1.898	1.557	2.603
0.50	0.933	1.115	1.485	1.952	2.385	2.381	2.001	1.708	2.385
0.75	0.753	0.853	1.121	1.490	1.904	2.055	1.980	1.894	2.055
1.0	0.630	0.674	0.890	1.188	1.546	1.772	1.879	1.925	1.772
1.5	0.468	0.461	0.586	0.782	1.023	1.276	1.554	1.757	1.276
2.0	0.372	0.366	0.431	0.578	0.755	0.990	1.323	1.615	0.990
3.0	0.267	0.268	0.292	0.389	0.495	0.657	0.903	1.124	0.657
4.0	0.204	0.206	0.223	0.287	0.353	0.459	0.621	0.768	0.459
5.0	0.178	0.179	0.187	0.225	0.269	0.342	0.457	0.560	0.342
7.5	0.120	0.121	0.120	0.137	0.156	0.192	0.249	0.300	0.192
10	0.077	0.079	0.079	0.089	0.101	0.122	0.153	0.182	0.122
S_{MS} (g)	1.42	1.65	2.08	2.39	2.43	2.18	1.80	1.54	2.43
S_{M1} (g)	0.67	0.67	0.89	1.19	1.55	1.78	2.44	3.04	1.78
S_{DS} (g)	0.95	1.10	1.38	1.59	1.62	1.46	1.20	1.02	1.62
S_{D1} (g)	0.45	0.45	0.59	0.79	1.03	1.19	1.63	2.02	1.19

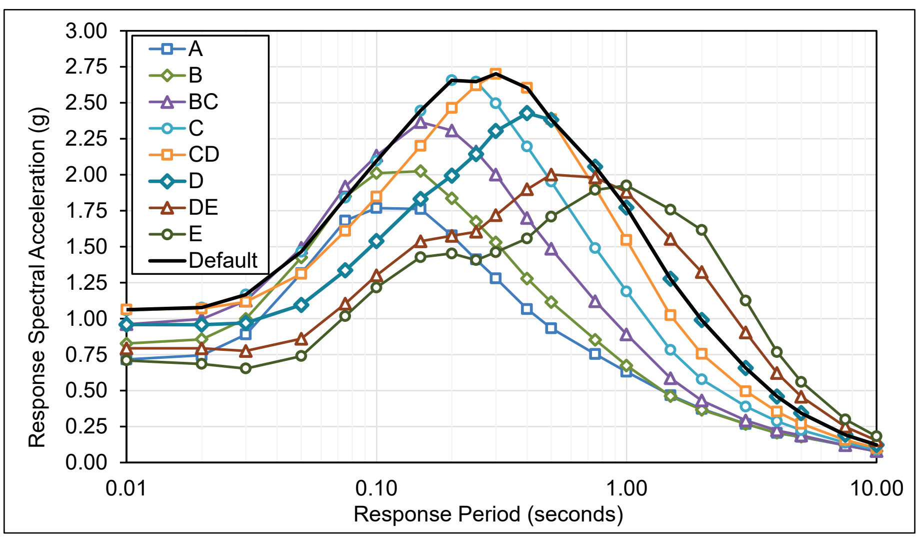


Figure D.3-20 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Vallejo Site.

Table D.3-21 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Rosa Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.859	0.954	1.109	1.234	1.237	1.098	0.884	0.757	1.237
0.01	0.863	0.961	1.114	1.238	1.241	1.104	0.892	0.769	1.241
0.02	0.902	1.007	1.151	1.254	1.245	1.101	0.878	0.740	1.254
0.03	1.090	1.211	1.312	1.347	1.291	1.108	0.850	0.698	1.347
0.05	1.608	1.740	1.768	1.684	1.495	1.203	0.896	0.749	1.684
0.08	2.039	2.235	2.226	2.111	1.813	1.430	1.111	0.998	2.111
0.10	2.121	2.331	2.464	2.405	2.071	1.629	1.288	1.179	2.405
0.15	2.104	2.350	2.764	2.839	2.483	1.940	1.510	1.374	2.839
0.20	1.905	2.182	2.750	3.186	2.843	2.199	1.615	1.422	3.186
0.25	1.722	2.017	2.613	3.229	3.104	2.429	1.703	1.415	3.229
0.30	1.573	1.864	2.444	3.057	3.276	2.664	1.866	1.508	3.276
0.40	1.331	1.589	2.116	2.718	3.246	2.899	2.147	1.680	3.246
0.50	1.175	1.414	1.886	2.464	3.002	2.899	2.316	1.923	3.002
0.75	0.967	1.103	1.447	1.917	2.431	2.576	2.396	2.254	2.576
1.0	0.818	0.879	1.160	1.549	2.006	2.271	2.352	2.385	2.271
1.5	0.597	0.611	0.778	1.043	1.370	1.695	2.035	2.292	1.695
2.0	0.476	0.484	0.575	0.775	1.018	1.330	1.769	2.176	1.330
3.0	0.347	0.350	0.387	0.518	0.667	0.887	1.223	1.544	0.887
4.0	0.266	0.269	0.293	0.379	0.470	0.615	0.841	1.048	0.615
5.0	0.228	0.230	0.241	0.294	0.351	0.448	0.603	0.743	0.448
7.5	0.145	0.146	0.145	0.167	0.184	0.227	0.297	0.357	0.227
10	0.092	0.094	0.094	0.103	0.115	0.139	0.173	0.219	0.139
S_{MS} (g)	1.71	1.96	2.47	2.91	2.95	2.61	2.08	1.73	2.95
S_{M1} (g)	0.86	0.88	1.16	1.55	2.01	2.39	3.30	4.17	2.39
S_{DS} (g)	1.14	1.31	1.65	1.94	1.97	1.74	1.39	1.15	1.97
S_{D1} (g)	0.57	0.59	0.77	1.03	1.34	1.60	2.20	2.78	1.60

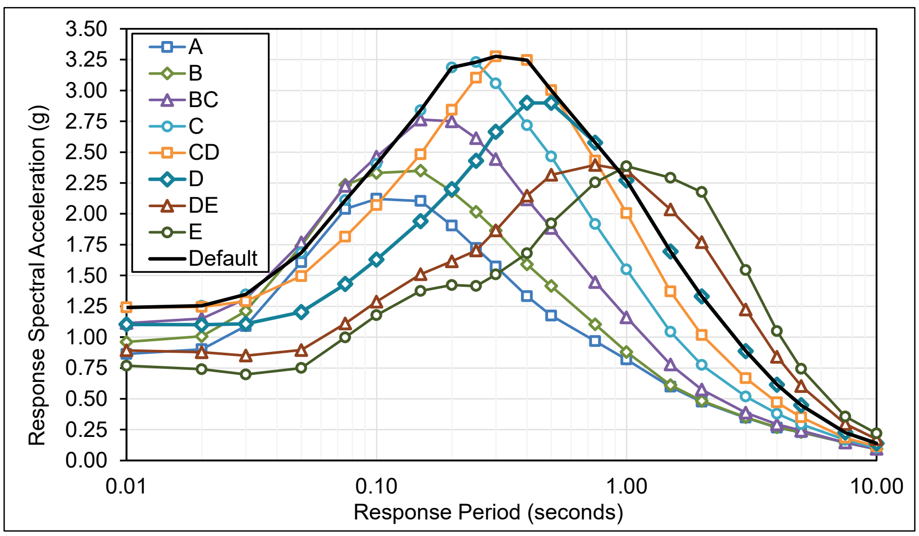


Figure D.3-21 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Santa Rosa Site.

Table D.3-22 **MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Seattle Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.567	0.676	0.760	0.833	0.884	0.887	0.755	0.678	0.887
0.01	0.569	0.677	0.760	0.833	0.882	0.892	0.763	0.673	0.892
0.02	0.624	0.695	0.770	0.833	0.869	0.868	0.731	0.637	0.869
0.03	0.713	0.781	0.846	0.895	0.911	0.889	0.706	0.564	0.911
0.05	0.945	1.029	1.066	1.079	1.048	0.977	0.733	0.627	1.079
0.08	1.217	1.371	1.437	1.467	1.439	1.175	0.961	0.904	1.467
0.10	1.419	1.681	1.820	1.910	1.714	1.447	1.381	1.316	1.910
0.15	1.401	1.748	2.005	2.183	1.999	1.785	1.753	1.700	2.183
0.20	1.167	1.532	1.862	2.139	2.207	1.894	1.932	1.919	2.207
0.25	1.002	1.371	1.717	2.079	2.348	1.972	2.081	2.113	2.348
0.30	0.884	1.242	1.584	1.985	2.319	2.176	2.136	2.201	2.319
0.40	0.692	0.996	1.301	1.695	2.080	2.336	1.981	2.082	2.336
0.50	0.580	0.851	1.127	1.497	1.909	2.217	2.038	2.050	2.217
0.75	0.444	0.646	0.862	1.159	1.538	1.847	2.108	2.077	1.847
1.0	0.365	0.525	0.705	0.959	1.296	1.600	1.920	2.068	1.600
1.5	0.256	0.360	0.482	0.659	0.906	1.169	1.485	1.707	1.169
2.0	0.200	0.280	0.368	0.501	0.692	0.923	1.226	1.459	0.923
3.0	0.134	0.184	0.236	0.320	0.441	0.592	0.798	0.961	0.592
4.0	0.101	0.140	0.177	0.237	0.320	0.420	0.557	0.663	0.420
5.0	0.081	0.109	0.135	0.178	0.236	0.304	0.397	0.469	0.304
7.5	0.058	0.078	0.095	0.121	0.154	0.192	0.243	0.280	0.192
10	0.045	0.060	0.071	0.088	0.108	0.131	0.160	0.182	0.131
S_{MS} (g)	1.05	1.38	1.68	1.93	2.11	2.10	1.92	1.98	2.11
S_{M1} (g)	0.36	0.52	0.71	0.96	1.30	1.66	2.21	2.63	1.66
S_{DS} (g)	0.70	0.92	1.12	1.28	1.41	1.40	1.28	1.32	1.41
S_{D1} (g)	0.24	0.35	0.47	0.64	0.86	1.11	1.47	1.75	1.11

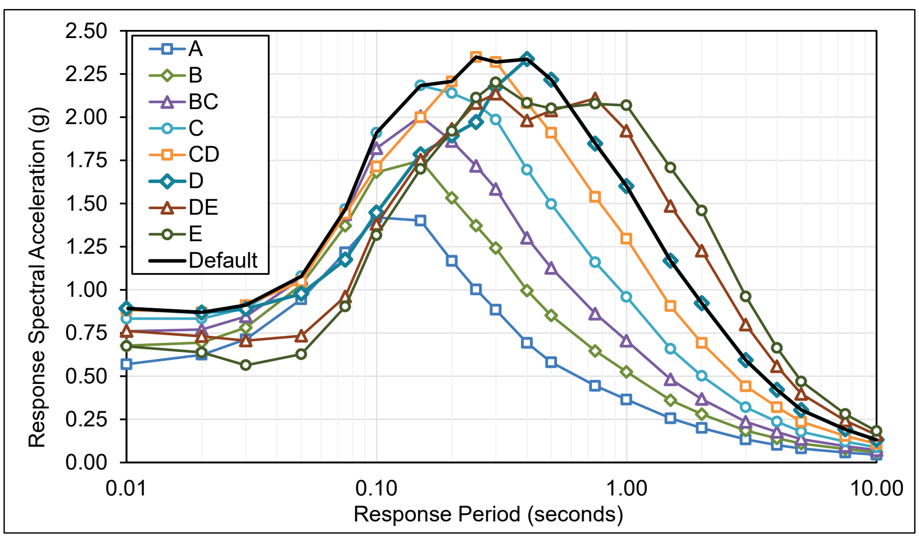


Figure D.3-22 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Seattle Site.

Table D.3-23 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Tacoma Site

Period *T (s)*	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.483	0.565	0.648	0.712	0.741	0.694	0.607	0.626	0.741
0.01	0.485	0.568	0.649	0.712	0.748	0.703	0.617	0.622	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.603	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.550	0.792
0.05	0.811	0.888	0.951	0.954	0.888	0.758	0.620	0.598	0.954
0.08	1.040	1.142	1.214	1.193	1.076	0.927	0.860	0.848	1.193
0.10	1.119	1.252	1.371	1.368	1.281	1.265	1.203	1.214	1.368
0.15	1.117	1.291	1.535	1.606	1.509	1.535	1.512	1.549	1.606
0.20	0.985	1.194	1.500	1.710	1.662	1.636	1.674	1.763	1.710
0.25	0.821	1.075	1.397	1.714	1.766	1.649	1.747	1.898	1.766
0.30	0.704	0.976	1.262	1.587	1.829	1.705	1.738	1.935	1.829
0.40	0.544	0.783	1.022	1.335	1.655	1.802	1.607	1.821	1.802
0.50	0.438	0.639	0.847	1.125	1.447	1.705	1.681	1.763	1.705
0.75	0.317	0.453	0.603	0.811	1.079	1.311	1.548	1.703	1.311
1.0	0.259	0.366	0.490	0.663	0.893	1.113	1.362	1.682	1.113
1.5	0.182	0.252	0.336	0.455	0.619	0.801	1.033	1.327	0.801
2.0	0.141	0.194	0.253	0.341	0.465	0.616	0.826	1.101	0.616
3.0	0.095	0.129	0.165	0.220	0.298	0.397	0.537	0.719	0.397
4.0	0.071	0.097	0.121	0.159	0.211	0.276	0.367	0.490	0.276
5.0	0.056	0.075	0.091	0.118	0.153	0.197	0.259	0.342	0.197
7.5	0.038	0.049	0.059	0.074	0.093	0.116	0.148	0.198	0.116
10	0.030	0.040	0.047	0.057	0.070	0.085	0.105	0.136	0.085
S_{MS} (g)	0.89	1.07	1.35	1.54	1.65	1.62	1.57	1.74	1.65
S_{M1} (g)	0.26	0.37	0.49	0.66	0.89	1.11	1.49	1.98	1.11
S_{DS} (g)	0.59	0.72	0.90	1.03	1.10	1.08	1.05	1.16	1.10
S_{D1} (g)	0.17	0.24	0.33	0.44	0.60	0.74	0.99	1.32	0.74

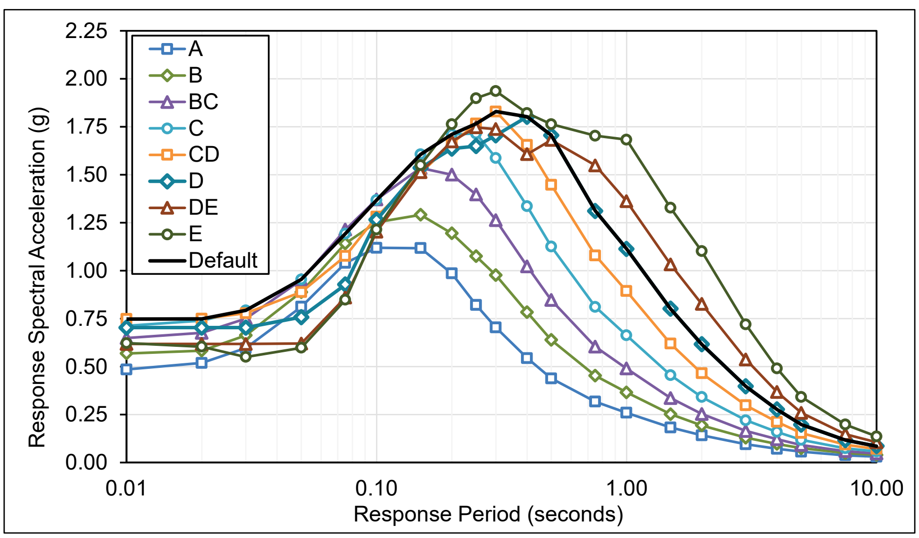


Figure D.3-23 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Tacoma Site.

Table D.3-24 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Everett Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.436	0.517	0.588	0.653	0.696	0.706	0.696	0.547	0.706
0.01	0.438	0.518	0.590	0.654	0.696	0.706	0.695	0.547	0.706
0.02	0.501	0.554	0.620	0.681	0.717	0.719	0.681	0.547	0.719
0.03	0.573	0.624	0.684	0.733	0.753	0.738	0.683	0.547	0.753
0.05	0.751	0.811	0.849	0.869	0.850	0.797	0.696	0.551	0.869
0.08	0.962	1.070	1.130	1.162	1.140	1.079	0.747	0.714	1.162
0.10	1.082	1.272	1.391	1.466	1.478	1.100	1.048	1.019	1.478
0.15	1.065	1.312	1.520	1.666	1.736	1.341	1.314	1.301	1.736
0.20	0.907	1.169	1.431	1.659	1.798	1.440	1.461	1.480	1.798
0.25	0.774	1.031	1.300	1.585	1.790	1.858	1.541	1.598	1.858
0.30	0.677	0.920	1.181	1.486	1.741	1.892	1.553	1.638	1.892
0.40	0.536	0.741	0.972	1.268	1.563	1.757	1.732	1.553	1.757
0.50	0.444	0.619	0.822	1.091	1.395	1.615	1.728	1.596	1.615
0.75	0.333	0.452	0.602	0.807	1.067	1.281	1.478	1.589	1.281
1.0	0.274	0.366	0.491	0.661	0.886	1.096	1.316	1.499	1.096
1.5	0.193	0.252	0.335	0.454	0.614	0.792	1.010	1.201	0.792
2.0	0.150	0.195	0.252	0.342	0.463	0.613	0.817	1.006	0.613
3.0	0.101	0.131	0.164	0.221	0.296	0.395	0.532	0.660	0.395
4.0	0.075	0.099	0.122	0.161	0.211	0.276	0.366	0.450	0.276
5.0	0.061	0.078	0.094	0.121	0.156	0.200	0.261	0.318	0.200
7.5	0.042	0.053	0.062	0.077	0.096	0.120	0.152	0.183	0.120
10	0.032	0.041	0.048	0.058	0.071	0.086	0.105	0.124	0.086
S_{MS} (g)	0.82	1.05	1.29	1.49	1.62	1.70	1.56	1.47	1.70
S_{M1} (g)	0.27	0.37	0.49	0.66	0.89	1.10	1.47	1.81	1.10
S_{DS} (g)	0.54	0.70	0.86	1.00	1.08	1.14	1.04	0.98	1.14
S_{D1} (g)	0.18	0.24	0.33	0.44	0.59	0.74	0.98	1.21	0.74

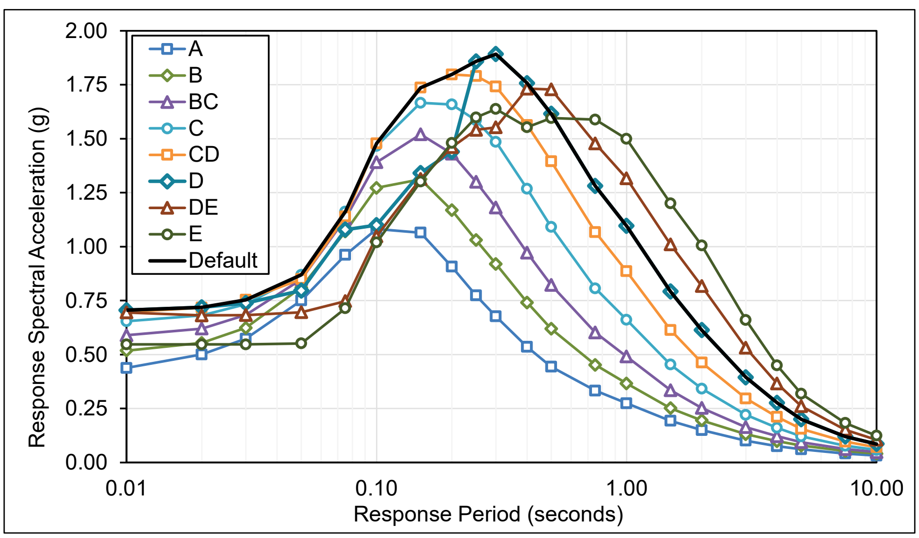


Figure D.3-24 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Everett Site.

Table D.3-25 **MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Portland Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.316	0.374	0.421	0.459	0.484	0.487	0.477	0.482	0.487
0.01	0.317	0.375	0.422	0.460	0.484	0.487	0.477	0.481	0.487
0.02	0.349	0.399	0.442	0.474	0.492	0.489	0.471	0.465	0.492
0.03	0.397	0.443	0.479	0.501	0.508	0.492	0.463	0.450	0.508
0.05	0.516	0.559	0.578	0.577	0.558	0.519	0.468	0.447	0.577
0.08	0.649	0.723	0.755	0.757	0.732	0.682	0.621	0.601	0.757
0.10	0.722	0.845	0.913	0.941	0.930	0.885	0.824	0.815	0.941
0.15	0.691	0.858	1.000	1.092	1.121	1.094	1.041	1.046	1.121
0.20	0.589	0.766	0.949	1.107	1.188	1.198	1.173	1.199	1.198
0.25	0.497	0.672	0.865	1.080	1.214	1.264	1.274	1.335	1.264
0.30	0.433	0.602	0.794	1.034	1.212	1.298	1.342	1.435	1.298
0.40	0.348	0.500	0.673	0.914	1.130	1.261	1.353	1.480	1.261
0.50	0.286	0.421	0.578	0.803	1.036	1.197	1.326	1.496	1.197
0.75	0.208	0.313	0.438	0.623	0.842	1.012	1.174	1.396	1.012
1.0	0.162	0.251	0.358	0.526	0.729	0.905	1.099	1.342	0.905
1.5	0.112	0.178	0.255	0.380	0.536	0.695	0.894	1.148	0.695
2.0	0.085	0.137	0.196	0.293	0.416	0.554	0.743	0.993	0.554
3.0	0.056	0.091	0.129	0.194	0.275	0.368	0.498	0.669	0.368
4.0	0.042	0.068	0.096	0.143	0.198	0.261	0.347	0.466	0.261
5.0	0.034	0.054	0.074	0.107	0.146	0.189	0.247	0.327	0.189
7.5	0.023	0.036	0.048	0.068	0.090	0.113	0.143	0.193	0.113
10	0.021	0.031	0.040	0.054	0.069	0.084	0.104	0.134	0.084
S_{MS} (g)	0.53	0.69	0.85	1.00	1.09	1.17	1.22	1.35	1.17
S_{M1} (g)	0.16	0.25	0.36	0.53	0.75	1.00	1.35	1.81	1.00
S_{DS} (g)	0.35	0.46	0.57	0.66	0.73	0.78	0.81	0.90	0.78
S_{D1} (g)	0.11	0.17	0.24	0.35	0.50	0.67	0.90	1.20	0.67

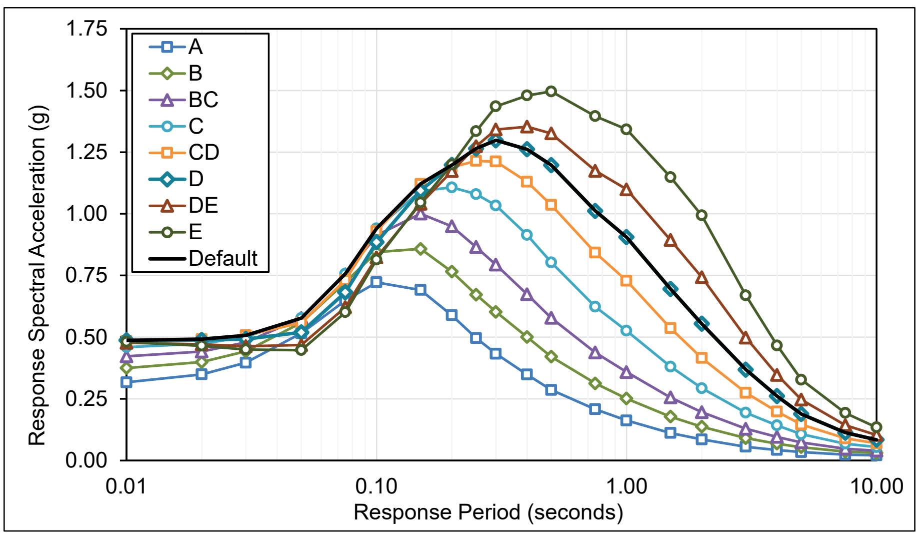


Figure D.3-25 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Portland Site.

Table D.3-26 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Salt Lake City Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.526	0.608	0.710	0.780	0.777	0.714	0.622	0.572	0.780
0.01	0.530	0.612	0.715	0.784	0.782	0.718	0.626	0.577	0.784
0.02	0.562	0.645	0.747	0.808	0.797	0.728	0.628	0.573	0.808
0.03	0.678	0.760	0.849	0.877	0.836	0.740	0.619	0.557	0.877
0.05	0.983	1.069	1.111	1.085	0.975	0.824	0.669	0.593	1.085
0.08	1.219	1.346	1.391	1.337	1.173	0.977	0.791	0.708	1.337
0.10	1.273	1.463	1.568	1.531	1.348	1.124	0.914	0.825	1.531
0.15	1.239	1.468	1.748	1.787	1.611	1.354	1.104	0.999	1.787
0.20	1.131	1.374	1.739	1.957	1.821	1.551	1.271	1.156	1.957
0.25	1.014	1.253	1.619	1.962	1.940	1.693	1.408	1.284	1.962
0.30	0.925	1.154	1.505	1.880	2.008	1.810	1.534	1.410	2.008
0.40	0.764	0.960	1.268	1.645	1.938	1.861	1.643	1.532	1.938
0.50	0.660	0.825	1.100	1.443	1.770	1.806	1.661	1.587	1.806
0.75	0.528	0.634	0.834	1.099	1.415	1.546	1.531	1.538	1.546
1.0	0.425	0.484	0.638	0.842	1.098	1.284	1.385	1.459	1.284
1.5	0.295	0.317	0.408	0.534	0.702	0.894	1.105	1.277	0.894
2.0	0.226	0.240	0.291	0.376	0.490	0.663	0.893	1.116	0.663
3.0	0.152	0.159	0.179	0.228	0.292	0.404	0.564	0.717	0.404
4.0	0.105	0.109	0.119	0.150	0.187	0.256	0.353	0.445	0.256
5.0	0.079	0.082	0.087	0.107	0.130	0.175	0.238	0.297	0.175
7.5	0.038	0.039	0.041	0.050	0.059	0.077	0.101	0.125	0.077
10	0.023	0.024	0.026	0.030	0.036	0.045	0.057	0.070	0.045
S_{MS} (g)	1.02	1.24	1.57	1.77	1.81	1.68	1.50	1.43	1.81
S_{M1} (g)	0.43	0.48	0.64	0.84	1.10	1.28	1.61	2.01	1.28
S_{DS} (g)	0.68	0.82	1.04	1.18	1.21	1.12	1.00	0.95	1.21
S_{D1} (g)	0.28	0.32	0.43	0.56	0.73	0.86	1.07	1.34	0.86

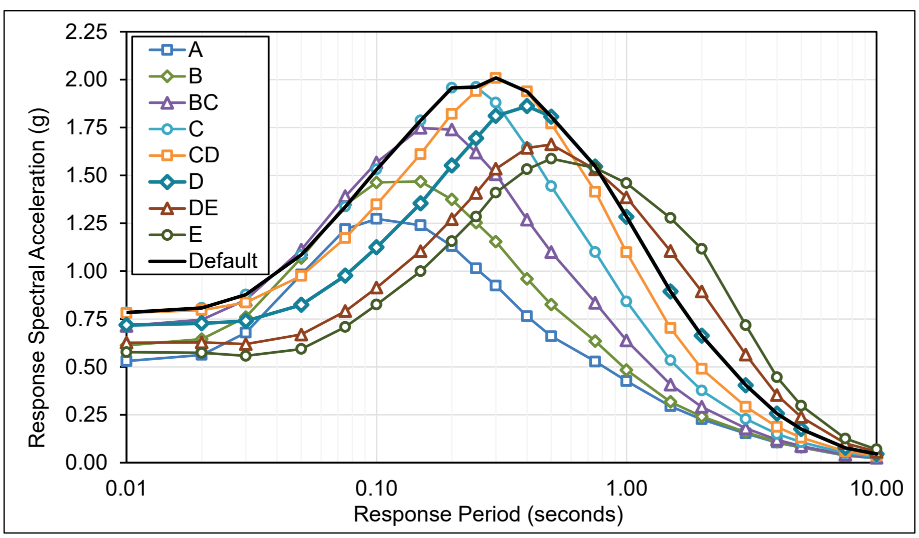


Figure D.3-26 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Salt Lake City Site.

Table D.3-27 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Boise Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.107	0.123	0.145	0.168	0.191	0.206	0.218	0.226	0.206
0.01	0.107	0.124	0.145	0.169	0.192	0.208	0.219	0.228	0.208
0.02	0.111	0.127	0.149	0.171	0.193	0.209	0.219	0.227	0.209
0.03	0.128	0.144	0.165	0.185	0.205	0.216	0.222	0.227	0.216
0.05	0.175	0.193	0.213	0.231	0.246	0.251	0.250	0.249	0.251
0.08	0.223	0.247	0.275	0.297	0.313	0.317	0.314	0.314	0.317
0.10	0.241	0.275	0.314	0.348	0.374	0.384	0.387	0.391	0.384
0.15	0.239	0.283	0.343	0.401	0.451	0.481	0.499	0.512	0.481
0.20	0.215	0.261	0.331	0.409	0.481	0.532	0.569	0.595	0.532
0.25	0.186	0.230	0.301	0.390	0.479	0.548	0.606	0.647	0.548
0.30	0.163	0.204	0.273	0.364	0.463	0.546	0.624	0.683	0.546
0.40	0.130	0.164	0.225	0.308	0.411	0.505	0.602	0.675	0.505
0.50	0.109	0.137	0.191	0.268	0.367	0.464	0.568	0.653	0.464
0.75	0.079	0.097	0.136	0.194	0.273	0.354	0.448	0.533	0.354
1.0	0.060	0.070	0.100	0.145	0.206	0.275	0.361	0.437	0.275
1.5	0.040	0.045	0.063	0.093	0.135	0.185	0.252	0.315	0.185
2.0	0.031	0.035	0.047	0.068	0.099	0.136	0.189	0.241	0.136
3.0	0.021	0.024	0.031	0.046	0.066	0.091	0.126	0.163	0.091
4.0	0.016	0.019	0.024	0.035	0.050	0.067	0.092	0.118	0.067
5.0	0.013	0.016	0.020	0.029	0.040	0.053	0.070	0.090	0.053
7.5	0.010	0.013	0.017	0.023	0.031	0.040	0.051	0.067	0.040
10	0.009	0.011	0.014	0.019	0.025	0.031	0.038	0.049	0.031
S_{MS} (g)	0.19	0.23	0.30	0.37	0.43	0.49	0.56	0.61	0.49
S_{M1} (g)	0.06	0.07	0.10	0.14	0.21	0.28	0.36	0.44	0.28
S_{DS} (g)	0.13	0.16	0.20	0.25	0.29	0.33	0.37	0.41	0.33
S_{D1} (g)	0.04	0.05	0.07	0.10	0.14	0.18	0.24	0.29	0.18

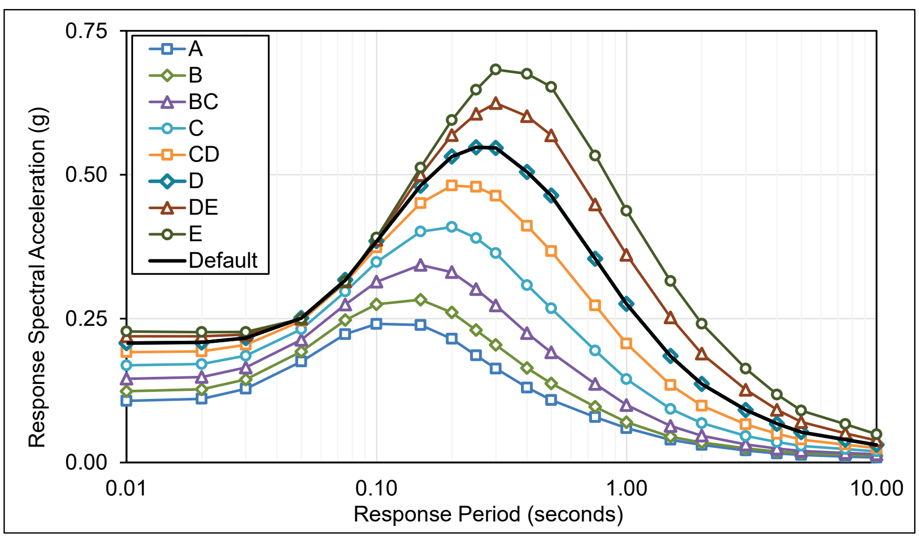


Figure D.3-27 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Boise Site.

Table D.3-28 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Reno Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.677	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.873	0.947	0.955	0.958	0.888	0.758	0.620	0.563	0.958
0.08	1.064	1.183	1.214	1.193	1.076	0.900	0.760	0.732	1.193
0.10	1.119	1.287	1.371	1.368	1.241	1.040	0.865	0.838	1.368
0.15	1.117	1.291	1.563	1.606	1.497	1.266	1.034	0.993	1.606
0.20	1.012	1.197	1.537	1.822	1.718	1.445	1.154	1.080	1.822
0.25	0.897	1.075	1.397	1.808	1.874	1.623	1.299	1.153	1.874
0.30	0.810	0.976	1.299	1.665	1.928	1.764	1.443	1.301	1.928
0.40	0.689	0.833	1.138	1.525	1.823	1.823	1.607	1.484	1.823
0.50	0.579	0.717	0.999	1.382	1.734	1.803	1.681	1.596	1.803
0.75	0.423	0.509	0.719	1.018	1.375	1.566	1.598	1.589	1.566
1.0	0.323	0.375	0.537	0.774	1.074	1.315	1.512	1.578	1.315
1.5	0.207	0.233	0.331	0.484	0.690	0.904	1.151	1.366	0.904
2.0	0.155	0.174	0.235	0.343	0.492	0.670	0.911	1.144	0.670
3.0	0.102	0.113	0.143	0.209	0.301	0.417	0.580	0.740	0.417
4.0	0.072	0.080	0.098	0.143	0.202	0.276	0.379	0.481	0.276
5.0	0.057	0.063	0.074	0.106	0.148	0.198	0.267	0.336	0.198
7.5	0.033	0.037	0.043	0.059	0.079	0.103	0.134	0.168	0.103
10	0.023	0.027	0.031	0.041	0.054	0.067	0.085	0.105	0.067
S_{MS} (g)	0.91	1.08	1.38	1.64	1.74	1.64	1.51	1.44	1.74
S_{M1} (g)	0.32	0.38	0.54	0.77	1.07	1.32	1.64	2.06	1.32
S_{DS} (g)	0.61	0.72	0.92	1.09	1.16	1.09	1.01	0.96	1.16
S_{D1} (g)	0.22	0.25	0.36	0.52	0.72	0.88	1.09	1.37	0.88

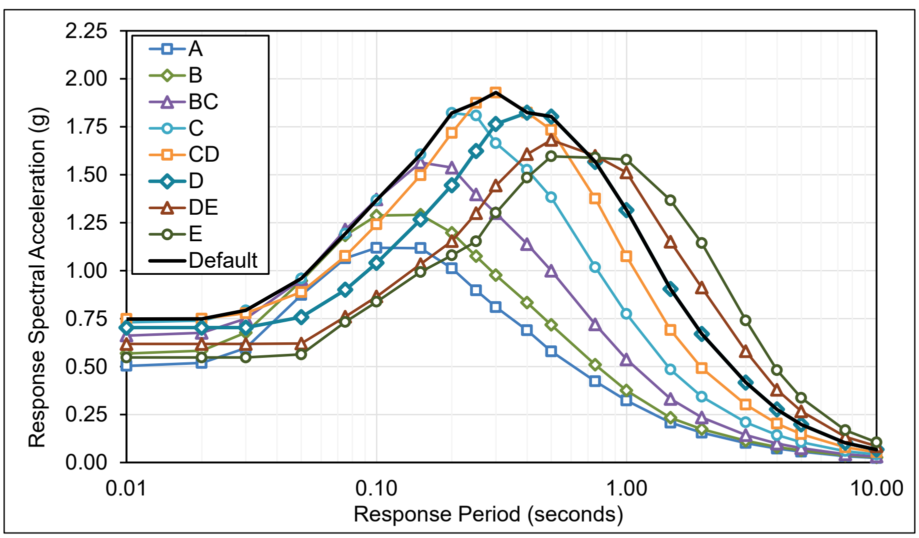


Figure D.3-28 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Reno Site.

Table D.3-29 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Las Vegas Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.220	0.254	0.296	0.332	0.354	0.354	0.341	0.335	0.354
0.01	0.221	0.255	0.298	0.334	0.356	0.356	0.343	0.337	0.356
0.02	0.231	0.264	0.307	0.341	0.361	0.359	0.343	0.334	0.361
0.03	0.271	0.304	0.345	0.371	0.381	0.368	0.342	0.329	0.381
0.05	0.380	0.417	0.450	0.463	0.452	0.419	0.376	0.356	0.463
0.08	0.483	0.534	0.575	0.584	0.560	0.514	0.462	0.438	0.584
0.10	0.517	0.589	0.654	0.677	0.657	0.609	0.554	0.532	0.677
0.15	0.506	0.599	0.717	0.782	0.788	0.749	0.697	0.678	0.788
0.20	0.454	0.551	0.696	0.817	0.861	0.842	0.801	0.789	0.861
0.25	0.389	0.481	0.628	0.787	0.875	0.886	0.867	0.869	0.886
0.30	0.339	0.424	0.566	0.736	0.864	0.907	0.915	0.935	0.907
0.40	0.267	0.335	0.459	0.622	0.782	0.868	0.922	0.967	0.868
0.50	0.220	0.277	0.386	0.535	0.702	0.815	0.900	0.968	0.815
0.75	0.159	0.194	0.275	0.389	0.532	0.648	0.754	0.845	0.648
1.0	0.119	0.138	0.198	0.285	0.399	0.508	0.624	0.720	0.508
1.5	0.077	0.086	0.121	0.177	0.255	0.343	0.454	0.551	0.343
2.0	0.059	0.065	0.086	0.125	0.180	0.248	0.342	0.429	0.248
3.0	0.040	0.043	0.052	0.076	0.110	0.154	0.215	0.271	0.154
4.0	0.030	0.032	0.037	0.054	0.077	0.106	0.146	0.183	0.106
5.0	0.024	0.026	0.029	0.041	0.058	0.078	0.106	0.132	0.078
7.5	0.018	0.020	0.022	0.031	0.041	0.054	0.071	0.088	0.054
10	0.015	0.017	0.019	0.025	0.032	0.041	0.052	0.064	0.041
S_{MS} (g)	0.41	0.50	0.63	0.74	0.79	0.82	0.83	0.87	0.82
S_{M1} (g)	0.12	0.14	0.20	0.28	0.40	0.51	0.62	0.77	0.51
S_{DS} (g)	0.27	0.33	0.42	0.49	0.53	0.54	0.55	0.58	0.54
S_{D1} (g)	0.08	0.09	0.13	0.19	0.27	0.34	0.42	0.51	0.34

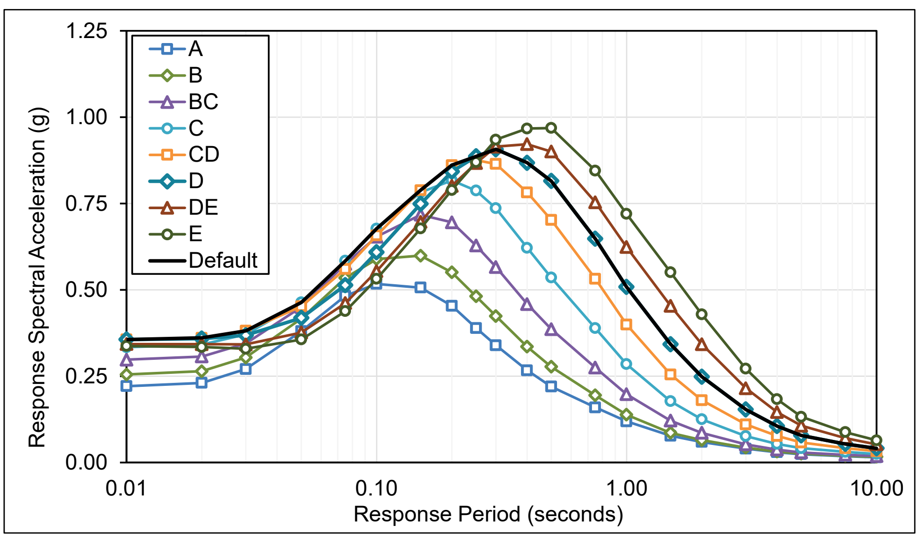


Figure D.3-29 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Las Vegas Site.

Table D.3-30 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, St. Louis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.380	0.368	0.368	0.364	0.357	0.349	0.336	0.336	0.364
0.01	0.411	0.399	0.398	0.394	0.386	0.376	0.362	0.362	0.394
0.02	0.519	0.583	0.586	0.577	0.553	0.546	0.530	0.530	0.577
0.03	0.596	0.662	0.701	0.683	0.634	0.624	0.604	0.547	0.683
0.05	0.811	0.784	0.863	0.838	0.759	0.740	0.620	0.551	0.838
0.08	0.783	0.826	0.932	0.912	0.824	0.791	0.713	0.624	0.912
0.10	0.754	0.910	1.034	1.008	0.880	0.833	0.771	0.724	1.008
0.15	0.640	0.725	0.829	0.860	0.836	0.799	0.731	0.731	0.860
0.20	0.542	0.550	0.632	0.698	0.756	0.744	0.679	0.679	0.756
0.25	0.482	0.490	0.537	0.613	0.697	0.705	0.643	0.643	0.705
0.30	0.429	0.433	0.458	0.538	0.636	0.645	0.610	0.610	0.645
0.40	0.345	0.348	0.363	0.443	0.555	0.571	0.546	0.546	0.571
0.50	0.290	0.294	0.305	0.380	0.494	0.525	0.512	0.512	0.525
0.75	0.221	0.224	0.232	0.293	0.394	0.443	0.434	0.434	0.443
1.0	0.177	0.178	0.182	0.234	0.321	0.378	0.363	0.363	0.378
1.5	0.123	0.124	0.128	0.165	0.224	0.260	0.253	0.253	0.260
2.0	0.096	0.097	0.100	0.128	0.172	0.190	0.186	0.186	0.190
3.0	0.063	0.062	0.064	0.082	0.109	0.116	0.113	0.113	0.116
4.0	0.044	0.043	0.045	0.057	0.075	0.079	0.076	0.076	0.079
5.0	0.033	0.033	0.034	0.043	0.057	0.059	0.057	0.057	0.059
7.5	0.021	0.020	0.021	0.027	0.035	0.037	0.036	0.036	0.037
10	0.014	0.014	0.014	0.018	0.023	0.024	0.024	0.024	0.024
S_{MS} (g)	0.49	0.49	0.57	0.63	0.68	0.67	0.61	0.61	0.68
S_{M1} (g)	0.18	0.18	0.18	0.23	0.32	0.38	0.36	0.36	0.38
S_{DS} (g)	0.33	0.33	0.38	0.42	0.45	0.45	0.41	0.41	0.45
S_{D1} (g)	0.12	0.12	0.12	0.16	0.21	0.25	0.24	0.24	0.25

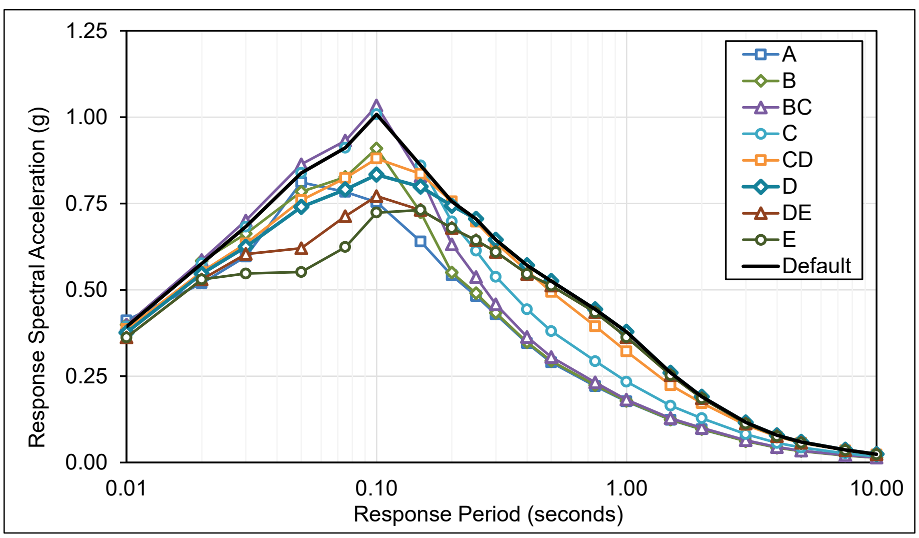


Figure D.3-30 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, St. Louis Site.

Table D.3-31 **MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Memphis Site**

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.729	0.710	0.709	0.726	0.685	0.648	0.607	0.547	0.726
0.01	0.905	0.878	0.878	0.768	0.748	0.703	0.617	0.608	0.768
0.02	1.258	1.223	1.222	1.136	1.031	0.984	0.933	0.933	1.136
0.03	1.499	1.454	1.481	1.339	1.171	1.101	1.033	1.033	1.339
0.05	1.693	1.638	1.802	1.603	1.341	1.223	1.118	1.118	1.603
0.08	1.548	1.633	1.839	1.653	1.367	1.212	1.081	1.081	1.653
0.10	1.489	1.784	2.020	1.818	1.439	1.237	1.067	1.067	1.818
0.15	1.243	1.394	1.593	1.606	1.497	1.266	1.002	0.969	1.606
0.20	1.032	1.139	1.304	1.374	1.380	1.241	1.048	1.010	1.380
0.25	0.919	1.005	1.099	1.204	1.261	1.152	0.964	0.964	1.261
0.30	0.810	0.876	0.926	1.051	1.152	1.049	0.900	0.900	1.152
0.40	0.688	0.691	0.721	0.867	1.030	0.966	0.826	0.826	1.030
0.50	0.569	0.576	0.597	0.739	0.925	0.903	0.792	0.792	0.925
0.75	0.430	0.435	0.450	0.570	0.760	0.818	0.740	0.740	0.818
1.0	0.344	0.346	0.353	0.454	0.623	0.718	0.656	0.656	0.718
1.5	0.242	0.243	0.251	0.322	0.438	0.506	0.485	0.485	0.506
2.0	0.185	0.186	0.193	0.247	0.331	0.364	0.351	0.351	0.364
3.0	0.121	0.119	0.124	0.158	0.208	0.220	0.210	0.210	0.220
4.0	0.081	0.080	0.083	0.106	0.140	0.145	0.139	0.139	0.145
5.0	0.062	0.061	0.063	0.080	0.105	0.108	0.103	0.103	0.108
7.5	0.038	0.037	0.039	0.049	0.064	0.066	0.062	0.062	0.066
10	0.026	0.025	0.026	0.032	0.041	0.042	0.040	0.040	0.042
S_{MS} (g)	0.93	1.03	1.17	1.24	1.24	1.12	0.94	0.91	1.24
S_{M1} (g)	0.34	0.35	0.35	0.45	0.62	0.72	0.66	0.66	0.72
S_{DS} (g)	0.62	0.68	0.78	0.82	0.83	0.74	0.63	0.61	0.83
S_{D1} (g)	0.23	0.23	0.24	0.30	0.42	0.48	0.44	0.44	0.48

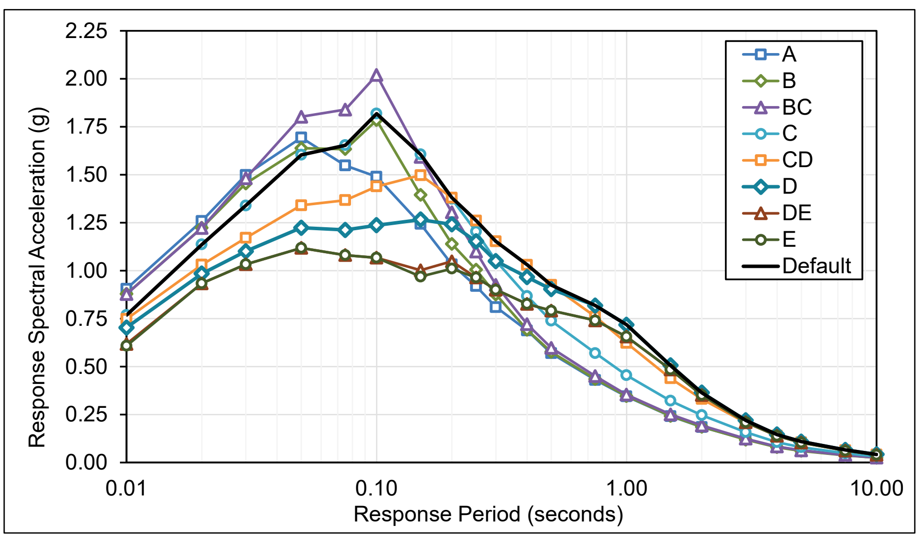


Figure D.3-31 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Memphis Site.

Table D.3-32 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Charleston Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	1.102	1.076	1.076	0.989	0.907	0.835	0.777	0.777	0.989
0.01	1.288	1.254	1.253	1.134	1.027	0.943	0.873	0.873	1.134
0.02	1.841	1.795	1.794	1.665	1.519	1.446	1.369	1.369	1.665
0.03	2.128	2.073	2.106	1.919	1.670	1.562	1.461	1.461	1.919
0.05	2.310	2.247	2.424	2.183	1.831	1.655	1.506	1.506	2.183
0.08	2.182	2.280	2.504	2.262	1.861	1.617	1.419	1.419	2.262
0.10	2.061	2.387	2.632	2.393	1.900	1.595	1.347	1.347	2.393
0.15	1.717	1.908	2.133	2.029	1.731	1.423	1.155	1.155	2.029
0.20	1.417	1.422	1.612	1.635	1.532	1.274	1.009	1.009	1.635
0.25	1.229	1.234	1.344	1.419	1.387	1.154	0.889	0.889	1.419
0.30	1.065	1.065	1.124	1.240	1.271	1.047	0.818	0.818	1.271
0.40	0.833	0.831	0.865	1.025	1.165	1.000	0.773	0.773	1.165
0.50	0.678	0.682	0.706	0.868	1.050	0.952	0.750	0.750	1.050
0.75	0.488	0.490	0.508	0.644	0.852	0.886	0.750	0.750	0.886
1.0	0.375	0.375	0.383	0.492	0.674	0.764	0.672	0.672	0.764
1.5	0.246	0.245	0.254	0.326	0.444	0.511	0.484	0.484	0.511
2.0	0.176	0.175	0.182	0.233	0.313	0.342	0.328	0.328	0.342
3.0	0.105	0.102	0.107	0.136	0.179	0.187	0.177	0.177	0.187
4.0	0.066	0.065	0.067	0.086	0.113	0.117	0.111	0.111	0.117
5.0	0.048	0.047	0.049	0.062	0.081	0.083	0.079	0.079	0.083
7.5	0.027	0.026	0.028	0.035	0.045	0.046	0.043	0.043	0.046
10	0.017	0.017	0.017	0.022	0.028	0.028	0.026	0.026	0.028
S_{MS} (g)	1.28	1.28	1.45	1.47	1.38	1.15	0.91	0.91	1.47
S_{M1} (g)	0.37	0.37	0.38	0.49	0.67	0.76	0.67	0.67	0.76
S_{DS} (g)	0.85	0.85	0.97	0.98	0.92	0.76	0.61	0.61	0.98
S_{D1} (g)	0.25	0.25	0.26	0.33	0.45	0.51	0.45	0.45	0.51

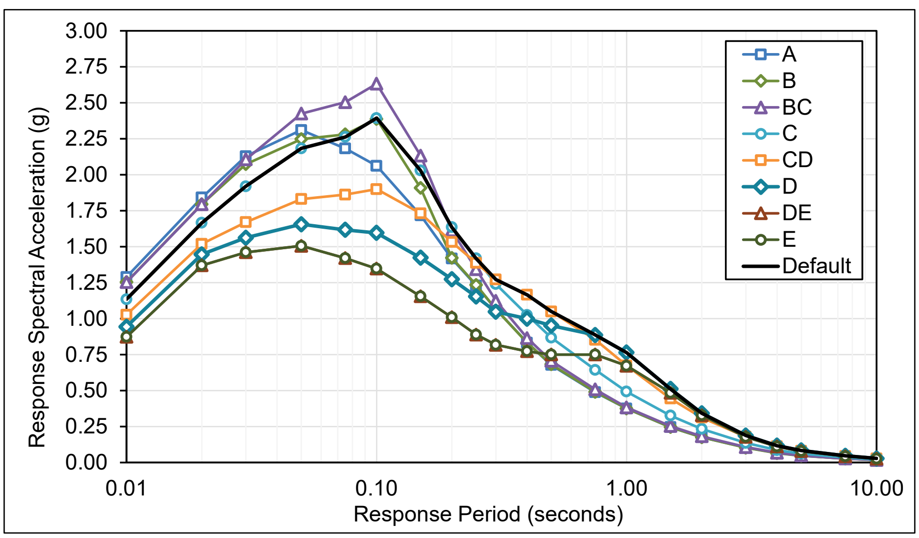


Figure D.3-32 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Charleston Site.

Table D.3-33 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Chicago Site

Period *T (s)*	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.084	0.082	0.082	0.086	0.089	0.090	0.089	0.089	0.090
0.01	0.091	0.088	0.088	0.092	0.095	0.096	0.095	0.095	0.096
0.02	0.124	0.120	0.120	0.124	0.124	0.127	0.125	0.125	0.127
0.03	0.145	0.140	0.143	0.147	0.143	0.146	0.144	0.144	0.147
0.05	0.170	0.163	0.180	0.185	0.177	0.180	0.177	0.177	0.185
0.08	0.165	0.174	0.197	0.204	0.196	0.198	0.194	0.194	0.204
0.10	0.163	0.197	0.225	0.231	0.215	0.217	0.210	0.210	0.231
0.15	0.146	0.165	0.189	0.206	0.215	0.220	0.213	0.213	0.220
0.20	0.132	0.134	0.154	0.176	0.205	0.217	0.210	0.210	0.217
0.25	0.123	0.124	0.136	0.161	0.196	0.215	0.211	0.211	0.215
0.30	0.117	0.118	0.125	0.151	0.190	0.209	0.214	0.214	0.209
0.40	0.106	0.107	0.112	0.138	0.181	0.201	0.209	0.209	0.201
0.50	0.098	0.099	0.103	0.129	0.172	0.196	0.207	0.207	0.196
0.75	0.081	0.082	0.085	0.108	0.146	0.171	0.179	0.179	0.171
1.0	0.068	0.069	0.070	0.090	0.124	0.149	0.150	0.150	0.149
1.5	0.050	0.050	0.052	0.066	0.090	0.105	0.105	0.105	0.105
2.0	0.041	0.041	0.042	0.054	0.073	0.082	0.081	0.081	0.082
3.0	0.027	0.027	0.028	0.035	0.047	0.051	0.051	0.051	0.051
4.0	0.020	0.020	0.020	0.026	0.034	0.037	0.036	0.036	0.037
5.0	0.015	0.015	0.016	0.020	0.026	0.028	0.027	0.027	0.028
7.5	0.010	0.010	0.010	0.013	0.017	0.018	0.018	0.018	0.018
10	0.007	0.007	0.007	0.009	0.011	0.012	0.012	0.012	0.012
SMS (g)	0.12	0.12	0.14	0.16	0.18	0.20	0.19	0.19	0.20
SM1 (g)	0.07	0.07	0.08	0.10	0.13	0.15	0.15	0.15	0.15
SDS (g)	0.08	0.08	0.09	0.11	0.12	0.13	0.13	0.13	0.13
SD1 (g)	0.05	0.05	0.05	0.07	0.09	0.10	0.10	0.10	0.10

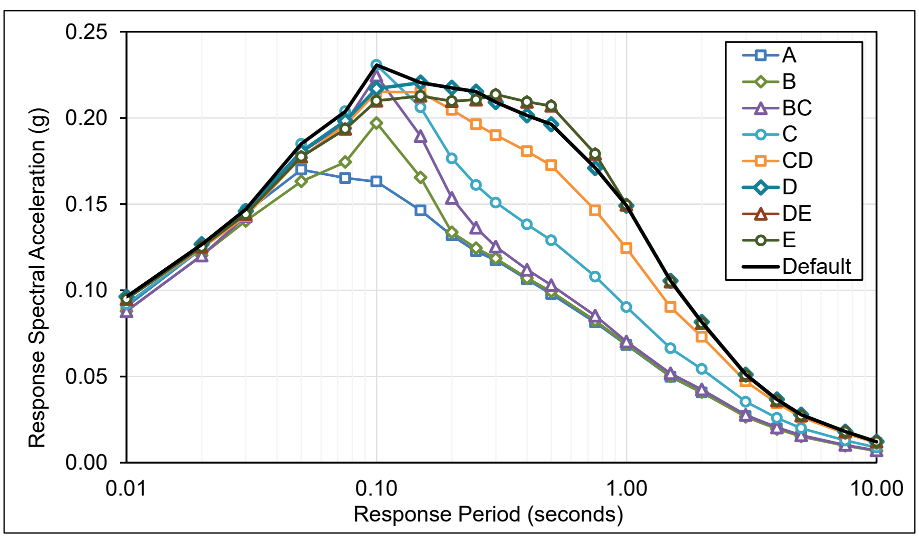


Figure D.3-33 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, Chicago Site.

Table D.3-34 **MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, New York Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.199	0.193	0.193	0.194	0.194	0.191	0.186	0.186	0.194
0.01	0.221	0.214	0.214	0.216	0.215	0.212	0.206	0.206	0.216
0.02	0.331	0.321	0.321	0.321	0.312	0.311	0.304	0.304	0.321
0.03	0.395	0.382	0.389	0.386	0.364	0.363	0.353	0.353	0.386
0.05	0.447	0.430	0.474	0.470	0.433	0.429	0.413	0.413	0.470
0.08	0.413	0.436	0.492	0.490	0.452	0.440	0.419	0.419	0.490
0.10	0.379	0.457	0.521	0.516	0.459	0.443	0.416	0.416	0.516
0.15	0.296	0.334	0.382	0.402	0.399	0.389	0.362	0.362	0.402
0.20	0.233	0.235	0.270	0.302	0.334	0.337	0.312	0.312	0.337
0.25	0.190	0.192	0.210	0.243	0.283	0.293	0.274	0.274	0.293
0.30	0.163	0.163	0.172	0.204	0.247	0.257	0.249	0.249	0.257
0.40	0.123	0.123	0.129	0.158	0.201	0.213	0.209	0.209	0.213
0.50	0.099	0.100	0.104	0.130	0.171	0.186	0.187	0.187	0.186
0.75	0.067	0.067	0.069	0.088	0.119	0.136	0.138	0.138	0.136
1.0	0.049	0.049	0.050	0.064	0.088	0.105	0.103	0.103	0.105
1.5	0.030	0.030	0.031	0.039	0.054	0.063	0.062	0.062	0.063
2.0	0.021	0.021	0.022	0.028	0.038	0.042	0.042	0.042	0.042
3.0	0.012	0.012	0.012	0.016	0.021	0.022	0.022	0.022	0.022
4.0	0.008	0.008	0.008	0.010	0.014	0.015	0.015	0.015	0.015
5.0	0.006	0.006	0.006	0.008	0.010	0.011	0.010	0.010	0.011
7.5	0.003	0.003	0.003	0.004	0.006	0.006	0.006	0.006	0.006
10	0.002	0.002	0.002	0.003	0.004	0.004	0.004	0.004	0.004
S_{MS} (g)	0.21	0.21	0.24	0.27	0.30	0.30	0.28	0.28	0.30
S_{M1} (g)	0.05	0.05	0.05	0.06	0.09	0.11	0.10	0.10	0.11
S_{DS} (g)	0.14	0.14	0.16	0.18	0.20	0.20	0.19	0.19	0.20
S_{D1} (g)	0.03	0.03	0.03	0.04	0.06	0.07	0.07	0.07	0.07

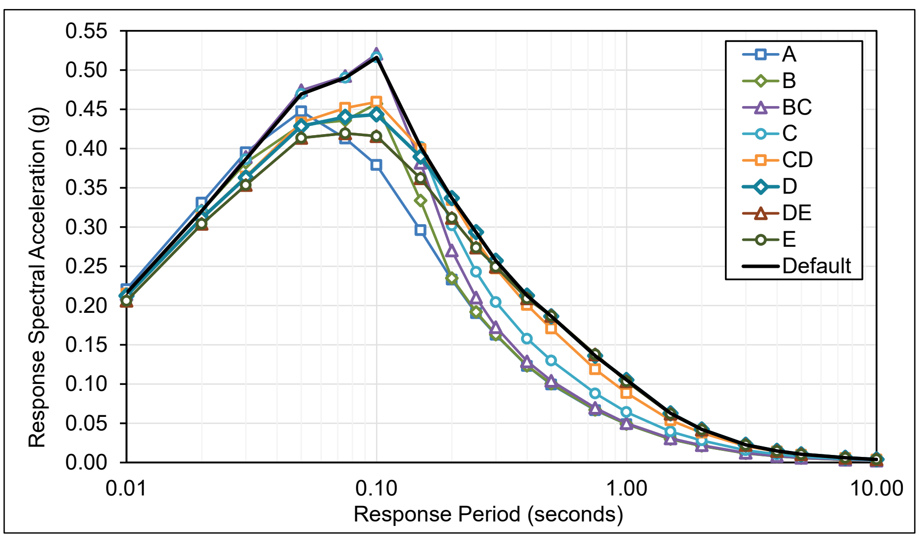


Figure D.3-34 Plots of MCE$_R$ multi-period response spectra (MPRS) proposed for the 2020 *NEHRP Provisions* and ASCE 7-22, New York Site.

Appendix E

Multi-Period Response Spectra of 34 U.S. City Sites Derived from Parameters S_S, S_1, and T_L

This appendix provides tables and plots of multi-period response spectra (MPRS) of 34 U.S. city sites derived from parameters S_S, S_1, and T_L using the methods of Chapters 3, 4, and 5 of this study. Tables of derived MPRS include corresponding values of design parameters S_{MS}, S_{M1}, S_{DS}, and S_{D1} for each site class. The derived MPRS and values of design parameters in this appendix are compared in Chapter 6 with those proposed for the 2020 *NEHRP Provisions* and ASCE 7-22 (Appendix D) for example sites.

Section E.1 provides MPRS tables and plots of derived probabilistic MCE_R ground motions calculated in accordance with the methods of Chapter 4.

Section E.2 provides MPRS tables and plots of derived deterministic MCE_R ground motions calculated in accordance with the methods of Chapter 5 (i.e., without the deterministic lower limit MPRS of Table 5.5-2).

Section E.3 provides MPRS tables and plots of derived MCE_R ground motions calculated in accordance with the requirements of Section 21.2.3 of the 2020 *NEHRP Provisions* and ASCE 7-22 (i.e., the lesser of derived probabilistic MCE_R and derived deterministic MCE_R ground motions) where derived deterministic MCE_R ground motions include the deterministic lower limit MPRS of Table 5.5-2).

E.1 Derived Probabilistic MCE_R Ground Motions

Table E.1-1 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Los Angeles Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.706	0.790	0.916	1.005	1.030	0.973	0.875	0.825	1.030
0.01	0.711	0.795	0.921	1.010	1.036	0.979	0.882	0.832	1.036
0.02	0.739	0.823	0.947	1.027	1.043	0.982	0.878	0.820	1.043
0.03	0.876	0.956	1.065	1.109	1.091	0.996	0.865	0.796	1.109
0.05	1.264	1.349	1.399	1.382	1.283	1.119	0.943	0.860	1.382
0.08	1.632	1.757	1.817	1.769	1.607	1.389	1.182	1.093	1.769
0.10	1.740	1.919	2.068	2.053	1.882	1.641	1.415	1.323	2.053
0.15	1.704	1.935	2.292	2.379	2.236	1.971	1.707	1.596	2.379
0.20	1.513	1.749	**2.203**	2.508	2.437	2.179	1.891	1.772	2.508
0.25	1.340	1.566	2.040	2.514	2.546	2.331	2.053	1.938	2.546
0.30	1.203	1.411	1.880	2.405	2.587	2.445	2.202	2.102	2.587
0.40	1.001	1.175	1.605	2.147	2.536	2.460	2.300	2.227	2.536
0.50	0.853	1.001	1.395	1.912	2.368	2.407	2.328	2.264	2.407
0.75	0.638	0.728	1.031	1.451	1.912	2.047	2.102	2.143	2.047
1.0	0.496	0.550	**0.789**	1.135	1.555	1.758	1.940	2.062	1.758
1.5	0.319	0.344	0.489	0.713	1.010	1.276	1.585	1.834	1.276
2.0	0.239	0.255	0.344	0.501	0.718	0.977	1.323	1.641	0.977
3.0	0.159	0.169	0.211	0.307	0.444	0.616	0.860	1.091	0.616
4.0	0.118	0.124	0.149	0.214	0.306	0.420	0.579	0.729	0.420
5.0	0.097	0.101	0.116	0.163	0.229	0.310	0.421	0.523	0.310
7.5	0.065	0.067	0.072	0.098	0.133	0.174	0.229	0.279	0.174
10	0.046	0.047	0.051	0.067	0.087	0.111	0.141	0.168	0.111
S_{MS} (g)	1.36	1.57	1.98	2.26	2.33	2.21	2.10	2.04	2.33
S_{M1} (g)	0.50	0.55	0.79	1.13	1.55	1.76	2.38	2.95	1.76
S_{DS} (g)	0.91	1.05	1.32	1.51	1.55	1.48	1.40	1.36	1.55
S_{D1} (g)	0.33	0.37	0.53	0.76	1.04	1.17	1.59	1.97	1.17

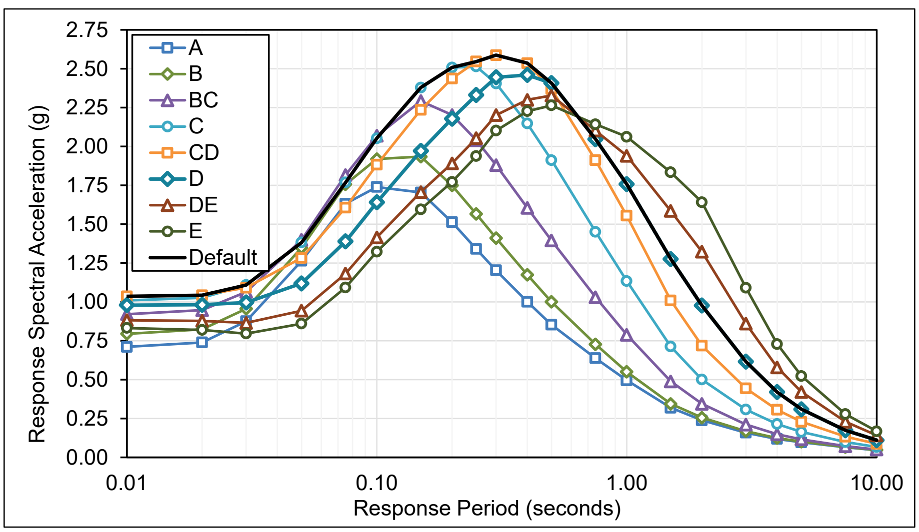


Figure E.1-1 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Los Angeles Site.

Table E.1-2 **Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Century City Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.760	0.850	0.986	1.081	1.108	1.047	0.942	0.888	1.108
0.01	0.765	0.855	0.992	1.087	1.115	1.054	0.950	0.896	1.115
0.02	0.796	0.886	1.019	1.105	1.122	1.057	0.945	0.883	1.122
0.03	0.942	1.029	1.146	1.193	1.174	1.072	0.931	0.857	1.193
0.05	1.360	1.452	1.506	1.487	1.381	1.204	1.015	0.926	1.487
0.08	1.756	1.891	1.955	1.904	1.729	1.495	1.272	1.176	1.904
0.10	1.872	2.066	2.226	2.209	2.026	1.766	1.523	1.424	2.209
0.15	1.834	2.082	2.467	2.560	2.407	2.122	1.837	1.717	2.560
0.20	1.628	1.882	**2.370**	2.699	2.623	2.345	2.035	1.907	2.699
0.25	1.461	1.706	2.224	2.740	2.740	2.509	2.209	2.086	2.740
0.30	1.325	1.553	2.070	2.648	2.784	2.631	2.370	2.262	2.784
0.40	1.118	1.313	1.794	2.399	2.788	2.647	2.475	2.397	2.788
0.50	0.964	1.130	1.575	2.160	2.645	2.624	2.537	2.437	2.645
0.75	0.734	0.838	1.186	1.671	2.191	2.279	2.341	2.367	2.279
1.0	0.578	0.642	**0.920**	1.323	1.813	1.986	2.192	2.317	1.986
1.5	0.372	0.401	0.570	0.831	1.177	1.469	1.825	2.107	1.469
2.0	0.279	0.298	0.401	0.584	0.838	1.139	1.542	1.914	1.139
3.0	0.185	0.197	0.246	0.358	0.517	0.718	1.003	1.272	0.718
4.0	0.138	0.145	0.173	0.250	0.357	0.489	0.675	0.849	0.489
5.0	0.113	0.118	0.135	0.191	0.267	0.361	0.490	0.610	0.361
7.5	0.076	0.078	0.084	0.115	0.155	0.203	0.267	0.325	0.203
10	0.054	0.055	0.059	0.078	0.101	0.129	0.165	0.196	0.129
S_{MS} (g)	1.47	1.69	2.13	2.47	2.51	2.38	2.28	2.19	2.51
S_{M1} (g)	0.58	0.64	0.92	1.32	1.81	2.05	2.78	3.44	2.05
S_{DS} (g)	0.98	1.13	1.42	1.64	1.67	1.59	1.52	1.46	1.67
S_{D1} (g)	0.39	0.43	0.61	0.88	1.21	1.37	1.85	2.30	1.37

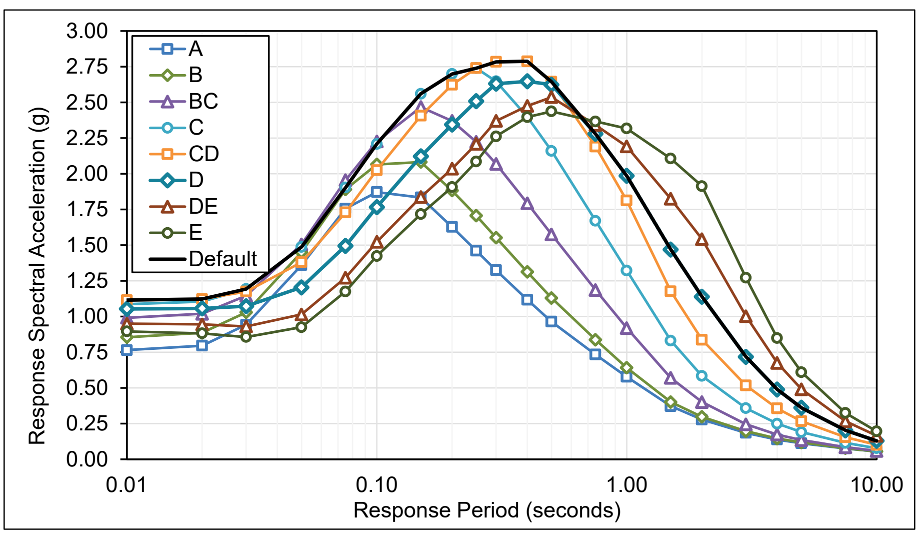


Figure E.1-2 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Century City Site.

Table E.1-3 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Northridge Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.709	0.793	0.920	1.009	1.034	0.977	0.879	0.828	1.034
0.01	0.714	0.798	0.925	1.014	1.040	0.983	0.886	0.836	1.040
0.02	0.742	0.827	0.951	1.031	1.047	0.986	0.882	0.824	1.047
0.03	0.879	0.960	1.069	1.113	1.096	1.001	0.868	0.800	1.113
0.05	1.269	1.354	1.405	1.388	1.289	1.124	0.947	0.864	1.388
0.08	1.638	1.764	1.824	1.776	1.614	1.395	1.187	1.097	1.776
0.10	1.747	1.927	2.077	2.061	1.890	1.648	1.421	1.329	2.061
0.15	1.711	1.943	2.302	2.389	2.246	1.980	1.714	1.603	2.389
0.20	1.519	1.756	**2.212**	2.519	2.447	2.188	1.899	1.779	2.519
0.25	1.341	1.566	2.041	2.515	2.557	2.341	2.061	1.946	2.557
0.30	1.200	1.407	1.875	2.399	2.598	2.455	2.211	2.111	2.598
0.40	0.993	1.166	1.594	2.132	2.530	2.470	2.309	2.236	2.530
0.50	0.844	0.990	1.379	1.891	2.351	2.408	2.329	2.274	2.408
0.75	0.627	0.715	1.013	1.427	1.882	2.034	2.089	2.135	2.034
1.0	0.485	0.539	**0.772**	1.111	1.522	1.739	1.919	2.043	1.739
1.5	0.313	0.337	0.479	0.698	0.989	1.255	1.558	1.804	1.255
2.0	0.234	0.250	0.337	0.490	0.703	0.956	1.295	1.607	0.956
3.0	0.156	0.165	0.206	0.301	0.434	0.603	0.842	1.068	0.603
4.0	0.116	0.122	0.145	0.210	0.299	0.411	0.567	0.713	0.411
5.0	0.095	0.099	0.113	0.160	0.224	0.303	0.412	0.512	0.303
7.5	0.064	0.065	0.071	0.096	0.130	0.170	0.224	0.273	0.170
10	0.046	0.046	0.050	0.065	0.085	0.108	0.138	0.165	0.108
S_{MS} (g)	1.37	1.58	1.99	2.27	2.34	2.22	2.10	2.05	2.34
S_{M1} (g)	0.49	0.54	0.77	1.11	1.52	1.74	2.33	2.89	1.74
S_{DS} (g)	0.91	1.05	1.33	1.51	1.56	1.48	1.40	1.36	1.56
S_{D1} (g)	0.32	0.36	0.51	0.74	1.01	1.16	1.55	1.93	1.16

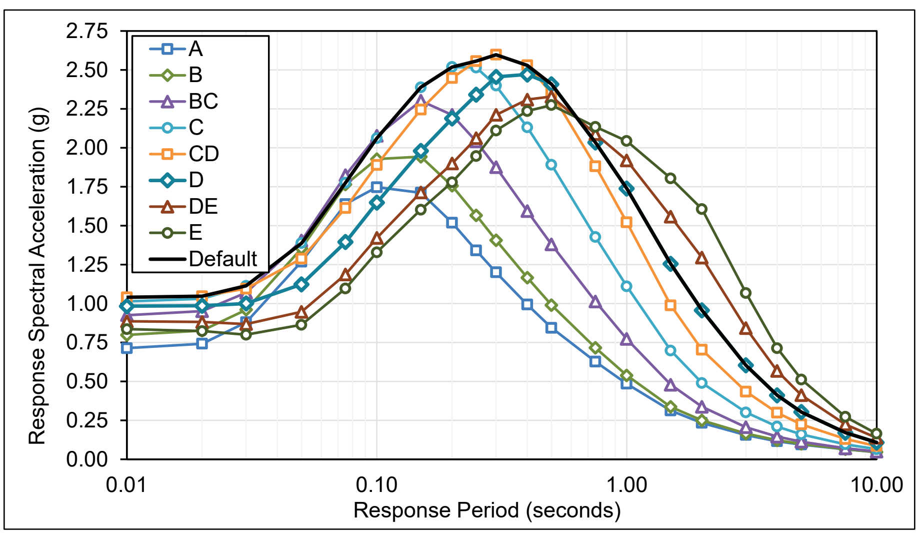


Figure E.1-3 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Northridge Site.

Table E.1-4 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Long Beach Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.616	0.690	0.802	0.886	0.918	0.881	0.807	0.770	0.918
0.01	0.620	0.694	0.806	0.890	0.924	0.887	0.814	0.776	0.924
0.02	0.644	0.717	0.828	0.904	0.929	0.889	0.810	0.766	0.929
0.03	0.760	0.831	0.929	0.976	0.974	0.904	0.800	0.746	0.976
0.05	1.090	1.165	1.219	1.218	1.148	1.019	0.876	0.808	1.218
0.08	1.408	1.518	1.585	1.562	1.443	1.270	1.101	1.028	1.562
0.10	1.505	1.663	1.806	1.815	1.693	1.505	1.324	1.251	1.815
0.15	1.478	1.680	1.998	2.102	2.015	1.816	1.608	1.521	2.102
0.20	1.314	1.520	**1.918**	2.205	2.190	2.006	1.786	1.695	2.205
0.25	1.181	1.382	1.802	2.235	2.274	2.138	1.936	1.855	2.274
0.30	1.072	1.259	1.679	2.160	2.295	2.229	2.068	2.006	2.295
0.40	0.906	1.067	1.459	1.958	2.294	2.318	2.143	2.113	2.318
0.50	0.783	0.922	1.284	1.766	2.181	2.291	2.191	2.135	2.291
0.75	0.599	0.685	0.970	1.368	1.806	1.975	2.004	2.056	1.975
1.0	0.474	0.527	**0.754**	1.085	1.495	1.711	1.856	1.987	1.711
1.5	0.308	0.331	0.470	0.686	0.974	1.266	1.534	1.783	1.266
2.0	0.233	0.248	0.334	0.485	0.697	0.949	1.288	1.600	0.949
3.0	0.157	0.166	0.206	0.300	0.434	0.602	0.841	1.066	0.602
4.0	0.118	0.124	0.147	0.212	0.302	0.415	0.573	0.720	0.415
5.0	0.097	0.101	0.115	0.163	0.228	0.308	0.419	0.521	0.308
7.5	0.066	0.068	0.073	0.100	0.135	0.177	0.233	0.283	0.177
10	0.048	0.049	0.052	0.069	0.090	0.114	0.146	0.173	0.114
S_{MS} (g)	1.18	1.37	1.73	2.01	2.07	2.09	1.97	1.92	2.09
S_{M1} (g)	0.47	0.53	0.75	1.09	1.50	1.71	2.32	2.88	1.71
S_{DS} (g)	0.79	0.91	1.15	1.34	1.38	1.39	1.31	1.28	1.39
S_{D1} (g)	0.32	0.35	0.50	0.72	1.00	1.14	1.55	1.92	1.14

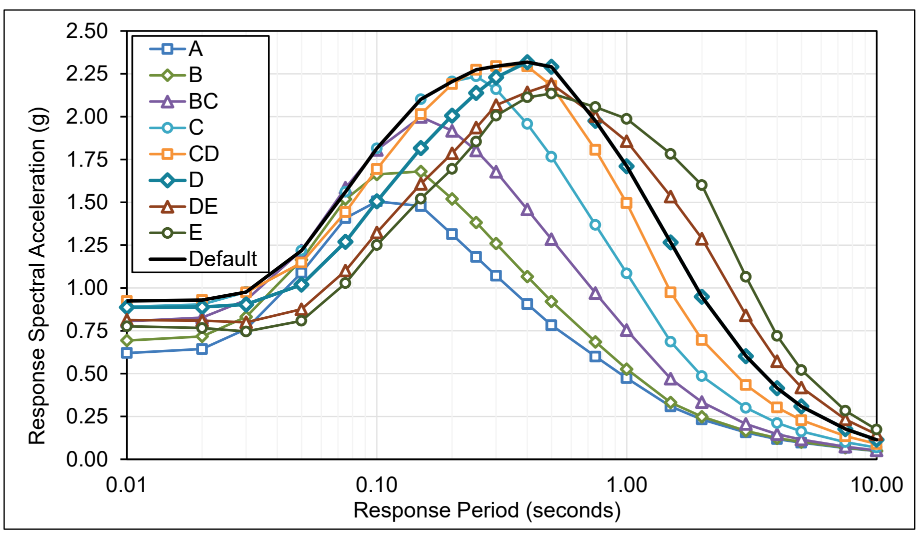


Figure E.1-4 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Long Beach Site.

Table E.1-5 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Irvine Site

Period	5% -Damped Response Spectral Acceleration (g)								
***T* (s)**	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.463	0.519	0.605	0.677	0.718	0.708	0.670	0.652	0.718
0.01	0.466	0.522	0.609	0.681	0.722	0.713	0.675	0.658	0.722
0.02	0.483	0.539	0.624	0.691	0.726	0.714	0.673	0.650	0.726
0.03	0.567	0.621	0.699	0.747	0.763	0.729	0.668	0.636	0.763
0.05	0.804	0.862	0.916	0.934	0.904	0.828	0.736	0.691	0.934
0.08	1.039	1.123	1.192	1.201	1.142	1.037	0.927	0.879	1.201
0.10	1.115	1.234	1.360	1.398	1.346	1.238	1.122	1.077	1.398
0.15	1.100	1.252	1.498	1.616	1.608	1.507	1.384	1.334	1.616
0.20	0.976	1.132	**1.430**	1.676	1.736	1.663	1.546	1.499	1.736
0.25	0.849	0.997	1.302	1.633	1.781	1.758	1.671	1.641	1.781
0.30	0.749	0.884	1.181	1.533	1.779	1.812	1.770	1.767	1.812
0.40	0.607	0.720	0.985	1.330	1.663	1.783	1.810	1.844	1.783
0.50	0.509	0.605	0.844	1.167	1.515	1.696	1.779	1.846	1.696
0.75	0.371	0.428	0.606	0.857	1.162	1.366	1.508	1.630	1.366
1.0	0.284	0.318	**0.455**	0.655	0.912	1.123	1.313	1.465	1.123
1.5	0.187	0.201	0.285	0.415	0.594	0.784	1.004	1.191	0.784
2.0	0.144	0.153	0.204	0.296	0.426	0.583	0.795	0.991	0.583
3.0	0.098	0.103	0.127	0.185	0.267	0.370	0.517	0.655	0.370
4.0	0.074	0.077	0.091	0.132	0.188	0.258	0.356	0.447	0.258
5.0	0.061	0.063	0.072	0.102	0.143	0.193	0.263	0.326	0.193
7.5	0.043	0.044	0.048	0.065	0.089	0.116	0.153	0.186	0.116
10	0.032	0.033	0.035	0.046	0.061	0.078	0.099	0.119	0.078
S_{MS} (g)	0.88	1.02	1.29	1.51	1.60	1.63	1.63	1.66	1.63
S_{M1} (g)	0.28	0.32	0.45	0.66	0.91	1.12	1.43	1.78	1.12
S_{DS} (g)	0.59	0.68	0.86	1.01	1.07	1.09	1.09	1.11	1.09
S_{D1} (g)	0.19	0.21	0.30	0.44	0.61	0.75	0.95	1.19	0.75

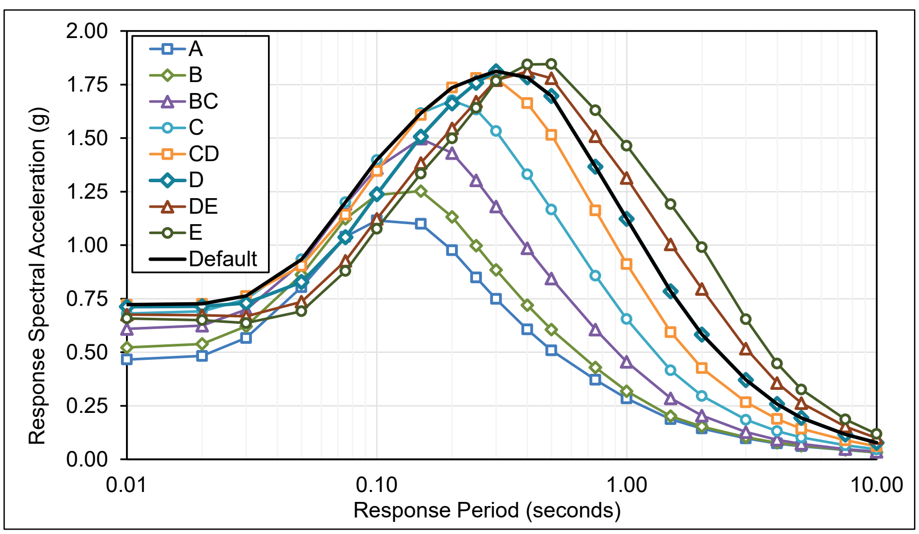


Figure E.1-5 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Irvine Site.

Table E.1-6 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Riverside Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.577	0.647	0.756	0.850	0.905	0.890	0.835	0.806	0.905
0.01	0.580	0.651	0.760	0.855	0.910	0.896	0.841	0.813	0.910
0.02	0.600	0.671	0.778	0.866	0.914	0.897	0.839	0.803	0.914
0.03	0.705	0.773	0.871	0.936	0.960	0.917	0.832	0.786	0.960
0.05	1.009	1.080	1.149	1.177	1.143	1.045	0.921	0.860	1.177
0.08	1.305	1.409	1.498	1.517	1.448	1.313	1.167	1.103	1.517
0.10	1.397	1.544	1.706	1.763	1.701	1.559	1.406	1.344	1.763
0.15	1.376	1.562	1.873	2.030	2.021	1.882	1.709	1.633	2.030
0.20	1.228	1.418	**1.793**	2.112	2.184	2.071	1.891	1.816	2.184
0.25	1.068	1.247	1.627	2.048	2.247	2.195	2.042	1.979	2.247
0.30	0.943	1.105	1.473	1.914	2.247	2.270	2.170	2.131	2.270
0.40	0.768	0.902	1.230	1.659	2.097	2.235	2.234	2.232	2.235
0.50	0.648	0.761	1.058	1.460	1.909	2.128	2.195	2.247	2.128
0.75	0.475	0.541	0.761	1.076	1.464	1.717	1.865	1.987	1.717
1.0	0.367	0.405	**0.575**	0.828	1.156	1.428	1.648	1.816	1.428
1.5	0.247	0.263	0.372	0.542	0.773	1.020	1.296	1.525	1.020
2.0	0.192	0.204	0.274	0.398	0.571	0.783	1.065	1.327	0.783
3.0	0.138	0.146	0.181	0.263	0.380	0.527	0.735	0.932	0.527
4.0	0.111	0.116	0.138	0.199	0.283	0.388	0.535	0.673	0.388
5.0	0.095	0.099	0.113	0.160	0.223	0.301	0.408	0.509	0.301
7.5	0.067	0.069	0.075	0.101	0.136	0.178	0.233	0.284	0.178
10	0.048	0.049	0.053	0.069	0.089	0.113	0.144	0.171	0.113
S_{MS} (g)	1.10	1.28	1.61	1.90	2.02	2.04	2.01	2.02	2.04
S_{M1} (g)	0.37	0.40	0.58	0.83	1.16	1.43	1.99	2.52	1.43
S_{DS} (g)	0.74	0.85	1.08	1.27	1.35	1.36	1.34	1.35	1.36
S_{D1} (g)	0.24	0.27	0.38	0.55	0.77	0.95	1.32	1.68	0.95

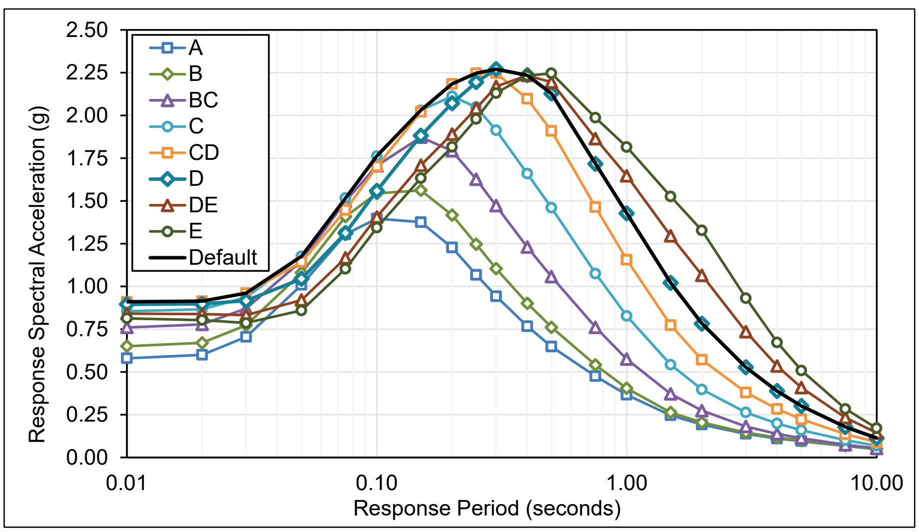


Figure E.1-6 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Riverside Site.

Table E.1-7 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, San Bernardino Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.946	1.057	1.230	1.349	1.372	1.280	1.140	1.069	1.372
0.01	0.952	1.064	1.236	1.356	1.380	1.289	1.149	1.079	1.380
0.02	0.990	1.102	1.272	1.378	1.389	1.293	1.144	1.064	1.389
0.03	1.168	1.278	1.428	1.485	1.452	1.312	1.127	1.033	1.485
0.05	1.677	1.794	1.866	1.841	1.699	1.469	1.232	1.122	1.841
0.08	2.150	2.319	2.402	2.334	2.107	1.811	1.541	1.428	2.334
0.10	2.285	2.522	2.721	2.689	2.449	2.125	1.836	1.723	2.689
0.15	2.251	2.552	3.033	3.123	2.901	2.537	2.196	2.061	3.123
0.20	2.015	2.323	**2.927**	3.324	3.175	2.801	2.422	2.274	3.324
0.25	1.772	2.064	2.684	3.303	3.344	3.003	2.624	2.485	3.344
0.30	1.581	1.845	2.454	3.130	3.431	3.162	2.808	2.679	3.431
0.40	1.318	1.539	2.097	2.792	3.350	3.241	2.947	2.835	3.350
0.50	1.133	1.320	1.833	2.505	3.127	3.180	2.968	2.895	3.180
0.75	0.856	0.970	1.367	1.923	2.531	2.733	2.677	2.690	2.733
1.0	0.674	0.745	**1.061**	1.528	2.084	2.398	2.527	2.628	2.398
1.5	0.458	0.494	0.702	1.021	1.444	1.821	2.192	2.490	1.821
2.0	0.354	0.381	0.516	0.750	1.077	1.455	1.951	2.408	1.455
3.0	0.259	0.277	0.351	0.513	0.740	1.028	1.435	1.821	1.028
4.0	0.207	0.220	0.266	0.384	0.548	0.752	1.039	1.308	0.752
5.0	0.176	0.186	0.215	0.304	0.426	0.576	0.781	0.974	0.576
7.5	0.114	0.117	0.129	0.175	0.236	0.308	0.404	0.492	0.308
10	0.079	0.081	0.087	0.114	0.148	0.187	0.237	0.281	0.187
S_{MS} (g)	1.81	2.09	2.63	2.99	3.09	2.92	2.67	2.61	3.09
S_{M1} (g)	0.67	0.74	1.06	1.53	2.08	2.78	3.87	4.92	2.78
S_{DS} (g)	1.21	1.39	1.76	1.99	2.06	1.94	1.78	1.74	2.06
S_{D1} (g)	0.45	0.50	0.71	1.02	1.39	1.85	2.58	3.28	1.85

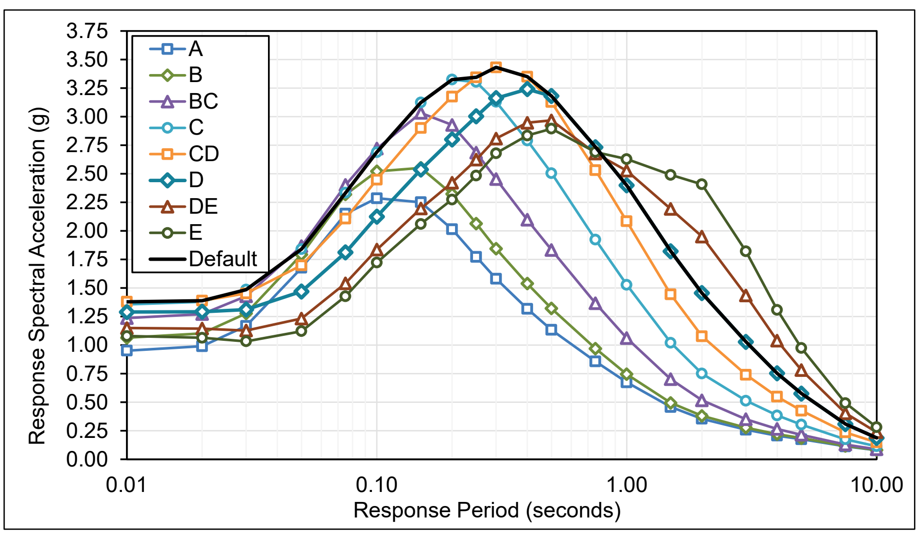


Figure E.1-7 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, San Bernardino Site.

Table E.1-8 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, San Luis Obispo Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.399	0.448	0.525	0.597	0.653	0.669	0.662	0.660	0.669
0.01	0.402	0.451	0.527	0.600	0.656	0.673	0.666	0.666	0.673
0.02	0.415	0.464	0.539	0.607	0.659	0.674	0.664	0.659	0.674
0.03	0.484	0.531	0.601	0.657	0.694	0.691	0.663	0.648	0.694
0.05	0.680	0.730	0.787	0.824	0.828	0.791	0.734	0.705	0.828
0.08	0.877	0.950	1.026	1.065	1.055	1.000	0.929	0.899	1.065
0.10	0.946	1.048	1.173	1.245	1.253	1.204	1.136	1.111	1.253
0.15	0.936	1.067	1.284	1.435	1.502	1.481	1.425	1.405	1.502
0.20	0.832	0.967	**1.224**	1.469	1.608	1.633	1.600	1.593	1.633
0.25	0.724	0.852	1.116	1.420	1.630	1.712	1.726	1.746	1.712
0.30	0.640	0.757	1.014	1.333	1.612	1.746	1.818	1.874	1.746
0.40	0.520	0.619	0.851	1.158	1.492	1.696	1.837	1.940	1.696
0.50	0.438	0.524	0.734	1.021	1.361	1.605	1.793	1.936	1.605
0.75	0.323	0.373	0.531	0.753	1.039	1.274	1.489	1.672	1.274
1.0	0.249	0.277	**0.399**	0.575	0.810	1.032	1.264	1.457	1.032
1.5	0.168	0.180	0.254	0.371	0.534	0.719	0.944	1.142	0.719
2.0	0.132	0.140	0.185	0.268	0.386	0.532	0.731	0.914	0.532
3.0	0.092	0.096	0.117	0.170	0.246	0.341	0.477	0.602	0.341
4.0	0.070	0.073	0.086	0.124	0.176	0.242	0.334	0.419	0.242
5.0	0.059	0.061	0.068	0.097	0.136	0.183	0.250	0.310	0.183
7.5	0.044	0.045	0.048	0.066	0.089	0.117	0.154	0.187	0.117
10	0.034	0.034	0.036	0.048	0.063	0.081	0.104	0.124	0.081
S_{MS} (g)	0.75	0.87	1.10	1.32	1.47	1.57	1.65	1.75	1.57
S_{M1} (g)	0.25	0.28	0.40	0.57	0.81	1.03	1.32	1.65	1.03
S_{DS} (g)	0.50	0.58	0.73	0.88	0.98	1.05	1.10	1.16	1.05
S_{D1} (g)	0.17	0.18	0.27	0.38	0.54	0.69	0.88	1.10	0.69

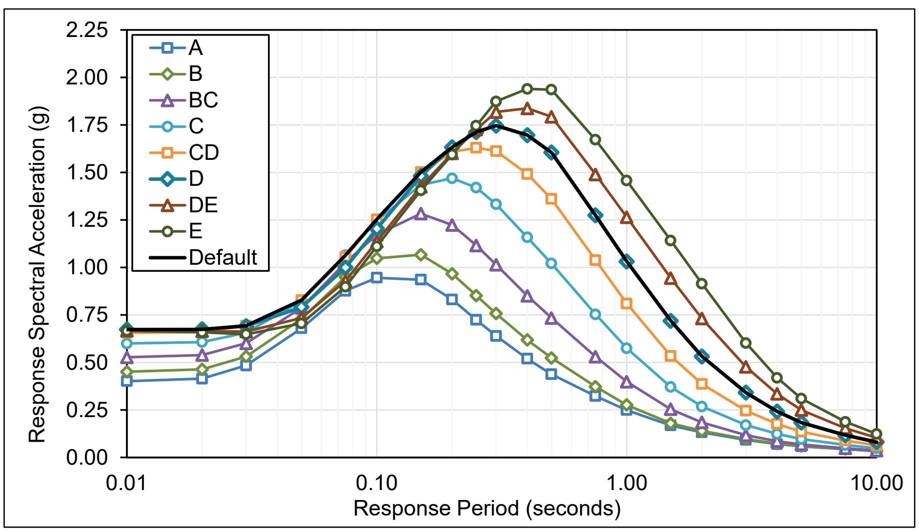


Figure E.1-8 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, San Luis Obispo Site.

Table E.1-9 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, San Diego Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.558	0.625	0.728	0.810	0.851	0.829	0.773	0.745	0.851
0.01	0.562	0.629	0.732	0.815	0.856	0.834	0.779	0.751	0.856
0.02	0.582	0.649	0.751	0.827	0.861	0.836	0.776	0.742	0.861
0.03	0.684	0.750	0.841	0.893	0.903	0.852	0.768	0.725	0.903
0.05	0.976	1.044	1.103	1.115	1.068	0.965	0.845	0.787	1.115
0.08	1.263	1.364	1.438	1.435	1.347	1.207	1.065	1.003	1.435
0.10	1.356	1.499	1.641	1.670	1.587	1.437	1.285	1.224	1.670
0.15	1.335	1.519	1.813	1.934	1.892	1.741	1.572	1.501	1.934
0.20	1.186	1.375	**1.736**	2.018	2.050	1.923	1.750	1.678	2.050
0.25	1.026	1.203	1.569	1.959	2.115	2.041	1.894	1.837	2.115
0.30	0.902	1.061	1.417	1.832	2.118	2.114	2.015	1.982	2.118
0.40	0.725	0.856	1.171	1.577	1.966	2.073	2.071	2.076	2.073
0.50	0.604	0.713	0.994	1.371	1.775	1.963	2.026	2.086	1.963
0.75	0.434	0.498	0.704	0.994	1.342	1.569	1.709	1.830	1.569
1.0	0.329	0.366	**0.524**	0.754	1.045	1.288	1.492	1.649	1.288
1.5	0.215	0.231	0.327	0.477	0.680	0.891	1.139	1.345	0.891
2.0	0.163	0.174	0.233	0.338	0.486	0.664	0.904	1.125	0.664
3.0	0.110	0.117	0.144	0.210	0.303	0.420	0.587	0.743	0.420
4.0	0.083	0.087	0.103	0.149	0.212	0.291	0.402	0.505	0.291
5.0	0.068	0.071	0.081	0.115	0.161	0.217	0.295	0.367	0.217
7.5	0.048	0.049	0.053	0.072	0.098	0.128	0.168	0.205	0.128
10	0.035	0.036	0.038	0.051	0.066	0.084	0.108	0.128	0.084
S_{MS} (g)	1.07	1.24	1.56	1.82	1.91	1.90	1.86	1.88	1.91
S_{M1} (g)	0.33	0.37	0.52	0.75	1.04	1.29	1.63	2.03	1.29
S_{DS} (g)	0.71	0.82	1.04	1.21	1.27	1.27	1.24	1.25	1.27
S_{D1} (g)	0.22	0.24	0.35	0.50	0.70	0.86	1.08	1.35	0.86

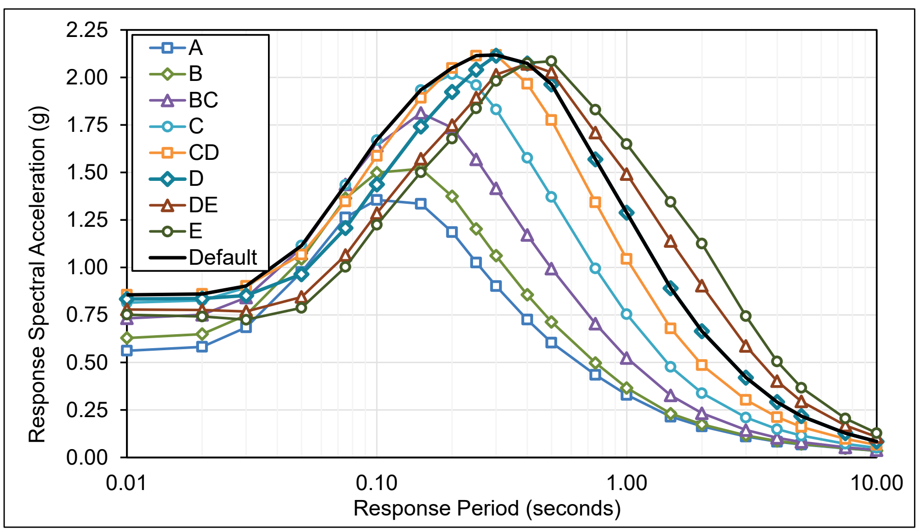


Figure E.1-9 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, San Diego Site.

Table E.1-10 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Santa Barbara Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.788	0.881	1.022	1.121	1.149	1.086	0.977	0.920	1.149
0.01	0.793	0.887	1.028	1.127	1.156	1.093	0.985	0.929	1.156
0.02	0.825	0.919	1.057	1.146	1.164	1.096	0.980	0.915	1.164
0.03	0.977	1.067	1.188	1.237	1.218	1.112	0.965	0.889	1.237
0.05	1.411	1.505	1.561	1.542	1.432	1.249	1.053	0.960	1.542
0.08	1.821	1.960	2.027	1.974	1.793	1.550	1.319	1.219	1.974
0.10	1.941	2.142	2.308	2.291	2.100	1.831	1.579	1.477	2.291
0.15	1.902	2.159	2.558	2.655	2.496	2.200	1.905	1.781	2.655
0.20	1.688	1.952	**2.458**	2.799	2.720	2.431	2.111	1.977	2.799
0.25	1.492	1.742	2.270	2.798	2.841	2.601	2.291	2.163	2.841
0.30	1.336	1.566	2.088	2.671	2.887	2.728	2.457	2.345	2.887
0.40	1.107	1.300	1.776	2.376	2.816	2.745	2.566	2.485	2.816
0.50	0.942	1.104	1.539	2.110	2.621	2.679	2.590	2.527	2.679
0.75	0.701	0.799	1.132	1.595	2.102	2.266	2.328	2.377	2.266
1.0	0.543	0.603	**0.864**	1.243	1.703	1.940	2.141	2.279	1.940
1.5	0.350	0.377	0.536	0.781	1.106	1.402	1.741	2.016	1.402
2.0	0.262	0.280	0.377	0.549	0.787	1.070	1.449	1.798	1.070
3.0	0.174	0.185	0.231	0.337	0.486	0.675	0.942	1.195	0.675
4.0	0.130	0.136	0.163	0.235	0.335	0.460	0.634	0.798	0.460
5.0	0.106	0.111	0.127	0.179	0.251	0.339	0.461	0.573	0.339
7.5	0.071	0.073	0.079	0.108	0.146	0.191	0.250	0.305	0.191
10	0.051	0.052	0.056	0.073	0.095	0.121	0.155	0.184	0.121
S_{MS} (g)	1.52	1.76	2.21	2.52	2.60	2.47	2.33	2.27	2.60
S_{M1} (g)	0.54	0.60	0.86	1.24	1.70	1.94	2.61	3.24	1.94
S_{DS} (g)	1.01	1.17	1.47	1.68	1.73	1.65	1.55	1.52	1.73
S_{D1} (g)	0.36	0.40	0.58	0.83	1.14	1.29	1.74	2.16	1.29

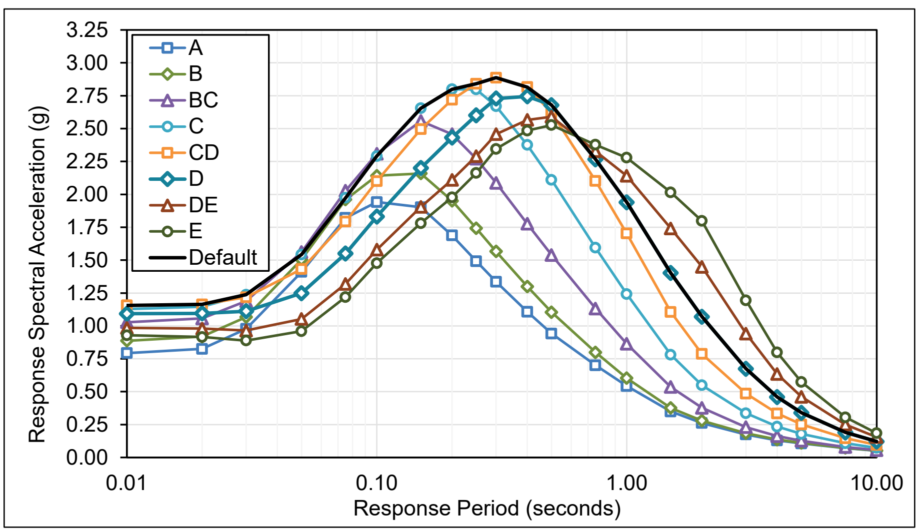


Figure E.1-10 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Santa Barbara Site.

Table E.1-11 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Ventura Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.749	0.838	0.972	1.066	1.092	1.032	0.928	0.875	1.092
0.01	0.754	0.843	0.977	1.071	1.099	1.039	0.936	0.883	1.099
0.02	0.784	0.873	1.004	1.089	1.106	1.041	0.931	0.870	1.106
0.03	0.929	1.014	1.129	1.176	1.157	1.057	0.917	0.844	1.176
0.05	1.341	1.431	1.484	1.466	1.361	1.187	1.000	0.912	1.466
0.08	1.730	1.863	1.927	1.876	1.704	1.473	1.254	1.159	1.876
0.10	1.845	2.036	2.194	2.177	1.996	1.741	1.501	1.403	2.177
0.15	1.807	2.052	2.431	2.523	2.372	2.091	1.810	1.693	2.523
0.20	1.605	1.855	**2.336**	2.660	2.585	2.311	2.006	1.879	2.660
0.25	1.466	1.712	2.231	2.749	2.700	2.472	2.177	2.055	2.749
0.30	1.347	1.579	2.105	2.693	2.744	2.593	2.336	2.229	2.744
0.40	1.160	1.362	1.861	2.489	2.831	2.609	2.439	2.362	2.831
0.50	1.015	1.190	1.658	2.273	2.742	2.632	2.545	2.402	2.742
0.75	0.791	0.903	1.278	1.800	2.348	2.355	2.418	2.418	2.355
1.0	0.632	0.702	**1.006**	1.447	1.983	2.089	2.306	2.421	2.089
1.5	0.407	0.439	0.624	0.909	1.288	1.583	1.966	2.264	1.583
2.0	0.305	0.326	0.439	0.639	0.916	1.246	1.687	2.093	1.246
3.0	0.203	0.215	0.269	0.392	0.566	0.786	1.097	1.391	0.786
4.0	0.151	0.159	0.189	0.273	0.390	0.535	0.739	0.929	0.535
5.0	0.124	0.129	0.147	0.208	0.292	0.395	0.537	0.667	0.395
7.5	0.083	0.085	0.092	0.125	0.170	0.222	0.292	0.355	0.222
10	0.059	0.061	0.065	0.085	0.111	0.141	0.180	0.214	0.141
S_{MS} (g)	1.44	1.67	2.10	2.47	2.55	2.37	2.29	2.16	2.55
S_{M1} (g)	0.63	0.70	1.01	1.45	1.98	2.24	3.04	3.77	2.24
S_{DS} (g)	0.96	1.11	1.40	1.65	1.70	1.58	1.53	1.44	1.70
S_{D1} (g)	0.42	0.47	0.67	0.96	1.32	1.49	2.02	2.51	1.49

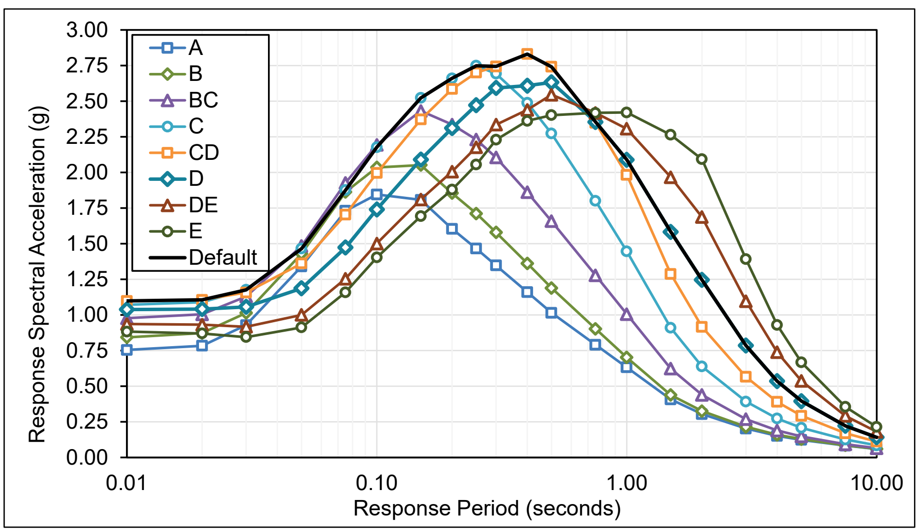


Figure E.1-11 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Ventura Site.

Table E.1-12 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Oakland Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.810	0.906	1.051	1.153	1.181	1.116	1.004	0.946	1.181
0.01	0.816	0.912	1.057	1.159	1.188	1.123	1.012	0.955	1.188
0.02	0.848	0.944	1.086	1.178	1.196	1.126	1.007	0.941	1.196
0.03	1.005	1.097	1.221	1.272	1.252	1.143	0.992	0.913	1.272
0.05	1.450	1.547	1.605	1.586	1.472	1.284	1.082	0.987	1.586
0.08	1.872	2.015	2.084	2.029	1.844	1.594	1.356	1.253	2.029
0.10	1.996	2.202	2.373	2.355	2.159	1.883	1.623	1.518	2.355
0.15	1.955	2.220	2.630	2.729	2.565	2.262	1.958	1.831	2.729
0.20	1.736	2.006	**2.527**	2.877	2.796	2.500	2.170	2.033	2.877
0.25	1.544	1.803	2.350	2.896	2.921	2.674	2.355	2.223	2.921
0.30	1.391	1.630	2.173	2.779	2.968	2.805	2.526	2.411	2.968
0.40	1.162	1.364	1.864	2.493	2.929	2.822	2.638	2.555	2.929
0.50	0.995	1.166	1.625	2.228	2.749	2.773	2.681	2.598	2.773
0.75	0.748	0.853	1.208	1.702	2.238	2.374	2.438	2.479	2.374
1.0	0.584	0.648	**0.929**	1.336	1.831	2.048	2.261	2.399	2.048
1.5	0.376	0.405	0.576	0.840	1.189	1.496	1.859	2.149	1.496
2.0	0.281	0.301	0.405	0.590	0.846	1.150	1.557	1.933	1.150
3.0	0.187	0.199	0.248	0.362	0.522	0.725	1.013	1.285	0.725
4.0	0.139	0.146	0.175	0.252	0.360	0.494	0.682	0.858	0.494
5.0	0.114	0.119	0.136	0.192	0.270	0.365	0.495	0.616	0.365
7.5	0.077	0.079	0.085	0.116	0.157	0.205	0.269	0.328	0.205
10	0.055	0.056	0.060	0.078	0.103	0.130	0.166	0.198	0.130
S_{MS} (g)	1.56	1.81	2.27	2.61	2.67	2.54	2.41	2.34	2.67
S_{M1} (g)	0.58	0.65	0.93	1.34	1.83	2.07	2.80	3.48	2.07
S_{DS} (g)	1.04	1.20	1.52	1.74	1.78	1.69	1.61	1.56	1.78
S_{D1} (g)	0.39	0.43	0.62	0.89	1.22	1.38	1.87	2.32	1.38

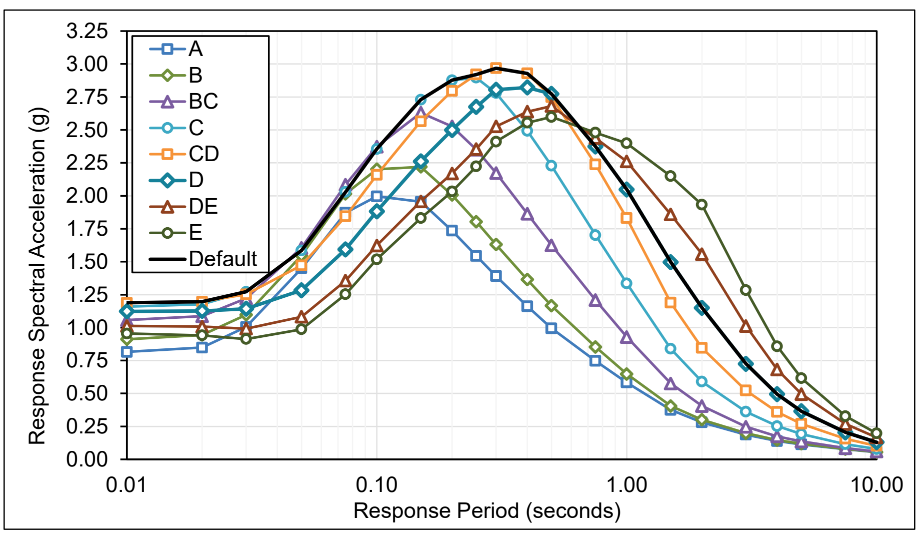


Figure E.1-12 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Oakland Site.

Table E.1-13 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Concord Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.940	1.050	1.219	1.336	1.370	1.294	1.164	1.097	1.370
0.01	0.946	1.057	1.225	1.343	1.378	1.303	1.174	1.107	1.378
0.02	0.983	1.095	1.260	1.365	1.387	1.306	1.168	1.091	1.387
0.03	1.165	1.272	1.416	1.475	1.451	1.325	1.150	1.059	1.475
0.05	1.681	1.794	1.861	1.838	1.707	1.488	1.255	1.144	1.838
0.08	2.170	2.337	2.416	2.353	2.137	1.848	1.573	1.453	2.353
0.10	2.314	2.553	2.751	2.730	2.503	2.183	1.882	1.760	2.730
0.15	2.267	2.573	3.049	3.164	2.974	2.622	2.270	2.123	3.164
0.20	2.012	2.326	**2.930**	3.336	3.242	2.898	2.515	2.357	3.336
0.25	1.783	2.083	2.714	3.344	3.386	3.101	2.730	2.577	3.386
0.30	1.601	1.877	2.501	3.200	3.441	3.252	2.929	2.795	3.441
0.40	1.332	1.563	2.136	2.857	3.373	3.272	3.059	2.962	3.373
0.50	1.136	1.331	1.856	2.544	3.151	3.202	3.097	3.012	3.202
0.75	0.849	0.968	1.372	1.932	2.544	2.723	2.797	2.851	2.723
1.0	0.660	0.733	**1.050**	1.510	2.070	2.339	2.582	2.744	2.339
1.5	0.425	0.458	0.651	0.949	1.344	1.698	2.110	2.441	1.698
2.0	0.318	0.340	0.458	0.667	0.956	1.300	1.761	2.185	1.300
3.0	0.212	0.225	0.280	0.409	0.591	0.820	1.145	1.452	0.820
4.0	0.158	0.166	0.198	0.285	0.407	0.559	0.771	0.970	0.559
5.0	0.129	0.135	0.154	0.218	0.305	0.412	0.560	0.697	0.412
7.5	0.087	0.089	0.096	0.131	0.177	0.232	0.304	0.371	0.232
10	0.062	0.063	0.068	0.089	0.116	0.147	0.188	0.224	0.147
S_{MS} (g)	1.81	2.09	2.64	3.01	3.10	2.94	2.79	2.71	3.10
S_{M1} (g)	0.66	0.73	1.05	1.51	2.07	2.34	3.17	3.93	2.34
S_{DS} (g)	1.21	1.40	1.76	2.01	2.06	1.96	1.86	1.81	2.06
S_{D1} (g)	0.44	0.49	0.70	1.01	1.38	1.56	2.11	2.62	1.56

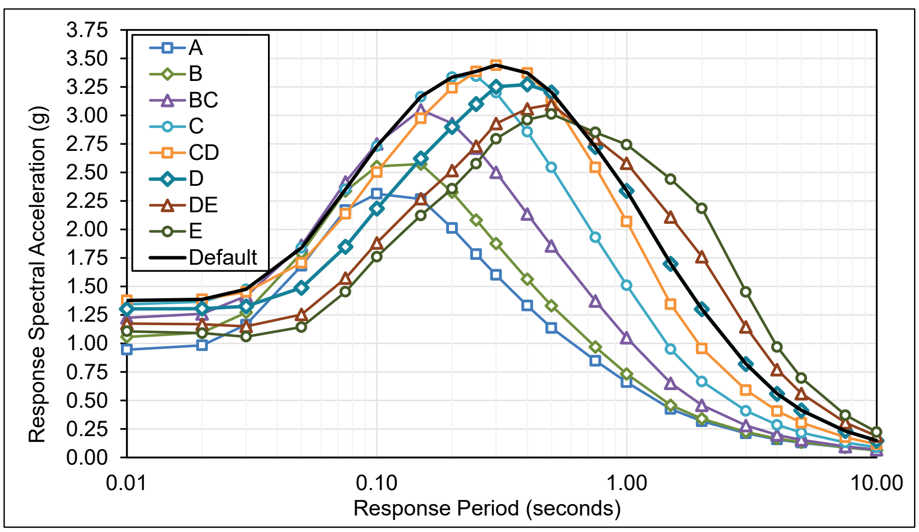


Figure E.1-13 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Concord Site.

Table E.1-14 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Monterey Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.490	0.550	0.644	0.729	0.786	0.789	0.761	0.747	0.789
0.01	0.493	0.553	0.648	0.733	0.791	0.794	0.767	0.754	0.794
0.02	0.509	0.569	0.662	0.742	0.794	0.795	0.764	0.745	0.795
0.03	0.595	0.653	0.739	0.801	0.834	0.813	0.760	0.732	0.834
0.05	0.840	0.902	0.968	1.003	0.992	0.928	0.842	0.800	1.003
0.08	1.082	1.171	1.258	1.290	1.256	1.168	1.067	1.024	1.290
0.10	1.161	1.285	1.431	1.500	1.481	1.394	1.294	1.257	1.500
0.15	1.145	1.303	1.568	1.727	1.765	1.699	1.597	1.558	1.765
0.20	1.023	1.186	**1.502**	1.789	1.904	1.873	1.781	1.748	1.904
0.25	0.893	1.047	1.369	1.736	1.951	1.978	1.922	1.907	1.978
0.30	0.790	0.930	1.243	1.626	1.940	2.035	2.033	2.048	2.035
0.40	0.643	0.761	1.041	1.411	1.805	1.990	2.075	2.130	1.990
0.50	0.543	0.645	0.898	1.244	1.644	1.888	2.026	2.124	1.888
0.75	0.402	0.460	0.649	0.919	1.259	1.512	1.700	1.850	1.512
1.0	0.311	0.344	**0.490**	0.705	0.989	1.242	1.473	1.651	1.242
1.5	0.212	0.225	0.318	0.464	0.664	0.883	1.138	1.353	0.883
2.0	0.167	0.176	0.234	0.340	0.489	0.671	0.916	1.140	0.671
3.0	0.120	0.126	0.154	0.224	0.324	0.449	0.627	0.793	0.449
4.0	0.095	0.099	0.117	0.169	0.241	0.330	0.456	0.572	0.330
5.0	0.081	0.085	0.096	0.136	0.190	0.257	0.349	0.433	0.257
7.5	0.060	0.061	0.066	0.090	0.121	0.159	0.208	0.254	0.159
10	0.044	0.045	0.048	0.063	0.083	0.105	0.134	0.159	0.105
S_{MS} (g)	0.92	1.07	1.35	1.61	1.76	1.83	1.87	1.92	1.83
S_{M1} (g)	0.31	0.34	0.49	0.71	0.99	1.24	1.69	2.14	1.24
S_{DS} (g)	0.61	0.71	0.90	1.07	1.17	1.22	1.24	1.28	1.22
S_{D1} (g)	0.21	0.23	0.33	0.47	0.66	0.83	1.13	1.43	0.83

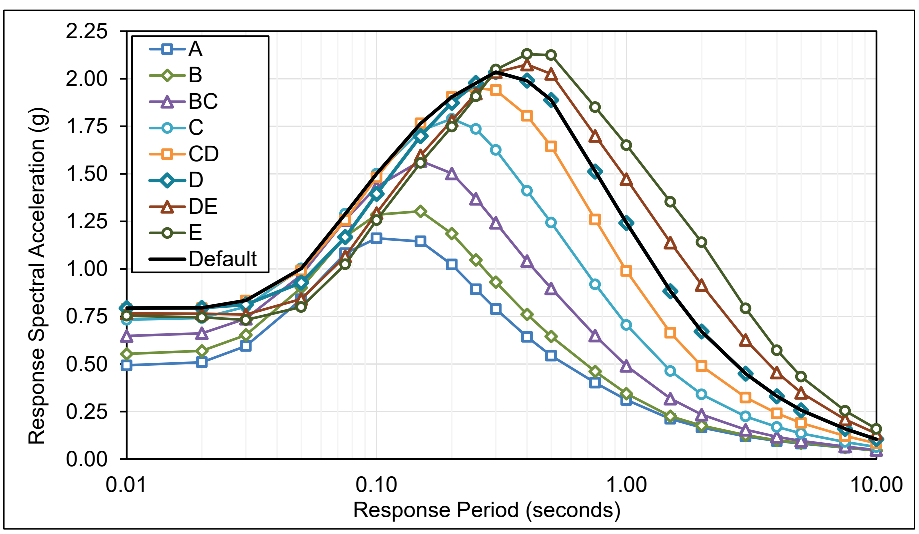


Figure E.1-14 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Monterey Site.

Table E.1-15 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Sacramento Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.221	0.248	0.290	0.334	0.377	0.403	0.420	0.435	0.403
0.01	0.222	0.249	0.291	0.336	0.379	0.405	0.423	0.438	0.405
0.02	0.229	0.256	0.297	0.339	0.379	0.405	0.422	0.434	0.405
0.03	0.263	0.288	0.327	0.364	0.398	0.415	0.422	0.429	0.415
0.05	0.357	0.384	0.419	0.450	0.471	0.474	0.467	0.464	0.474
0.08	0.456	0.494	0.543	0.580	0.602	0.602	0.592	0.591	0.602
0.10	0.495	0.550	0.624	0.684	0.724	0.736	0.737	0.745	0.736
0.15	0.493	0.564	0.682	0.788	0.874	0.921	0.950	0.975	0.921
0.20	0.442	0.516	**0.655**	0.806	0.936	1.021	1.082	1.127	1.021
0.25	0.388	0.460	0.603	0.780	0.951	1.074	1.175	1.249	1.074
0.30	0.347	0.415	0.554	0.739	0.939	1.097	1.239	1.344	1.097
0.40	0.287	0.347	0.474	0.653	0.874	1.065	1.258	1.398	1.065
0.50	0.247	0.301	0.418	0.587	0.808	1.013	1.228	1.391	1.013
0.75	0.189	0.222	0.311	0.445	0.626	0.809	1.013	1.192	0.809
1.0	0.149	0.168	**0.238**	0.346	0.494	0.655	0.850	1.024	0.655
1.5	0.105	0.115	0.161	0.237	0.343	0.468	0.634	0.791	0.468
2.0	0.085	0.092	0.123	0.179	0.259	0.356	0.490	0.625	0.356
3.0	0.061	0.066	0.082	0.120	0.173	0.238	0.329	0.423	0.238
4.0	0.047	0.051	0.062	0.091	0.128	0.174	0.238	0.304	0.174
5.0	0.040	0.043	0.051	0.073	0.101	0.135	0.181	0.229	0.135
7.5	0.032	0.034	0.039	0.054	0.073	0.094	0.123	0.155	0.094
10	0.026	0.029	0.033	0.044	0.057	0.072	0.091	0.112	0.072
S_{MS} (g)	0.40	0.46	0.59	0.73	0.86	0.99	1.13	1.26	0.99
S_{M1} (g)	0.15	0.17	0.24	0.35	0.49	0.66	0.89	1.14	0.66
S_{DS} (g)	0.27	0.31	0.39	0.48	0.57	0.66	0.75	0.84	0.66
S_{D1} (g)	0.10	0.11	0.16	0.23	0.33	0.44	0.59	0.76	0.44

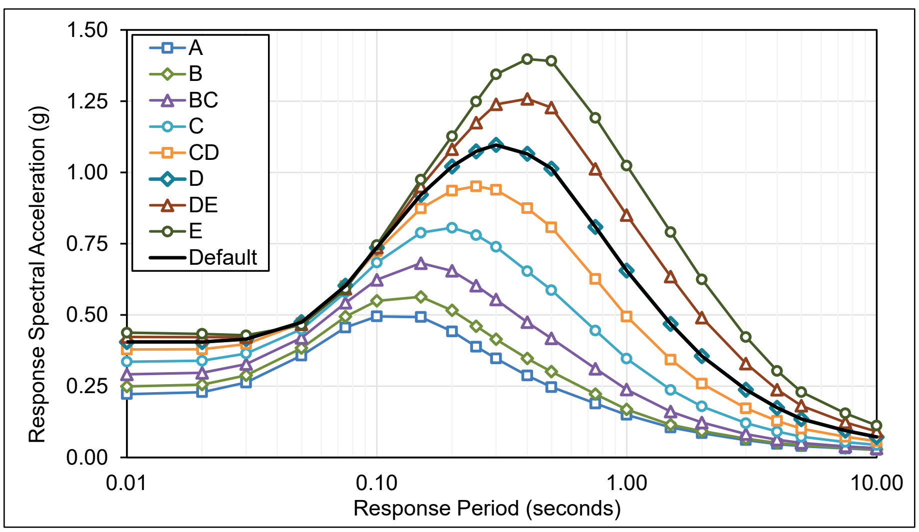


Figure E.1-15 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Sacramento Site.

Table E.1-16 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, San Francisco Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.637	0.715	0.836	0.940	1.000	0.983	0.922	0.891	1.000
0.01	0.641	0.719	0.840	0.945	1.006	0.990	0.930	0.899	1.006
0.02	0.663	0.741	0.860	0.957	1.010	0.992	0.927	0.888	1.010
0.03	0.779	0.854	0.963	1.035	1.061	1.013	0.920	0.869	1.061
0.05	1.115	1.193	1.269	1.300	1.264	1.155	1.018	0.950	1.300
0.08	1.443	1.557	1.656	1.676	1.600	1.451	1.290	1.219	1.676
0.10	1.544	1.706	1.885	1.948	1.880	1.723	1.554	1.485	1.948
0.15	1.521	1.727	2.070	2.244	2.233	2.080	1.888	1.805	2.244
0.20	1.357	1.567	**1.982**	2.334	2.414	2.289	2.090	2.007	2.414
0.25	1.192	1.392	1.823	2.296	2.484	2.425	2.257	2.188	2.484
0.30	1.061	1.243	1.670	2.170	2.484	2.509	2.398	2.355	2.509
0.40	0.875	1.027	1.420	1.915	2.360	2.502	2.469	2.467	2.502
0.50	0.746	0.876	1.238	1.708	2.179	2.405	2.453	2.483	2.405
0.75	0.556	0.633	0.913	1.290	1.713	1.976	2.127	2.247	1.976
1.0	0.435	0.480	**0.702**	1.010	1.378	1.664	1.906	2.087	1.664
1.5	0.297	0.318	0.454	0.662	0.944	1.210	1.529	1.793	1.210
2.0	0.235	0.249	0.334	0.485	0.697	0.940	1.275	1.585	0.940
3.0	0.169	0.178	0.221	0.322	0.464	0.643	0.898	1.137	0.643
4.0	0.135	0.142	0.168	0.243	0.346	0.474	0.653	0.821	0.474
5.0	0.116	0.121	0.138	0.195	0.273	0.368	0.499	0.621	0.368
7.5	0.082	0.084	0.091	0.123	0.166	0.217	0.284	0.347	0.217
10	0.059	0.060	0.064	0.084	0.109	0.138	0.176	0.209	0.138
S_{MS} (g)	1.22	1.41	1.78	2.10	2.24	2.26	2.22	2.23	2.26
S_{M1} (g)	0.43	0.48	0.70	1.01	1.38	1.74	2.42	3.07	1.74
S_{DS} (g)	0.81	0.94	1.19	1.40	1.49	1.51	1.48	1.49	1.51
S_{D1} (g)	0.29	0.32	0.47	0.67	0.92	1.16	1.62	2.05	1.16

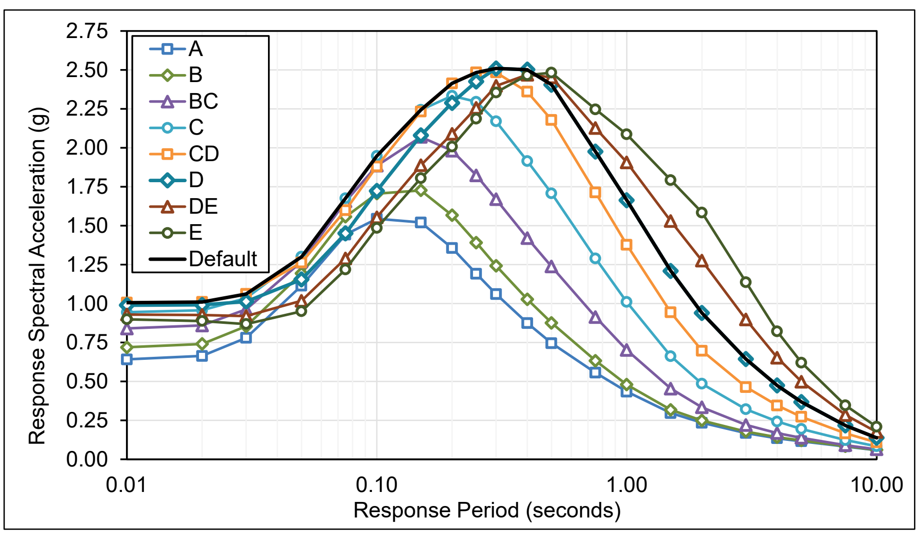


Figure E.1-16 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, San Francisco Site.

Table E.1-17 **Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, San Mateo Site**

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.758	0.847	0.985	1.080	1.098	1.025	0.913	0.856	1.098
0.01	0.762	0.852	0.990	1.086	1.105	1.032	0.920	0.864	1.105
0.02	0.793	0.883	1.018	1.104	1.113	1.035	0.916	0.852	1.113
0.03	0.935	1.023	1.144	1.189	1.163	1.050	0.903	0.827	1.189
0.05	1.343	1.436	1.494	1.474	1.360	1.177	0.987	0.898	1.474
0.08	1.722	1.857	1.924	1.869	1.687	1.451	1.234	1.143	1.869
0.10	1.830	2.019	2.179	2.154	1.961	1.702	1.470	1.380	2.154
0.15	1.802	2.043	2.429	2.501	2.323	2.032	1.759	1.650	2.501
0.20	1.613	1.860	**2.344**	2.662	2.543	2.243	1.939	1.821	2.662
0.25	1.436	1.672	2.186	2.681	2.678	2.405	2.101	1.990	2.681
0.30	1.293	1.509	2.026	2.568	2.748	2.532	2.249	2.146	2.748
0.40	1.094	1.278	1.768	2.330	2.724	2.596	2.360	2.270	2.724
0.50	0.952	1.109	1.571	2.118	2.572	2.581	2.377	2.318	2.581
0.75	0.734	0.831	1.206	1.665	2.126	2.272	2.203	2.214	2.272
1.0	0.586	0.648	**0.955**	1.344	1.776	2.028	2.120	2.205	2.028
1.5	0.406	0.438	0.632	0.919	1.256	1.576	1.888	2.145	1.576
2.0	0.319	0.343	0.465	0.676	0.951	1.280	1.712	2.113	1.280
3.0	0.233	0.250	0.316	0.462	0.667	0.926	1.292	1.639	0.926
4.0	0.187	0.198	0.239	0.346	0.493	0.678	0.935	1.178	0.678
5.0	0.158	0.167	0.193	0.274	0.384	0.518	0.703	0.877	0.518
7.5	0.102	0.106	0.116	0.158	0.212	0.277	0.363	0.443	0.277
10	0.071	0.073	0.079	0.103	0.133	0.168	0.214	0.253	0.168
S_{MS} (g)	1.45	1.67	2.11	2.41	2.47	2.34	2.14	2.09	2.47
S_{M1} (g)	0.59	0.65	0.96	1.34	1.80	2.50	3.49	4.43	2.50
S_{DS} (g)	0.97	1.12	1.41	1.61	1.65	1.56	1.43	1.39	1.65
S_{D1} (g)	0.39	0.43	0.64	0.90	1.20	1.67	2.33	2.95	1.67

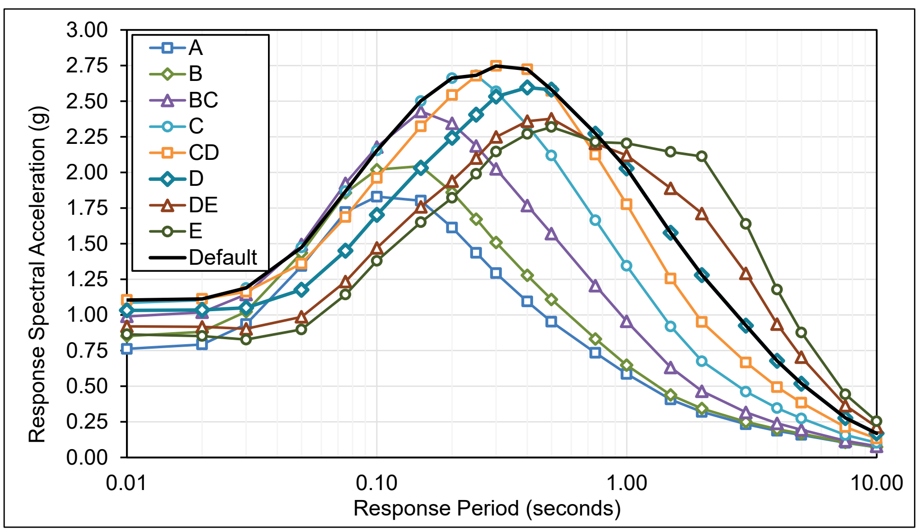


Figure E.1-17 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, San Mateo Site.

Table E.1-18 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, San Jose Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.763	0.853	0.992	1.088	1.107	1.033	0.919	0.862	1.107
0.01	0.768	0.858	0.997	1.094	1.113	1.040	0.927	0.871	1.113
0.02	0.799	0.889	1.026	1.112	1.121	1.043	0.923	0.858	1.121
0.03	0.942	1.031	1.152	1.198	1.171	1.058	0.909	0.833	1.198
0.05	1.353	1.447	1.505	1.485	1.370	1.185	0.994	0.905	1.485
0.08	1.735	1.870	1.938	1.883	1.700	1.461	1.243	1.152	1.883
0.10	1.844	2.034	2.195	2.169	1.975	1.714	1.481	1.390	2.169
0.15	1.816	2.058	2.446	2.520	2.340	2.047	1.772	1.662	2.520
0.20	1.625	1.874	**2.362**	2.682	2.562	2.260	1.954	1.835	2.682
0.25	1.439	1.676	2.187	2.686	2.698	2.423	2.117	2.004	2.698
0.30	1.291	1.506	2.014	2.561	2.768	2.551	2.266	2.161	2.768
0.40	1.085	1.267	1.743	2.306	2.726	2.615	2.377	2.287	2.726
0.50	0.940	1.095	1.538	2.086	2.562	2.585	2.394	2.335	2.585
0.75	0.719	0.814	1.166	1.623	2.099	2.253	2.194	2.205	2.253
1.0	0.570	0.630	**0.917**	1.302	1.743	1.997	2.094	2.178	1.997
1.5	0.392	0.423	0.606	0.882	1.222	1.537	1.845	2.095	1.537
2.0	0.306	0.329	0.446	0.648	0.920	1.240	1.660	2.049	1.240
3.0	0.224	0.240	0.303	0.443	0.640	0.888	1.240	1.573	0.888
4.0	0.179	0.190	0.230	0.332	0.474	0.650	0.897	1.130	0.650
5.0	0.152	0.160	0.186	0.263	0.368	0.497	0.675	0.842	0.497
7.5	0.098	0.101	0.111	0.151	0.204	0.266	0.349	0.425	0.266
10	0.068	0.070	0.076	0.098	0.128	0.162	0.205	0.243	0.162
S_{MS} (g)	1.46	1.69	2.13	2.42	2.49	2.35	2.15	2.10	2.49
S_{M1} (g)	0.57	0.63	0.92	1.30	1.74	2.40	3.35	4.25	2.40
S_{DS} (g)	0.98	1.12	1.42	1.61	1.66	1.57	1.44	1.40	1.66
S_{D1} (g)	0.38	0.42	0.61	0.87	1.16	1.60	2.23	2.83	1.60

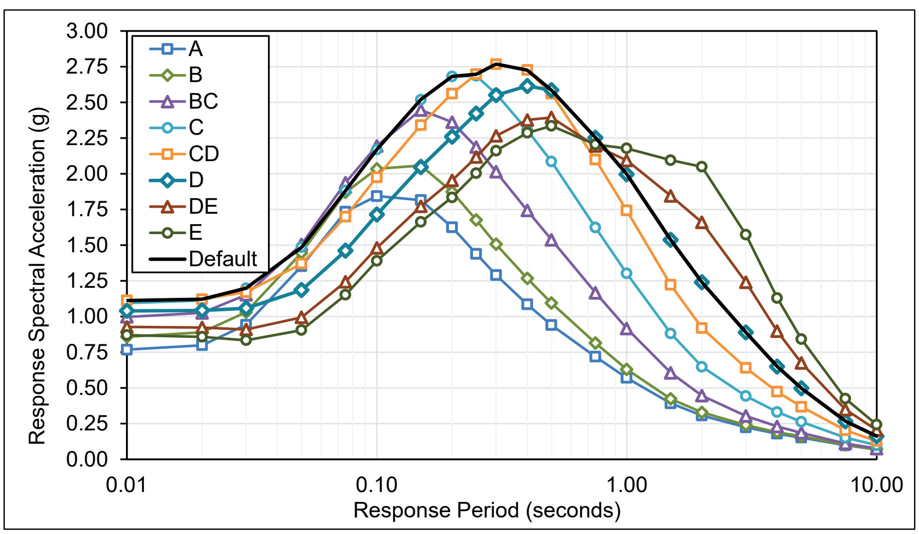


Figure E.1-18 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, San Jose Site.

Table E.1-19 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Santa Cruz Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.567	0.637	0.744	0.837	0.890	0.875	0.821	0.793	0.890
0.01	0.571	0.640	0.748	0.841	0.896	0.881	0.828	0.800	0.896
0.02	0.591	0.660	0.766	0.852	0.899	0.883	0.825	0.791	0.899
0.03	0.694	0.761	0.857	0.921	0.945	0.902	0.819	0.774	0.945
0.05	0.993	1.063	1.130	1.158	1.125	1.028	0.906	0.846	1.158
0.08	1.285	1.387	1.475	1.493	1.424	1.292	1.149	1.086	1.493
0.10	1.375	1.519	1.678	1.734	1.674	1.534	1.384	1.322	1.734
0.15	1.354	1.538	1.843	1.998	1.989	1.852	1.681	1.607	1.998
0.20	1.208	1.395	**1.765**	2.078	2.149	2.038	1.861	1.787	2.149
0.25	1.055	1.232	1.611	2.028	2.211	2.160	2.009	1.948	2.211
0.30	0.935	1.096	1.465	1.905	2.212	2.234	2.135	2.097	2.234
0.40	0.765	0.899	1.234	1.664	2.080	2.211	2.198	2.196	2.211
0.50	0.649	0.763	1.067	1.473	1.905	2.115	2.170	2.211	2.115
0.75	0.479	0.546	0.777	1.097	1.477	1.720	1.861	1.975	1.720
1.0	0.372	0.411	**0.591**	0.851	1.176	1.438	1.654	1.817	1.438
1.5	0.252	0.269	0.382	0.558	0.795	1.036	1.312	1.542	1.036
2.0	0.198	0.210	0.281	0.409	0.587	0.799	1.086	1.351	0.799
3.0	0.142	0.150	0.186	0.271	0.391	0.542	0.756	0.958	0.542
4.0	0.114	0.119	0.142	0.205	0.291	0.399	0.550	0.692	0.399
5.0	0.098	0.102	0.116	0.164	0.230	0.310	0.420	0.523	0.310
7.5	0.069	0.071	0.077	0.104	0.140	0.183	0.240	0.292	0.183
10	0.050	0.051	0.054	0.071	0.092	0.116	0.148	0.176	0.116
S_{MS} (g)	1.09	1.26	1.59	1.87	1.99	2.01	1.98	1.99	2.01
S_{M1} (g)	0.37	0.41	0.59	0.85	1.18	1.46	2.04	2.59	1.46
S_{DS} (g)	0.72	0.84	1.06	1.25	1.33	1.34	1.32	1.33	1.34
S_{D1} (g)	0.25	0.27	0.39	0.57	0.78	0.98	1.36	1.72	0.98

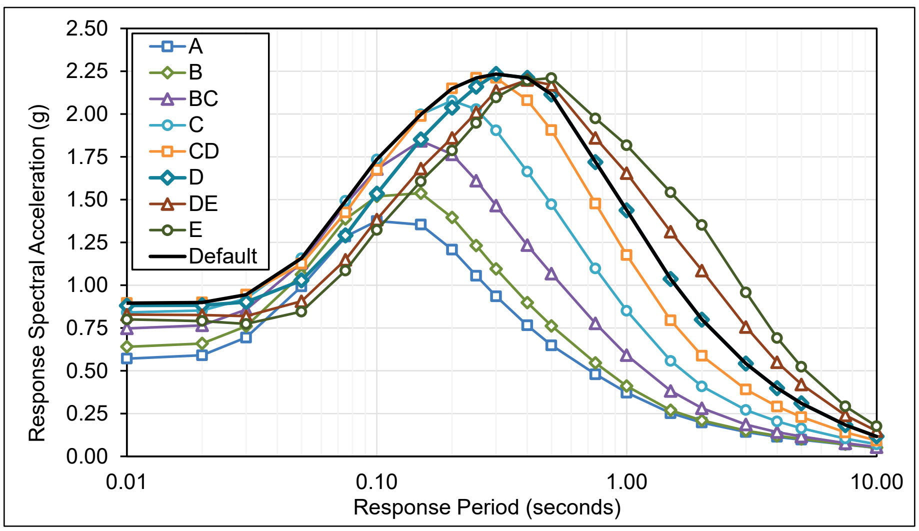


Figure E.1-19 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Santa Cruz Site.

Table E.1-20 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Vallejo Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.759	0.848	0.984	1.079	1.106	1.045	0.940	0.886	1.106
0.01	0.764	0.854	0.990	1.085	1.113	1.052	0.948	0.894	1.113
0.02	0.794	0.884	1.017	1.103	1.120	1.055	0.943	0.881	1.120
0.03	0.941	1.027	1.144	1.191	1.172	1.070	0.929	0.855	1.191
0.05	1.358	1.449	1.503	1.485	1.379	1.202	1.013	0.924	1.485
0.08	1.753	1.887	1.952	1.900	1.726	1.492	1.270	1.174	1.900
0.10	1.869	2.062	2.222	2.205	2.022	1.763	1.520	1.422	2.205
0.15	1.831	2.079	2.463	2.556	2.402	2.118	1.834	1.714	2.556
0.20	1.625	1.879	**2.366**	2.694	2.618	2.341	2.032	1.903	2.694
0.25	1.460	1.705	2.222	2.738	2.735	2.504	2.205	2.082	2.738
0.30	1.325	1.554	2.070	2.649	2.779	2.626	2.366	2.258	2.779
0.40	1.120	1.315	1.797	2.403	2.789	2.643	2.470	2.392	2.789
0.50	0.967	1.133	1.580	2.166	2.649	2.622	2.536	2.433	2.649
0.75	0.737	0.841	1.192	1.678	2.200	2.283	2.344	2.368	2.283
1.0	0.581	0.645	**0.925**	1.330	1.823	1.991	2.198	2.322	1.991
1.5	0.374	0.403	0.573	0.836	1.184	1.476	1.833	2.116	1.476
2.0	0.280	0.299	0.404	0.587	0.842	1.145	1.550	1.924	1.145
3.0	0.186	0.198	0.247	0.360	0.520	0.722	1.008	1.279	0.722
4.0	0.139	0.146	0.174	0.251	0.358	0.492	0.679	0.854	0.492
5.0	0.114	0.118	0.135	0.192	0.269	0.363	0.493	0.613	0.363
7.5	0.076	0.078	0.085	0.115	0.156	0.204	0.268	0.326	0.204
10	0.054	0.056	0.060	0.078	0.102	0.130	0.166	0.197	0.130
S_{MS} (g)	1.46	1.69	2.13	2.46	2.51	2.38	2.28	2.19	2.51
S_{M1} (g)	0.58	0.65	0.92	1.33	1.82	2.06	2.79	3.46	2.06
S_{DS} (g)	0.98	1.13	1.42	1.64	1.67	1.59	1.52	1.46	1.67
S_{D1} (g)	0.39	0.43	0.62	0.89	1.22	1.37	1.86	2.31	1.37

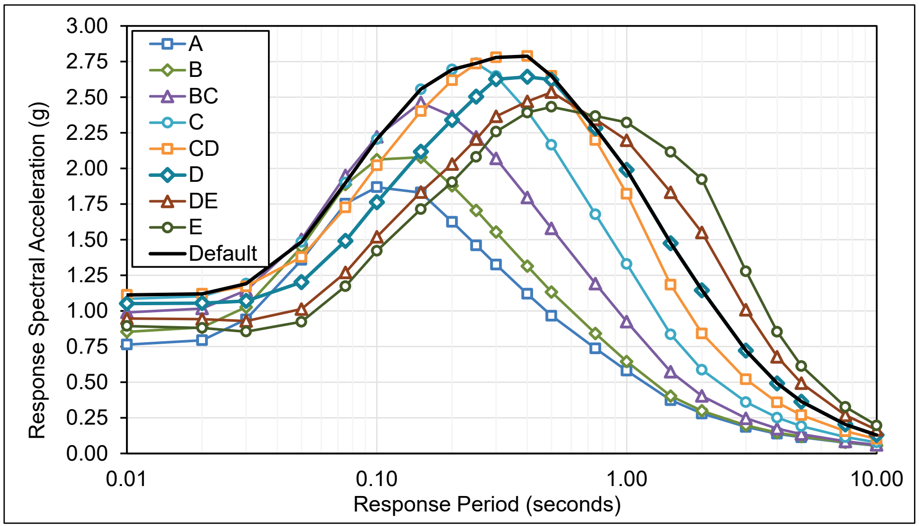


Figure E.1-20 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Vallejo Site.

Table E.1-21 **Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Santa Rosa Site**

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.907	1.014	1.177	1.290	1.322	1.249	1.124	1.059	1.322
0.01	0.913	1.021	1.183	1.297	1.330	1.258	1.133	1.069	1.330
0.02	0.949	1.057	1.216	1.318	1.339	1.261	1.128	1.053	1.339
0.03	1.125	1.228	1.367	1.424	1.401	1.280	1.110	1.022	1.424
0.05	1.623	1.732	1.797	1.775	1.648	1.437	1.211	1.105	1.775
0.08	2.095	2.256	2.333	2.271	2.064	1.784	1.518	1.403	2.271
0.10	2.234	2.465	2.656	2.636	2.417	2.107	1.817	1.699	2.636
0.15	2.188	2.485	2.944	3.055	2.872	2.532	2.192	2.049	3.055
0.20	1.943	2.246	**2.829**	3.221	3.130	2.798	2.429	2.275	3.221
0.25	1.765	2.062	2.687	3.311	3.270	2.994	2.636	2.489	3.311
0.30	1.616	1.895	2.525	3.231	3.322	3.140	2.828	2.699	3.322
0.40	1.384	1.625	2.220	2.969	3.398	3.159	2.953	2.860	3.398
0.50	1.206	1.413	1.970	2.701	3.271	3.171	3.066	2.908	3.271
0.75	0.934	1.065	1.509	2.125	2.776	2.812	2.888	2.898	2.812
1.0	0.743	0.825	**1.183**	1.701	2.331	2.483	2.740	2.883	2.483
1.5	0.479	0.516	0.733	1.069	1.514	1.869	2.321	2.675	1.869
2.0	0.358	0.383	0.516	0.751	1.077	1.465	1.983	2.461	1.465
3.0	0.239	0.253	0.316	0.461	0.665	0.924	1.289	1.636	0.924
4.0	0.178	0.187	0.223	0.321	0.458	0.629	0.868	1.092	0.629
5.0	0.145	0.152	0.173	0.245	0.343	0.464	0.631	0.785	0.464
7.5	0.098	0.100	0.108	0.147	0.199	0.261	0.343	0.418	0.261
10	0.070	0.071	0.076	0.100	0.131	0.166	0.212	0.252	0.166
S_{MS} (g)	1.75	2.02	2.55	2.98	3.06	2.85	2.76	2.62	3.06
S_{M1} (g)	0.74	0.83	1.18	1.70	2.33	2.64	3.57	4.43	2.64
S_{DS} (g)	1.17	1.35	1.70	1.99	2.04	1.90	1.84	1.74	2.04
S_{D1} (g)	0.50	0.55	0.79	1.13	1.55	1.76	2.38	2.95	1.76

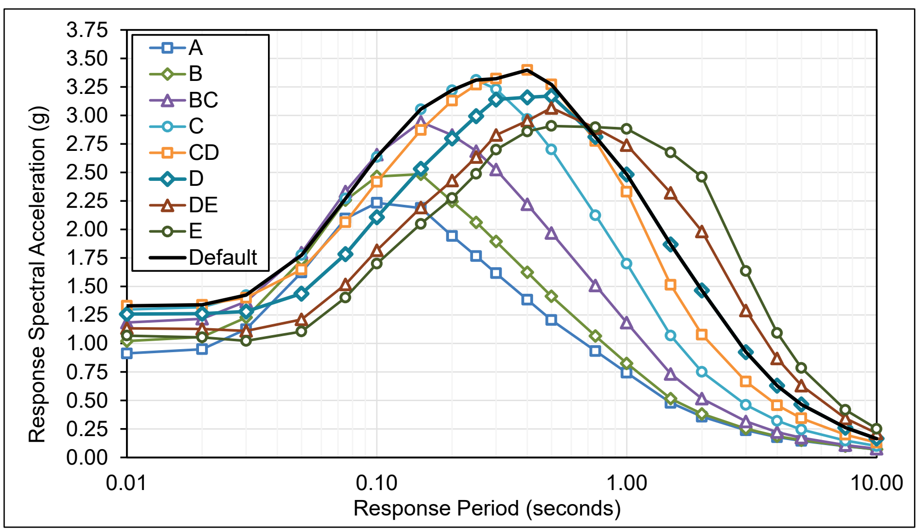


Figure E.1-21 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Santa Rosa Site.

Table E.1-22 **Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Seattle Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.629	0.698	0.787	0.853	0.889	0.884	0.860	0.880	0.889
0.01	0.631	0.701	0.789	0.854	0.889	0.884	0.859	0.877	0.889
0.02	0.715	0.764	0.845	0.903	0.927	0.911	0.867	0.852	0.927
0.03	0.820	0.867	0.937	0.972	0.974	0.935	0.872	0.846	0.974
0.05	1.086	1.143	1.167	1.147	1.090	1.002	0.900	0.866	1.147
0.08	1.402	1.499	1.545	1.525	1.457	1.357	1.247	1.226	1.525
0.10	1.589	1.751	1.875	1.914	1.886	1.813	1.722	1.741	1.914
0.15	1.505	1.723	2.003	2.160	2.203	2.170	2.114	2.182	2.203
0.20	1.274	1.504	**1.862**	2.153	2.276	2.299	2.304	2.424	2.299
0.25	1.105	1.336	1.718	2.138	2.342	2.342	2.403	2.592	2.342
0.30	0.983	1.203	1.586	2.056	2.340	2.384	2.416	2.648	2.384
0.40	0.816	1.010	1.362	1.840	2.200	2.316	2.405	2.660	2.316
0.50	0.682	0.849	1.170	1.618	2.006	2.182	2.323	2.624	2.182
0.75	0.506	0.625	0.877	1.245	1.601	1.814	2.013	2.350	1.814
1.0	0.400	0.494	**0.705**	1.030	1.353	1.598	1.867	2.233	1.598
1.5	0.260	0.321	0.461	0.683	0.963	1.204	1.523	1.910	1.204
2.0	0.192	0.238	0.336	0.499	0.710	0.950	1.275	1.675	0.950
3.0	0.122	0.151	0.209	0.313	0.445	0.601	0.819	1.087	0.601
4.0	0.088	0.109	0.149	0.221	0.308	0.409	0.548	0.725	0.409
5.0	0.069	0.085	0.112	0.163	0.223	0.291	0.383	0.503	0.291
7.5	0.045	0.054	0.070	0.100	0.132	0.167	0.213	0.282	0.167
10	0.037	0.044	0.056	0.077	0.098	0.120	0.148	0.190	0.120
S_{MS} (g)	1.15	1.35	1.68	1.94	2.11	2.15	2.17	2.39	2.15
S_{M1} (g)	0.40	0.49	0.71	1.03	1.35	1.71	2.30	3.01	1.71
S_{DS} (g)	0.76	0.90	1.12	1.29	1.41	1.43	1.45	1.60	1.43
S_{D1} (g)	0.27	0.33	0.47	0.69	0.90	1.14	1.53	2.01	1.14

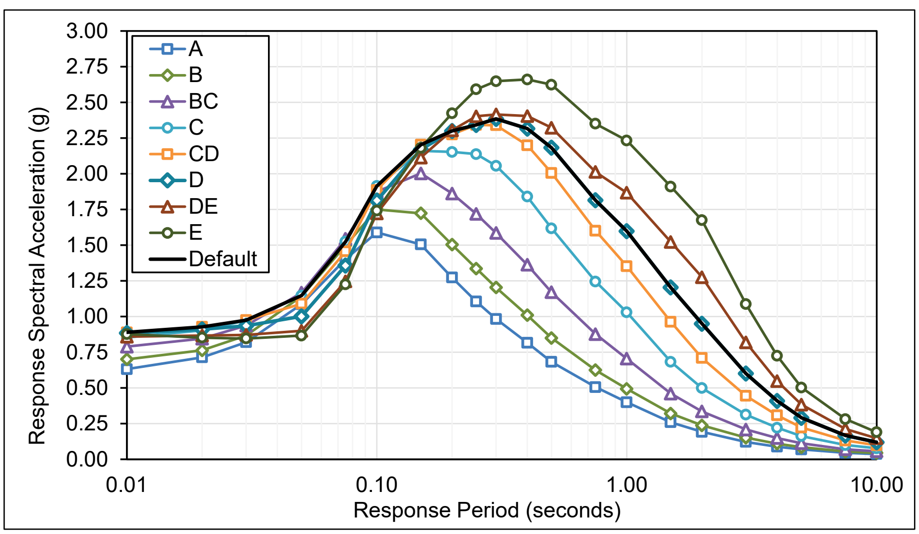


Figure E.1-22 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Seattle Site.

Table E.1-23 **Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Tacoma Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.533	0.593	0.668	0.732	0.778	0.792	0.786	0.811	0.792
0.01	0.535	0.594	0.670	0.733	0.779	0.791	0.784	0.809	0.791
0.02	0.609	0.649	0.719	0.777	0.815	0.818	0.796	0.791	0.818
0.03	0.695	0.733	0.794	0.837	0.858	0.842	0.802	0.786	0.858
0.05	0.908	0.955	0.984	0.984	0.959	0.902	0.828	0.805	0.984
0.08	1.175	1.257	1.311	1.319	1.292	1.229	1.149	1.137	1.319
0.10	1.342	1.479	1.601	1.666	1.681	1.646	1.586	1.612	1.681
0.15	1.274	1.460	1.702	1.877	1.966	1.976	1.952	2.024	1.976
0.20	1.078	1.274	**1.576**	1.855	2.024	2.098	2.135	2.257	2.098
0.25	0.905	1.095	1.409	1.766	2.015	2.130	2.229	2.417	2.130
0.30	0.783	0.960	1.265	1.645	1.953	2.113	2.239	2.472	2.113
0.40	0.624	0.774	1.044	1.405	1.755	1.966	2.144	2.400	1.966
0.50	0.506	0.633	0.872	1.198	1.557	1.796	2.009	2.304	1.796
0.75	0.357	0.444	0.622	0.874	1.183	1.414	1.642	1.954	1.414
1.0	0.275	0.343	**0.490**	0.706	0.981	1.211	1.466	1.787	1.211
1.5	0.181	0.226	0.325	0.482	0.682	0.880	1.133	1.441	0.880
2.0	0.136	0.170	0.240	0.358	0.509	0.682	0.918	1.213	0.682
3.0	0.088	0.110	0.153	0.229	0.326	0.439	0.598	0.795	0.439
4.0	0.065	0.081	0.111	0.165	0.230	0.305	0.408	0.541	0.305
5.0	0.052	0.064	0.085	0.123	0.168	0.219	0.289	0.380	0.219
7.5	0.035	0.042	0.054	0.077	0.102	0.129	0.164	0.218	0.129
10	0.029	0.035	0.044	0.060	0.077	0.094	0.115	0.149	0.094
S_{MS} **(g)**	0.97	1.15	1.42	1.67	1.82	1.92	2.02	2.22	1.92
S_{M1} **(g)**	0.28	0.34	0.49	0.71	0.98	1.23	1.65	2.18	1.23
S_{DS} **(g)**	0.65	0.76	0.95	1.11	1.21	1.28	1.34	1.48	1.28
S_{D1} **(g)**	0.18	0.23	0.33	0.47	0.65	0.82	1.10	1.46	0.82

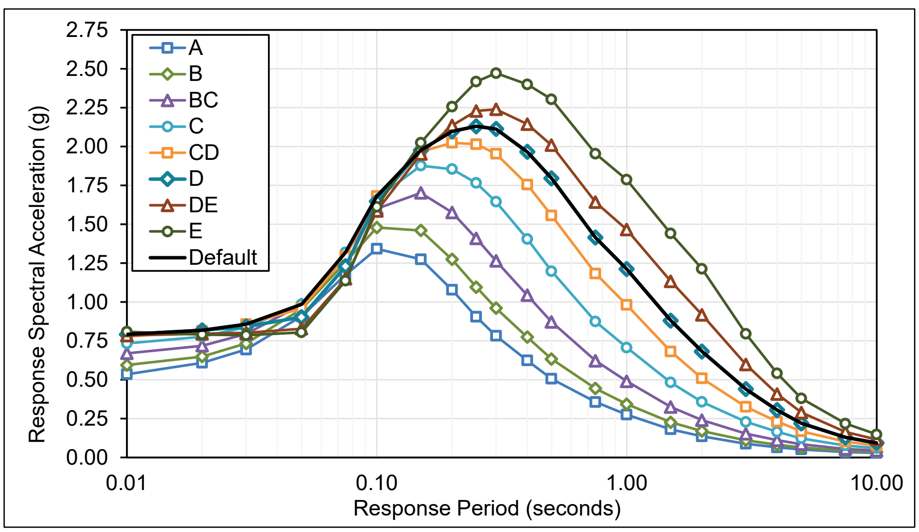


Figure E.1-23 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Tacoma Site.

Table E.1-24 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Everett Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.484	0.538	0.607	0.665	0.707	0.719	0.713	0.736	0.719
0.01	0.486	0.540	0.608	0.665	0.707	0.718	0.712	0.734	0.718
0.02	0.553	0.589	0.653	0.705	0.740	0.742	0.723	0.718	0.742
0.03	0.630	0.665	0.721	0.760	0.778	0.764	0.728	0.713	0.778
0.05	0.824	0.867	0.893	0.894	0.870	0.819	0.752	0.730	0.894
0.08	1.067	1.141	1.190	1.198	1.173	1.116	1.043	1.032	1.198
0.10	1.218	1.343	1.453	1.513	1.526	1.495	1.440	1.464	1.526
0.15	1.157	1.325	1.545	1.704	1.785	1.794	1.772	1.838	1.794
0.20	0.979	1.157	**1.431**	1.684	1.837	1.904	1.938	2.049	1.904
0.25	0.834	1.010	1.298	1.623	1.852	1.934	2.024	2.194	1.934
0.30	0.730	0.896	1.180	1.526	1.812	1.937	2.033	2.244	1.937
0.40	0.593	0.735	0.991	1.323	1.653	1.829	1.979	2.215	1.829
0.50	0.487	0.610	0.839	1.141	1.482	1.689	1.877	2.153	1.689
0.75	0.351	0.437	0.613	0.848	1.149	1.356	1.568	1.866	1.356
1.0	0.276	0.344	**0.491**	0.695	0.965	1.177	1.420	1.731	1.177
1.5	0.182	0.227	0.325	0.483	0.683	0.871	1.120	1.424	0.871
2.0	0.136	0.170	0.240	0.358	0.509	0.683	0.920	1.215	0.683
3.0	0.088	0.110	0.153	0.229	0.326	0.440	0.599	0.796	0.440
4.0	0.065	0.082	0.111	0.165	0.231	0.305	0.408	0.541	0.305
5.0	0.052	0.064	0.085	0.123	0.169	0.220	0.289	0.380	0.220
7.5	0.035	0.042	0.055	0.077	0.102	0.129	0.165	0.218	0.129
10	0.029	0.035	0.044	0.060	0.077	0.094	0.116	0.149	0.094
S_{MS} (g)	0.88	1.04	1.29	1.52	1.67	1.74	1.83	2.02	1.74
S_{M1} (g)	0.28	0.34	0.49	0.69	0.96	1.23	1.66	2.19	1.23
S_{DS} (g)	0.59	0.69	0.86	1.01	1.11	1.16	1.22	1.35	1.16
S_{D1} (g)	0.18	0.23	0.33	0.46	0.64	0.82	1.10	1.46	0.82

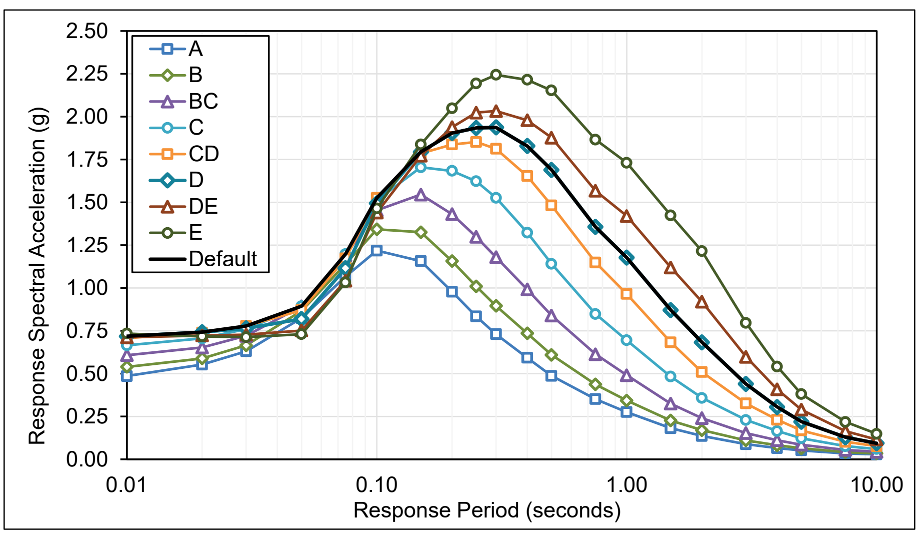


Figure E.1-24 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Everett Site.

Table E.1-25 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Portland Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.340	0.378	0.425	0.462	0.488	0.495	0.487	0.497	0.495
0.01	0.341	0.379	0.425	0.462	0.488	0.494	0.487	0.496	0.494
0.02	0.372	0.404	0.445	0.476	0.495	0.495	0.480	0.479	0.495
0.03	0.417	0.447	0.481	0.502	0.510	0.498	0.472	0.463	0.510
0.05	0.530	0.559	0.575	0.574	0.558	0.524	0.478	0.460	0.574
0.08	0.674	0.723	0.753	0.757	0.736	0.694	0.638	0.621	0.757
0.10	0.770	0.850	0.916	0.947	0.944	0.906	0.851	0.845	0.947
0.15	0.751	0.862	1.001	1.097	1.136	1.121	1.077	1.087	1.136
0.20	0.648	0.767	**0.949**	1.107	1.200	1.225	1.213	1.246	1.225
0.25	0.553	0.673	0.864	1.079	1.225	1.291	1.318	1.388	1.291
0.30	0.488	0.604	0.793	1.036	1.220	1.325	1.387	1.494	1.325
0.40	0.399	0.502	0.673	0.917	1.136	1.282	1.398	1.540	1.282
0.50	0.331	0.422	0.577	0.806	1.043	1.215	1.367	1.558	1.215
0.75	0.245	0.315	0.437	0.627	0.850	1.027	1.206	1.447	1.027
1.0	0.194	0.253	**0.358**	0.530	0.736	0.916	1.120	1.382	0.916
1.5	0.137	0.180	0.258	0.386	0.544	0.706	0.912	1.177	0.706
2.0	0.105	0.139	0.199	0.298	0.422	0.562	0.756	1.014	0.562
3.0	0.070	0.092	0.131	0.197	0.279	0.374	0.505	0.680	0.374
4.0	0.053	0.070	0.097	0.145	0.202	0.265	0.352	0.472	0.265
5.0	0.042	0.055	0.075	0.109	0.148	0.192	0.251	0.333	0.192
7.5	0.029	0.037	0.049	0.070	0.092	0.116	0.147	0.198	0.116
10	0.026	0.032	0.041	0.056	0.071	0.087	0.107	0.138	0.087
S_{MS} (g)	0.58	0.69	0.85	1.00	1.10	1.19	1.26	1.40	1.19
S_{M1} (g)	0.19	0.25	0.36	0.54	0.76	1.01	1.36	1.84	1.01
S_{DS} (g)	0.39	0.46	0.57	0.66	0.73	0.80	0.84	0.93	0.80
S_{D1} (g)	0.13	0.17	0.24	0.36	0.51	0.67	0.91	1.22	0.67

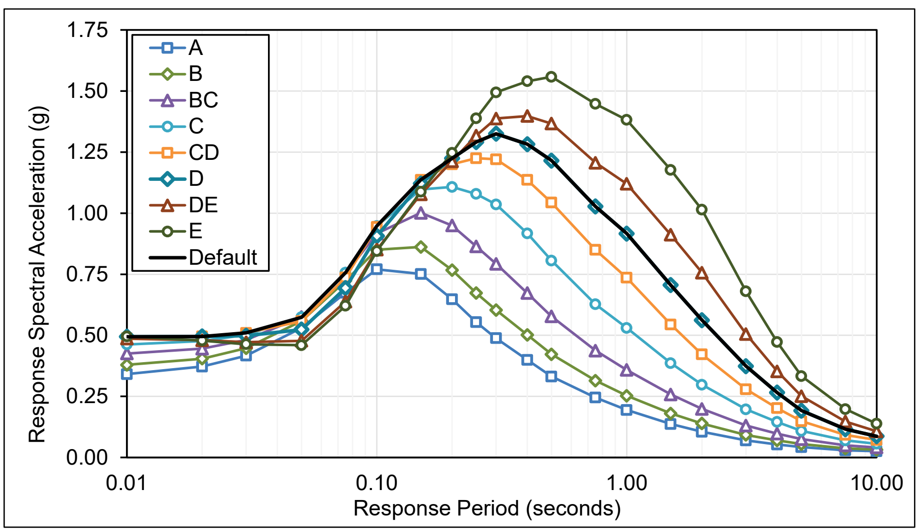


Figure E.1-25 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Portland Site.

Table E.1-26 **Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Salt Lake City Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.559	0.625	0.727	0.803	0.833	0.799	0.732	0.698	0.833
0.01	0.562	0.629	0.731	0.807	0.838	0.804	0.738	0.704	0.838
0.02	0.584	0.651	0.751	0.820	0.843	0.806	0.735	0.695	0.843
0.03	0.689	0.754	0.842	0.886	0.883	0.820	0.725	0.677	0.886
0.05	0.988	1.056	1.106	1.105	1.041	0.924	0.795	0.733	1.105
0.08	1.277	1.377	1.437	1.416	1.308	1.152	0.999	0.932	1.416
0.10	1.365	1.508	1.638	1.646	1.536	1.365	1.200	1.134	1.646
0.15	1.341	1.524	1.812	1.906	1.828	1.647	1.458	1.380	1.906
0.20	1.191	1.378	**1.739**	1.999	1.986	1.820	1.620	1.537	1.999
0.25	1.059	1.239	1.616	2.004	2.062	1.939	1.755	1.682	2.062
0.30	0.952	1.119	1.492	1.920	2.081	2.022	1.875	1.819	2.081
0.40	0.795	0.935	1.279	1.717	2.040	2.072	1.943	1.916	2.072
0.50	0.680	0.800	1.115	1.534	1.913	2.026	1.964	1.936	2.026
0.75	0.512	0.585	0.829	1.169	1.549	1.716	1.762	1.821	1.716
1.0	0.401	0.445	**0.638**	0.917	1.264	1.468	1.612	1.734	1.468
1.5	0.260	0.280	0.397	0.580	0.823	1.069	1.310	1.526	1.069
2.0	0.197	0.210	0.282	0.410	0.589	0.802	1.088	1.352	0.802
3.0	0.133	0.140	0.174	0.254	0.367	0.509	0.710	0.901	0.509
4.0	0.099	0.104	0.124	0.179	0.256	0.351	0.484	0.608	0.351
5.0	0.082	0.085	0.097	0.138	0.193	0.261	0.354	0.440	0.261
7.5	0.056	0.057	0.062	0.084	0.114	0.149	0.197	0.239	0.149
10	0.040	0.041	0.044	0.058	0.076	0.096	0.123	0.147	0.096
S_{MS} (g)	1.07	1.24	1.57	1.80	1.87	1.86	1.77	1.74	1.87
S_{M1} (g)	0.40	0.45	0.64	0.92	1.26	1.47	1.96	2.43	1.47
S_{DS} (g)	0.71	0.83	1.04	1.20	1.25	1.24	1.18	1.16	1.25
S_{D1} (g)	0.27	0.30	0.43	0.61	0.84	0.98	1.31	1.62	0.98

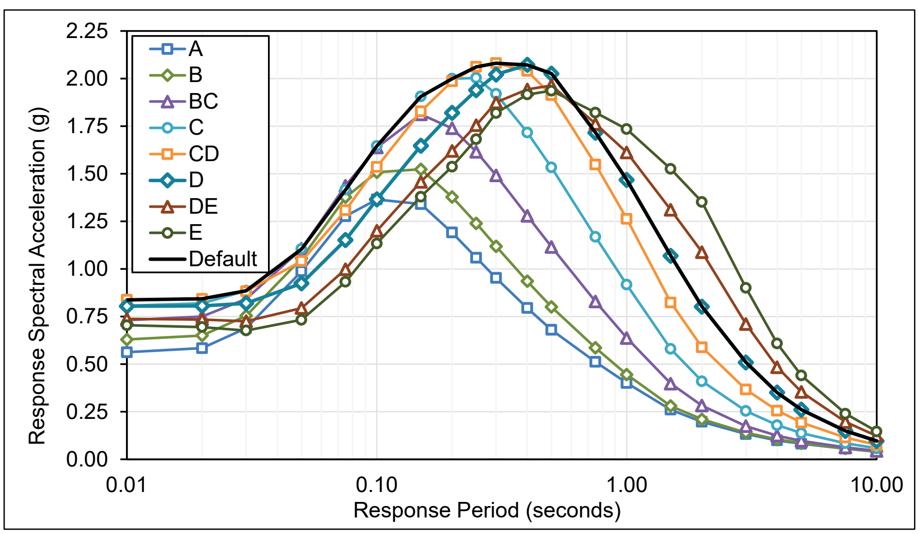


Figure E.1-26 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Salt Lake City Site.

Table E.1-27 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Boise Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.108	0.122	0.143	0.164	0.184	0.195	0.201	0.206	0.195
0.01	0.109	0.122	0.144	0.165	0.185	0.196	0.202	0.207	0.196
0.02	0.112	0.126	0.147	0.168	0.186	0.197	0.202	0.206	0.197
0.03	0.130	0.144	0.164	0.182	0.197	0.203	0.204	0.205	0.203
0.05	0.178	0.193	0.212	0.227	0.236	0.235	0.227	0.224	0.236
0.08	0.228	0.248	0.273	0.291	0.299	0.295	0.284	0.280	0.299
0.10	0.247	0.275	0.312	0.340	0.355	0.355	0.348	0.346	0.355
0.15	0.247	0.283	0.342	0.393	0.429	0.444	0.447	0.451	0.444
0.20	0.223	0.261	**0.331**	0.404	0.461	0.493	0.511	0.525	0.493
0.25	0.193	0.229	0.299	0.385	0.462	0.512	0.549	0.576	0.512
0.30	0.169	0.203	0.270	0.358	0.449	0.516	0.571	0.613	0.516
0.40	0.135	0.163	0.222	0.303	0.400	0.482	0.559	0.620	0.482
0.50	0.113	0.136	0.189	0.265	0.360	0.448	0.537	0.608	0.448
0.75	0.083	0.097	0.136	0.193	0.270	0.348	0.433	0.508	0.348
1.0	0.063	0.071	**0.100**	0.144	0.205	0.273	0.353	0.423	0.273
1.5	0.042	0.046	0.064	0.094	0.136	0.185	0.252	0.313	0.185
2.0	0.033	0.035	0.047	0.069	0.099	0.137	0.190	0.240	0.137
3.0	0.023	0.025	0.031	0.045	0.065	0.090	0.125	0.159	0.090
4.0	0.018	0.019	0.023	0.033	0.047	0.064	0.089	0.112	0.064
5.0	0.015	0.016	0.019	0.026	0.037	0.049	0.067	0.084	0.049
7.5	0.012	0.013	0.015	0.021	0.028	0.036	0.047	0.060	0.036
10	0.010	0.011	0.013	0.017	0.022	0.028	0.035	0.044	0.028
S_{MS} (g)	0.20	0.23	0.30	0.36	0.42	0.46	0.51	0.56	0.46
S_{M1} (g)	0.06	0.07	0.10	0.14	0.21	0.27	0.35	0.43	0.27
S_{DS} (g)	0.13	0.16	0.20	0.24	0.28	0.31	0.34	0.37	0.31
S_{D1} (g)	0.04	0.05	0.07	0.10	0.14	0.18	0.24	0.29	0.18

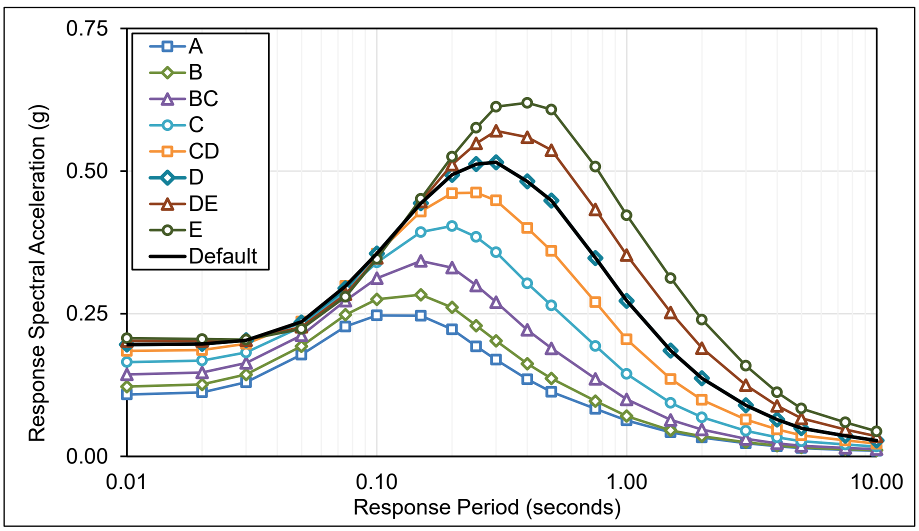


Figure E.1-27 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Boise Site.

Table E.1-28 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Reno Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.551	0.619	0.719	0.799	0.840	0.821	0.769	0.743	0.840
0.01	0.554	0.623	0.723	0.803	0.844	0.826	0.775	0.749	0.844
0.02	0.577	0.646	0.745	0.819	0.853	0.831	0.775	0.743	0.853
0.03	0.682	0.749	0.839	0.889	0.899	0.852	0.773	0.731	0.899
0.05	0.978	1.049	1.105	1.116	1.072	0.975	0.859	0.802	1.116
0.08	1.253	1.356	1.426	1.423	1.342	1.210	1.073	1.013	1.423
0.10	1.340	1.487	1.622	1.649	1.571	1.430	1.283	1.224	1.649
0.15	1.312	1.502	1.795	1.917	1.884	1.744	1.580	1.512	1.917
0.20	1.173	1.372	**1.735**	2.024	2.066	1.948	1.780	1.712	2.066
0.25	1.018	1.204	1.572	1.973	2.128	2.064	1.922	1.869	2.128
0.30	0.897	1.066	1.423	1.848	2.129	2.134	2.039	2.012	2.134
0.40	0.723	0.861	1.177	1.589	1.978	2.092	2.080	2.090	2.092
0.50	0.605	0.720	1.002	1.385	1.789	1.980	2.037	2.094	1.980
0.75	0.443	0.511	0.723	1.023	1.379	1.602	1.741	1.871	1.602
1.0	0.335	0.375	**0.537**	0.774	1.074	1.313	1.519	1.689	1.313
1.5	0.214	0.232	0.330	0.482	0.687	0.901	1.147	1.365	0.901
2.0	0.159	0.173	0.233	0.340	0.488	0.666	0.906	1.138	0.666
3.0	0.104	0.112	0.142	0.208	0.299	0.414	0.575	0.735	0.414
4.0	0.075	0.080	0.098	0.142	0.202	0.276	0.378	0.480	0.276
5.0	0.059	0.063	0.075	0.106	0.148	0.198	0.268	0.337	0.198
7.5	0.035	0.038	0.044	0.061	0.081	0.105	0.137	0.173	0.105
10	0.025	0.028	0.032	0.043	0.056	0.070	0.088	0.109	0.070
S_{MS} (g)	1.06	1.23	1.56	1.82	1.92	1.92	1.87	1.88	1.92
S_{M1} (g)	0.33	0.37	0.54	0.77	1.07	1.31	1.63	2.05	1.31
S_{DS} (g)	0.70	0.82	1.04	1.21	1.28	1.28	1.25	1.26	1.28
S_{D1} (g)	0.22	0.25	0.36	0.52	0.72	0.88	1.09	1.37	0.88

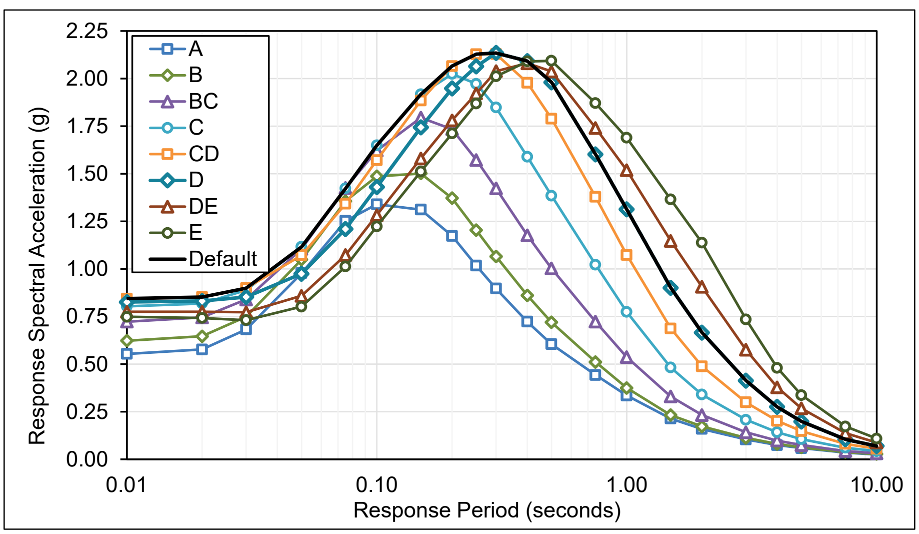


Figure E.1-28 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Reno Site.

Table E.1-29 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Las Vegas Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.225	0.254	0.297	0.335	0.360	0.363	0.354	0.350	0.363
0.01	0.227	0.255	0.298	0.336	0.362	0.365	0.356	0.352	0.365
0.02	0.236	0.265	0.307	0.343	0.366	0.368	0.356	0.349	0.368
0.03	0.275	0.304	0.345	0.374	0.387	0.378	0.356	0.345	0.387
0.05	0.383	0.415	0.449	0.466	0.460	0.431	0.392	0.374	0.466
0.08	0.488	0.532	0.574	0.589	0.572	0.531	0.483	0.462	0.589
0.10	0.527	0.586	0.653	0.683	0.672	0.631	0.582	0.562	0.683
0.15	0.521	0.598	0.718	0.790	0.808	0.779	0.734	0.718	0.808
0.20	0.470	0.550	**0.696**	0.823	0.880	0.875	0.843	0.836	0.880
0.25	0.405	0.481	0.628	0.791	0.894	0.919	0.912	0.921	0.919
0.30	0.354	0.423	0.564	0.737	0.878	0.938	0.960	0.988	0.938
0.40	0.279	0.334	0.457	0.620	0.788	0.890	0.962	1.016	0.890
0.50	0.230	0.276	0.385	0.534	0.706	0.832	0.933	1.010	0.832
0.75	0.167	0.193	0.273	0.387	0.532	0.656	0.772	0.871	0.656
1.0	0.124	0.138	**0.198**	0.285	0.400	0.515	0.638	0.739	0.515
1.5	0.080	0.086	0.122	0.178	0.256	0.345	0.460	0.559	0.345
2.0	0.061	0.065	0.087	0.126	0.182	0.250	0.345	0.433	0.250
3.0	0.041	0.043	0.053	0.077	0.112	0.156	0.218	0.275	0.156
4.0	0.030	0.032	0.038	0.055	0.078	0.107	0.147	0.185	0.107
5.0	0.024	0.026	0.029	0.042	0.058	0.079	0.107	0.134	0.079
7.5	0.018	0.019	0.022	0.030	0.041	0.053	0.070	0.087	0.053
10	0.015	0.016	0.018	0.024	0.032	0.040	0.051	0.063	0.040
S_{MS} (g)	0.42	0.50	0.63	0.74	0.80	0.84	0.87	0.91	0.84
S_{M1} (g)	0.12	0.14	0.20	0.29	0.40	0.51	0.64	0.78	0.51
S_{DS} (g)	0.28	0.33	0.42	0.49	0.54	0.56	0.58	0.61	0.56
S_{D1} (g)	0.08	0.09	0.13	0.19	0.27	0.34	0.43	0.52	0.34

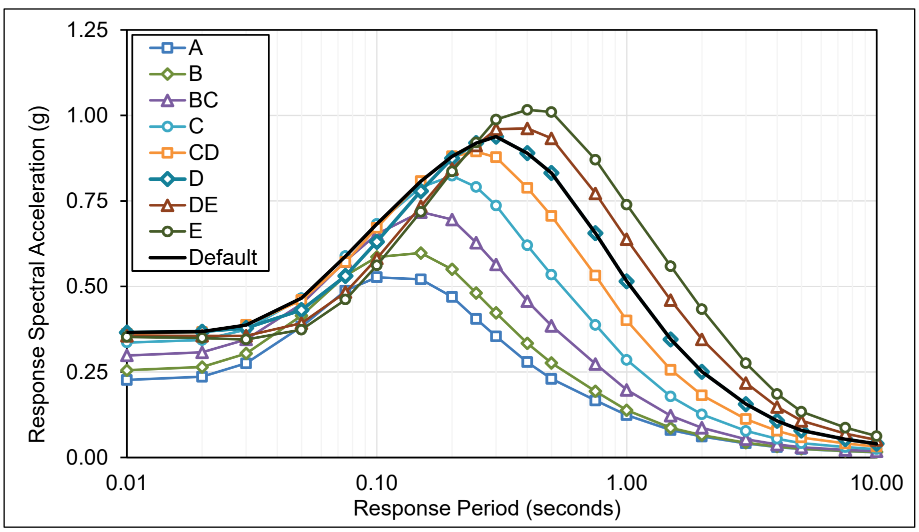


Figure E.1-29 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Las Vegas Site.

Table E.1-30 **Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, St. Louis Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.213	0.239	0.280	0.323	0.363	0.389	0.406	0.420	0.389
0.01	0.214	0.240	0.281	0.324	0.365	0.391	0.408	0.422	0.391
0.02	0.221	0.246	0.286	0.327	0.366	0.391	0.407	0.418	0.391
0.03	0.254	0.278	0.316	0.352	0.384	0.401	0.407	0.414	0.401
0.05	0.345	0.370	0.405	0.434	0.455	0.458	0.450	0.448	0.458
0.08	0.440	0.477	0.523	0.559	0.581	0.581	0.571	0.570	0.581
0.10	0.477	0.530	0.601	0.659	0.698	0.710	0.711	0.719	0.710
0.15	0.475	0.544	0.657	0.760	0.843	0.889	0.917	0.940	0.889
0.20	0.427	0.498	**0.632**	0.777	0.903	0.985	1.044	1.087	0.985
0.25	0.367	0.435	0.565	0.738	0.918	1.036	1.133	1.204	1.036
0.30	0.323	0.386	0.507	0.687	0.892	1.058	1.195	1.297	1.058
0.40	0.260	0.314	0.417	0.591	0.811	1.001	1.214	1.348	1.001
0.50	0.219	0.267	0.356	0.520	0.735	0.933	1.158	1.312	0.933
0.75	0.161	0.189	0.249	0.379	0.550	0.716	0.915	1.076	0.716
1.0	0.123	0.139	**0.182**	0.286	0.422	0.564	0.744	0.896	0.564
1.5	0.083	0.091	0.123	0.187	0.282	0.387	0.529	0.660	0.387
2.0	0.065	0.070	0.094	0.137	0.206	0.285	0.395	0.503	0.285
3.0	0.047	0.050	0.063	0.092	0.132	0.182	0.252	0.323	0.182
4.0	0.036	0.039	0.048	0.069	0.098	0.133	0.182	0.232	0.133
5.0	0.030	0.033	0.039	0.056	0.077	0.103	0.139	0.175	0.103
7.5	0.024	0.026	0.030	0.041	0.056	0.072	0.094	0.118	0.072
10	0.020	0.022	0.025	0.033	0.044	0.055	0.070	0.086	0.055
S_{MS} (g)	0.38	0.45	0.57	0.70	0.83	0.95	1.09	1.21	0.95
S_{M1} (g)	0.12	0.14	0.18	0.29	0.42	0.56	0.74	0.91	0.56
S_{DS} (g)	0.26	0.30	0.38	0.47	0.55	0.63	0.73	0.81	0.63
S_{D1} (g)	0.08	0.09	0.12	0.19	0.28	0.38	0.50	0.60	0.38

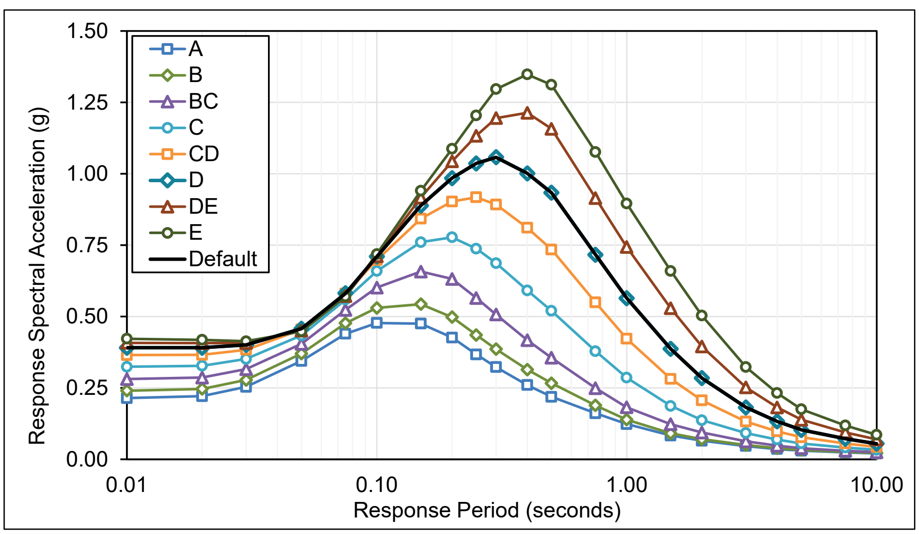


Figure E.1-30 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, St. Louis Site.

Table E.1-31 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Memphis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.425	0.477	0.559	0.633	0.682	0.685	0.660	0.649	0.685
0.01	0.428	0.480	0.562	0.636	0.686	0.689	0.665	0.654	0.689
0.02	0.442	0.494	0.574	0.644	0.689	0.690	0.663	0.647	0.690
0.03	0.516	0.567	0.641	0.695	0.723	0.706	0.660	0.635	0.723
0.05	0.729	0.782	0.840	0.870	0.861	0.805	0.731	0.694	0.870
0.08	0.939	1.016	1.091	1.120	1.090	1.013	0.926	0.889	1.120
0.10	1.007	1.115	1.242	1.302	1.285	1.210	1.123	1.091	1.302
0.15	0.993	1.131	1.361	1.499	1.532	1.474	1.386	1.352	1.532
0.20	0.888	1.029	**1.304**	1.553	1.653	1.626	1.545	1.517	1.653
0.25	0.762	0.894	1.161	1.471	1.693	1.716	1.668	1.655	1.716
0.30	0.665	0.784	1.033	1.351	1.655	1.766	1.765	1.777	1.766
0.40	0.530	0.627	0.838	1.136	1.498	1.691	1.801	1.849	1.691
0.50	0.440	0.522	0.704	0.976	1.334	1.577	1.725	1.809	1.577
0.75	0.315	0.361	0.486	0.687	0.980	1.225	1.398	1.522	1.225
1.0	0.238	0.263	**0.353**	0.509	0.747	0.983	1.181	1.323	0.983
1.5	0.157	0.167	0.229	0.334	0.479	0.676	0.879	1.044	0.676
2.0	0.120	0.127	0.169	0.245	0.353	0.501	0.688	0.857	0.501
3.0	0.086	0.091	0.111	0.162	0.233	0.324	0.452	0.572	0.324
4.0	0.069	0.072	0.085	0.122	0.174	0.238	0.329	0.413	0.238
5.0	0.059	0.061	0.069	0.098	0.137	0.185	0.251	0.313	0.185
7.5	0.043	0.044	0.048	0.065	0.088	0.115	0.150	0.183	0.115
10	0.032	0.033	0.035	0.046	0.060	0.076	0.096	0.115	0.076
S_{MS} (g)	0.80	0.93	1.17	1.40	1.52	1.59	1.62	1.66	1.59
S_{M1} (g)	0.24	0.26	0.35	0.51	0.75	0.98	1.24	1.54	0.98
S_{DS} (g)	0.53	0.62	0.78	0.93	1.02	1.06	1.08	1.11	1.06
S_{D1} (g)	0.16	0.18	0.24	0.34	0.50	0.66	0.83	1.03	0.66

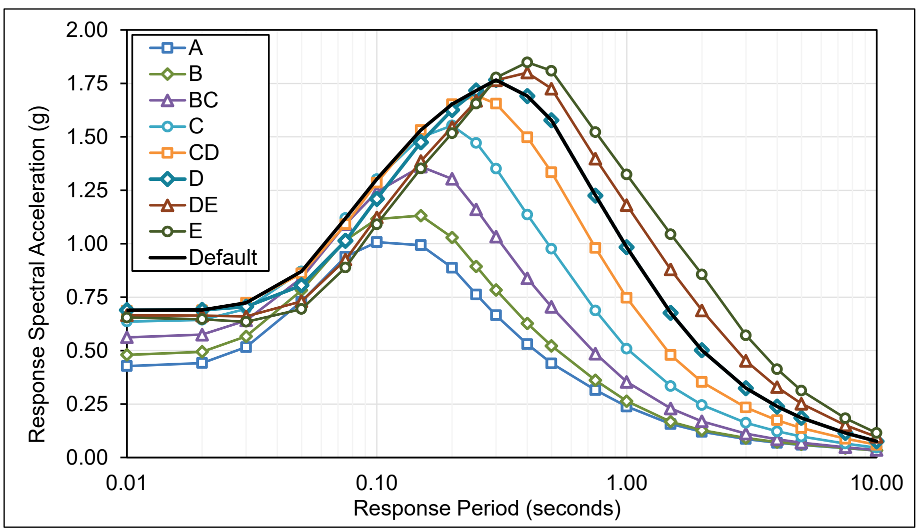


Figure E.1-31 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Memphis Site.

Table E.1-32 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Charleston Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.522	0.585	0.682	0.763	0.809	0.798	0.756	0.735	0.809
0.01	0.525	0.589	0.686	0.767	0.814	0.803	0.761	0.742	0.814
0.02	0.544	0.607	0.703	0.779	0.819	0.805	0.759	0.733	0.819
0.03	0.639	0.700	0.788	0.842	0.860	0.822	0.753	0.717	0.860
0.05	0.906	0.972	1.033	1.053	1.019	0.933	0.829	0.779	1.053
0.08	1.172	1.266	1.344	1.353	1.287	1.170	1.045	0.991	1.353
0.10	1.257	1.392	1.533	1.576	1.518	1.395	1.265	1.214	1.576
0.15	1.240	1.412	1.688	1.822	1.813	1.699	1.560	1.504	1.822
0.20	1.100	1.276	**1.612**	1.889	1.957	1.874	1.742	1.690	1.957
0.25	0.933	1.084	1.415	1.774	2.007	1.981	1.883	1.850	2.007
0.30	0.806	0.932	1.245	1.616	1.938	2.042	1.996	1.992	2.042
0.40	0.631	0.722	0.988	1.334	1.711	1.917	2.041	2.078	1.917
0.50	0.515	0.583	0.813	1.123	1.489	1.756	1.934	2.081	1.756
0.75	0.357	0.382	0.541	0.765	1.046	1.315	1.530	1.699	1.315
1.0	0.263	0.268	**0.383**	0.551	0.768	1.025	1.265	1.440	1.025
1.5	0.164	0.169	0.240	0.350	0.500	0.660	0.895	1.072	0.660
2.0	0.121	0.129	0.171	0.249	0.358	0.490	0.670	0.834	0.490
3.0	0.083	0.087	0.107	0.156	0.225	0.312	0.435	0.551	0.312
4.0	0.062	0.065	0.077	0.111	0.158	0.217	0.300	0.377	0.217
5.0	0.051	0.053	0.061	0.086	0.120	0.163	0.221	0.275	0.163
7.5	0.036	0.037	0.040	0.055	0.075	0.098	0.129	0.157	0.098
10	0.027	0.028	0.030	0.039	0.051	0.065	0.084	0.100	0.065
S_{MS} (g)	0.99	1.15	1.45	1.70	1.81	1.84	1.84	1.87	1.84
S_{M1} (g)	0.26	0.27	0.38	0.55	0.77	1.02	1.26	1.50	1.02
S_{DS} (g)	0.66	0.77	0.97	1.13	1.20	1.23	1.22	1.25	1.23
S_{D1} (g)	0.18	0.18	0.26	0.37	0.51	0.68	0.84	1.00	0.68

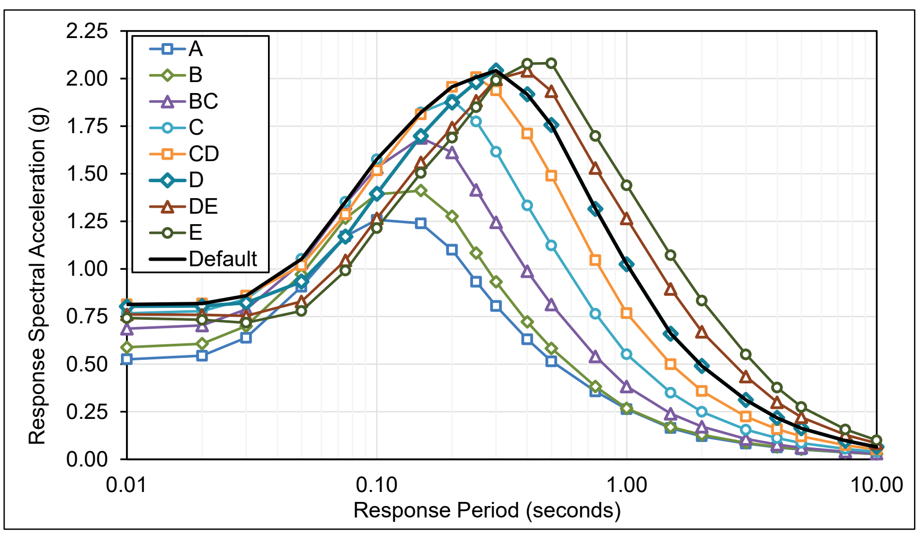


Figure E.1-32 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Charleston Site.

Table E.1-33 Probabilistic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, Chicago Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.052	0.058	0.068	0.078	0.088	0.095	0.099	0.102	0.095
0.01	0.052	0.058	0.068	0.079	0.089	0.095	0.099	0.103	0.095
0.02	0.054	0.060	0.070	0.080	0.089	0.095	0.099	0.102	0.095
0.03	0.062	0.068	0.077	0.085	0.093	0.097	0.099	0.101	0.097
0.05	0.084	0.090	0.098	0.105	0.111	0.111	0.109	0.109	0.111
0.08	0.107	0.116	0.127	0.136	0.141	0.141	0.139	0.139	0.141
0.10	0.116	0.129	0.146	0.160	0.170	0.173	0.173	0.175	0.173
0.15	0.116	0.132	0.160	0.185	0.205	0.216	0.223	0.229	0.216
0.20	0.104	0.121	**0.154**	0.189	0.220	0.239	0.254	0.264	0.239
0.25	0.093	0.111	0.146	0.187	0.223	0.252	0.276	0.293	0.252
0.30	0.085	0.102	0.138	0.181	0.224	0.257	0.290	0.315	0.257
0.40	0.073	0.088	0.123	0.165	0.215	0.258	0.295	0.328	0.258
0.50	0.064	0.078	0.112	0.152	0.203	0.251	0.296	0.335	0.251
0.75	0.051	0.060	0.088	0.120	0.163	0.209	0.256	0.302	0.209
1.0	0.041	0.047	**0.070**	0.096	0.132	0.174	0.222	0.268	0.174
1.5	0.030	0.033	0.047	0.068	0.095	0.129	0.174	0.217	0.129
2.0	0.025	0.027	0.036	0.053	0.074	0.101	0.139	0.177	0.101
3.0	0.018	0.019	0.024	0.035	0.051	0.070	0.097	0.125	0.070
4.0	0.014	0.015	0.018	0.027	0.038	0.051	0.070	0.090	0.051
5.0	0.012	0.013	0.015	0.021	0.030	0.040	0.053	0.068	0.040
7.5	0.009	0.010	0.012	0.016	0.021	0.028	0.036	0.046	0.028
10	0.008	0.008	0.010	0.013	0.017	0.021	0.027	0.033	0.021
S_{MS} (g)	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.30	0.23
S_{M1} (g)	0.05	0.05	0.07	0.10	0.14	0.19	0.26	0.34	0.19
S_{DS} (g)	0.06	0.07	0.09	0.11	0.13	0.15	0.18	0.20	0.15
S_{D1} (g)	0.03	0.03	0.05	0.06	0.09	0.13	0.17	0.22	0.13

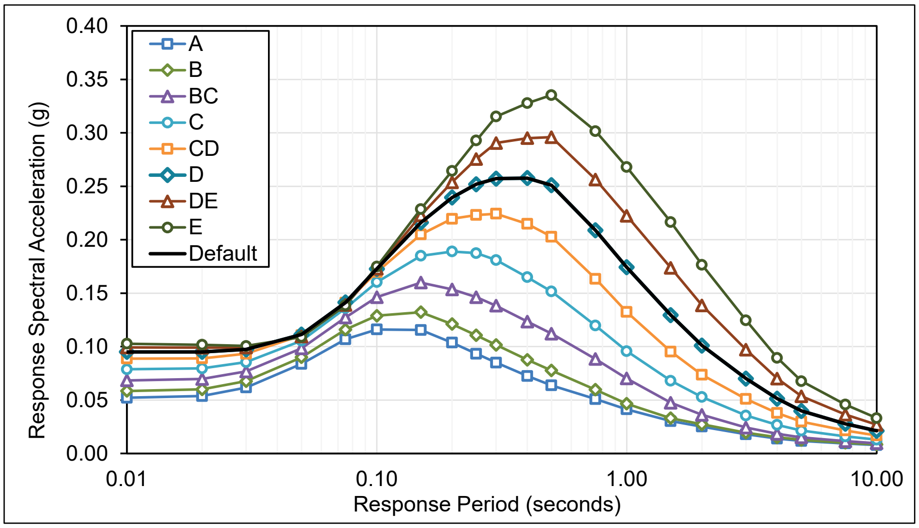


Figure E.1-33 Plots of probabilistic MCE_R multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, Chicago Site.

Table E.1-34 Probabilistic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 4, New York Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.088	0.099	0.117	0.134	0.150	0.159	0.164	0.168	0.159
0.01	0.089	0.100	0.117	0.135	0.151	0.160	0.165	0.169	0.160
0.02	0.092	0.103	0.120	0.137	0.152	0.161	0.165	0.168	0.161
0.03	0.106	0.117	0.134	0.149	0.161	0.166	0.166	0.167	0.166
0.05	0.146	0.158	0.173	0.185	0.193	0.191	0.185	0.182	0.193
0.08	0.186	0.203	0.223	0.237	0.244	0.240	0.232	0.228	0.244
0.10	0.202	0.225	0.255	0.277	0.290	0.290	0.284	0.283	0.290
0.15	0.201	0.231	0.280	0.321	0.350	0.362	0.365	0.368	0.362
0.20	0.182	0.213	**0.270**	0.330	0.377	0.403	0.417	0.429	0.403
0.25	0.152	0.180	0.232	0.297	0.377	0.418	0.448	0.470	0.418
0.30	0.129	0.154	0.200	0.264	0.348	0.421	0.466	0.500	0.421
0.40	0.098	0.117	0.151	0.207	0.285	0.367	0.430	0.506	0.367
0.50	0.078	0.095	0.121	0.169	0.238	0.322	0.393	0.470	0.322
0.75	0.053	0.062	0.076	0.108	0.153	0.222	0.288	0.353	0.222
1.0	0.038	0.042	**0.050**	0.072	0.103	0.159	0.218	0.270	0.159
1.5	0.023	0.025	0.032	0.047	0.068	0.093	0.139	0.174	0.093
2.0	0.017	0.018	0.024	0.034	0.050	0.068	0.095	0.120	0.068
3.0	0.012	0.012	0.015	0.022	0.032	0.045	0.062	0.080	0.045
4.0	0.009	0.009	0.011	0.017	0.024	0.032	0.044	0.056	0.032
5.0	0.007	0.008	0.009	0.013	0.018	0.025	0.033	0.042	0.025
7.5	0.006	0.006	0.007	0.010	0.014	0.018	0.023	0.030	0.018
10	0.005	0.005	0.006	0.009	0.011	0.014	0.018	0.022	0.014
S_{MS} (g)	0.16	0.19	0.24	0.30	0.34	0.38	0.42	0.46	0.38
S_{M1} (g)	0.04	0.04	0.05	0.07	0.10	0.16	0.22	0.27	0.16
S_{DS} (g)	0.11	0.13	0.16	0.20	0.23	0.25	0.28	0.30	0.25
S_{D1} (g)	0.03	0.03	0.03	0.05	0.07	0.11	0.15	0.18	0.11

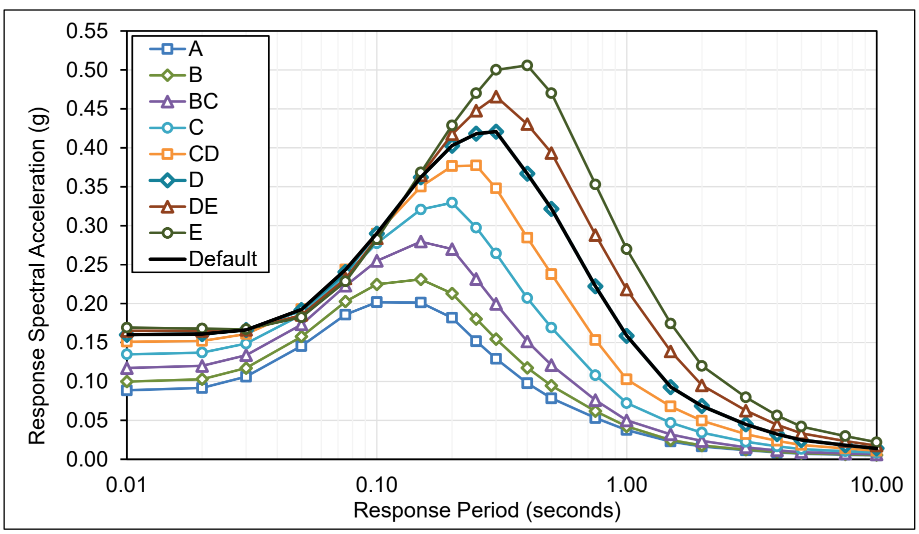


Figure E.1-34 Plots of probabilistic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 4, New York Site.

E.2 Derived Deterministic MCE_R Ground Motions (without the Lower Limit)

Table E.2-1 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Los Angeles Site

0.840	0.948	1.098	1.174	1.135	0.992	0.804	0.694	1.174
0.845	0.954	1.105	1.188	1.157	1.004	0.804	0.694	1.188
0.881	0.990	1.141	1.207	1.157	1.004	0.804	0.694	1.207
1.026	1.140	1.280	1.299	1.204	1.022	0.812	0.694	1.299
1.430	1.566	1.644	1.576	1.370	1.086	0.812	0.697	1.576
1.853	2.033	2.098	1.953	1.643	1.272	0.957	0.805	1.953
1.997	2.235	2.379	2.236	1.878	1.447	1.055	0.884	2.236
1.982	2.291	2.692	2.641	2.253	1.728	1.236	1.022	2.641
1.764	2.081	**2.607**	2.831	2.504	1.948	1.394	1.148	2.831
1.549	1.855	2.402	2.877	2.711	2.174	1.580	1.311	2.877
1.377	1.660	2.200	2.779	2.843	2.370	1.772	1.490	2.843
1.133	1.370	1.862	2.489	2.835	2.536	1.999	1.718	2.835
0.958	1.159	1.605	2.203	2.661	2.545	2.109	1.866	2.661
0.727	0.846	1.190	1.679	2.171	2.262	2.062	1.934	2.262
0.565	0.640	**0.913**	1.316	1.770	1.999	2.016	2.001	1.999
0.362	0.400	0.567	0.830	1.158	1.459	1.738	1.935	1.459
0.264	0.291	0.394	0.576	0.819	1.111	1.494	1.814	1.111
0.174	0.192	0.245	0.359	0.517	0.723	1.017	1.271	0.723
0.123	0.135	0.167	0.244	0.347	0.481	0.669	0.832	0.481
0.094	0.103	0.124	0.177	0.248	0.338	0.463	0.570	0.338
0.049	0.054	0.063	0.086	0.116	0.152	0.201	0.244	0.152
0.032	0.034	0.040	0.052	0.068	0.086	0.109	0.130	0.086
1.59	1.87	2.35	2.59	2.56	2.29	1.90	1.68	2.59
0.57	0.64	0.91	1.32	1.77	2.00	2.75	3.43	2.00
1.06	1.25	1.56	1.73	1.71	1.53	1.27	1.12	1.73
0.38	0.43	0.61	0.88	1.18	1.33	1.83	2.29	1.33

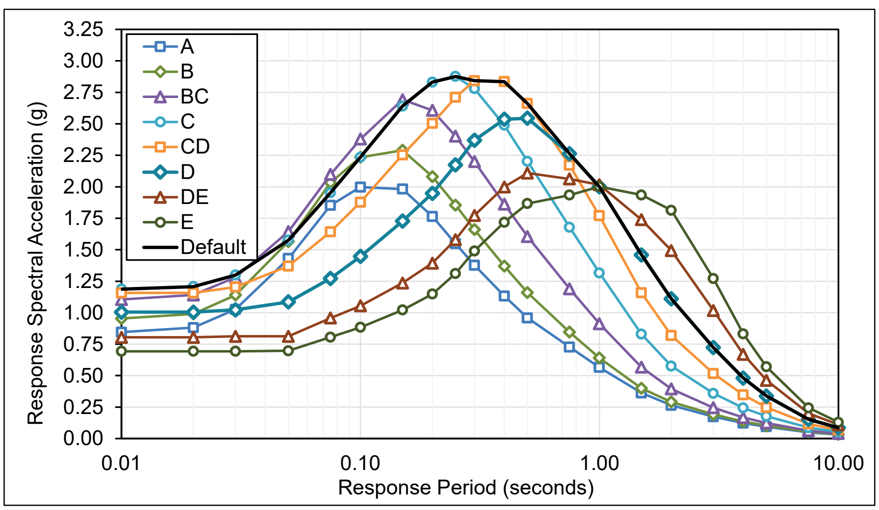


Figure E.2-1 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Los Angeles Site.

Table E.2-2 **Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Century City Site**

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.886	1.000	1.159	1.241	1.203	1.054	0.855	0.738	1.241
0.01	0.891	1.006	1.166	1.254	1.224	1.065	0.855	0.738	1.254
0.02	0.927	1.042	1.201	1.274	1.224	1.065	0.855	0.738	1.274
0.03	1.076	1.196	1.344	1.367	1.270	1.083	0.859	0.738	1.367
0.05	1.490	1.631	1.716	1.649	1.438	1.143	0.859	0.739	1.649
0.08	1.922	2.109	2.181	2.037	1.719	1.336	1.006	0.848	2.037
0.10	2.070	2.316	2.471	2.330	1.965	1.519	1.111	0.933	2.330
0.15	2.062	2.383	2.803	2.759	2.364	1.820	1.307	1.082	2.759
0.20	1.848	2.180	**2.732**	2.974	2.640	2.062	1.480	1.221	2.974
0.25	1.634	1.957	2.535	3.040	2.873	2.310	1.684	1.399	3.040
0.30	1.466	1.768	2.343	2.962	3.037	2.536	1.899	1.598	3.037
0.40	1.234	1.493	2.028	2.710	3.095	2.767	2.179	1.873	3.095
0.50	1.062	1.286	1.780	2.441	2.954	2.821	2.332	2.061	2.954
0.75	0.822	0.957	1.346	1.898	2.457	2.551	2.322	2.173	2.551
1.0	0.656	0.742	**1.058**	1.525	2.052	2.310	2.313	2.286	2.310
1.5	0.444	0.490	0.694	1.016	1.418	1.783	2.114	2.288	1.783
2.0	0.336	0.371	0.503	0.735	1.043	1.415	1.898	2.288	1.415
3.0	0.237	0.262	0.334	0.490	0.705	0.986	1.387	1.733	0.986
4.0	0.179	0.196	0.243	0.354	0.504	0.699	0.973	1.210	0.699
5.0	0.144	0.157	0.189	0.270	0.377	0.515	0.706	0.870	0.515
7.5	0.082	0.089	0.105	0.144	0.193	0.253	0.334	0.406	0.253
10	0.055	0.059	0.067	0.089	0.115	0.146	0.186	0.221	0.146
S_{MS} (g)	1.66	1.96	2.46	2.74	2.79	2.54	2.10	1.85	2.79
S_{M1} (g)	0.66	0.74	1.06	1.53	2.05	2.66	3.74	4.68	2.66
S_{DS} (g)	1.11	1.31	1.64	1.82	1.86	1.69	1.40	1.24	1.86
S_{D1} (g)	0.44	0.49	0.71	1.02	1.37	1.78	2.50	3.12	1.78

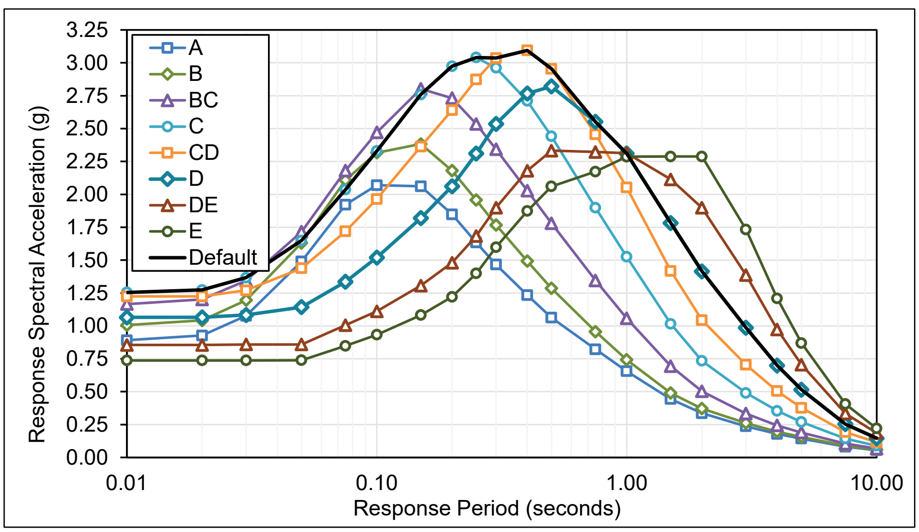


Figure E.2-2 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Century City Site.

Table E.2-3 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Northridge Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.673	0.760	0.883	0.958	0.951	0.859	0.721	0.633	0.958
0.01	0.677	0.764	0.888	0.964	0.968	0.875	0.721	0.633	0.968
0.02	0.702	0.788	0.911	0.979	0.968	0.875	0.721	0.633	0.979
0.03	0.810	0.900	1.015	1.051	1.002	0.875	0.721	0.633	1.051
0.05	1.113	1.219	1.295	1.269	1.138	0.933	0.764	0.656	1.269
0.08	1.435	1.575	1.649	1.576	1.370	1.100	0.840	0.724	1.576
0.10	1.547	1.732	1.869	1.808	1.576	1.263	0.958	0.820	1.808
0.15	1.548	1.789	2.114	2.140	1.905	1.529	1.147	0.973	2.140
0.20	1.395	1.645	**2.064**	2.294	2.123	1.738	1.310	1.111	2.294
0.25	1.231	1.474	1.911	2.321	2.282	1.929	1.483	1.270	2.321
0.30	1.104	1.331	1.765	2.251	2.386	2.096	1.660	1.442	2.386
0.40	0.932	1.128	1.533	2.058	2.404	2.256	1.882	1.672	2.404
0.50	0.805	0.974	1.348	1.857	2.287	2.280	1.993	1.820	2.287
0.75	0.617	0.718	1.010	1.429	1.870	2.010	1.934	1.860	2.010
1.0	0.492	0.558	**0.795**	1.148	1.557	1.800	1.875	1.901	1.800
1.5	0.340	0.375	0.532	0.780	1.094	1.394	1.689	1.901	1.394
2.0	0.263	0.290	0.394	0.576	0.820	1.116	1.507	1.834	1.116
3.0	0.189	0.209	0.267	0.391	0.562	0.788	1.108	1.384	0.788
4.0	0.146	0.161	0.199	0.290	0.413	0.572	0.797	0.991	0.572
5.0	0.120	0.131	0.158	0.225	0.315	0.429	0.588	0.725	0.429
7.5	0.071	0.077	0.091	0.125	0.168	0.220	0.291	0.353	0.220
10	0.047	0.051	0.059	0.077	0.100	0.127	0.162	0.192	0.127
S_{MS} (g)	1.26	1.48	1.86	2.09	2.16	2.05	1.79	1.64	2.16
S_{M1} (g)	0.49	0.56	0.79	1.15	1.56	2.13	2.99	3.74	2.13
S_{DS} (g)	0.84	0.99	1.24	1.39	1.44	1.37	1.20	1.09	1.44
S_{D1} (g)	0.33	0.37	0.53	0.77	1.04	1.42	1.99	2.49	1.42

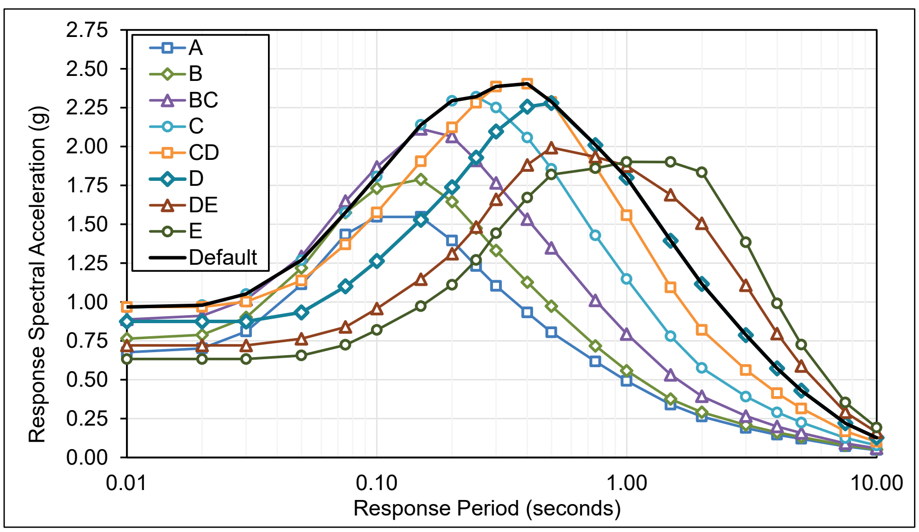


Figure E.2-3 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Northridge Site.

Table E.2-4 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Long Beach Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.898	1.014	1.175	1.260	1.224	1.076	0.874	0.754	1.260
0.01	0.903	1.020	1.182	1.273	1.245	1.086	0.874	0.754	1.273
0.02	0.939	1.055	1.216	1.292	1.245	1.086	0.874	0.754	1.292
0.03	1.087	1.208	1.359	1.385	1.290	1.103	0.875	0.754	1.385
0.05	1.499	1.641	1.729	1.665	1.456	1.160	0.875	0.754	1.665
0.08	1.929	2.117	2.193	2.053	1.738	1.354	1.021	0.863	2.053
0.10	2.076	2.324	2.483	2.348	1.986	1.541	1.130	0.950	2.348
0.15	2.071	2.394	2.818	2.782	2.392	1.848	1.332	1.105	2.782
0.20	1.863	2.198	**2.755**	3.005	2.677	2.099	1.513	1.250	3.005
0.25	1.653	1.980	2.565	3.079	2.919	2.355	1.724	1.435	3.079
0.30	1.490	1.796	2.382	3.012	3.095	2.593	1.949	1.643	3.095
0.40	1.268	1.534	2.086	2.786	3.184	2.855	2.254	1.940	3.184
0.50	1.102	1.333	1.847	2.532	3.065	2.931	2.427	2.147	3.065
0.75	0.860	1.001	1.409	1.986	2.570	2.669	2.436	2.281	2.669
1.0	0.694	0.786	**1.120**	1.615	2.172	2.444	2.445	2.415	2.444
1.5	0.483	0.533	0.755	1.106	1.543	1.938	2.297	2.415	1.938
2.0	0.373	0.412	0.558	0.815	1.158	1.569	2.104	2.415	1.569
3.0	0.271	0.299	0.382	0.561	0.806	1.128	1.587	1.983	1.128
4.0	0.210	0.231	0.287	0.417	0.594	0.823	1.145	1.425	0.823
5.0	0.173	0.189	0.227	0.325	0.454	0.619	0.848	1.046	0.619
7.5	0.102	0.111	0.130	0.179	0.240	0.315	0.416	0.505	0.315
10	0.068	0.073	0.084	0.111	0.144	0.183	0.233	0.276	0.183
S_{MS} (g)	1.68	1.98	2.48	2.77	2.87	2.64	2.18	1.93	2.87
S_{M1} (g)	0.69	0.79	1.12	1.62	2.18	3.05	4.28	5.35	3.05
S_{DS} (g)	1.12	1.32	1.65	1.85	1.91	1.76	1.46	1.29	1.91
S_{D1} (g)	0.46	0.52	0.75	1.08	1.45	2.03	2.86	3.57	2.03

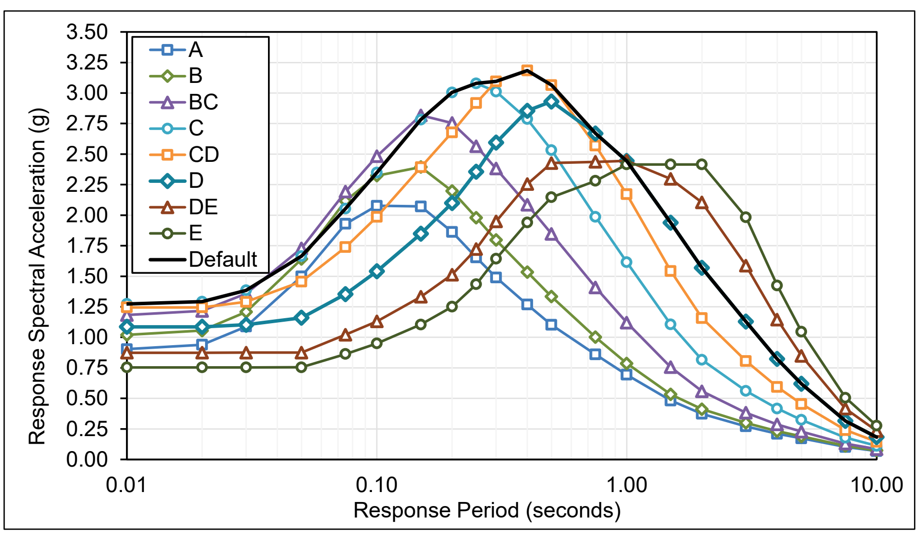


Figure E.2-4 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Long Beach Site.

Table E.2-5 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Irvine Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.899	1.015	1.175	1.257	1.218	1.067	0.867	0.750	1.257
0.01	0.904	1.020	1.182	1.272	1.243	1.081	0.868	0.750	1.272
0.02	0.944	1.061	1.222	1.294	1.243	1.081	0.868	0.750	1.294
0.03	1.101	1.223	1.374	1.396	1.296	1.101	0.878	0.750	1.396
0.05	1.543	1.689	1.775	1.703	1.483	1.177	0.881	0.756	1.703
0.08	2.003	2.198	2.270	2.116	1.783	1.383	1.039	0.876	2.116
0.10	2.158	2.415	2.572	2.421	2.037	1.573	1.148	0.963	2.421
0.15	2.132	2.464	2.896	2.848	2.437	1.873	1.344	1.113	2.848
0.20	1.886	2.225	**2.788**	3.032	2.693	2.104	1.511	1.247	3.032
0.25	1.646	1.972	2.554	3.061	2.897	2.336	1.708	1.422	3.061
0.30	1.453	1.752	2.322	2.935	3.014	2.530	1.905	1.608	3.014
0.40	1.179	1.427	1.939	2.593	2.959	2.668	2.122	1.834	2.959
0.50	0.986	1.193	1.653	2.268	2.745	2.645	2.216	1.973	2.745
0.75	0.736	0.850	1.205	1.700	2.202	2.311	2.130	2.009	2.311
1.0	0.562	0.637	**0.908**	1.310	1.763	2.005	2.044	2.045	2.005
1.5	0.348	0.384	0.544	0.797	1.114	1.408	1.689	1.890	1.408
2.0	0.247	0.273	0.370	0.540	0.768	1.043	1.406	1.710	1.043
3.0	0.155	0.171	0.219	0.321	0.462	0.646	0.909	1.136	0.646
4.0	0.105	0.116	0.143	0.209	0.297	0.412	0.573	0.713	0.412
5.0	0.078	0.085	0.103	0.147	0.205	0.280	0.384	0.473	0.280
7.5	0.039	0.042	0.050	0.068	0.091	0.120	0.158	0.192	0.120
10	0.025	0.027	0.031	0.041	0.052	0.066	0.085	0.100	0.066
S_{MS} (g)	1.70	2.00	2.51	2.75	2.71	2.40	1.99	1.78	2.75
S_{M1} (g)	0.56	0.64	0.91	1.31	1.76	2.00	2.53	3.08	2.00
S_{DS} (g)	1.13	1.34	1.67	1.84	1.81	1.60	1.33	1.18	1.84
S_{D1} (g)	0.37	0.42	0.61	0.87	1.18	1.34	1.69	2.05	1.34

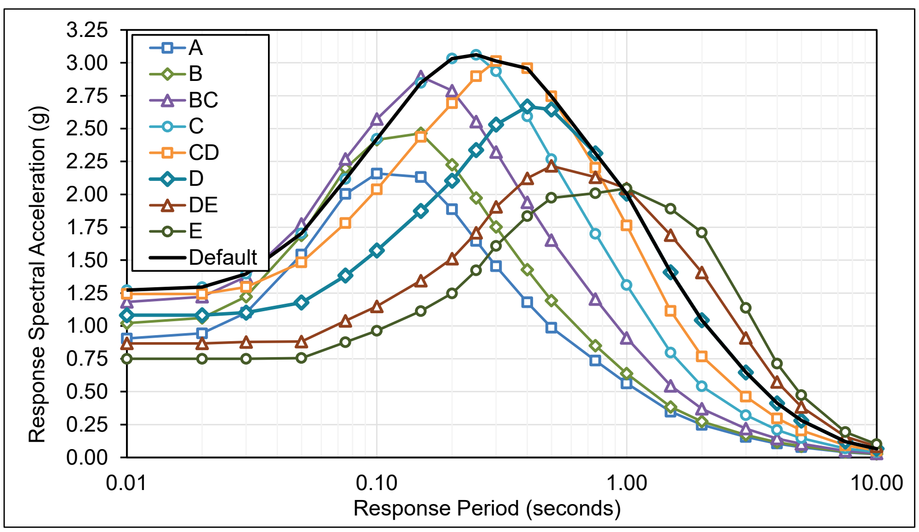


Figure E.2-5 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Irvine Site.

Table E.2-6 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Riverside Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.464	0.524	0.610	0.672	0.685	0.641	0.561	0.501	0.685
0.01	0.467	0.527	0.613	0.676	0.692	0.652	0.565	0.501	0.692
0.02	0.482	0.542	0.627	0.685	0.694	0.652	0.565	0.501	0.694
0.03	0.555	0.617	0.698	0.736	0.722	0.652	0.565	0.501	0.736
0.05	0.760	0.832	0.893	0.895	0.828	0.705	0.576	0.514	0.895
0.08	0.979	1.075	1.141	1.119	1.008	0.841	0.666	0.582	1.119
0.10	1.058	1.184	1.294	1.288	1.166	0.975	0.773	0.677	1.288
0.15	1.060	1.225	1.455	1.519	1.413	1.193	0.942	0.822	1.519
0.20	0.957	1.129	**1.419**	1.614	1.565	1.354	1.082	0.948	1.614
0.25	0.842	1.008	1.308	1.611	1.657	1.484	1.216	1.078	1.657
0.30	0.752	0.907	1.204	1.551	1.706	1.589	1.345	1.212	1.706
0.40	0.630	0.763	1.038	1.400	1.677	1.664	1.485	1.373	1.677
0.50	0.541	0.655	0.907	1.255	1.577	1.651	1.541	1.465	1.651
0.75	0.409	0.476	0.670	0.950	1.259	1.409	1.442	1.435	1.409
1.0	0.323	0.366	**0.521**	0.754	1.032	1.230	1.343	1.406	1.230
1.5	0.221	0.244	0.346	0.508	0.716	0.928	1.153	1.320	0.928
2.0	0.171	0.189	0.256	0.374	0.534	0.731	0.995	1.217	0.731
3.0	0.121	0.134	0.171	0.251	0.361	0.505	0.711	0.888	0.505
4.0	0.093	0.102	0.127	0.185	0.263	0.365	0.508	0.632	0.365
5.0	0.076	0.083	0.100	0.143	0.200	0.272	0.373	0.460	0.272
7.5	0.046	0.050	0.058	0.080	0.107	0.141	0.186	0.226	0.141
10	0.030	0.032	0.037	0.049	0.064	0.081	0.103	0.122	0.081
S_{MS} (g)	0.86	1.02	1.28	1.45	1.54	1.50	1.39	1.32	1.54
S_{M1} (g)	0.32	0.37	0.52	0.75	1.03	1.36	1.92	2.40	1.36
S_{DS} (g)	0.57	0.68	0.85	0.97	1.02	1.00	0.92	0.88	1.02
S_{D1} (g)	0.22	0.24	0.35	0.50	0.69	0.91	1.28	1.60	0.91

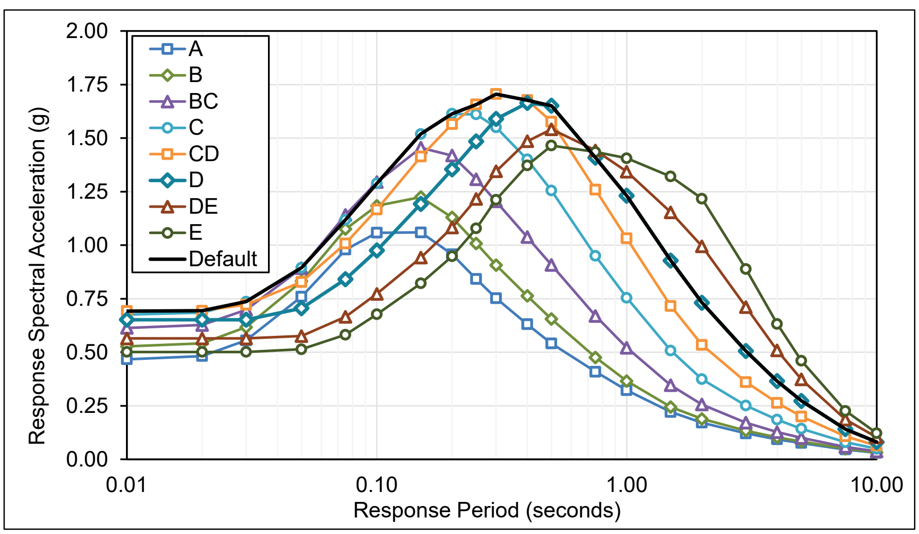


Figure E.2-6 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Riverside Site.

Table E.2-7 **Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, San Bernardino Site**

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.907	1.024	1.187	1.272	1.235	1.085	0.881	0.760	1.272
0.01	0.912	1.030	1.193	1.285	1.256	1.095	0.881	0.760	1.285
0.02	0.948	1.066	1.228	1.304	1.256	1.095	0.881	0.760	1.304
0.03	1.099	1.221	1.372	1.399	1.302	1.113	0.883	0.760	1.399
0.05	1.516	1.659	1.747	1.682	1.470	1.171	0.883	0.761	1.682
0.08	1.951	2.141	2.217	2.075	1.755	1.367	1.031	0.871	2.075
0.10	2.100	2.350	2.510	2.373	2.006	1.555	1.141	0.958	2.373
0.15	2.095	2.421	2.849	2.811	2.416	1.865	1.343	1.114	2.811
0.20	1.883	2.221	**2.784**	3.036	2.703	2.118	1.525	1.260	3.036
0.25	1.670	2.000	2.590	3.109	2.946	2.376	1.737	1.446	3.109
0.30	1.504	1.813	2.403	3.039	3.122	2.615	1.964	1.655	3.122
0.40	1.277	1.545	2.100	2.806	3.207	2.874	2.268	1.952	3.207
0.50	1.108	1.341	1.857	2.547	3.083	2.947	2.440	2.158	3.083
0.75	0.864	1.005	1.414	1.995	2.581	2.680	2.446	2.290	2.680
1.0	0.695	0.788	**1.123**	1.619	2.177	2.450	2.452	2.422	2.450
1.5	0.482	0.532	0.753	1.103	1.540	1.934	2.292	2.422	1.934
2.0	0.371	0.410	0.555	0.811	1.152	1.560	2.093	2.422	1.560
3.0	0.269	0.296	0.378	0.555	0.798	1.117	1.571	1.963	1.117
4.0	0.207	0.228	0.282	0.411	0.585	0.811	1.129	1.404	0.811
5.0	0.170	0.185	0.223	0.319	0.446	0.608	0.834	1.028	0.608
7.5	0.100	0.108	0.127	0.175	0.235	0.308	0.406	0.494	0.308
10	0.067	0.072	0.082	0.109	0.141	0.179	0.228	0.270	0.179
S_{MS} **(g)**	1.69	2.00	2.51	2.80	2.89	2.65	2.20	1.94	2.89
S_{M1} **(g)**	0.70	0.79	1.12	1.62	2.18	3.02	4.24	5.30	3.02
S_{DS} **(g)**	1.13	1.33	1.67	1.87	1.92	1.77	1.46	1.29	1.92
S_{D1} **(g)**	0.46	0.53	0.75	1.08	1.45	2.01	2.83	3.53	2.01

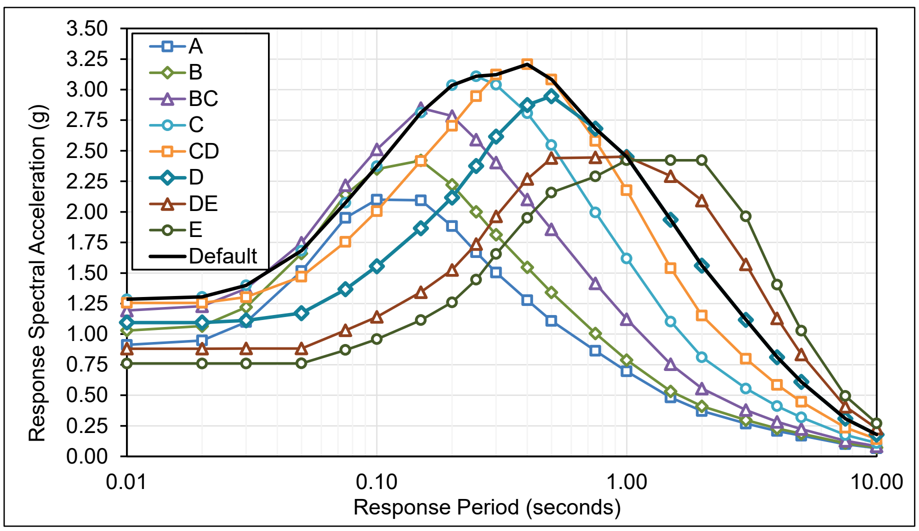


Figure E.2-7 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, San Bernardino Site.

Table E.2-8 **Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, San Luis Obispo Site**

Period	5%-Damped Response Spectral Acceleration (g)								
***T* (s)**	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.630	0.711	0.825	0.894	0.887	0.802	0.676	0.594	0.894
0.01	0.633	0.715	0.830	0.901	0.904	0.819	0.676	0.594	0.904
0.02	0.659	0.740	0.855	0.918	0.907	0.819	0.676	0.594	0.918
0.03	0.766	0.851	0.959	0.990	0.943	0.819	0.676	0.594	0.990
0.05	1.067	1.168	1.238	1.211	1.084	0.890	0.722	0.621	1.211
0.08	1.386	1.521	1.589	1.515	1.316	1.057	0.805	0.691	1.515
0.10	1.500	1.678	1.807	1.744	1.518	1.217	0.924	0.792	1.744
0.15	1.494	1.727	2.038	2.059	1.833	1.473	1.107	0.940	2.059
0.20	1.329	1.568	**1.968**	2.183	2.022	1.659	1.256	1.068	2.183
0.25	1.157	1.386	1.797	2.180	2.149	1.825	1.412	1.214	2.180
0.30	1.020	1.229	1.632	2.080	2.208	1.954	1.561	1.362	2.208
0.40	0.829	1.003	1.364	1.833	2.141	2.029	1.714	1.534	2.141
0.50	0.694	0.839	1.163	1.603	1.977	1.989	1.767	1.629	1.989
0.75	0.512	0.592	0.838	1.186	1.555	1.689	1.652	1.603	1.689
1.0	0.392	0.444	**0.633**	0.915	1.242	1.449	1.537	1.578	1.449
1.5	0.246	0.271	0.385	0.564	0.792	1.015	1.244	1.410	1.015
2.0	0.177	0.196	0.266	0.388	0.553	0.755	1.024	1.250	0.755
3.0	0.113	0.125	0.159	0.234	0.336	0.471	0.662	0.827	0.471
4.0	0.078	0.086	0.106	0.155	0.220	0.305	0.425	0.528	0.305
5.0	0.059	0.064	0.077	0.110	0.154	0.210	0.288	0.355	0.210
7.5	0.030	0.032	0.038	0.052	0.070	0.092	0.122	0.148	0.092
10	0.019	0.020	0.023	0.031	0.040	0.051	0.065	0.077	0.051
S_{MS} (g)	1.20	1.41	1.77	1.96	1.99	1.83	1.59	1.47	1.99
S_{M1} (g)	0.39	0.44	0.63	0.91	1.24	1.45	1.84	2.25	1.45
S_{DS} (g)	0.80	0.94	1.18	1.31	1.33	1.22	1.06	0.98	1.33
S_{D1} (g)	0.26	0.30	0.42	0.61	0.83	0.97	1.23	1.50	0.97

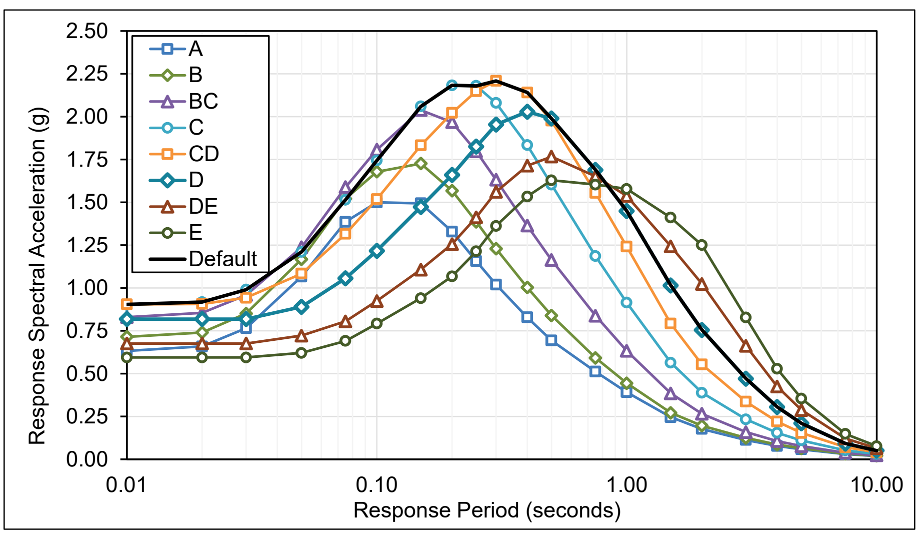


Figure E.2-8 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, San Luis Obispo Site.

Table E.2-9 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, San Diego Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.697	0.787	0.914	0.991	0.984	0.890	0.751	0.661	0.991
0.01	0.701	0.792	0.919	0.998	1.003	0.909	0.751	0.661	1.003
0.02	0.730	0.820	0.947	1.017	1.006	0.909	0.751	0.661	1.017
0.03	0.849	0.943	1.063	1.098	1.046	0.909	0.751	0.661	1.098
0.05	1.184	1.296	1.374	1.345	1.205	0.990	0.803	0.691	1.345
0.08	1.539	1.689	1.765	1.684	1.464	1.177	0.898	0.770	1.684
0.10	1.665	1.864	2.008	1.939	1.690	1.356	1.031	0.884	1.939
0.15	1.657	1.915	2.261	2.287	2.038	1.640	1.235	1.050	2.287
0.20	1.472	1.736	**2.179**	2.419	2.244	1.846	1.400	1.191	2.419
0.25	1.279	1.532	1.987	2.411	2.381	2.027	1.573	1.353	2.411
0.30	1.125	1.356	1.800	2.296	2.441	2.165	1.735	1.516	2.441
0.40	0.911	1.103	1.500	2.016	2.356	2.239	1.898	1.702	2.356
0.50	0.760	0.920	1.275	1.758	2.169	2.188	1.951	1.803	2.188
0.75	0.558	0.643	0.915	1.294	1.697	1.849	1.815	1.765	1.849
1.0	0.426	0.482	**0.687**	0.994	1.349	1.578	1.679	1.728	1.578
1.5	0.264	0.292	0.414	0.607	0.852	1.093	1.343	1.525	1.093
2.0	0.190	0.209	0.284	0.415	0.591	0.807	1.096	1.339	0.807
3.0	0.119	0.131	0.168	0.246	0.354	0.496	0.698	0.873	0.496
4.0	0.081	0.089	0.111	0.161	0.229	0.318	0.443	0.550	0.318
5.0	0.060	0.066	0.080	0.114	0.159	0.217	0.297	0.366	0.217
7.5	0.031	0.033	0.039	0.053	0.072	0.094	0.124	0.151	0.094
10	0.019	0.021	0.024	0.031	0.041	0.052	0.066	0.078	0.052
S_{MS} **(g)**	1.32	1.56	1.96	2.18	2.20	2.02	1.76	1.62	2.20
S_{M1} **(g)**	0.43	0.48	0.69	0.99	1.35	1.58	1.97	2.41	1.58
S_{DS} **(g)**	0.88	1.04	1.31	1.45	1.46	1.34	1.17	1.08	1.46
S_{D1} **(g)**	0.28	0.32	0.46	0.66	0.90	1.05	1.31	1.61	1.05

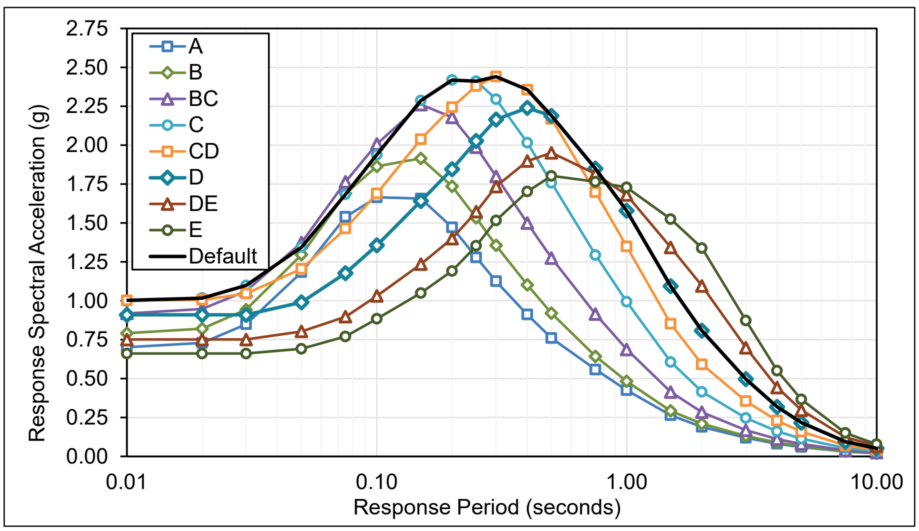


Figure E.2-9 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, San Diego Site.

Table E.2-10 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Santa Barbara Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	1.023	1.155	1.338	1.431	1.385	1.212	0.982	0.847	1.431
0.01	1.029	1.162	1.346	1.448	1.411	1.226	0.982	0.847	1.448
0.02	1.072	1.205	1.388	1.470	1.411	1.226	0.982	0.847	1.470
0.03	1.247	1.385	1.556	1.581	1.466	1.247	0.989	0.847	1.581
0.05	1.732	1.897	1.993	1.912	1.664	1.320	0.989	0.850	1.912
0.08	2.240	2.457	2.538	2.366	1.992	1.545	1.162	0.979	2.366
0.10	2.413	2.700	2.877	2.707	2.277	1.757	1.282	1.075	2.707
0.15	2.399	2.773	3.260	3.202	2.736	2.101	1.505	1.245	3.202
0.20	2.143	2.528	**3.168**	3.443	3.049	2.375	1.701	1.401	3.443
0.25	1.888	2.262	2.929	3.511	3.310	2.656	1.932	1.603	3.511
0.30	1.687	2.033	2.696	3.406	3.487	2.907	2.173	1.827	3.487
0.40	1.404	1.698	2.308	3.084	3.518	3.143	2.473	2.124	3.518
0.50	1.198	1.450	2.008	2.754	3.331	3.180	2.629	2.323	3.331
0.75	0.918	1.069	1.504	2.122	2.746	2.854	2.596	2.430	2.854
1.0	0.724	0.820	**1.168**	1.685	2.267	2.555	2.564	2.537	2.555
1.5	0.477	0.526	0.746	1.092	1.524	1.918	2.278	2.531	1.918
2.0	0.354	0.391	0.530	0.774	1.100	1.492	2.003	2.430	1.492
3.0	0.242	0.267	0.341	0.500	0.719	1.006	1.415	1.768	1.006
4.0	0.177	0.194	0.241	0.350	0.499	0.691	0.962	1.197	0.691
5.0	0.139	0.152	0.183	0.261	0.365	0.498	0.682	0.841	0.498
7.5	0.076	0.083	0.097	0.133	0.179	0.235	0.310	0.377	0.235
10	0.050	0.054	0.062	0.082	0.106	0.135	0.171	0.203	0.135
S_{MS} (g)	1.93	2.28	2.85	3.16	3.17	2.86	2.37	2.09	3.17
S_{M1} (g)	0.72	0.82	1.17	1.68	2.27	2.72	3.82	4.77	2.72
S_{DS} (g)	1.29	1.52	1.90	2.11	2.11	1.91	1.58	1.39	2.11
S_{D1} (g)	0.48	0.55	0.78	1.12	1.51	1.81	2.55	3.18	1.81

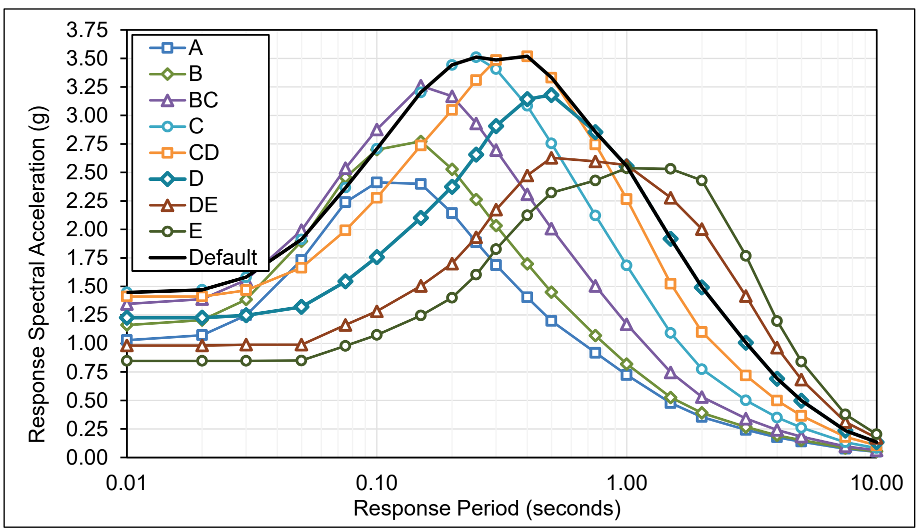


Figure E.2-10 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Santa Barbara Site.

Table E.2-11 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Ventura Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.994	1.122	1.301	1.396	1.356	1.192	0.968	0.836	1.396
0.01	1.000	1.129	1.308	1.409	1.378	1.203	0.968	0.836	1.409
0.02	1.039	1.168	1.346	1.430	1.378	1.203	0.968	0.836	1.430
0.03	1.203	1.337	1.503	1.533	1.428	1.222	0.969	0.836	1.533
0.05	1.657	1.815	1.912	1.842	1.611	1.285	0.969	0.836	1.842
0.08	2.132	2.340	2.424	2.271	1.923	1.499	1.131	0.956	2.271
0.10	2.295	2.568	2.744	2.596	2.197	1.706	1.252	1.052	2.596
0.15	2.290	2.646	3.115	3.077	2.647	2.046	1.475	1.224	3.077
0.20	2.061	2.431	**3.047**	3.325	2.964	2.325	1.676	1.386	3.325
0.25	1.849	2.214	2.881	3.407	3.232	2.610	1.911	1.591	3.407
0.30	1.682	2.028	2.710	3.372	3.429	2.875	2.161	1.822	3.429
0.40	1.453	1.758	2.423	3.180	3.533	3.168	2.503	2.154	3.533
0.50	1.277	1.546	2.179	2.932	3.446	3.256	2.697	2.386	3.446
0.75	1.017	1.184	1.708	2.358	2.956	3.042	2.723	2.602	3.042
1.0	0.832	0.943	**1.385**	1.952	2.540	2.838	2.723	2.690	2.838
1.5	0.592	0.653	0.938	1.373	1.850	2.314	2.723	2.690	2.314
2.0	0.465	0.513	0.695	1.015	1.413	1.909	2.560	2.690	1.909
3.0	0.339	0.374	0.478	0.701	1.008	1.411	1.984	2.479	1.411
4.0	0.264	0.290	0.360	0.523	0.745	1.032	1.437	1.788	1.032
5.0	0.217	0.237	0.286	0.408	0.571	0.779	1.068	1.316	0.779
7.5	0.129	0.140	0.164	0.226	0.303	0.398	0.525	0.638	0.398
10	0.086	0.093	0.107	0.141	0.182	0.231	0.295	0.349	0.231
S_{MS} **(g)**	1.85	2.19	2.74	3.07	3.18	2.93	2.43	2.15	3.18
S_{M1} **(g)**	0.84	0.94	1.39	1.95	2.72	3.81	5.36	6.69	3.81
S_{DS} **(g)**	1.24	1.46	1.83	2.04	2.12	1.95	1.62	1.43	2.12
S_{D1} **(g)**	0.56	0.63	0.92	1.30	1.81	2.54	3.57	4.46	2.54

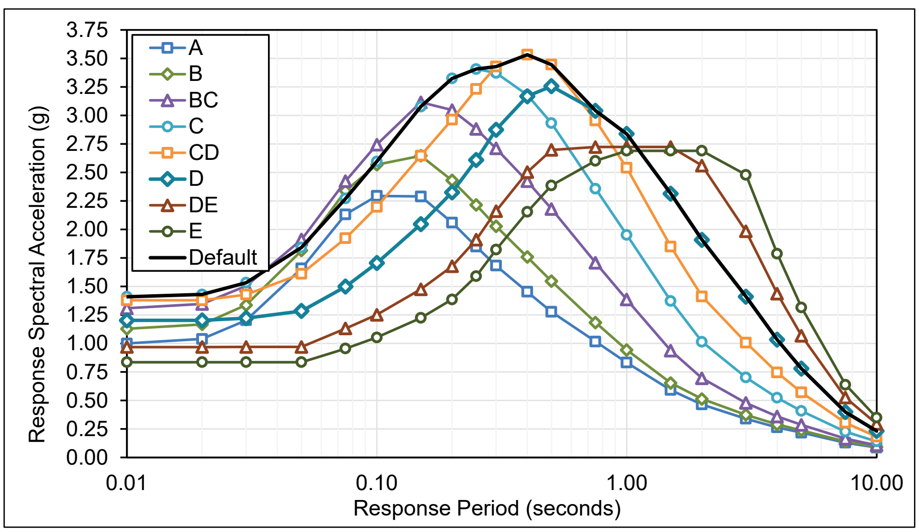


Figure E.2-11 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Ventura Site.

Table E.2-12 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Oakland Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.668	0.754	0.875	0.950	0.943	0.851	0.714	0.627	0.950
0.01	0.672	0.758	0.880	0.956	0.959	0.867	0.714	0.627	0.959
0.02	0.696	0.782	0.903	0.971	0.960	0.867	0.714	0.627	0.971
0.03	0.804	0.894	1.008	1.043	0.993	0.867	0.714	0.627	1.043
0.05	1.106	1.211	1.286	1.260	1.129	0.926	0.757	0.650	1.260
0.08	1.427	1.566	1.639	1.565	1.360	1.092	0.833	0.718	1.565
0.10	1.539	1.723	1.859	1.797	1.565	1.253	0.950	0.813	1.797
0.15	1.539	1.779	2.102	2.127	1.892	1.518	1.138	0.965	2.127
0.20	1.386	1.635	**2.052**	2.279	2.108	1.724	1.299	1.101	2.279
0.25	1.222	1.464	1.898	2.304	2.264	1.913	1.470	1.258	2.304
0.30	1.095	1.320	1.752	2.233	2.365	2.078	1.645	1.428	2.365
0.40	0.923	1.116	1.517	2.037	2.378	2.231	1.861	1.653	2.378
0.50	0.795	0.962	1.332	1.834	2.259	2.251	1.968	1.797	2.259
0.75	0.608	0.708	0.996	1.408	1.843	1.981	1.906	1.834	1.981
1.0	0.484	0.549	**0.781**	1.129	1.531	1.770	1.844	1.871	1.770
1.5	0.332	0.367	0.520	0.762	1.069	1.363	1.651	1.858	1.363
2.0	0.256	0.283	0.383	0.560	0.797	1.086	1.466	1.785	1.086
3.0	0.183	0.202	0.257	0.378	0.543	0.761	1.070	1.337	0.761
4.0	0.140	0.154	0.191	0.278	0.396	0.549	0.764	0.951	0.549
5.0	0.114	0.125	0.150	0.215	0.300	0.410	0.561	0.692	0.410
7.5	0.068	0.073	0.086	0.118	0.159	0.208	0.275	0.334	0.208
10	0.045	0.048	0.055	0.073	0.095	0.120	0.153	0.181	0.120
S_{MS} (g)	1.25	1.47	1.85	2.07	2.14	2.03	1.77	1.62	2.14
S_{M1} (g)	0.48	0.55	0.78	1.13	1.53	2.05	2.89	3.61	2.05
S_{DS} (g)	0.83	0.98	1.23	1.38	1.43	1.35	1.18	1.08	1.43
S_{D1} (g)	0.32	0.37	0.52	0.75	1.02	1.37	1.93	2.41	1.37

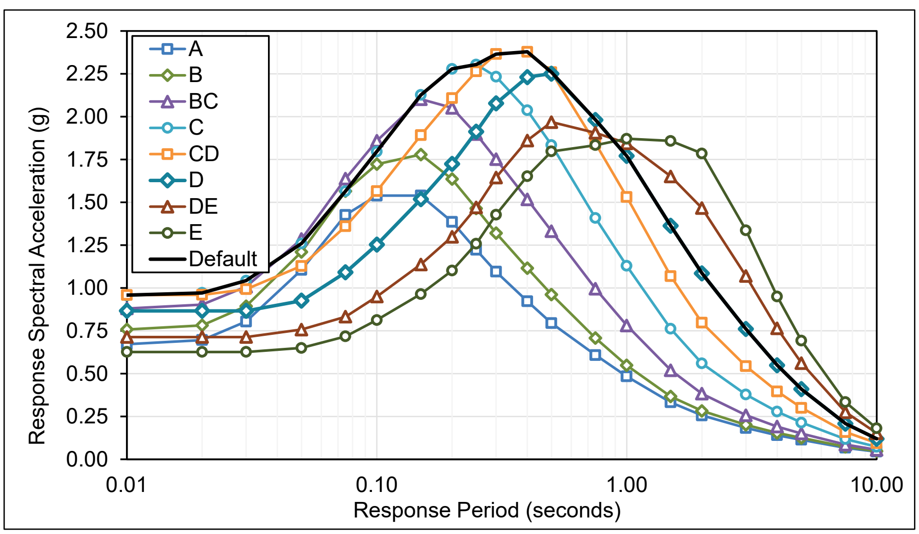


Figure E.2-12 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Oakland Site.

Table E.2-13 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Concord Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.878	0.991	1.148	1.227	1.186	1.038	0.841	0.725	1.227
0.01	0.883	0.996	1.154	1.241	1.210	1.050	0.841	0.725	1.241
0.02	0.920	1.034	1.192	1.261	1.210	1.050	0.841	0.725	1.261
0.03	1.071	1.190	1.337	1.357	1.258	1.068	0.848	0.725	1.357
0.05	1.492	1.634	1.716	1.645	1.430	1.134	0.848	0.729	1.645
0.08	1.932	2.120	2.188	2.038	1.714	1.328	0.999	0.841	2.038
0.10	2.082	2.330	2.480	2.332	1.959	1.510	1.101	0.923	2.332
0.15	2.067	2.389	2.808	2.756	2.352	1.804	1.291	1.067	2.756
0.20	1.842	2.173	**2.722**	2.957	2.616	2.036	1.457	1.200	2.957
0.25	1.618	1.938	2.510	3.007	2.835	2.273	1.653	1.371	3.007
0.30	1.441	1.737	2.303	2.909	2.977	2.482	1.855	1.560	2.977
0.40	1.189	1.439	1.956	2.613	2.980	2.664	2.098	1.803	2.980
0.50	1.008	1.220	1.690	2.319	2.803	2.679	2.219	1.963	2.803
0.75	0.767	0.893	1.257	1.772	2.293	2.388	2.176	2.039	2.388
1.0	0.599	0.679	**0.967**	1.395	1.876	2.119	2.133	2.116	2.119
1.5	0.387	0.427	0.606	0.887	1.238	1.559	1.856	2.065	1.559
2.0	0.284	0.313	0.424	0.620	0.881	1.194	1.606	1.950	1.194
3.0	0.189	0.209	0.267	0.391	0.562	0.787	1.107	1.383	0.787
4.0	0.135	0.148	0.184	0.268	0.381	0.529	0.736	0.915	0.529
5.0	0.104	0.114	0.138	0.196	0.274	0.374	0.513	0.632	0.374
7.5	0.056	0.060	0.071	0.097	0.131	0.172	0.226	0.275	0.172
10	0.036	0.039	0.045	0.059	0.077	0.097	0.124	0.147	0.097
S_{MS} (g)	1.66	1.96	2.45	2.71	2.68	2.41	2.00	1.77	2.71
S_{M1} (g)	0.60	0.68	0.97	1.40	1.88	2.15	2.99	3.73	2.15
S_{DS} (g)	1.11	1.30	1.63	1.80	1.79	1.61	1.33	1.18	1.80
S_{D1} (g)	0.40	0.45	0.64	0.93	1.25	1.43	1.99	2.49	1.43

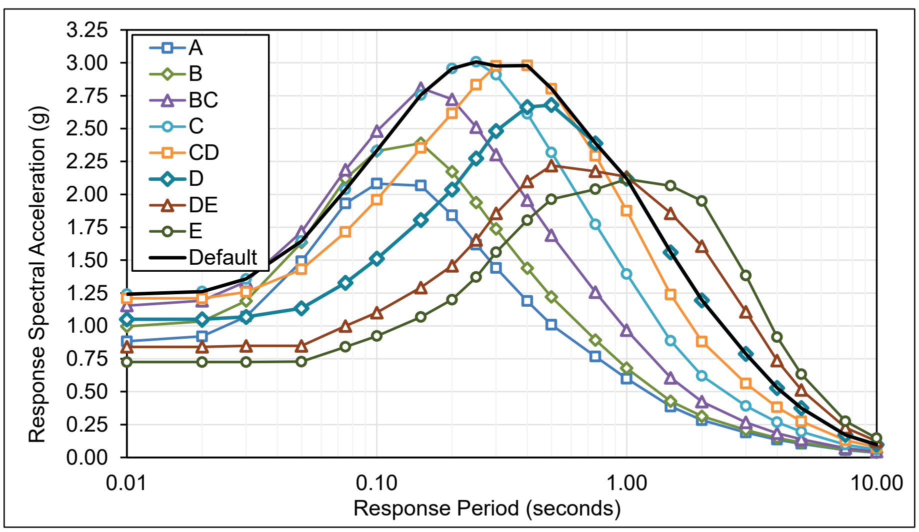


Figure E.2-13 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Concord Site.

Table E.2-14 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Monterey Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.718	0.811	0.941	1.020	1.012	0.915	0.771	0.679	1.020
0.01	0.722	0.815	0.946	1.027	1.032	0.934	0.771	0.679	1.032
0.02	0.751	0.844	0.975	1.047	1.035	0.934	0.771	0.679	1.047
0.03	0.874	0.971	1.093	1.130	1.076	0.934	0.771	0.679	1.130
0.05	1.217	1.332	1.412	1.382	1.237	1.016	0.824	0.709	1.382
0.08	1.582	1.736	1.813	1.729	1.502	1.207	0.920	0.789	1.729
0.10	1.711	1.915	2.063	1.991	1.733	1.390	1.056	0.905	1.991
0.15	1.704	1.970	2.325	2.350	2.092	1.682	1.265	1.074	2.350
0.20	1.516	1.788	**2.244**	2.489	2.307	1.894	1.435	1.220	2.489
0.25	1.319	1.580	2.048	2.485	2.450	2.082	1.613	1.386	2.485
0.30	1.162	1.401	1.859	2.370	2.517	2.228	1.781	1.555	2.517
0.40	0.944	1.142	1.553	2.087	2.438	2.311	1.954	1.750	2.438
0.50	0.789	0.955	1.323	1.824	2.249	2.265	2.013	1.857	2.265
0.75	0.581	0.672	0.952	1.348	1.767	1.921	1.880	1.825	1.921
1.0	0.445	0.504	**0.718**	1.038	1.409	1.646	1.747	1.794	1.646
1.5	0.278	0.307	0.436	0.639	0.897	1.149	1.409	1.599	1.149
2.0	0.201	0.221	0.300	0.439	0.626	0.854	1.158	1.414	0.854
3.0	0.127	0.140	0.179	0.263	0.379	0.530	0.746	0.932	0.530
4.0	0.088	0.096	0.119	0.174	0.247	0.343	0.477	0.594	0.343
5.0	0.066	0.072	0.086	0.123	0.173	0.235	0.323	0.398	0.235
7.5	0.033	0.036	0.043	0.058	0.079	0.103	0.136	0.165	0.103
10	0.021	0.023	0.026	0.035	0.045	0.057	0.072	0.086	0.057
S_{MS} (g)	1.36	1.61	2.02	2.24	2.27	2.08	1.81	1.67	2.27
S_{M1} (g)	0.44	0.50	0.72	1.04	1.41	1.65	2.08	2.55	1.65
S_{DS} (g)	0.91	1.07	1.35	1.49	1.51	1.39	1.21	1.11	1.51
S_{D1} (g)	0.30	0.34	0.48	0.69	0.94	1.10	1.39	1.70	1.10

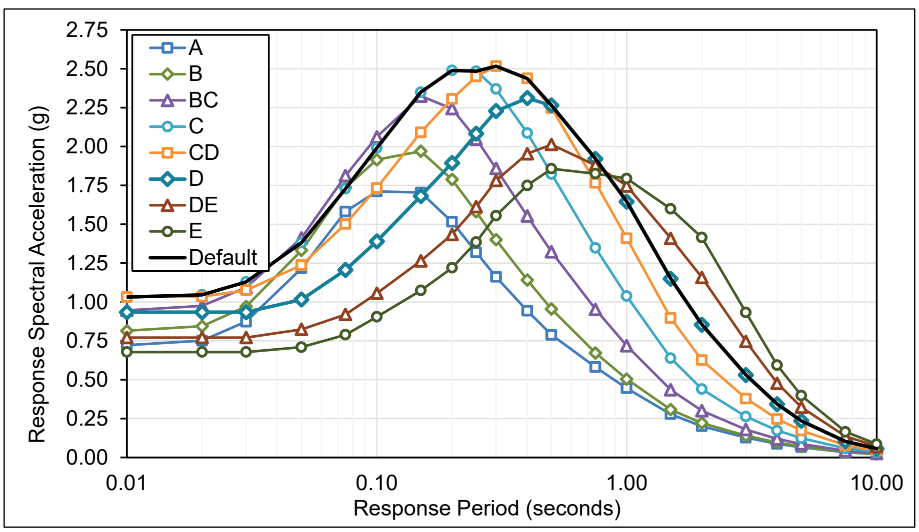


Figure E.2-14 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Monterey Site.

Table E.2-15 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Sacramento Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.166	0.187	0.218	0.240	0.244	0.228	0.199	0.178	0.244
0.01	0.167	0.188	0.219	0.241	0.247	0.232	0.200	0.178	0.247
0.02	0.172	0.194	0.224	0.245	0.247	0.232	0.200	0.178	0.247
0.03	0.199	0.221	0.250	0.263	0.258	0.232	0.200	0.178	0.263
0.05	0.273	0.299	0.321	0.321	0.296	0.252	0.205	0.183	0.321
0.08	0.353	0.388	0.411	0.402	0.362	0.302	0.238	0.208	0.402
0.10	0.382	0.428	0.467	0.464	0.420	0.350	0.277	0.243	0.464
0.15	0.384	0.444	0.527	0.549	0.510	0.429	0.338	0.295	0.549
0.20	0.346	0.408	**0.513**	0.582	0.564	0.487	0.388	0.340	0.582
0.25	0.303	0.363	0.471	0.579	0.595	0.532	0.436	0.386	0.595
0.30	0.270	0.325	0.432	0.556	0.610	0.568	0.480	0.433	0.610
0.40	0.224	0.271	0.369	0.498	0.596	0.591	0.527	0.487	0.596
0.50	0.191	0.231	0.321	0.443	0.556	0.582	0.544	0.517	0.582
0.75	0.143	0.167	0.235	0.333	0.441	0.493	0.506	0.504	0.493
1.0	0.112	0.127	**0.181**	0.262	0.359	0.428	0.468	0.490	0.428
1.5	0.075	0.083	0.118	0.173	0.243	0.316	0.393	0.450	0.316
2.0	0.057	0.063	0.086	0.125	0.179	0.245	0.333	0.408	0.245
3.0	0.040	0.044	0.056	0.082	0.118	0.165	0.232	0.290	0.165
4.0	0.030	0.033	0.040	0.059	0.084	0.116	0.162	0.201	0.116
5.0	0.024	0.026	0.031	0.045	0.062	0.085	0.116	0.143	0.085
7.5	0.014	0.015	0.017	0.024	0.032	0.042	0.056	0.068	0.042
10	0.009	0.010	0.011	0.015	0.019	0.024	0.031	0.036	0.024
S_{MS} (g)	0.31	0.37	0.46	0.52	0.55	0.53	0.49	0.47	0.55
S_{M1} (g)	0.11	0.13	0.18	0.26	0.36	0.44	0.63	0.78	0.44
S_{DS} (g)	0.21	0.24	0.31	0.35	0.37	0.35	0.33	0.31	0.37
S_{D1} (g)	0.07	0.08	0.12	0.17	0.24	0.30	0.42	0.52	0.30

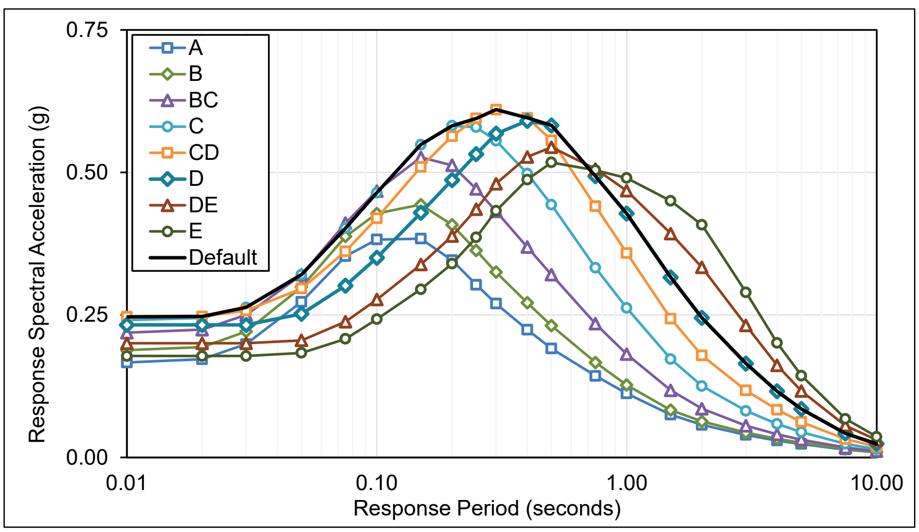


Figure E.2-15 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Sacramento Site.

Table E.2-16 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, San Francisco Site

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.519	0.586	0.683	0.753	0.768	0.718	0.629	0.564	0.768
0.01	0.522	0.589	0.686	0.757	0.775	0.729	0.636	0.564	0.775
0.02	0.539	0.606	0.702	0.767	0.776	0.729	0.636	0.564	0.776
0.03	0.620	0.689	0.780	0.823	0.808	0.729	0.636	0.564	0.823
0.05	0.846	0.926	0.995	0.998	0.924	0.788	0.644	0.574	0.998
0.08	1.088	1.195	1.269	1.245	1.123	0.938	0.743	0.649	1.245
0.10	1.173	1.313	1.437	1.431	1.297	1.086	0.861	0.754	1.431
0.15	1.173	1.356	1.612	1.684	1.569	1.325	1.047	0.914	1.684
0.20	1.062	1.253	**1.573**	1.791	1.739	1.505	1.204	1.055	1.791
0.25	0.936	1.121	1.454	1.792	1.844	1.653	1.355	1.202	1.844
0.30	0.839	1.011	1.343	1.729	1.903	1.774	1.501	1.353	1.903
0.40	0.706	0.854	1.163	1.568	1.880	1.865	1.664	1.538	1.880
0.50	0.609	0.737	1.021	1.412	1.774	1.858	1.733	1.646	1.858
0.75	0.462	0.538	0.758	1.074	1.424	1.593	1.628	1.619	1.593
1.0	0.367	0.415	**0.592**	0.857	1.172	1.397	1.524	1.593	1.397
1.5	0.255	0.281	0.398	0.585	0.824	1.068	1.326	1.517	1.068
2.0	0.199	0.219	0.297	0.435	0.620	0.849	1.155	1.413	0.849
3.0	0.143	0.158	0.202	0.296	0.426	0.596	0.839	1.049	0.596
4.0	0.112	0.123	0.152	0.222	0.316	0.437	0.609	0.757	0.437
5.0	0.092	0.101	0.121	0.173	0.242	0.330	0.452	0.558	0.330
7.5	0.057	0.061	0.072	0.099	0.133	0.175	0.230	0.280	0.175
10	0.038	0.040	0.046	0.061	0.080	0.101	0.128	0.152	0.101
S_{MS} (g)	0.96	1.13	1.42	1.61	1.71	1.68	1.56	1.48	1.71
S_{M1} (g)	0.37	0.42	0.59	0.86	1.17	1.61	2.27	2.83	1.61
S_{DS} (g)	0.64	0.75	0.94	1.07	1.14	1.12	1.04	0.99	1.14
S_{D1} (g)	0.24	0.28	0.39	0.57	0.78	1.07	1.51	1.89	1.07

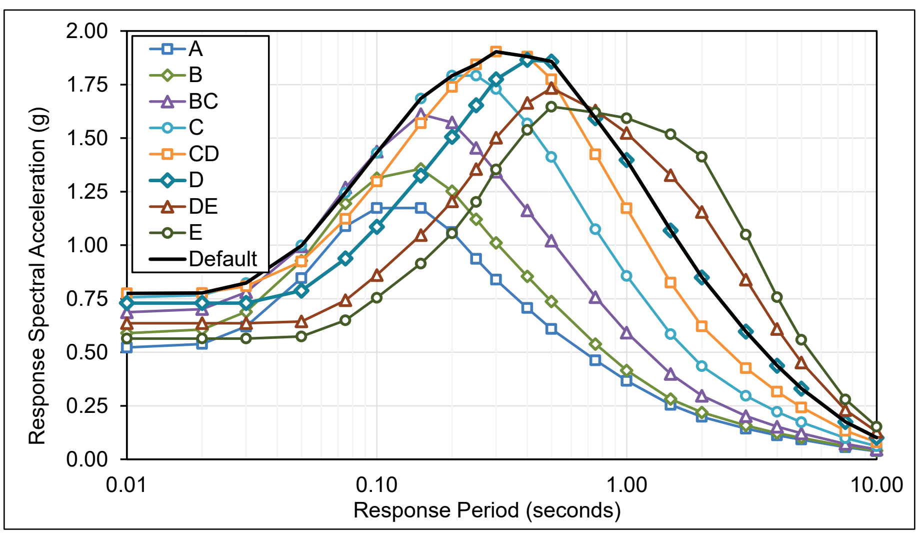


Figure E.2-16 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, San Francisco Site.

Table E.2-17 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, San Mateo Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.678	0.765	0.889	0.965	0.958	0.865	0.726	0.637	0.965
0.01	0.682	0.769	0.893	0.970	0.974	0.880	0.726	0.637	0.974
0.02	0.706	0.794	0.916	0.986	0.975	0.880	0.726	0.637	0.986
0.03	0.815	0.906	1.022	1.058	1.008	0.880	0.726	0.637	1.058
0.05	1.120	1.226	1.303	1.277	1.145	0.939	0.769	0.660	1.277
0.08	1.443	1.584	1.659	1.586	1.379	1.107	0.845	0.729	1.586
0.10	1.556	1.742	1.881	1.819	1.585	1.271	0.964	0.825	1.819
0.15	1.557	1.799	2.126	2.152	1.916	1.539	1.154	0.979	2.152
0.20	1.403	1.655	**2.077**	2.308	2.136	1.749	1.319	1.118	2.308
0.25	1.249	1.496	1.946	2.335	2.296	1.941	1.493	1.278	2.335
0.30	1.128	1.360	1.816	2.286	2.401	2.110	1.672	1.452	2.401
0.40	0.964	1.166	1.603	2.121	2.421	2.272	1.895	1.684	2.421
0.50	0.839	1.016	1.428	1.936	2.327	2.297	2.008	1.834	2.327
0.75	0.654	0.761	1.094	1.520	1.938	2.067	1.989	1.914	2.067
1.0	0.528	0.599	**0.875**	1.240	1.636	1.879	1.957	1.918	1.879
1.5	0.372	0.411	0.588	0.862	1.173	1.490	1.804	1.918	1.490
2.0	0.292	0.322	0.436	0.638	0.892	1.212	1.637	1.918	1.212
3.0	0.211	0.232	0.297	0.436	0.626	0.877	1.234	1.542	0.877
4.0	0.164	0.180	0.223	0.325	0.462	0.640	0.891	1.109	0.640
5.0	0.134	0.147	0.177	0.253	0.353	0.482	0.660	0.814	0.482
7.5	0.081	0.087	0.103	0.141	0.189	0.249	0.328	0.398	0.249
10	0.054	0.057	0.066	0.087	0.113	0.143	0.183	0.217	0.143
S_{MS} (g)	1.26	1.49	1.87	2.10	2.18	2.07	1.81	1.65	2.18
S_{M1} (g)	0.53	0.60	0.87	1.24	1.69	2.37	3.33	4.16	2.37
S_{DS} (g)	0.84	0.99	1.25	1.40	1.45	1.38	1.20	1.10	1.45
S_{D1} (g)	0.35	0.40	0.58	0.83	1.13	1.58	2.22	2.77	1.58

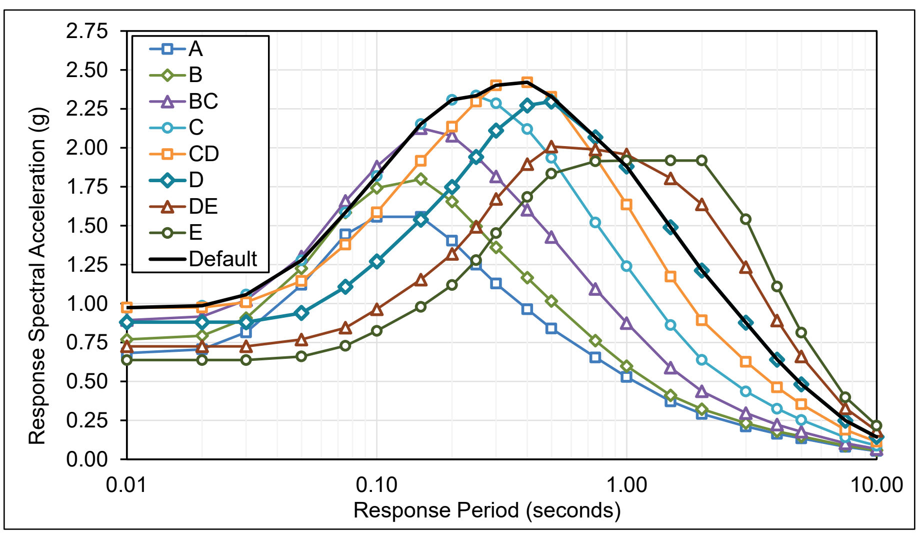


Figure E.2-17 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, San Mateo Site.

Table E.2-18 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, San Jose Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.469	0.529	0.617	0.680	0.695	0.650	0.569	0.513	0.695
0.01	0.472	0.532	0.620	0.684	0.700	0.659	0.579	0.513	0.700
0.02	0.486	0.547	0.633	0.692	0.702	0.659	0.579	0.513	0.702
0.03	0.559	0.621	0.703	0.742	0.729	0.659	0.579	0.513	0.742
0.05	0.760	0.832	0.894	0.898	0.832	0.710	0.581	0.517	0.898
0.08	0.974	1.070	1.137	1.117	1.008	0.843	0.668	0.584	1.117
0.10	1.048	1.173	1.285	1.281	1.163	0.974	0.773	0.678	1.281
0.15	1.046	1.210	1.438	1.505	1.403	1.186	0.939	0.820	1.505
0.20	0.948	1.119	**1.405**	1.602	1.557	1.349	1.080	0.947	1.602
0.25	0.845	1.012	1.317	1.606	1.655	1.484	1.217	1.080	1.655
0.30	0.765	0.922	1.232	1.566	1.714	1.598	1.352	1.219	1.714
0.40	0.654	0.792	1.088	1.444	1.714	1.688	1.506	1.391	1.714
0.50	0.571	0.691	0.970	1.318	1.639	1.689	1.575	1.495	1.689
0.75	0.443	0.515	0.739	1.025	1.340	1.483	1.514	1.495	1.483
1.0	0.356	0.403	**0.588**	0.830	1.118	1.324	1.442	1.495	1.324
1.5	0.255	0.281	0.402	0.584	0.809	1.047	1.299	1.484	1.047
2.0	0.203	0.223	0.303	0.443	0.620	0.851	1.157	1.415	0.851
3.0	0.149	0.164	0.209	0.307	0.438	0.619	0.871	1.088	0.619
4.0	0.118	0.129	0.161	0.234	0.333	0.461	0.642	0.799	0.461
5.0	0.098	0.107	0.129	0.185	0.258	0.352	0.483	0.595	0.352
7.5	0.062	0.067	0.079	0.108	0.145	0.190	0.251	0.305	0.190
10	0.041	0.044	0.051	0.067	0.087	0.110	0.141	0.167	0.110
S_{MS} **(g)**	0.85	1.01	1.26	1.45	1.54	1.52	1.42	1.35	1.54
S_{M1} **(g)**	0.36	0.40	0.59	0.83	1.20	1.67	2.35	2.94	1.67
S_{DS} **(g)**	0.57	0.67	0.84	0.96	1.03	1.01	0.94	0.90	1.03
S_{D1} **(g)**	0.24	0.27	0.39	0.55	0.80	1.11	1.57	1.96	1.11

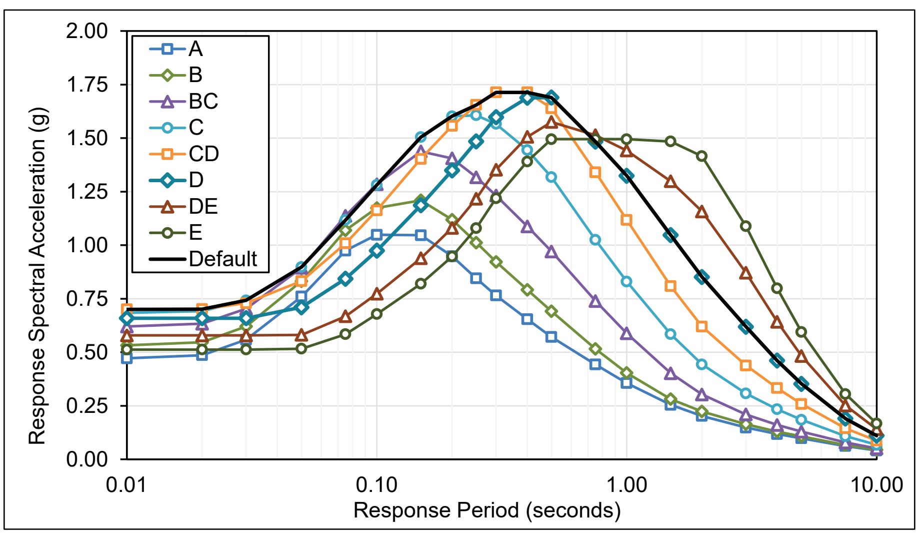


Figure E.2-18 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, San Jose Site.

Table E.2-19 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Santa Cruz Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.544	0.615	0.716	0.789	0.805	0.753	0.659	0.592	0.805
0.01	0.547	0.618	0.720	0.793	0.812	0.765	0.667	0.592	0.812
0.02	0.565	0.635	0.735	0.804	0.814	0.765	0.667	0.592	0.814
0.03	0.649	0.722	0.817	0.863	0.846	0.765	0.667	0.592	0.863
0.05	0.886	0.970	1.042	1.045	0.968	0.825	0.675	0.601	1.045
0.08	1.138	1.250	1.328	1.303	1.175	0.982	0.778	0.680	1.303
0.10	1.227	1.373	1.503	1.497	1.357	1.136	0.901	0.790	1.497
0.15	1.226	1.417	1.684	1.761	1.641	1.386	1.096	0.956	1.761
0.20	1.110	1.309	**1.645**	1.873	1.819	1.575	1.260	1.104	1.873
0.25	0.979	1.172	1.521	1.875	1.930	1.730	1.418	1.258	1.930
0.30	0.878	1.059	1.406	1.811	1.994	1.858	1.573	1.418	1.994
0.40	0.740	0.896	1.219	1.644	1.972	1.956	1.745	1.612	1.972
0.50	0.639	0.773	1.071	1.482	1.863	1.950	1.819	1.728	1.950
0.75	0.486	0.566	0.796	1.129	1.497	1.674	1.711	1.701	1.674
1.0	0.386	0.437	**0.623**	0.902	1.233	1.470	1.603	1.675	1.470
1.5	0.269	0.297	0.421	0.618	0.871	1.129	1.401	1.602	1.129
2.0	0.210	0.232	0.315	0.460	0.657	0.899	1.223	1.496	0.899
3.0	0.152	0.168	0.214	0.315	0.453	0.634	0.892	1.115	0.634
4.0	0.119	0.131	0.163	0.237	0.337	0.467	0.650	0.808	0.467
5.0	0.099	0.108	0.130	0.185	0.259	0.353	0.484	0.597	0.353
7.5	0.061	0.066	0.078	0.107	0.143	0.188	0.248	0.301	0.188
10	0.041	0.044	0.050	0.066	0.086	0.109	0.138	0.164	0.109
S_{MS} (g)	1.00	1.18	1.48	1.69	1.79	1.76	1.64	1.55	1.79
S_{M1} (g)	0.39	0.44	0.62	0.90	1.23	1.71	2.41	3.01	1.71
S_{DS} (g)	0.67	0.79	0.99	1.12	1.20	1.17	1.09	1.04	1.20
S_{D1} (g)	0.26	0.29	0.42	0.60	0.82	1.14	1.61	2.01	1.14

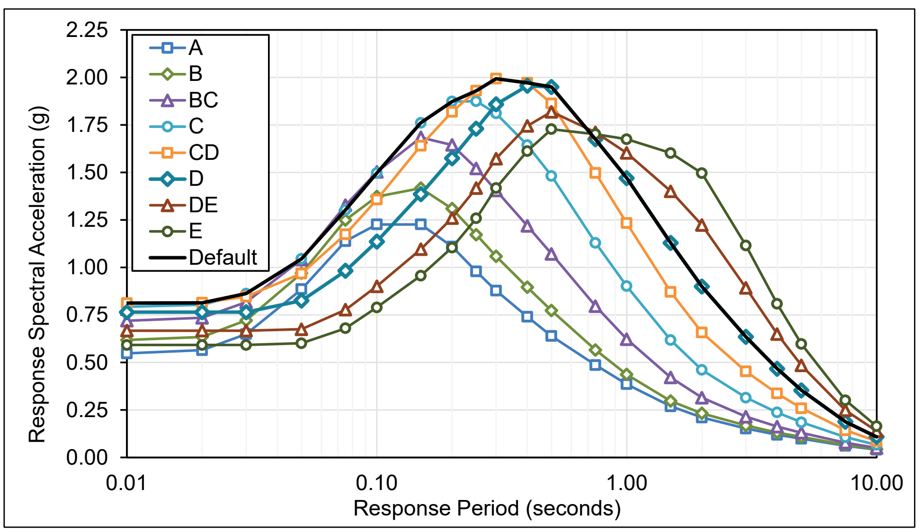


Figure E.2-19 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Santa Cruz Site.

Table E.2-20 **Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Vallejo Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.748	0.844	0.978	1.047	1.015	0.890	0.721	0.622	1.047
0.01	0.752	0.849	0.984	1.059	1.033	0.899	0.721	0.622	1.059
0.02	0.783	0.880	1.014	1.075	1.033	0.899	0.721	0.622	1.075
0.03	0.909	1.010	1.135	1.154	1.072	0.914	0.725	0.622	1.154
0.05	1.258	1.378	1.449	1.392	1.214	0.965	0.725	0.623	1.392
0.08	1.623	1.781	1.842	1.720	1.451	1.127	0.849	0.716	1.720
0.10	1.748	1.956	2.087	1.967	1.658	1.282	0.938	0.787	1.967
0.15	1.741	2.012	2.367	2.330	1.995	1.536	1.102	0.913	2.330
0.20	1.560	1.841	**2.307**	2.510	2.228	1.739	1.248	1.030	2.510
0.25	1.379	1.652	2.140	2.566	2.424	1.949	1.420	1.180	2.566
0.30	1.237	1.491	1.977	2.499	2.562	2.139	1.602	1.347	2.562
0.40	1.040	1.258	1.710	2.285	2.609	2.333	1.837	1.578	2.609
0.50	0.895	1.083	1.500	2.057	2.489	2.376	1.964	1.736	2.489
0.75	0.692	0.806	1.134	1.599	2.069	2.148	1.955	1.830	2.148
1.0	0.552	0.625	**0.890**	1.283	1.727	1.944	1.947	1.924	1.944
1.5	0.373	0.411	0.583	0.853	1.190	1.497	1.775	1.925	1.497
2.0	0.282	0.311	0.422	0.616	0.875	1.186	1.591	1.925	1.186
3.0	0.198	0.219	0.279	0.410	0.589	0.825	1.160	1.449	0.825
4.0	0.149	0.164	0.203	0.296	0.421	0.583	0.812	1.009	0.583
5.0	0.120	0.131	0.158	0.225	0.314	0.429	0.588	0.724	0.429
7.5	0.068	0.074	0.087	0.119	0.160	0.210	0.277	0.337	0.210
10	0.045	0.049	0.056	0.074	0.096	0.121	0.155	0.183	0.121
S_{MS} (g)	1.40	1.66	2.08	2.31	2.35	2.14	1.77	1.56	2.35
S_{M1} (g)	0.55	0.62	0.89	1.28	1.73	2.23	3.13	3.91	2.23
S_{DS} (g)	0.94	1.10	1.38	1.54	1.57	1.43	1.18	1.04	1.57
S_{D1} (g)	0.37	0.42	0.59	0.86	1.15	1.48	2.09	2.61	1.48

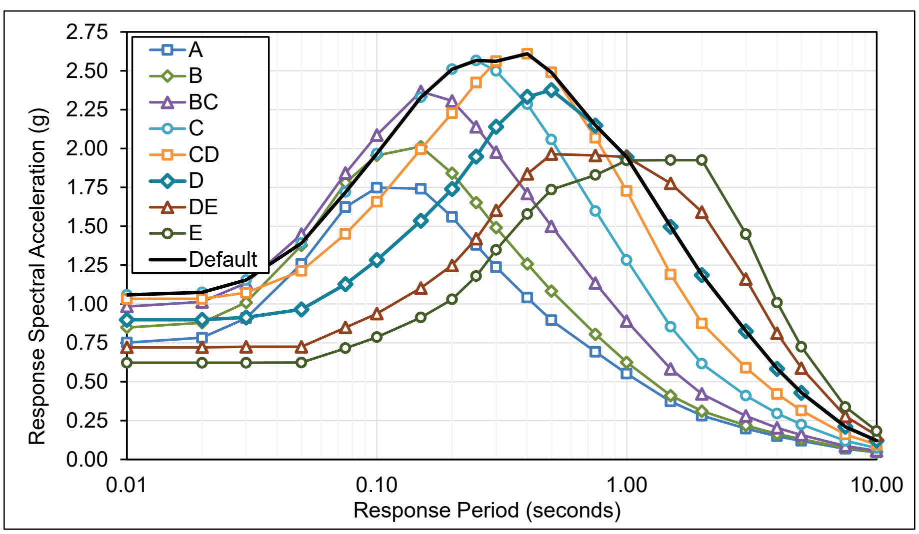


Figure E.2-20 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Vallejo Site.

Table E.2-21 Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Santa Rosa Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.897	1.013	1.174	1.260	1.224	1.076	0.874	0.754	1.260
0.01	0.903	1.019	1.181	1.272	1.244	1.085	0.874	0.754	1.272
0.02	0.938	1.054	1.215	1.291	1.244	1.085	0.874	0.754	1.291
0.03	1.086	1.206	1.357	1.383	1.289	1.103	0.875	0.754	1.383
0.05	1.496	1.638	1.725	1.663	1.454	1.160	0.875	0.754	1.663
0.08	1.925	2.112	2.188	2.050	1.735	1.353	1.021	0.863	2.050
0.10	2.071	2.318	2.477	2.343	1.983	1.539	1.130	0.950	2.343
0.15	2.067	2.388	2.811	2.777	2.389	1.847	1.332	1.105	2.777
0.20	1.860	2.194	**2.750**	3.001	2.675	2.098	1.513	1.251	3.001
0.25	1.656	1.983	2.572	3.075	2.917	2.355	1.724	1.436	3.075
0.30	1.497	1.805	2.398	3.019	3.094	2.594	1.950	1.645	3.094
0.40	1.281	1.550	2.115	2.811	3.189	2.859	2.259	1.944	3.189
0.50	1.118	1.353	1.883	2.568	3.083	2.939	2.435	2.154	3.083
0.75	0.878	1.022	1.449	2.031	2.603	2.697	2.458	2.307	2.697
1.0	0.712	0.807	**1.160**	1.662	2.213	2.485	2.458	2.428	2.485
1.5	0.500	0.552	0.785	1.150	1.588	1.992	2.361	2.428	1.992
2.0	0.389	0.429	0.582	0.850	1.200	1.625	2.179	2.428	1.625
3.0	0.284	0.313	0.400	0.587	0.844	1.181	1.661	2.076	1.181
4.0	0.221	0.243	0.301	0.438	0.624	0.865	1.204	1.497	0.865
5.0	0.182	0.199	0.240	0.342	0.478	0.653	0.894	1.102	0.653
7.5	0.108	0.117	0.138	0.189	0.254	0.333	0.440	0.535	0.333
10	0.072	0.078	0.089	0.118	0.153	0.194	0.247	0.293	0.194
S_{MS} (g)	1.67	1.97	2.47	2.77	2.87	2.64	2.19	1.94	2.87
S_{M1} (g)	0.71	0.81	1.16	1.66	2.28	3.19	4.49	5.61	3.19
S_{DS} (g)	1.12	1.32	1.65	1.85	1.91	1.76	1.46	1.29	1.91
S_{D1} (g)	0.47	0.54	0.77	1.11	1.52	2.13	2.99	3.74	2.13

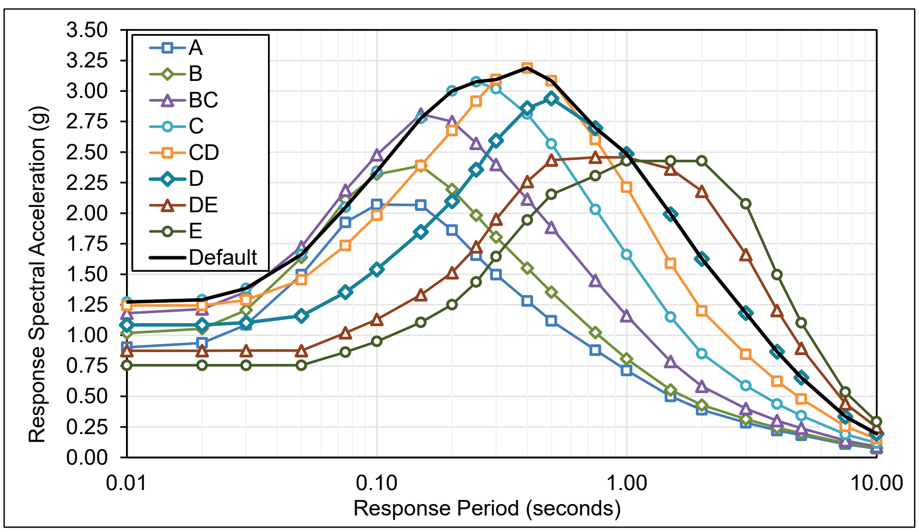


Figure E.2-21 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Santa Rosa Site.

Table E.2-22 **Deterministic MCE_R Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Seattle Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.696	0.786	0.913	0.992	0.986	0.891	0.748	0.657	0.992
0.01	0.700	0.790	0.918	0.997	1.002	0.906	0.748	0.657	1.002
0.02	0.724	0.814	0.941	1.013	1.002	0.906	0.748	0.657	1.013
0.03	0.836	0.928	1.047	1.085	1.036	0.906	0.748	0.657	1.085
0.05	1.145	1.253	1.332	1.308	1.174	0.965	0.791	0.680	1.308
0.08	1.472	1.616	1.694	1.621	1.412	1.135	0.868	0.749	1.621
0.10	1.586	1.775	1.918	1.858	1.622	1.302	0.989	0.847	1.858
0.15	1.586	1.833	2.167	2.197	1.960	1.576	1.184	1.005	2.197
0.20	1.432	1.690	**2.120**	2.359	2.187	1.794	1.355	1.150	2.359
0.25	1.273	1.525	1.982	2.390	2.354	1.993	1.535	1.315	2.390
0.30	1.151	1.387	1.848	2.338	2.467	2.171	1.721	1.496	2.467
0.40	0.985	1.192	1.632	2.170	2.501	2.349	1.960	1.742	2.501
0.50	0.859	1.040	1.454	1.982	2.406	2.385	2.085	1.905	2.406
0.75	0.669	0.779	1.110	1.553	2.000	2.139	2.059	1.981	2.139
1.0	0.541	0.613	**0.888**	1.267	1.689	1.945	2.024	2.009	1.945
1.5	0.384	0.424	0.604	0.886	1.220	1.552	1.878	2.009	1.552
2.0	0.303	0.334	0.453	0.662	0.932	1.267	1.711	2.009	1.267
3.0	0.222	0.244	0.312	0.458	0.659	0.923	1.298	1.622	0.923
4.0	0.174	0.192	0.238	0.346	0.492	0.682	0.950	1.182	0.682
5.0	0.145	0.158	0.190	0.272	0.380	0.519	0.710	0.876	0.519
7.5	0.088	0.096	0.112	0.154	0.207	0.272	0.359	0.436	0.272
10	0.059	0.063	0.073	0.096	0.124	0.157	0.200	0.238	0.157
S_{MS} (g)	1.29	1.52	1.91	2.15	2.25	2.15	1.88	1.71	2.25
S_{M1} (g)	0.54	0.61	0.89	1.27	1.78	2.49	3.50	4.38	2.49
S_{DS} (g)	0.86	1.01	1.27	1.43	1.50	1.43	1.25	1.14	1.50
S_{D1} (g)	0.36	0.41	0.59	0.84	1.19	1.66	2.34	2.92	1.66

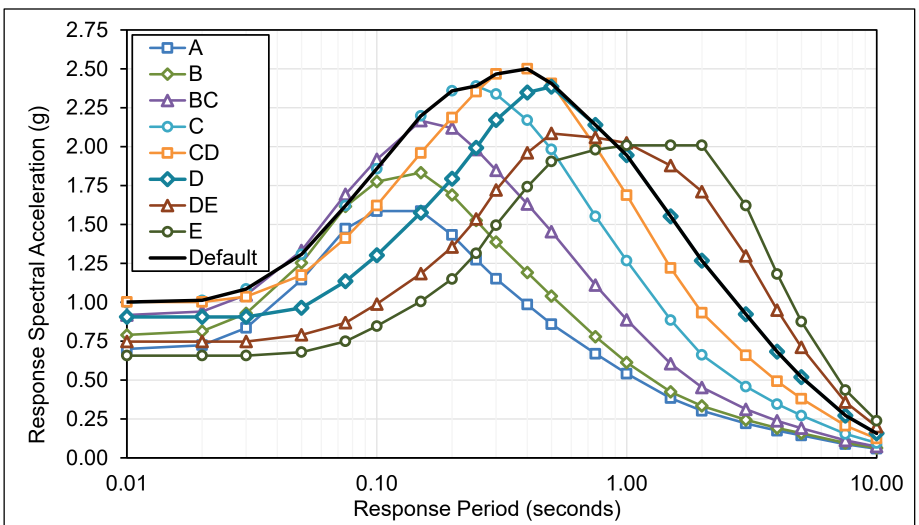


Figure E.2-22 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Seattle Site.

Table E.2-23 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Tacoma Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.409	0.462	0.538	0.593	0.606	0.567	0.496	0.447	0.606
0.01	0.411	0.464	0.541	0.596	0.611	0.574	0.504	0.447	0.611
0.02	0.424	0.477	0.552	0.604	0.612	0.574	0.504	0.447	0.612
0.03	0.487	0.541	0.613	0.647	0.636	0.574	0.504	0.447	0.647
0.05	0.663	0.726	0.780	0.783	0.726	0.619	0.507	0.450	0.783
0.08	0.850	0.933	0.992	0.974	0.879	0.735	0.583	0.510	0.974
0.10	0.914	1.023	1.120	1.117	1.014	0.849	0.674	0.591	1.117
0.15	0.912	1.055	1.254	1.312	1.223	1.034	0.818	0.715	1.312
0.20	0.827	0.976	**1.225**	1.397	1.358	1.176	0.942	0.825	1.397
0.25	0.737	0.882	1.149	1.401	1.443	1.294	1.061	0.942	1.443
0.30	0.667	0.804	1.074	1.366	1.494	1.393	1.179	1.063	1.494
0.40	0.571	0.690	0.949	1.259	1.494	1.472	1.313	1.213	1.494
0.50	0.498	0.603	0.846	1.149	1.430	1.473	1.373	1.303	1.473
0.75	0.386	0.449	0.645	0.894	1.169	1.293	1.320	1.303	1.293
1.0	0.311	0.352	**0.513**	0.724	0.975	1.155	1.257	1.303	1.155
1.5	0.222	0.245	0.351	0.509	0.705	0.913	1.132	1.295	0.913
2.0	0.177	0.195	0.264	0.387	0.541	0.742	1.009	1.235	0.742
3.0	0.130	0.143	0.183	0.268	0.382	0.540	0.760	0.949	0.540
4.0	0.103	0.113	0.140	0.204	0.290	0.402	0.560	0.696	0.402
5.0	0.086	0.094	0.113	0.161	0.225	0.307	0.421	0.519	0.307
7.5	0.054	0.058	0.069	0.094	0.126	0.166	0.219	0.266	0.166
10	0.036	0.039	0.044	0.059	0.076	0.096	0.123	0.146	0.096
S_{MS} (g)	0.74	0.88	1.10	1.26	1.34	1.33	1.24	1.17	1.34
S_{M1} (g)	0.32	0.35	0.51	0.72	1.04	1.46	2.05	2.56	1.46
S_{DS} (g)	0.50	0.59	0.74	0.84	0.90	0.88	0.82	0.78	0.90
S_{D1} (g)	0.21	0.23	0.34	0.48	0.70	0.97	1.37	1.71	0.97

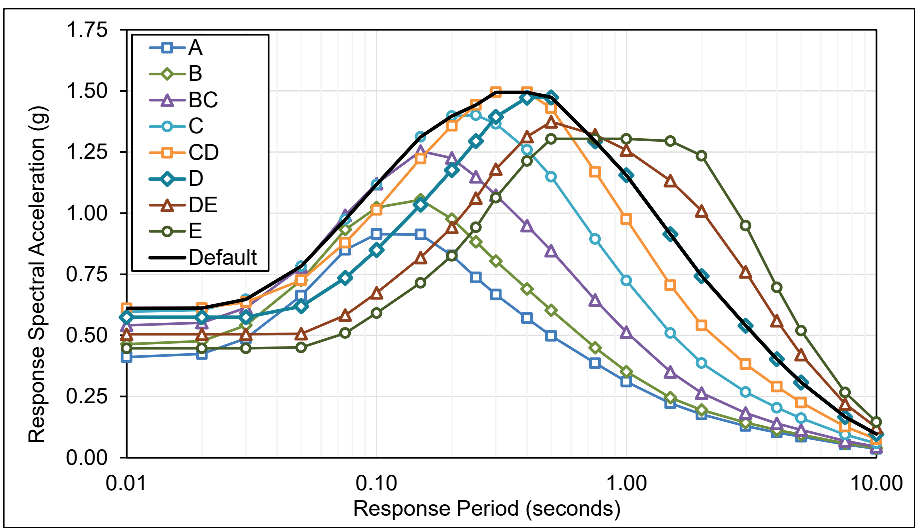


Figure E.2-23 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Tacoma Site.

Table E.2-24 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Everett Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.585	0.660	0.766	0.831	0.823	0.742	0.622	0.546	0.831
0.01	0.588	0.664	0.770	0.836	0.838	0.757	0.622	0.546	0.838
0.02	0.610	0.685	0.791	0.850	0.839	0.757	0.622	0.546	0.850
0.03	0.706	0.784	0.884	0.914	0.869	0.757	0.622	0.546	0.914
0.05	0.974	1.066	1.131	1.107	0.990	0.811	0.662	0.567	1.107
0.08	1.258	1.381	1.444	1.377	1.195	0.957	0.728	0.628	1.377
0.10	1.359	1.521	1.640	1.582	1.375	1.100	0.832	0.712	1.582
0.15	1.360	1.572	1.856	1.875	1.664	1.333	0.997	0.845	1.875
0.20	1.222	1.442	**1.809**	2.006	1.851	1.512	1.137	0.963	2.006
0.25	1.075	1.288	1.670	2.025	1.986	1.675	1.286	1.099	2.025
0.30	0.961	1.158	1.536	1.957	2.070	1.815	1.435	1.245	2.070
0.40	0.803	0.972	1.322	1.774	2.067	1.938	1.615	1.434	2.067
0.50	0.688	0.832	1.153	1.588	1.953	1.945	1.700	1.553	1.953
0.75	0.523	0.609	0.857	1.212	1.585	1.703	1.638	1.577	1.703
1.0	0.414	0.469	**0.668**	0.965	1.308	1.512	1.577	1.601	1.512
1.5	0.278	0.307	0.435	0.638	0.895	1.141	1.384	1.559	1.141
2.0	0.211	0.233	0.316	0.462	0.658	0.896	1.211	1.475	0.896
3.0	0.147	0.162	0.208	0.305	0.438	0.613	0.863	1.078	0.613
4.0	0.111	0.121	0.151	0.219	0.312	0.432	0.602	0.749	0.432
5.0	0.088	0.096	0.116	0.166	0.232	0.317	0.434	0.535	0.317
7.5	0.051	0.055	0.064	0.088	0.119	0.156	0.206	0.250	0.156
10	0.033	0.036	0.041	0.054	0.070	0.089	0.114	0.135	0.089
S_{MS} **(g)**	1.10	1.30	1.63	1.82	1.86	1.75	1.53	1.40	1.86
S_{M1} **(g)**	0.41	0.47	0.67	0.96	1.31	1.66	2.33	2.91	1.66
S_{DS} **(g)**	0.73	0.87	1.09	1.21	1.24	1.17	1.02	0.93	1.24
S_{D1} **(g)**	0.28	0.31	0.45	0.64	0.87	1.10	1.55	1.94	1.10

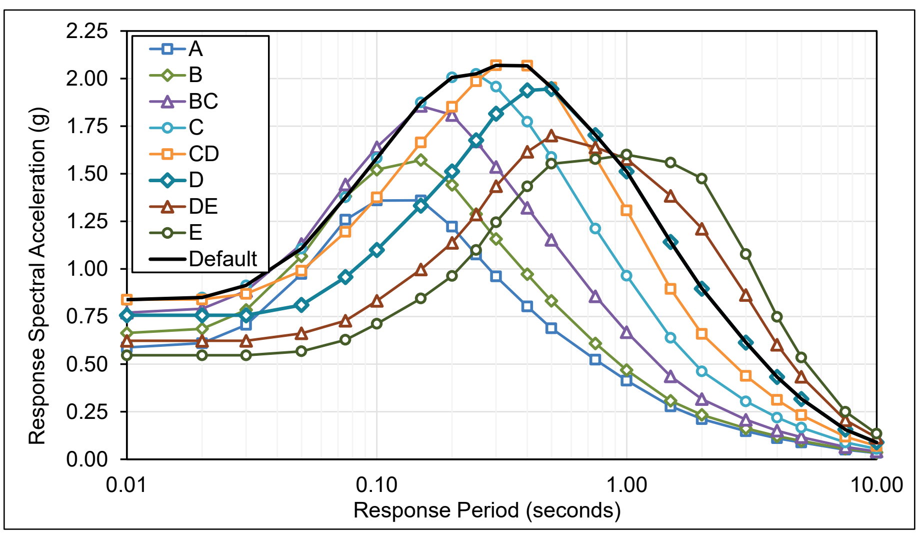


Figure E.2-24 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Everett Site.

Table E.2-25 Deterministic MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Portland Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.712	0.804	0.933	1.011	1.004	0.908	0.766	0.674	1.011
0.01	0.716	0.808	0.938	1.019	1.024	0.928	0.766	0.674	1.024
0.02	0.745	0.838	0.967	1.038	1.027	0.928	0.766	0.674	1.038
0.03	0.867	0.963	1.085	1.121	1.068	0.928	0.766	0.674	1.121
0.05	1.208	1.323	1.402	1.372	1.229	1.010	0.819	0.705	1.372
0.08	1.570	1.723	1.801	1.718	1.493	1.200	0.915	0.785	1.718
0.10	1.699	1.901	2.048	1.977	1.722	1.382	1.050	0.900	1.977
0.15	1.691	1.955	2.308	2.333	2.078	1.672	1.258	1.069	2.333
0.20	1.503	1.773	**2.225**	2.470	2.290	1.882	1.427	1.214	2.470
0.25	1.307	1.566	2.030	2.463	2.431	2.068	1.603	1.379	2.463
0.30	1.151	1.387	1.841	2.347	2.494	2.211	1.769	1.546	2.494
0.40	0.933	1.129	1.536	2.064	2.412	2.289	1.938	1.737	2.412
0.50	0.779	0.943	1.306	1.801	2.222	2.240	1.994	1.841	2.240
0.75	0.573	0.661	0.939	1.328	1.742	1.896	1.858	1.806	1.896
1.0	0.438	0.496	**0.707**	1.021	1.387	1.621	1.723	1.772	1.621
1.5	0.273	0.301	0.427	0.626	0.879	1.127	1.383	1.570	1.127
2.0	0.196	0.216	0.293	0.429	0.611	0.835	1.132	1.383	0.835
3.0	0.124	0.136	0.174	0.256	0.368	0.515	0.725	0.906	0.515
4.0	0.085	0.093	0.115	0.168	0.239	0.332	0.462	0.574	0.332
5.0	0.063	0.069	0.083	0.119	0.166	0.227	0.311	0.383	0.227
7.5	0.032	0.035	0.041	0.056	0.075	0.099	0.130	0.158	0.099
10	0.020	0.022	0.025	0.033	0.043	0.054	0.069	0.082	0.054
S_{MS} (g)	1.35	1.60	2.00	2.22	2.24	2.06	1.79	1.66	2.24
S_{M1} (g)	0.44	0.50	0.71	1.02	1.39	1.62	2.04	2.49	1.62
S_{DS} (g)	0.90	1.06	1.34	1.48	1.50	1.37	1.20	1.10	1.50
S_{D1} (g)	0.29	0.33	0.47	0.68	0.92	1.08	1.36	1.66	1.08

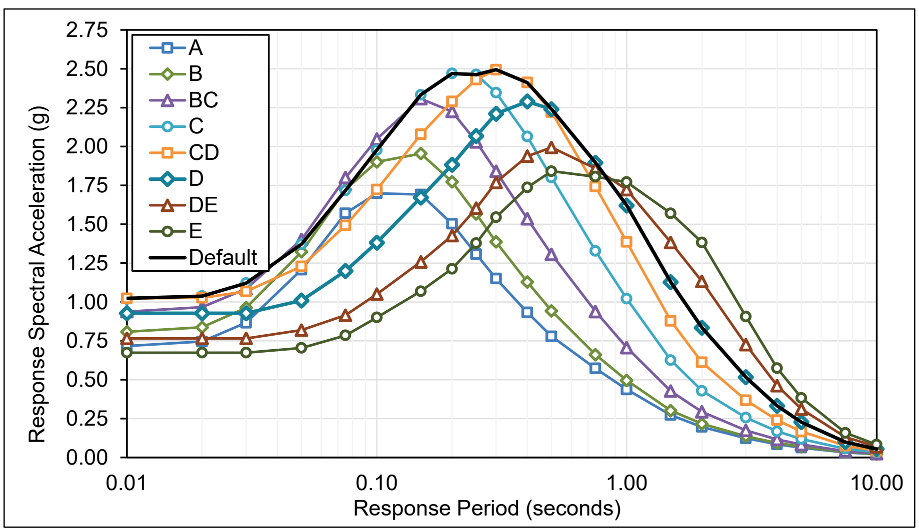


Figure E.2-25 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Portland Site.

Table E.2-26 Plots of Deterministic MCE$_R$ Multi-Period Response Spectra (MPRS) Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Salt Lake City Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.743	0.839	0.974	1.055	1.045	0.942	0.791	0.694	1.055
0.01	0.747	0.843	0.979	1.062	1.065	0.961	0.791	0.694	1.065
0.02	0.776	0.872	1.006	1.080	1.067	0.961	0.791	0.694	1.080
0.03	0.899	0.999	1.125	1.162	1.105	0.961	0.791	0.694	1.162
0.05	1.243	1.361	1.443	1.411	1.261	1.033	0.842	0.722	1.411
0.08	1.609	1.765	1.845	1.758	1.525	1.222	0.929	0.800	1.758
0.10	1.739	1.946	2.096	2.022	1.757	1.404	1.063	0.909	2.022
0.15	1.739	2.009	2.372	2.394	2.125	1.702	1.273	1.079	2.394
0.20	1.559	1.839	**2.307**	2.558	2.360	1.927	1.451	1.229	2.558
0.25	1.368	1.638	2.124	2.576	2.527	2.133	1.638	1.401	2.576
0.30	1.218	1.468	1.948	2.483	2.626	2.305	1.825	1.584	2.626
0.40	1.011	1.223	1.663	2.234	2.603	2.444	2.041	1.814	2.603
0.50	0.861	1.041	1.443	1.987	2.446	2.440	2.138	1.955	2.446
0.75	0.650	0.756	1.064	1.505	1.970	2.122	2.046	1.972	2.122
1.0	0.510	0.578	**0.823**	1.189	1.613	1.869	1.955	1.989	1.869
1.5	0.337	0.372	0.528	0.774	1.085	1.385	1.683	1.898	1.385
2.0	0.253	0.279	0.379	0.554	0.788	1.074	1.452	1.769	1.074
3.0	0.173	0.191	0.243	0.357	0.514	0.719	1.012	1.265	0.719
4.0	0.127	0.140	0.173	0.252	0.359	0.498	0.693	0.862	0.498
5.0	0.100	0.110	0.132	0.188	0.264	0.360	0.493	0.608	0.360
7.5	0.056	0.061	0.071	0.098	0.131	0.173	0.228	0.277	0.173
10	0.037	0.039	0.045	0.060	0.077	0.098	0.125	0.148	0.098
S_{MS} (g)	1.40	1.66	2.08	2.32	2.36	2.20	1.92	1.76	2.36
S_{M1} (g)	0.51	0.58	0.82	1.19	1.61	1.94	2.73	3.41	1.94
S_{DS} (g)	0.94	1.10	1.38	1.55	1.58	1.47	1.28	1.17	1.58
S_{D1} (g)	0.34	0.39	0.55	0.79	1.08	1.29	1.82	2.28	1.29

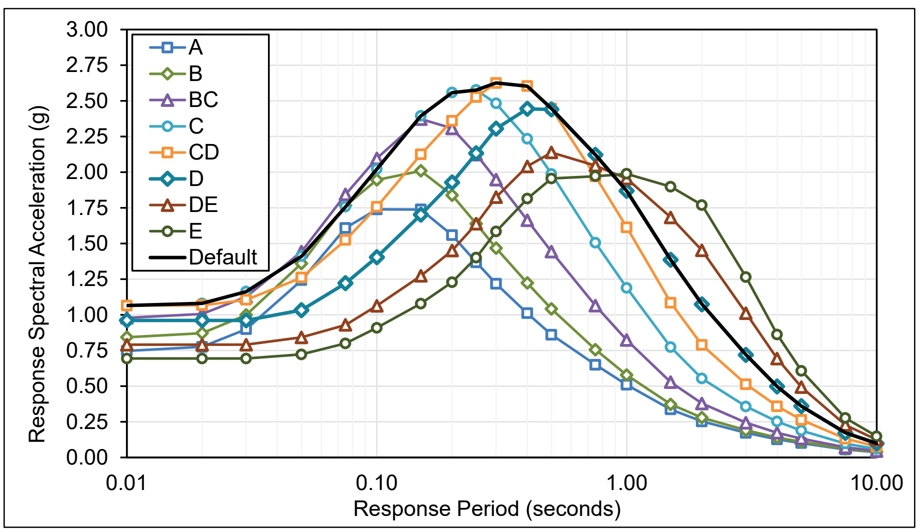


Figure E.2-26 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Salt Lake City Site.

Table E.2-27 Plots of Deterministic MCE$_R$ Multi-Period Response Spectra (MPRS) Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Boise Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.111	0.126	0.146	0.161	0.164	0.153	0.133	0.120	0.164
0.01	0.112	0.126	0.147	0.162	0.166	0.156	0.135	0.120	0.166
0.02	0.116	0.130	0.151	0.164	0.166	0.156	0.135	0.120	0.166
0.03	0.134	0.149	0.168	0.177	0.173	0.156	0.135	0.120	0.177
0.05	0.184	0.202	0.216	0.216	0.199	0.169	0.138	0.122	0.216
0.08	0.239	0.262	0.278	0.272	0.244	0.203	0.160	0.139	0.272
0.10	0.259	0.290	0.316	0.314	0.283	0.236	0.186	0.163	0.314
0.15	0.260	0.301	0.357	0.371	0.344	0.289	0.227	0.198	0.371
0.20	0.234	0.276	**0.347**	0.393	0.380	0.327	0.261	0.228	0.393
0.25	0.204	0.245	0.318	0.390	0.400	0.357	0.292	0.258	0.400
0.30	0.181	0.219	0.290	0.373	0.409	0.380	0.321	0.289	0.409
0.40	0.150	0.181	0.246	0.332	0.397	0.393	0.351	0.324	0.397
0.50	0.127	0.153	0.213	0.294	0.369	0.386	0.361	0.343	0.386
0.75	0.094	0.110	0.155	0.219	0.290	0.325	0.334	0.332	0.325
1.0	0.073	0.083	**0.119**	0.172	0.235	0.280	0.307	0.322	0.280
1.5	0.048	0.053	0.076	0.111	0.157	0.203	0.253	0.290	0.203
2.0	0.036	0.040	0.054	0.080	0.114	0.156	0.212	0.260	0.156
3.0	0.025	0.027	0.035	0.051	0.073	0.103	0.144	0.180	0.103
4.0	0.018	0.020	0.025	0.036	0.051	0.071	0.099	0.123	0.071
5.0	0.014	0.016	0.019	0.027	0.037	0.051	0.070	0.086	0.051
7.5	0.008	0.009	0.010	0.014	0.019	0.025	0.033	0.040	0.025
10	0.005	0.006	0.006	0.008	0.011	0.014	0.018	0.021	0.014
S_{MS} (g)	0.21	0.25	0.31	0.35	0.37	0.35	0.32	0.31	0.37
S_{M1} (g)	0.07	0.08	0.12	0.17	0.23	0.28	0.39	0.49	0.28
S_{DS} (g)	0.14	0.17	0.21	0.24	0.25	0.24	0.22	0.21	0.25
S_{D1} (g)	0.05	0.06	0.08	0.11	0.16	0.19	0.26	0.32	0.19

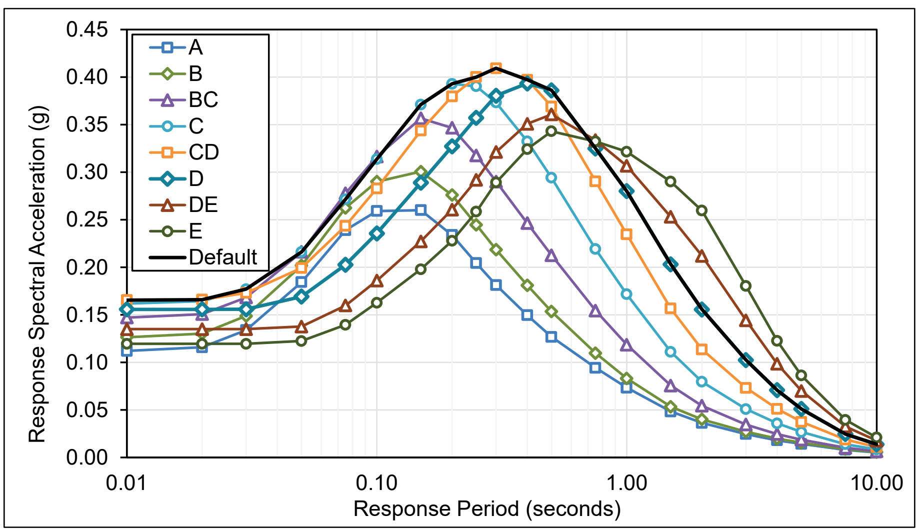


Figure E.2-27 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Boise Site.

Table E.2-28 Plots of Deterministic MCE_R Multi-Period Response Spectra (MPRS) Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Reno Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.489	0.552	0.642	0.704	0.716	0.667	0.583	0.527	0.716
0.01	0.491	0.555	0.645	0.708	0.726	0.684	0.595	0.527	0.726
0.02	0.510	0.573	0.663	0.721	0.728	0.684	0.595	0.527	0.728
0.03	0.592	0.657	0.743	0.780	0.762	0.686	0.595	0.527	0.780
0.05	0.823	0.901	0.964	0.961	0.885	0.751	0.607	0.537	0.961
0.08	1.073	1.177	1.244	1.214	1.088	0.905	0.714	0.623	1.214
0.10	1.165	1.304	1.420	1.405	1.265	1.054	0.832	0.728	1.405
0.15	1.165	1.346	1.596	1.658	1.535	1.290	1.016	0.886	1.658
0.20	1.037	1.223	**1.537**	1.739	1.681	1.451	1.159	1.015	1.739
0.25	0.897	1.075	1.395	1.712	1.756	1.573	1.291	1.146	1.756
0.30	0.786	0.947	1.258	1.618	1.774	1.656	1.406	1.271	1.774
0.40	0.634	0.768	1.045	1.411	1.683	1.676	1.507	1.400	1.683
0.50	0.527	0.638	0.884	1.224	1.535	1.615	1.523	1.458	1.615
0.75	0.381	0.437	0.622	0.887	1.175	1.323	1.375	1.377	1.323
1.0	0.289	0.327	**0.467**	0.676	0.925	1.109	1.227	1.297	1.109
1.5	0.179	0.197	0.280	0.411	0.580	0.754	0.945	1.089	0.754
2.0	0.128	0.142	0.192	0.281	0.402	0.551	0.752	0.923	0.551
3.0	0.080	0.088	0.112	0.165	0.237	0.332	0.468	0.585	0.332
4.0	0.054	0.059	0.074	0.107	0.153	0.212	0.295	0.367	0.212
5.0	0.040	0.044	0.053	0.075	0.105	0.144	0.197	0.243	0.144
7.5	0.020	0.022	0.026	0.035	0.048	0.062	0.082	0.100	0.062
10	0.013	0.014	0.016	0.021	0.027	0.034	0.043	0.051	0.034
S_{MS} (g)	0.93	1.10	1.38	1.57	1.60	1.51	1.37	1.31	1.60
S_{M1} (g)	0.29	0.33	0.47	0.68	0.92	1.11	1.35	1.66	1.11
S_{DS} (g)	0.62	0.73	0.92	1.04	1.06	1.01	0.91	0.87	1.06
S_{D1} (g)	0.19	0.22	0.31	0.45	0.62	0.74	0.90	1.11	0.74

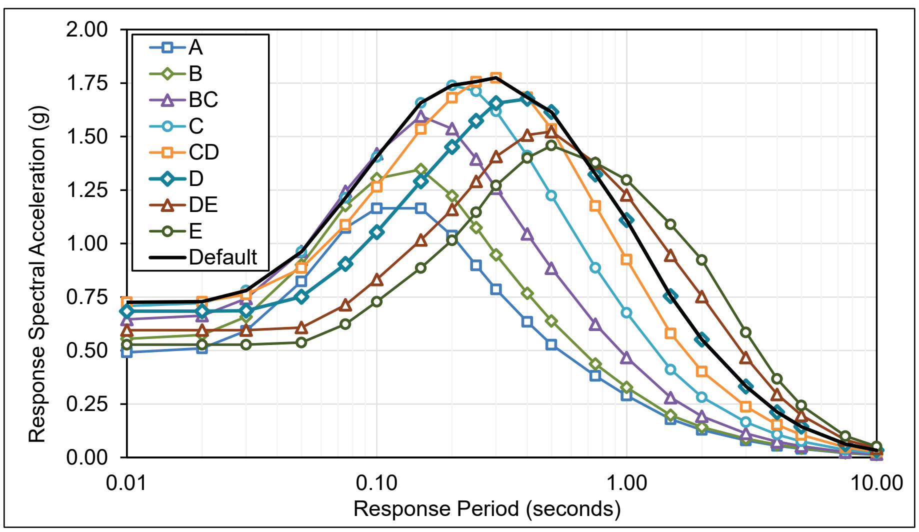


Figure E.2-28 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Reno Site.

Table E.2-29 Plots of Deterministic MCE$_R$ Multi-Period Response Spectra (MPRS) Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Las Vegas Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.556	0.627	0.730	0.807	0.828	0.780	0.689	0.621	0.828
0.01	0.559	0.630	0.734	0.811	0.836	0.796	0.695	0.621	0.836
0.02	0.581	0.653	0.757	0.829	0.844	0.797	0.695	0.621	0.844
0.03	0.675	0.750	0.850	0.900	0.887	0.804	0.695	0.621	0.900
0.05	0.939	1.028	1.106	1.113	1.036	0.889	0.720	0.645	1.113
0.08	1.230	1.350	1.437	1.416	1.284	1.080	0.861	0.756	1.416
0.10	1.342	1.502	1.647	1.648	1.503	1.267	1.012	0.891	1.648
0.15	1.336	1.545	1.836	1.932	1.817	1.552	1.241	1.091	1.932
0.20	1.180	1.392	**1.749**	2.000	1.970	1.733	1.410	1.248	2.000
0.25	1.002	1.201	1.559	1.924	2.012	1.843	1.546	1.390	2.012
0.30	0.857	1.009	1.372	1.770	1.972	1.886	1.643	1.506	1.972
0.40	0.661	0.757	1.079	1.472	1.774	1.809	1.676	1.583	1.809
0.50	0.535	0.606	0.864	1.248	1.577	1.696	1.650	1.610	1.696
0.75	0.356	0.404	0.576	0.834	1.145	1.320	1.418	1.444	1.320
1.0	0.267	0.303	**0.432**	0.626	0.859	1.046	1.188	1.278	1.046
1.5	0.151	0.167	0.237	0.348	0.492	0.646	0.822	0.958	0.646
2.0	0.102	0.112	0.152	0.223	0.319	0.439	0.603	0.742	0.439
3.0	0.057	0.063	0.080	0.118	0.169	0.237	0.334	0.418	0.237
4.0	0.036	0.039	0.049	0.071	0.102	0.141	0.196	0.244	0.141
5.0	0.025	0.028	0.033	0.047	0.066	0.091	0.124	0.153	0.091
7.5	0.011	0.012	0.015	0.020	0.027	0.035	0.047	0.057	0.035
10	0.007	0.007	0.008	0.011	0.015	0.018	0.023	0.028	0.018
S_{MS} **(g)**	1.06	1.25	1.57	1.80	1.81	1.70	1.51	1.45	1.81
S_{M1} **(g)**	0.27	0.30	0.43	0.63	0.86	1.05	1.19	1.34	1.05
S_{DS} **(g)**	0.71	0.84	1.05	1.20	1.21	1.13	1.01	0.97	1.21
S_{D1} **(g)**	0.18	0.20	0.29	0.42	0.57	0.70	0.79	0.89	0.70

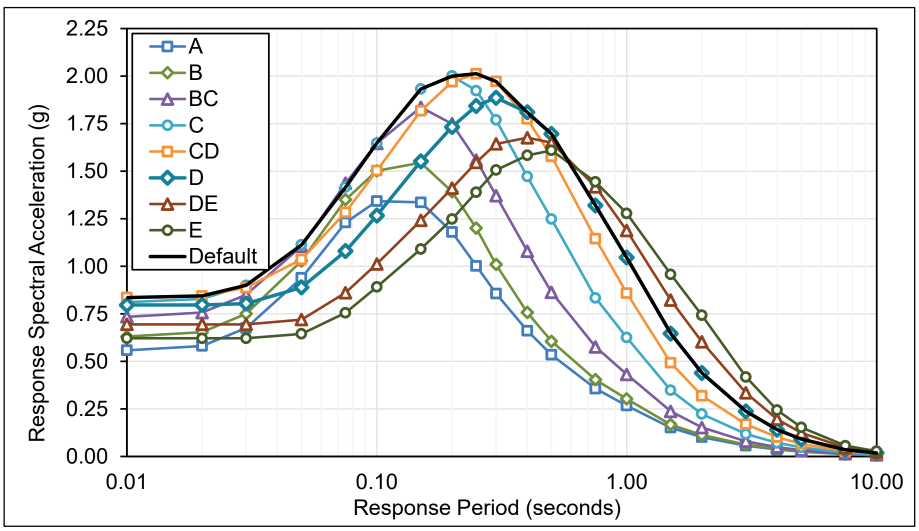


Figure E.2-29 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Las Vegas Site.

Table E.2-30 Plots of Deterministic MCE$_R$ Multi-Period Response Spectra (MPRS) Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, St. Louis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.151	0.170	0.198	0.217	0.221	0.206	0.180	0.162	0.221
0.01	0.151	0.171	0.199	0.219	0.224	0.210	0.183	0.162	0.224
0.02	0.157	0.176	0.204	0.222	0.224	0.210	0.183	0.162	0.224
0.03	0.181	0.201	0.228	0.239	0.234	0.211	0.183	0.162	0.239
0.05	0.250	0.273	0.293	0.292	0.269	0.229	0.186	0.165	0.292
0.08	0.324	0.356	0.376	0.368	0.330	0.274	0.216	0.188	0.368
0.10	0.351	0.393	0.429	0.425	0.383	0.319	0.251	0.220	0.425
0.15	0.353	0.408	0.484	0.503	0.465	0.391	0.307	0.267	0.503
0.20	0.317	0.374	**0.470**	0.532	0.514	0.442	0.352	0.308	0.532
0.25	0.277	0.331	0.430	0.528	0.541	0.483	0.394	0.349	0.541
0.30	0.245	0.295	0.392	0.505	0.553	0.513	0.433	0.390	0.553
0.40	0.202	0.244	0.332	0.448	0.535	0.530	0.472	0.437	0.535
0.50	0.171	0.206	0.286	0.396	0.496	0.519	0.485	0.461	0.519
0.75	0.127	0.147	0.207	0.294	0.389	0.436	0.448	0.446	0.436
1.0	0.098	0.111	**0.159**	0.230	0.314	0.375	0.410	0.431	0.375
1.5	0.064	0.071	0.101	0.148	0.208	0.270	0.336	0.386	0.270
2.0	0.048	0.053	0.072	0.105	0.150	0.206	0.280	0.343	0.206
3.0	0.032	0.036	0.045	0.067	0.096	0.134	0.189	0.236	0.134
4.0	0.023	0.026	0.032	0.047	0.066	0.092	0.128	0.159	0.092
5.0	0.018	0.020	0.024	0.034	0.048	0.066	0.090	0.111	0.066
7.5	0.010	0.011	0.013	0.018	0.024	0.031	0.041	0.050	0.031
10	0.007	0.007	0.008	0.011	0.014	0.018	0.022	0.027	0.018
S_{MS} (g)	0.29	0.34	0.42	0.48	0.50	0.48	0.44	0.41	0.50
S_{M1} (g)	0.10	0.11	0.16	0.23	0.31	0.37	0.51	0.64	0.37
S_{DS} (g)	0.19	0.22	0.28	0.32	0.33	0.32	0.29	0.28	0.33
S_{D1} (g)	0.07	0.07	0.11	0.15	0.21	0.25	0.34	0.42	0.25

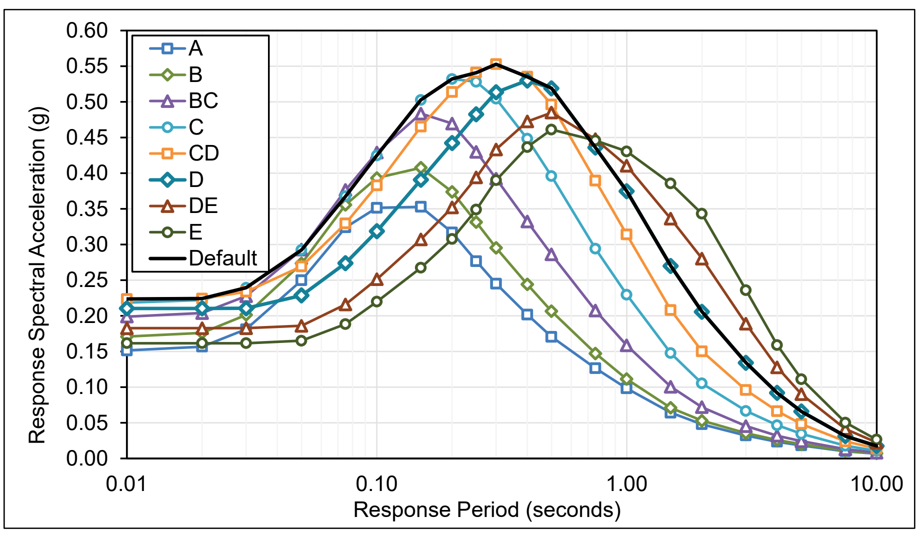


Figure E.2-30 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, St. Louis Site.

Table E.2-31 Plots of Deterministic MCE_R Multi-Period Response Spectra (MPRS) Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Memphis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.378	0.426	0.496	0.546	0.556	0.521	0.457	0.412	0.556
0.01	0.380	0.429	0.499	0.549	0.563	0.533	0.464	0.412	0.563
0.02	0.395	0.444	0.513	0.560	0.567	0.533	0.464	0.412	0.567
0.03	0.458	0.509	0.576	0.606	0.594	0.536	0.464	0.412	0.606
0.05	0.639	0.699	0.749	0.749	0.693	0.590	0.477	0.423	0.749
0.08	0.834	0.916	0.970	0.949	0.854	0.713	0.565	0.494	0.949
0.10	0.907	1.015	1.108	1.100	0.996	0.833	0.660	0.579	1.100
0.15	0.905	1.046	1.241	1.295	1.205	1.019	0.808	0.706	1.295
0.20	0.802	0.946	**1.189**	1.350	1.314	1.142	0.919	0.808	1.350
0.25	0.688	0.824	1.070	1.316	1.361	1.229	1.017	0.908	1.361
0.30	0.597	0.719	0.955	1.230	1.357	1.279	1.098	0.997	1.357
0.40	0.473	0.573	0.779	1.053	1.261	1.267	1.154	1.080	1.267
0.50	0.389	0.464	0.653	0.904	1.137	1.205	1.153	1.113	1.205
0.75	0.273	0.309	0.441	0.639	0.852	0.966	1.019	1.028	0.966
1.0	0.205	0.232	**0.331**	0.479	0.657	0.791	0.887	0.945	0.791
1.5	0.122	0.135	0.191	0.281	0.397	0.518	0.654	0.756	0.518
2.0	0.086	0.094	0.128	0.188	0.268	0.368	0.503	0.618	0.368
3.0	0.051	0.056	0.071	0.105	0.151	0.212	0.298	0.372	0.212
4.0	0.033	0.037	0.045	0.066	0.094	0.130	0.181	0.225	0.130
5.0	0.024	0.026	0.032	0.045	0.063	0.086	0.118	0.145	0.086
7.5	0.011	0.012	0.015	0.020	0.027	0.035	0.047	0.057	0.035
10	0.007	0.008	0.009	0.012	0.015	0.019	0.024	0.029	0.019
S_{MS} (g)	0.72	0.85	1.07	1.22	1.22	1.15	1.04	1.00	1.22
S_{M1} (g)	0.20	0.23	0.33	0.48	0.66	0.79	0.91	1.11	0.79
S_{DS} (g)	0.48	0.57	0.71	0.81	0.82	0.77	0.69	0.67	0.82
S_{D1} (g)	0.14	0.15	0.22	0.32	0.44	0.53	0.60	0.74	0.53

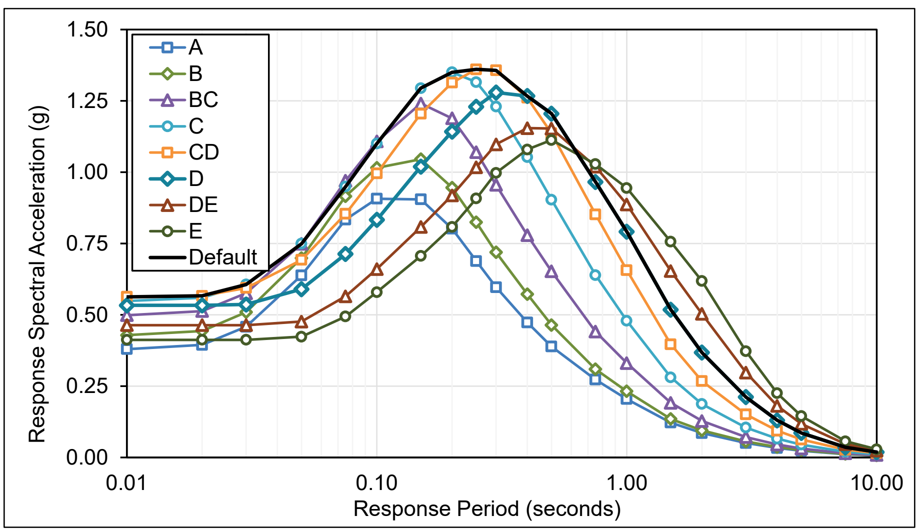


Figure E.2-31 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Memphis Site.

Table E.2-32 **Plots of Deterministic MCE_R Multi-Period Response Spectra (MPRS) Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Charleston Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.836	0.944	1.097	1.192	1.184	1.068	0.894	0.787	1.192
0.01	0.841	0.949	1.103	1.199	1.201	1.094	0.905	0.787	1.201
0.02	0.879	0.988	1.142	1.230	1.212	1.094	0.905	0.787	1.230
0.03	1.026	1.140	1.287	1.334	1.271	1.102	0.905	0.787	1.334
0.05	1.437	1.573	1.674	1.643	1.471	1.201	0.939	0.812	1.643
0.08	1.878	2.061	2.162	2.067	1.793	1.432	1.087	0.932	2.067
0.10	2.035	2.277	2.462	2.382	2.070	1.650	1.244	1.062	2.382
0.15	1.998	2.309	2.730	2.771	2.467	1.976	1.476	1.250	2.771
0.20	1.749	2.063	**2.587**	2.884	2.682	2.200	1.661	1.409	2.884
0.25	1.484	1.738	2.303	2.798	2.784	2.373	1.837	1.579	2.798
0.30	1.264	1.448	2.022	2.577	2.758	2.465	1.977	1.729	2.758
0.40	0.959	1.086	1.548	2.126	2.493	2.391	2.052	1.846	2.493
0.50	0.767	0.869	1.239	1.790	2.218	2.261	2.058	1.913	2.261
0.75	0.511	0.579	0.826	1.193	1.620	1.809	1.808	1.772	1.809
1.0	0.384	0.434	**0.619**	0.895	1.215	1.435	1.567	1.637	1.435
1.5	0.211	0.233	0.330	0.484	0.680	0.879	1.091	1.257	0.879
2.0	0.137	0.152	0.205	0.301	0.429	0.587	0.800	0.982	0.587
3.0	0.074	0.082	0.105	0.154	0.222	0.310	0.437	0.546	0.310
4.0	0.046	0.050	0.062	0.090	0.129	0.179	0.249	0.309	0.179
5.0	0.031	0.034	0.041	0.059	0.083	0.113	0.154	0.190	0.113
7.5	0.014	0.015	0.017	0.024	0.032	0.042	0.055	0.067	0.042
10	0.008	0.009	0.010	0.013	0.017	0.022	0.028	0.033	0.022
S_{MS} (g)	1.57	1.86	2.33	2.60	2.51	2.22	1.85	1.72	2.60
S_{M1} (g)	0.38	0.43	0.62	0.89	1.21	1.43	1.57	1.77	1.43
S_{DS} (g)	1.05	1.24	1.55	1.73	1.67	1.48	1.23	1.15	1.73
S_{D1} (g)	0.26	0.29	0.41	0.60	0.81	0.96	1.04	1.18	0.96

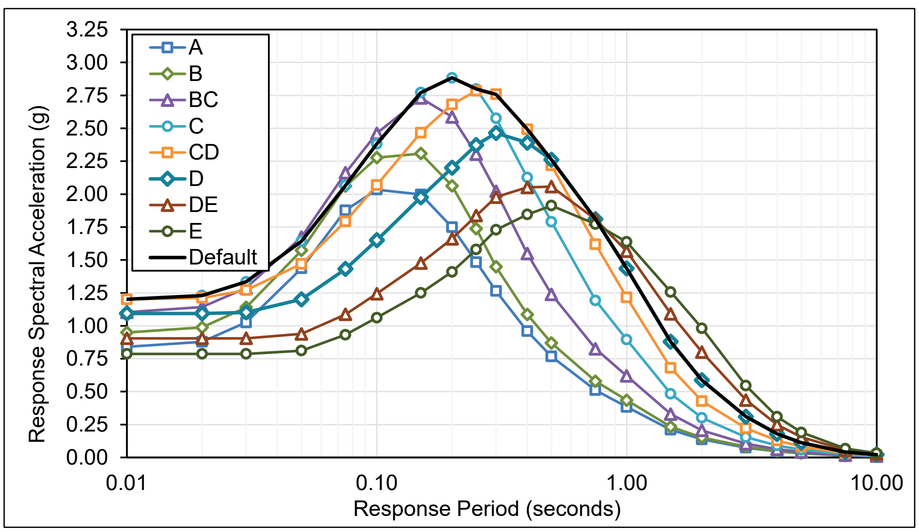


Figure E.2-32 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Charleston Site.

Table E.2-33 Plots of Deterministic MCE_R Multi-Period Response Spectra (MPRS) Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, Chicago Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.067	0.075	0.088	0.097	0.098	0.092	0.081	0.073	0.098
0.01	0.067	0.076	0.088	0.097	0.100	0.094	0.082	0.073	0.100
0.02	0.070	0.078	0.091	0.099	0.100	0.094	0.082	0.073	0.100
0.03	0.081	0.090	0.102	0.107	0.105	0.095	0.082	0.073	0.107
0.05	0.113	0.124	0.132	0.133	0.123	0.105	0.085	0.075	0.133
0.08	0.148	0.162	0.172	0.168	0.151	0.127	0.100	0.088	0.168
0.10	0.161	0.180	0.196	0.195	0.177	0.148	0.117	0.103	0.195
0.15	0.160	0.185	0.220	0.229	0.214	0.181	0.144	0.126	0.229
0.20	0.142	0.167	**0.210**	0.239	0.233	0.203	0.163	0.144	0.239
0.25	0.122	0.146	0.189	0.232	0.241	0.218	0.181	0.161	0.241
0.30	0.105	0.127	0.168	0.217	0.240	0.226	0.194	0.177	0.240
0.40	0.083	0.101	0.137	0.185	0.222	0.223	0.204	0.191	0.223
0.50	0.068	0.081	0.114	0.158	0.199	0.212	0.203	0.196	0.212
0.75	0.048	0.054	0.077	0.111	0.149	0.169	0.179	0.181	0.169
1.0	0.036	0.040	**0.058**	0.083	0.114	0.138	0.155	0.165	0.138
1.5	0.021	0.023	0.033	0.049	0.069	0.090	0.113	0.131	0.090
2.0	0.015	0.016	0.022	0.032	0.046	0.063	0.087	0.107	0.063
3.0	0.009	0.010	0.012	0.018	0.026	0.036	0.051	0.064	0.036
4.0	0.006	0.006	0.008	0.011	0.016	0.022	0.031	0.039	0.022
5.0	0.004	0.004	0.005	0.008	0.011	0.015	0.020	0.025	0.015
7.5	0.002	0.002	0.002	0.003	0.005	0.006	0.008	0.010	0.006
10	0.001	0.001	0.001	0.002	0.003	0.003	0.004	0.005	0.003
S_{MS} (g)	0.13	0.15	0.19	0.22	0.22	0.20	0.18	0.18	0.22
S_{M1} (g)	0.04	0.04	0.06	0.08	0.11	0.14	0.16	0.19	0.14
S_{DS} (g)	0.09	0.10	0.13	0.14	0.14	0.14	0.12	0.12	0.14
S_{D1} (g)	0.02	0.03	0.04	0.06	0.08	0.09	0.10	0.13	0.09

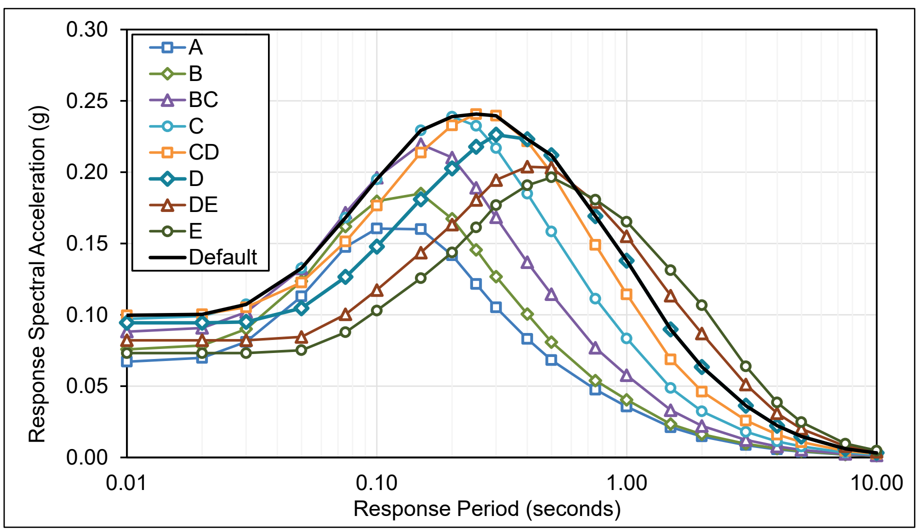


Figure E.2-33 Plots of deterministic MCE_R multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, Chicago Site.

Table E.2-34 Plots of Deterministic MCE$_R$ Multi-Period Response Spectra (MPRS) Derived from Parameters S_S and S_1 in Accordance with the Methods of Chapter 5, New York Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.086	0.097	0.113	0.125	0.128	0.121	0.107	0.097	0.128
0.01	0.086	0.097	0.113	0.125	0.129	0.123	0.108	0.097	0.129
0.02	0.090	0.101	0.117	0.128	0.131	0.124	0.108	0.097	0.131
0.03	0.104	0.116	0.131	0.139	0.138	0.125	0.108	0.097	0.139
0.05	0.145	0.159	0.171	0.172	0.161	0.138	0.112	0.100	0.172
0.08	0.190	0.209	0.222	0.219	0.199	0.168	0.134	0.118	0.219
0.10	0.207	0.232	0.255	0.256	0.234	0.197	0.158	0.139	0.256
0.15	0.206	0.239	0.284	0.299	0.282	0.242	0.194	0.171	0.299
0.20	0.182	0.215	**0.270**	0.309	0.306	0.270	0.220	0.195	0.309
0.25	0.071	0.081	0.115	0.167	0.311	0.286	0.241	0.217	0.311
0.30	0.059	0.067	0.096	0.139	0.191	0.291	0.255	0.234	0.291
0.40	0.045	0.050	0.072	0.104	0.143	0.175	0.258	0.244	0.175
0.50	0.036	0.040	0.058	0.083	0.115	0.140	0.162	0.247	0.140
0.75	0.024	0.027	0.038	0.056	0.076	0.093	0.108	0.128	0.093
1.0	0.018	0.020	**0.029**	0.042	0.057	0.070	0.081	0.096	0.070
1.5	0.010	0.011	0.015	0.023	0.032	0.042	0.054	0.064	0.042
2.0	0.007	0.007	0.010	0.014	0.021	0.028	0.039	0.048	0.028
3.0	0.004	0.004	0.005	0.007	0.011	0.015	0.021	0.026	0.015
4.0	0.002	0.002	0.003	0.004	0.006	0.009	0.012	0.015	0.009
5.0	0.002	0.002	0.002	0.003	0.004	0.006	0.008	0.009	0.006
7.5	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003	0.002
10	0.000	0.000	0.000	0.001	0.001	0.001	0.001	0.002	0.001
S_{MS} (g)	0.16	0.19	0.24	0.28	0.28	0.26	0.23	0.22	0.28
S_{M1} (g)	0.02	0.02	0.03	0.04	0.06	0.07	0.08	0.10	0.07
S_{DS} (g)	0.11	0.13	0.16	0.19	0.19	0.17	0.15	0.15	0.19
S_{D1} (g)	0.01	0.01	0.02	0.03	0.04	0.05	0.05	0.06	0.05

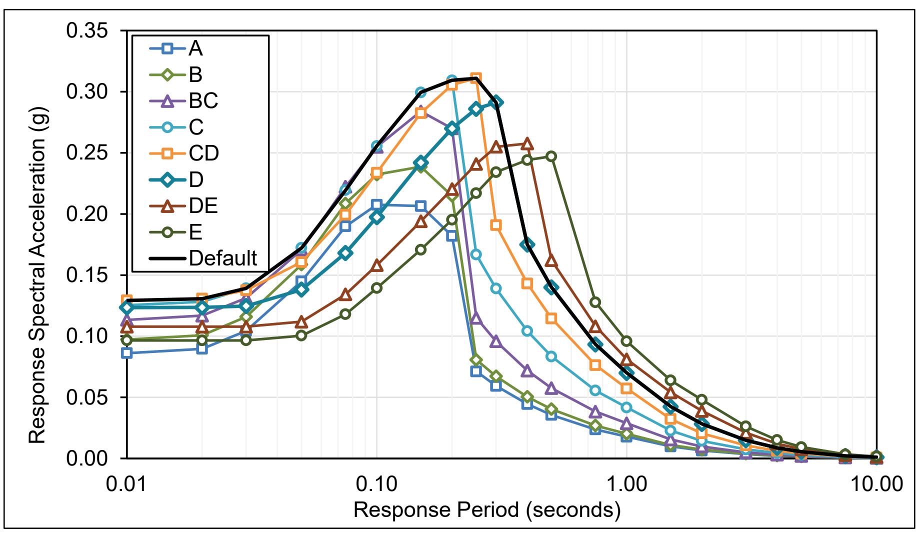


Figure E.2-34 Plots of deterministic MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S and S_1 in accordance with the methods of Chapter 5, New York Site.

E.3 Derived MCE$_R$ Ground Motions

Table E.3-1 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Los Angeles Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.706	0.790	0.916	1.005	1.030	0.973	0.804	0.694	1.030
0.01	0.711	0.795	0.921	1.010	1.036	0.979	0.804	0.694	1.036
0.02	0.739	0.823	0.947	1.027	1.043	0.982	0.804	0.694	1.043
0.03	0.876	0.956	1.065	1.109	1.091	0.996	0.812	0.694	1.109
0.05	1.264	1.349	1.399	1.382	1.283	1.086	0.812	0.697	1.382
0.08	1.632	1.757	1.817	1.769	1.607	1.272	0.957	0.805	1.769
0.10	1.740	1.919	2.068	2.053	1.878	1.447	1.055	0.884	2.053
0.15	1.704	1.935	2.292	2.379	2.236	1.728	1.236	1.022	2.379
0.20	1.513	1.749	**2.203**	2.508	2.437	1.948	1.394	1.148	2.508
0.25	1.340	1.566	2.040	2.514	2.546	2.174	1.580	1.311	2.546
0.30	1.203	1.411	1.880	2.405	2.587	2.370	1.772	1.490	2.587
0.40	1.001	1.175	1.605	2.147	2.536	2.460	1.999	1.718	2.536
0.50	0.853	1.001	1.395	1.912	2.368	2.407	2.109	1.866	2.407
0.75	0.638	0.728	1.031	1.451	1.912	2.047	2.062	1.934	2.047
1.0	0.496	0.550	**0.789**	1.135	1.555	1.758	1.940	2.001	1.758
1.5	0.319	0.344	0.489	0.713	1.010	1.276	1.585	1.834	1.276
2.0	0.239	0.255	0.344	0.501	0.718	0.977	1.323	1.641	0.977
3.0	0.159	0.169	0.211	0.307	0.444	0.616	0.860	1.091	0.616
4.0	0.118	0.124	0.149	0.214	0.306	0.420	0.579	0.729	0.420
5.0	0.097	0.101	0.116	0.163	0.229	0.310	0.421	0.523	0.310
7.5	0.063	0.067	0.072	0.098	0.133	0.174	0.229	0.279	0.174
10	0.042	0.045	0.051	0.067	0.087	0.111	0.141	0.168	0.111
S_{MS} (g)	1.36	1.57	1.98	2.26	2.33	2.21	1.90	1.68	2.33
S_{M1} (g)	0.50	0.55	0.79	1.13	1.55	1.76	2.38	2.95	1.76
S_{DS} (g)	0.91	1.05	1.32	1.51	1.55	1.48	1.27	1.12	1.55
S_{D1} (g)	0.33	0.37	0.53	0.76	1.04	1.17	1.59	1.97	1.17

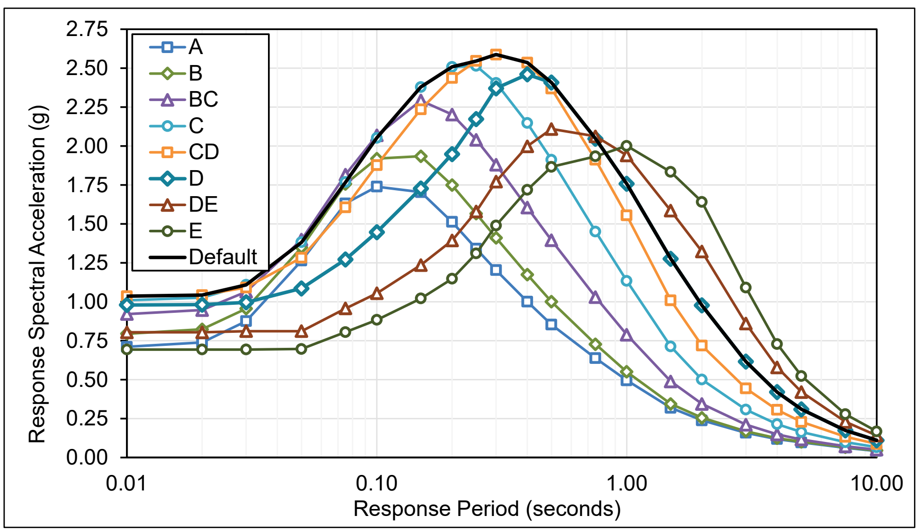


Figure E.3-1 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Los Angeles Site.

Table E.3-2 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Century City Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.760	0.850	0.986	1.081	1.108	1.047	0.855	0.738	1.108
0.01	0.765	0.855	0.992	1.087	1.115	1.054	0.855	0.738	1.115
0.02	0.796	0.886	1.019	1.105	1.122	1.057	0.855	0.738	1.122
0.03	0.942	1.029	1.146	1.193	1.174	1.072	0.859	0.738	1.193
0.05	1.360	1.452	1.506	1.487	1.381	1.143	0.859	0.739	1.487
0.08	1.756	1.891	1.955	1.904	1.719	1.336	1.006	0.848	1.904
0.10	1.872	2.066	2.226	2.209	1.965	1.519	1.111	0.933	2.209
0.15	1.834	2.082	2.467	2.560	2.364	1.820	1.307	1.082	2.560
0.20	1.628	1.882	**2.370**	2.699	2.623	2.062	1.480	1.221	2.699
0.25	1.461	1.706	2.224	2.740	2.740	2.310	1.684	1.399	2.740
0.30	1.325	1.553	2.070	2.648	2.784	2.536	1.899	1.598	2.784
0.40	1.118	1.313	1.794	2.399	2.788	2.647	2.179	1.873	2.788
0.50	0.964	1.130	1.575	2.160	2.645	2.624	2.332	2.061	2.645
0.75	0.734	0.838	1.186	1.671	2.191	2.279	2.322	2.173	2.279
1.0	0.578	0.642	**0.920**	1.323	1.813	1.986	2.192	2.286	1.986
1.5	0.372	0.401	0.570	0.831	1.177	1.469	1.825	2.107	1.469
2.0	0.279	0.298	0.401	0.584	0.838	1.139	1.542	1.914	1.139
3.0	0.185	0.197	0.246	0.358	0.517	0.718	1.003	1.272	0.718
4.0	0.138	0.145	0.173	0.250	0.357	0.489	0.675	0.849	0.489
5.0	0.113	0.118	0.135	0.191	0.267	0.361	0.490	0.610	0.361
7.5	0.076	0.078	0.084	0.115	0.155	0.203	0.267	0.325	0.203
10	0.054	0.055	0.059	0.078	0.101	0.129	0.165	0.196	0.129
S_{MS} (g)	1.47	1.69	2.13	2.47	2.51	2.38	2.10	1.85	2.51
S_{M1} (g)	0.58	0.64	0.92	1.32	1.81	2.05	2.78	3.44	2.05
S_{DS} (g)	0.98	1.13	1.42	1.64	1.67	1.59	1.40	1.24	1.67
S_{D1} (g)	0.39	0.43	0.61	0.88	1.21	1.37	1.85	2.30	1.37

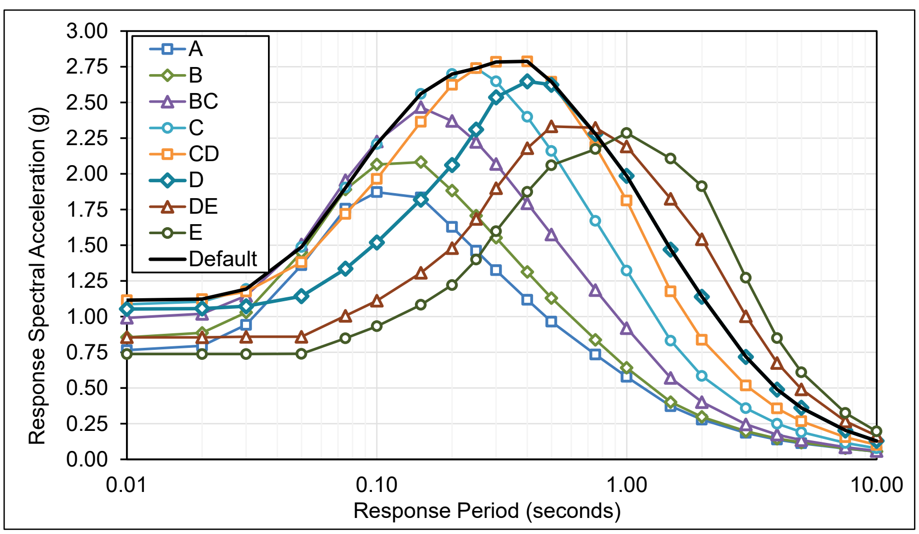


Figure E.3-2 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Century City Site.

Table E.3-3 **MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Northridge Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.673	0.760	0.883	0.958	0.951	0.859	0.721	0.633	0.958
0.01	0.677	0.764	0.888	0.964	0.968	0.875	0.721	0.633	0.968
0.02	0.702	0.788	0.911	0.979	0.968	0.875	0.721	0.633	0.979
0.03	0.810	0.900	1.015	1.051	1.002	0.875	0.721	0.633	1.051
0.05	1.113	1.219	1.295	1.269	1.138	0.933	0.764	0.656	1.269
0.08	1.435	1.575	1.649	1.576	1.370	1.100	0.840	0.724	1.576
0.10	1.547	1.732	1.869	1.808	1.576	1.263	0.958	0.820	1.808
0.15	1.548	1.789	2.114	2.140	1.905	1.529	1.147	0.973	2.140
0.20	1.395	1.645	**2.064**	2.294	2.123	1.738	1.310	1.111	2.294
0.25	1.231	1.474	1.911	2.321	2.282	1.929	1.483	1.270	2.321
0.30	1.104	1.331	1.765	2.251	2.386	2.096	1.660	1.442	2.386
0.40	0.932	1.128	1.533	2.058	2.404	2.256	1.882	1.672	2.404
0.50	0.805	0.974	1.348	1.857	2.287	2.280	1.993	1.820	2.287
0.75	0.617	0.715	1.010	1.427	1.870	2.010	1.934	1.860	2.010
1.0	0.485	0.539	**0.772**	1.111	1.522	1.739	1.875	1.901	1.739
1.5	0.313	0.337	0.479	0.698	0.989	1.255	1.558	1.804	1.255
2.0	0.234	0.250	0.337	0.490	0.703	0.956	1.295	1.607	0.956
3.0	0.156	0.165	0.206	0.301	0.434	0.603	0.842	1.068	0.603
4.0	0.116	0.122	0.145	0.210	0.299	0.411	0.567	0.713	0.411
5.0	0.095	0.099	0.113	0.160	0.224	0.303	0.412	0.512	0.303
7.5	0.064	0.065	0.071	0.096	0.130	0.170	0.224	0.273	0.170
10	0.046	0.046	0.050	0.065	0.085	0.108	0.138	0.165	0.108
S_{MS} (g)	1.26	1.48	1.86	2.09	2.16	2.05	1.79	1.64	2.16
S_{M1} (g)	0.49	0.54	0.77	1.11	1.52	1.74	2.33	2.89	1.74
S_{DS} (g)	0.84	0.99	1.24	1.39	1.44	1.37	1.20	1.09	1.44
S_{D1} (g)	0.32	0.36	0.51	0.74	1.01	1.16	1.55	1.93	1.16

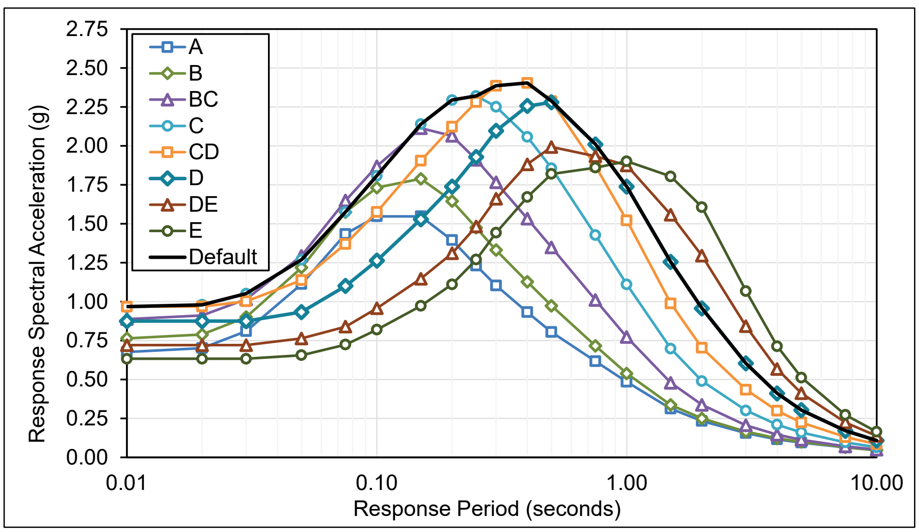


Figure E.3-3 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Northridge Site.

Table E.3-4 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Long Beach Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.616	0.690	0.802	0.886	0.918	0.881	0.807	0.754	0.918
0.01	0.620	0.694	0.806	0.890	0.924	0.887	0.814	0.754	0.924
0.02	0.644	0.717	0.828	0.904	0.929	0.889	0.810	0.754	0.929
0.03	0.760	0.831	0.929	0.976	0.974	0.904	0.800	0.746	0.976
0.05	1.090	1.165	1.219	1.218	1.148	1.019	0.875	0.754	1.218
0.08	1.408	1.518	1.585	1.562	1.443	1.270	1.021	0.863	1.562
0.10	1.505	1.663	1.806	1.815	1.693	1.505	1.130	0.950	1.815
0.15	1.478	1.680	1.998	2.102	2.015	1.816	1.332	1.105	2.102
0.20	1.314	1.520	**1.918**	2.205	2.190	2.006	1.513	1.250	2.205
0.25	1.181	1.382	1.802	2.235	2.274	2.138	1.724	1.435	2.274
0.30	1.072	1.259	1.679	2.160	2.295	2.229	1.949	1.643	2.295
0.40	0.906	1.067	1.459	1.958	2.294	2.318	2.143	1.940	2.318
0.50	0.783	0.922	1.284	1.766	2.181	2.291	2.191	2.135	2.291
0.75	0.599	0.685	0.970	1.368	1.806	1.975	2.004	2.056	1.975
1.0	0.474	0.527	**0.754**	1.085	1.495	1.711	1.856	1.987	1.711
1.5	0.308	0.331	0.470	0.686	0.974	1.266	1.534	1.783	1.266
2.0	0.233	0.248	0.334	0.485	0.697	0.949	1.288	1.600	0.949
3.0	0.157	0.166	0.206	0.300	0.434	0.602	0.841	1.066	0.602
4.0	0.118	0.124	0.147	0.212	0.302	0.415	0.573	0.720	0.415
5.0	0.097	0.101	0.115	0.163	0.228	0.308	0.419	0.521	0.308
7.5	0.066	0.068	0.073	0.100	0.135	0.177	0.233	0.283	0.177
10	0.048	0.049	0.052	0.069	0.090	0.114	0.146	0.173	0.114
S_{MS} (g)	1.18	1.37	1.73	2.01	2.07	2.09	1.97	1.92	2.09
S_{M1} (g)	0.47	0.53	0.75	1.09	1.50	1.71	2.32	2.88	1.71
S_{DS} (g)	0.79	0.91	1.15	1.34	1.38	1.39	1.31	1.28	1.39
S_{D1} (g)	0.32	0.35	0.50	0.72	1.00	1.14	1.55	1.92	1.14

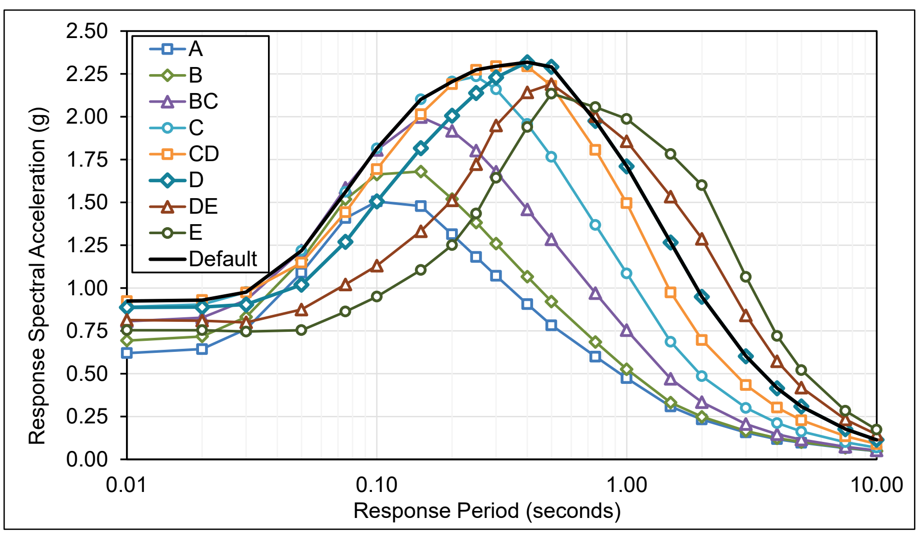


Figure E.3-4 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Long Beach Site.

Table E.3-5 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Irvine Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.463	0.519	0.605	0.677	0.718	0.708	0.670	0.652	0.718
0.01	0.466	0.522	0.609	0.681	0.722	0.713	0.675	0.658	0.722
0.02	0.483	0.539	0.624	0.691	0.726	0.714	0.673	0.650	0.726
0.03	0.567	0.621	0.699	0.747	0.763	0.729	0.668	0.636	0.763
0.05	0.804	0.862	0.916	0.934	0.904	0.828	0.736	0.691	0.934
0.08	1.039	1.123	1.192	1.201	1.142	1.037	0.927	0.876	1.201
0.10	1.115	1.234	1.360	1.398	1.346	1.238	1.122	0.963	1.398
0.15	1.100	1.252	1.498	1.616	1.608	1.507	1.344	1.113	1.616
0.20	0.976	1.132	**1.430**	1.676	1.736	1.663	1.511	1.247	1.736
0.25	0.849	0.997	1.302	1.633	1.781	1.758	1.671	1.422	1.781
0.30	0.749	0.884	1.181	1.533	1.779	1.812	1.770	1.608	1.812
0.40	0.607	0.720	0.985	1.330	1.663	1.783	1.810	1.834	1.783
0.50	0.509	0.605	0.844	1.167	1.515	1.696	1.779	1.846	1.696
0.75	0.371	0.428	0.606	0.857	1.162	1.366	1.508	1.630	1.366
1.0	0.284	0.318	**0.455**	0.655	0.912	1.123	1.313	1.465	1.123
1.5	0.187	0.201	0.285	0.415	0.594	0.784	1.004	1.191	0.784
2.0	0.144	0.153	0.204	0.296	0.426	0.583	0.795	0.991	0.583
3.0	0.098	0.103	0.127	0.185	0.267	0.370	0.517	0.655	0.370
4.0	0.074	0.077	0.091	0.132	0.188	0.258	0.356	0.447	0.258
5.0	0.061	0.063	0.072	0.102	0.143	0.193	0.263	0.326	0.193
7.5	0.043	0.044	0.048	0.065	0.089	0.116	0.153	0.186	0.116
10	0.032	0.033	0.035	0.046	0.061	0.078	0.099	0.119	0.078
S_{MS} (g)	0.88	1.02	1.29	1.51	1.60	1.63	1.63	1.66	1.63
S_{M1} (g)	0.28	0.32	0.45	0.66	0.91	1.12	1.43	1.78	1.12
S_{DS} (g)	0.59	0.68	0.86	1.01	1.07	1.09	1.09	1.11	1.09
S_{D1} (g)	0.19	0.21	0.30	0.44	0.61	0.75	0.95	1.19	0.75

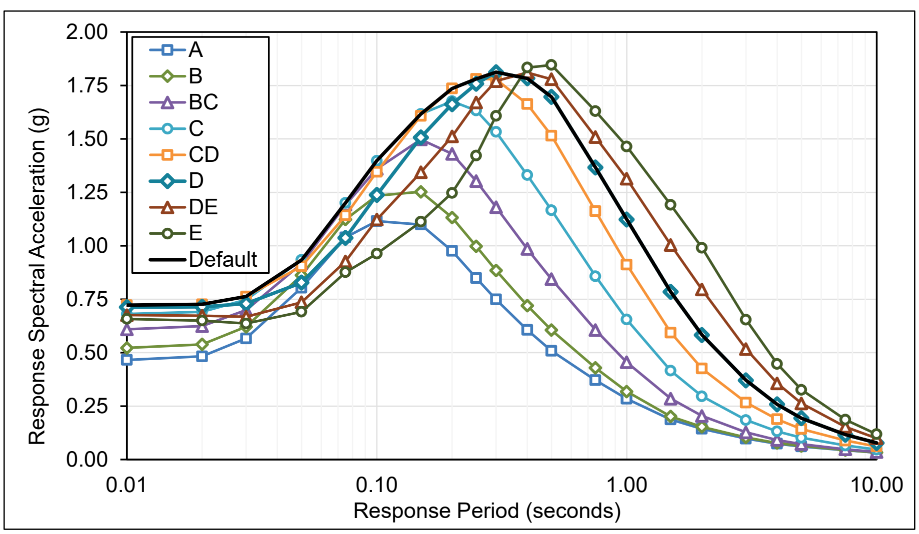


Figure E.3-5 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Irvine Site.

Table E.3-6 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Riverside Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.811	0.888	0.955	0.958	0.888	0.758	0.620	0.551	0.958
0.08	1.040	1.142	1.214	1.193	1.076	0.900	0.713	0.624	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.825	0.724	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.002	0.875	1.606
0.20	1.012	1.194	**1.500**	1.710	1.662	1.440	1.153	1.010	1.710
0.25	0.897	1.075	1.397	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.810	0.976	1.299	1.665	1.829	1.705	1.443	1.301	1.829
0.40	0.689	0.833	1.138	1.525	1.823	1.802	1.607	1.484	1.823
0.50	0.598	0.724	1.009	1.385	1.734	1.803	1.681	1.596	1.803
0.75	0.460	0.536	0.760	1.067	1.407	1.566	1.598	1.589	1.566
1.0	0.367	0.405	**0.575**	0.828	1.156	1.388	1.512	1.578	1.388
1.5	0.247	0.263	0.372	0.542	0.773	1.020	1.296	1.525	1.020
2.0	0.192	0.204	0.274	0.398	0.571	0.783	1.065	1.327	0.783
3.0	0.138	0.146	0.181	0.263	0.380	0.527	0.735	0.932	0.527
4.0	0.111	0.116	0.138	0.199	0.283	0.388	0.535	0.673	0.388
5.0	0.095	0.099	0.113	0.160	0.223	0.301	0.408	0.509	0.301
7.5	0.063	0.068	0.075	0.101	0.136	0.178	0.233	0.284	0.178
10	0.042	0.045	0.052	0.069	0.089	0.113	0.144	0.170	0.113
S_{MS} (g)	0.91	1.07	1.35	1.54	1.65	1.62	1.51	1.44	1.65
S_{M1} (g)	0.37	0.40	0.58	0.83	1.16	1.42	1.99	2.52	1.42
S_{DS} (g)	0.61	0.72	0.90	1.03	1.10	1.08	1.01	0.96	1.10
S_{D1} (g)	0.24	0.27	0.38	0.55	0.77	0.95	1.32	1.68	0.95

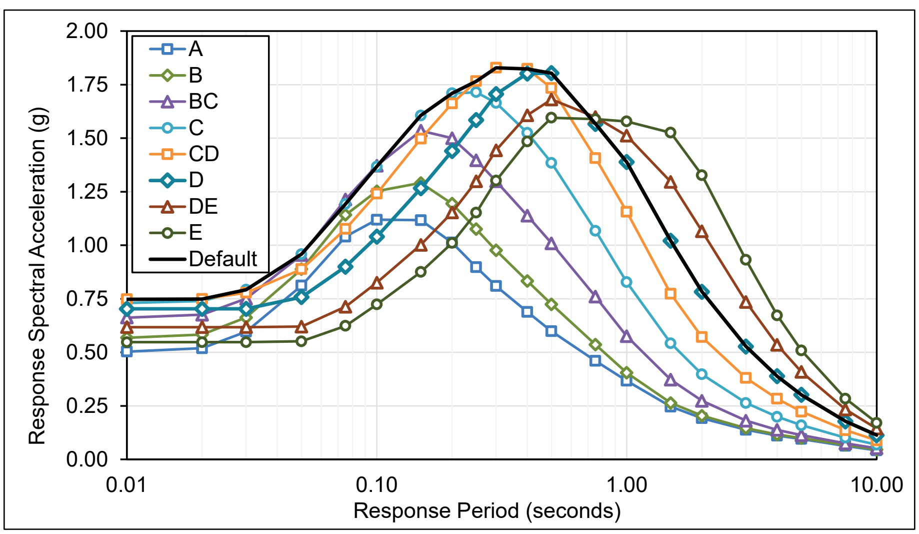


Figure E.3-6 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Riverside Site.

Table E.3-7 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, San Bernardino Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.907	1.024	1.187	1.272	1.235	1.085	0.881	0.760	1.272
0.01	0.912	1.030	1.193	1.285	1.256	1.095	0.881	0.760	1.285
0.02	0.948	1.066	1.228	1.304	1.256	1.095	0.881	0.760	1.304
0.03	1.099	1.221	1.372	1.399	1.302	1.113	0.883	0.760	1.399
0.05	1.516	1.659	1.747	1.682	1.470	1.171	0.883	0.761	1.682
0.08	1.951	2.141	2.217	2.075	1.755	1.367	1.031	0.871	2.075
0.10	2.100	2.350	2.510	2.373	2.006	1.555	1.141	0.958	2.373
0.15	2.095	2.421	2.849	2.811	2.416	1.865	1.343	1.114	2.811
0.20	1.883	2.221	**2.784**	3.036	2.703	2.118	1.525	1.260	3.036
0.25	1.670	2.000	2.590	3.109	2.946	2.376	1.737	1.446	3.109
0.30	1.504	1.813	2.403	3.039	3.122	2.615	1.964	1.655	3.122
0.40	1.277	1.539	2.097	2.792	3.207	2.874	2.268	1.952	3.207
0.50	1.108	1.320	1.833	2.505	3.083	2.947	2.440	2.158	3.083
0.75	0.856	0.970	1.367	1.923	2.531	2.680	2.446	2.290	2.680
1.0	0.674	0.745	**1.061**	1.528	2.084	2.398	2.452	2.422	2.398
1.5	0.458	0.494	0.702	1.021	1.444	1.821	2.192	2.422	1.821
2.0	0.354	0.381	0.516	0.750	1.077	1.455	1.951	2.408	1.455
3.0	0.259	0.277	0.351	0.513	0.740	1.028	1.435	1.821	1.028
4.0	0.207	0.220	0.266	0.384	0.548	0.752	1.039	1.308	0.752
5.0	0.170	0.185	0.215	0.304	0.426	0.576	0.781	0.974	0.576
7.5	0.100	0.108	0.127	0.175	0.235	0.308	0.404	0.492	0.308
10	0.067	0.072	0.082	0.109	0.141	0.179	0.228	0.270	0.179
S_{MS} (g)	1.69	2.00	2.51	2.80	2.89	2.65	2.20	1.94	2.89
S_{M1} (g)	0.67	0.74	1.06	1.53	2.08	2.78	3.87	4.92	2.78
S_{DS} (g)	1.13	1.33	1.67	1.87	1.92	1.77	1.46	1.29	1.92
S_{D1} (g)	0.45	0.50	0.71	1.02	1.39	1.85	2.58	3.28	1.85

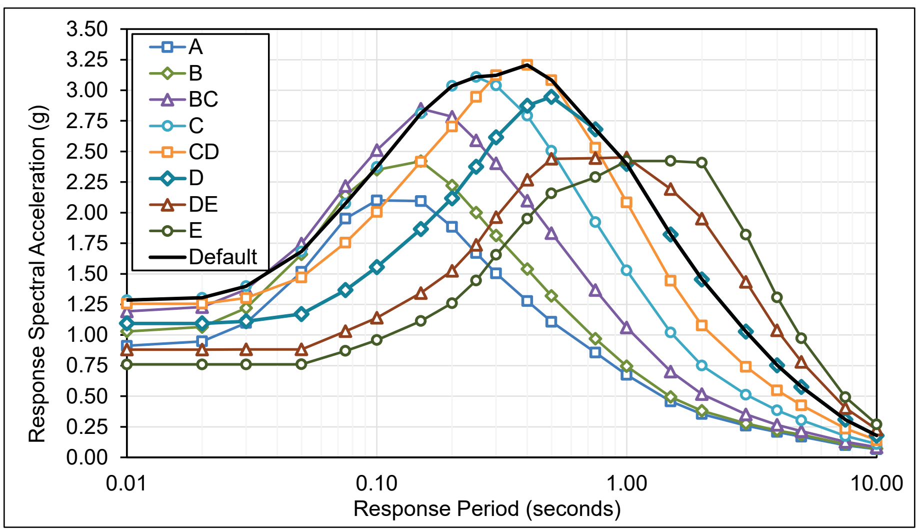


Figure E.3-7 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, San Bernardino Site.

Table E.3-8 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, San Luis Obispo Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.399	0.448	0.525	0.597	0.653	0.669	0.662	0.594	0.669
0.01	0.402	0.451	0.527	0.600	0.656	0.673	0.666	0.594	0.673
0.02	0.415	0.464	0.539	0.607	0.659	0.674	0.664	0.594	0.674
0.03	0.484	0.531	0.601	0.657	0.694	0.691	0.663	0.594	0.694
0.05	0.680	0.730	0.787	0.824	0.828	0.791	0.722	0.621	0.828
0.08	0.877	0.950	1.026	1.065	1.055	1.000	0.805	0.691	1.065
0.10	0.946	1.048	1.173	1.245	1.253	1.204	0.924	0.792	1.253
0.15	0.936	1.067	1.284	1.435	1.502	1.473	1.107	0.940	1.502
0.20	0.832	0.967	**1.224**	1.469	1.608	1.633	1.256	1.068	1.633
0.25	0.724	0.852	1.116	1.420	1.630	1.712	1.412	1.214	1.712
0.30	0.640	0.757	1.014	1.333	1.612	1.746	1.561	1.362	1.746
0.40	0.520	0.619	0.851	1.158	1.492	1.696	1.714	1.534	1.696
0.50	0.438	0.524	0.734	1.021	1.361	1.605	1.767	1.629	1.605
0.75	0.323	0.373	0.531	0.753	1.039	1.274	1.489	1.603	1.274
1.0	0.249	0.277	**0.399**	0.575	0.810	1.032	1.264	1.457	1.032
1.5	0.168	0.180	0.254	0.371	0.534	0.719	0.944	1.142	0.719
2.0	0.132	0.140	0.185	0.268	0.386	0.532	0.731	0.914	0.532
3.0	0.092	0.096	0.117	0.170	0.246	0.341	0.477	0.602	0.341
4.0	0.070	0.073	0.086	0.124	0.176	0.242	0.334	0.419	0.242
5.0	0.059	0.061	0.068	0.097	0.136	0.183	0.250	0.310	0.183
7.5	0.044	0.045	0.048	0.066	0.089	0.117	0.154	0.187	0.117
10	0.034	0.034	0.036	0.048	0.063	0.081	0.104	0.124	0.081
S_{MS} (g)	0.75	0.87	1.10	1.32	1.47	1.57	1.59	1.47	1.57
S_{M1} (g)	0.25	0.28	0.40	0.57	0.81	1.03	1.32	1.65	1.03
S_{DS} (g)	0.50	0.58	0.73	0.88	0.98	1.05	1.06	0.98	1.05
S_{D1} (g)	0.17	0.18	0.27	0.38	0.54	0.69	0.88	1.10	0.69

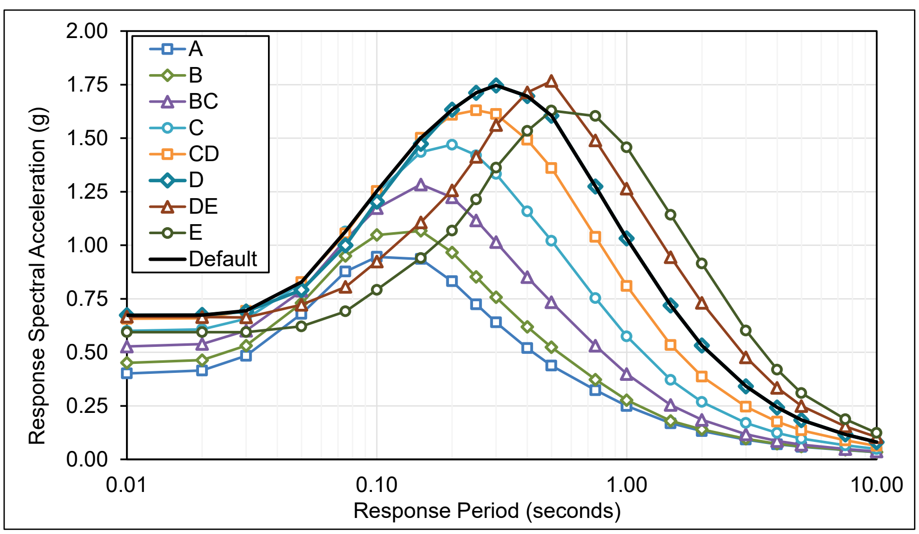


Figure E.3-8 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, San Luis Obispo Site.

Table E.3-9	MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, San Diego Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.558	0.625	0.728	0.810	0.851	0.829	0.751	0.661	0.851
0.01	0.562	0.629	0.732	0.815	0.856	0.834	0.751	0.661	0.856
0.02	0.582	0.649	0.751	0.827	0.861	0.836	0.751	0.661	0.861
0.03	0.684	0.750	0.841	0.893	0.903	0.852	0.751	0.661	0.903
0.05	0.976	1.044	1.103	1.115	1.068	0.965	0.803	0.691	1.115
0.08	1.263	1.364	1.438	1.435	1.347	1.177	0.898	0.770	1.435
0.10	1.356	1.499	1.641	1.670	1.587	1.356	1.031	0.884	1.670
0.15	1.335	1.519	1.813	1.934	1.892	1.640	1.235	1.050	1.934
0.20	1.186	1.375	**1.736**	2.018	2.050	1.846	1.400	1.191	2.050
0.25	1.026	1.203	1.569	1.959	2.115	2.027	1.573	1.353	2.115
0.30	0.902	1.061	1.417	1.832	2.118	2.114	1.735	1.516	2.118
0.40	0.725	0.856	1.171	1.577	1.966	2.073	1.898	1.702	2.073
0.50	0.604	0.713	0.994	1.371	1.775	1.963	1.951	1.803	1.963
0.75	0.434	0.498	0.704	0.994	1.342	1.569	1.709	1.765	1.569
1.0	0.329	0.366	**0.524**	0.754	1.045	1.288	1.492	1.649	1.288
1.5	0.215	0.231	0.327	0.477	0.680	0.891	1.139	1.345	0.891
2.0	0.163	0.174	0.233	0.338	0.486	0.664	0.904	1.125	0.664
3.0	0.110	0.117	0.144	0.210	0.303	0.420	0.587	0.743	0.420
4.0	0.083	0.087	0.103	0.149	0.212	0.291	0.402	0.505	0.291
5.0	0.068	0.071	0.081	0.115	0.161	0.217	0.295	0.367	0.217
7.5	0.048	0.049	0.053	0.072	0.098	0.128	0.168	0.205	0.128
10	0.035	0.036	0.038	0.051	0.066	0.084	0.108	0.128	0.084
S_{MS} (g)	1.07	1.24	1.56	1.82	1.91	1.90	1.76	1.62	1.91
S_{M1} (g)	0.33	0.37	0.52	0.75	1.04	1.29	1.63	2.03	1.29
S_{DS} (g)	0.71	0.82	1.04	1.21	1.27	1.27	1.17	1.08	1.27
S_{D1} (g)	0.22	0.24	0.35	0.50	0.70	0.86	1.08	1.35	0.86

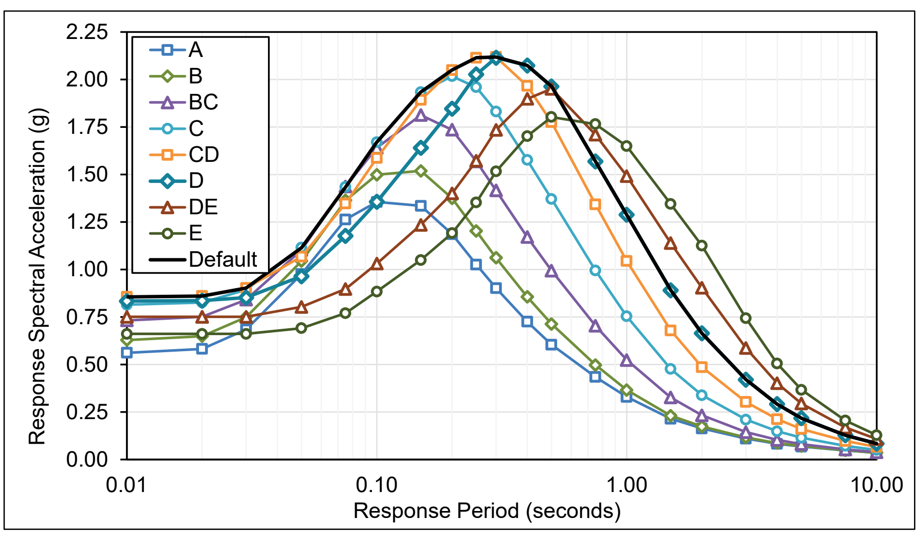


Figure E.3-9 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, San Diego Site.

Table E.3-10 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Santa Barbara Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.788	0.881	1.022	1.121	1.149	1.086	0.977	0.847	1.149
0.01	0.793	0.887	1.028	1.127	1.156	1.093	0.982	0.847	1.156
0.02	0.825	0.919	1.057	1.146	1.164	1.096	0.980	0.847	1.164
0.03	0.977	1.067	1.188	1.237	1.218	1.112	0.965	0.847	1.237
0.05	1.411	1.505	1.561	1.542	1.432	1.249	0.989	0.850	1.542
0.08	1.821	1.960	2.027	1.974	1.793	1.545	1.162	0.979	1.974
0.10	1.941	2.142	2.308	2.291	2.100	1.757	1.282	1.075	2.291
0.15	1.902	2.159	2.558	2.655	2.496	2.101	1.505	1.245	2.655
0.20	1.688	1.952	**2.458**	2.799	2.720	2.375	1.701	1.401	2.799
0.25	1.492	1.742	2.270	2.798	2.841	2.601	1.932	1.603	2.841
0.30	1.336	1.566	2.088	2.671	2.887	2.728	2.173	1.827	2.887
0.40	1.107	1.300	1.776	2.376	2.816	2.745	2.473	2.124	2.816
0.50	0.942	1.104	1.539	2.110	2.621	2.679	2.590	2.323	2.679
0.75	0.701	0.799	1.132	1.595	2.102	2.266	2.328	2.377	2.266
1.0	0.543	0.603	**0.864**	1.243	1.703	1.940	2.141	2.279	1.940
1.5	0.350	0.377	0.536	0.781	1.106	1.402	1.741	2.016	1.402
2.0	0.262	0.280	0.377	0.549	0.787	1.070	1.449	1.798	1.070
3.0	0.174	0.185	0.231	0.337	0.486	0.675	0.942	1.195	0.675
4.0	0.130	0.136	0.163	0.235	0.335	0.460	0.634	0.798	0.460
5.0	0.106	0.111	0.127	0.179	0.251	0.339	0.461	0.573	0.339
7.5	0.071	0.073	0.079	0.108	0.146	0.191	0.250	0.305	0.191
10	0.050	0.052	0.056	0.073	0.095	0.121	0.155	0.184	0.121
S_{MS} (g)	1.52	1.76	2.21	2.52	2.60	2.47	2.33	2.09	2.60
S_{M1} (g)	0.54	0.60	0.86	1.24	1.70	1.94	2.61	3.24	1.94
S_{DS} (g)	1.01	1.17	1.47	1.68	1.73	1.65	1.55	1.39	1.73
S_{D1} (g)	0.36	0.40	0.58	0.83	1.14	1.29	1.74	2.16	1.29

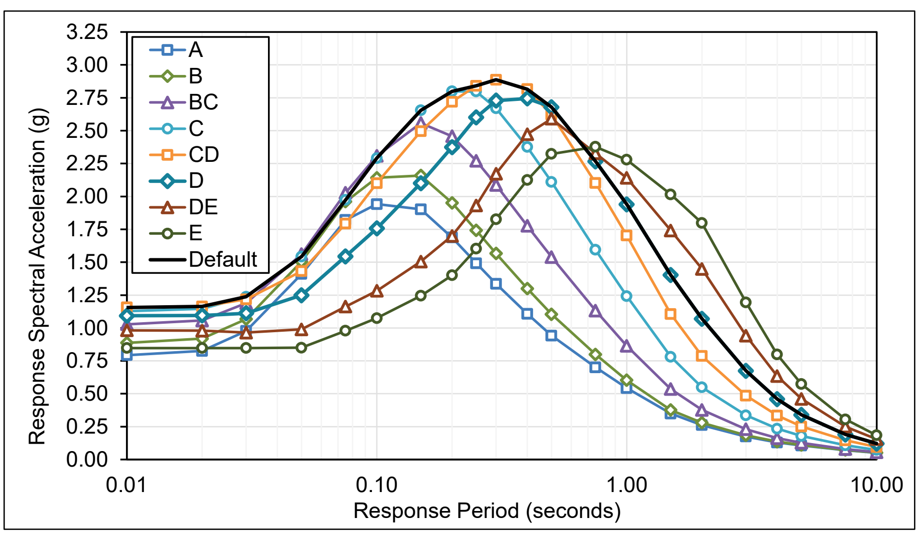


Figure E.3-10 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Santa Barbara Site.

Table E.3-11 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Ventura Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.749	0.838	0.972	1.066	1.092	1.032	0.928	0.836	1.092
0.01	0.754	0.843	0.977	1.071	1.099	1.039	0.936	0.836	1.099
0.02	0.784	0.873	1.004	1.089	1.106	1.041	0.931	0.836	1.106
0.03	0.929	1.014	1.129	1.176	1.157	1.057	0.917	0.836	1.176
0.05	1.341	1.431	1.484	1.466	1.361	1.187	0.969	0.836	1.466
0.08	1.730	1.863	1.927	1.876	1.704	1.473	1.131	0.956	1.876
0.10	1.845	2.036	2.194	2.177	1.996	1.706	1.252	1.052	2.177
0.15	1.807	2.052	2.431	2.523	2.372	2.046	1.475	1.224	2.523
0.20	1.605	1.855	**2.336**	2.660	2.585	2.311	1.676	1.386	2.660
0.25	1.466	1.712	2.231	2.749	2.700	2.472	1.911	1.591	2.749
0.30	1.347	1.579	2.105	2.693	2.744	2.593	2.161	1.822	2.744
0.40	1.160	1.362	1.861	2.489	2.831	2.609	2.439	2.154	2.831
0.50	1.015	1.190	1.658	2.273	2.742	2.632	2.545	2.386	2.742
0.75	0.791	0.903	1.278	1.800	2.348	2.355	2.418	2.418	2.355
1.0	0.632	0.702	**1.006**	1.447	1.983	2.089	2.306	2.421	2.089
1.5	0.407	0.439	0.624	0.909	1.288	1.583	1.966	2.264	1.583
2.0	0.305	0.326	0.439	0.639	0.916	1.246	1.687	2.093	1.246
3.0	0.203	0.215	0.269	0.392	0.566	0.786	1.097	1.391	0.786
4.0	0.151	0.159	0.189	0.273	0.390	0.535	0.739	0.929	0.535
5.0	0.124	0.129	0.147	0.208	0.292	0.395	0.537	0.667	0.395
7.5	0.083	0.085	0.092	0.125	0.170	0.222	0.292	0.355	0.222
10	0.059	0.061	0.065	0.085	0.111	0.141	0.180	0.214	0.141
S_{MS} (g)	1.44	1.67	2.10	2.47	2.55	2.37	2.29	2.15	2.55
S_{M1} (g)	0.63	0.70	1.01	1.45	1.98	2.24	3.04	3.77	2.24
S_{DS} (g)	0.96	1.11	1.40	1.65	1.70	1.58	1.53	1.43	1.70
S_{D1} (g)	0.42	0.47	0.67	0.96	1.32	1.49	2.02	2.51	1.49

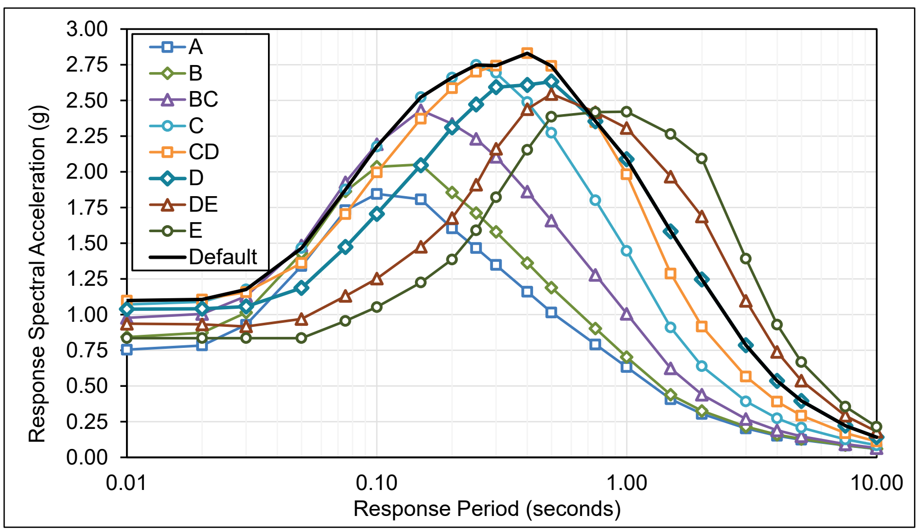


Figure E.3-11 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Ventura Site.

Table E.3-12 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Oakland Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.668	0.754	0.875	0.950	0.943	0.851	0.714	0.627	0.950
0.01	0.672	0.758	0.880	0.956	0.959	0.867	0.714	0.627	0.959
0.02	0.696	0.782	0.903	0.971	0.960	0.867	0.714	0.627	0.971
0.03	0.804	0.894	1.008	1.043	0.993	0.867	0.714	0.627	1.043
0.05	1.106	1.211	1.286	1.260	1.129	0.926	0.757	0.650	1.260
0.08	1.427	1.566	1.639	1.565	1.360	1.092	0.833	0.718	1.565
0.10	1.539	1.723	1.859	1.797	1.565	1.253	0.950	0.813	1.797
0.15	1.539	1.779	2.102	2.127	1.892	1.518	1.138	0.965	2.127
0.20	1.386	1.635	**2.052**	2.279	2.108	1.724	1.299	1.101	2.279
0.25	1.222	1.464	1.898	2.304	2.264	1.913	1.470	1.258	2.304
0.30	1.095	1.320	1.752	2.233	2.365	2.078	1.645	1.428	2.365
0.40	0.923	1.116	1.517	2.037	2.378	2.231	1.861	1.653	2.378
0.50	0.795	0.962	1.332	1.834	2.259	2.251	1.968	1.797	2.259
0.75	0.608	0.708	0.996	1.408	1.843	1.981	1.906	1.834	1.981
1.0	0.484	0.549	**0.781**	1.129	1.531	1.770	1.844	1.871	1.770
1.5	0.332	0.367	0.520	0.762	1.069	1.363	1.651	1.858	1.363
2.0	0.256	0.283	0.383	0.560	0.797	1.086	1.466	1.785	1.086
3.0	0.183	0.199	0.248	0.362	0.522	0.725	1.013	1.285	0.725
4.0	0.139	0.146	0.175	0.252	0.360	0.494	0.682	0.858	0.494
5.0	0.114	0.119	0.136	0.192	0.270	0.365	0.495	0.616	0.365
7.5	0.068	0.073	0.085	0.116	0.157	0.205	0.269	0.328	0.205
10	0.045	0.048	0.055	0.073	0.095	0.120	0.153	0.181	0.120
S_{MS} (g)	1.25	1.47	1.85	2.07	2.14	2.03	1.77	1.62	2.14
S_{M1} (g)	0.48	0.55	0.78	1.13	1.53	1.96	2.73	3.47	1.96
S_{DS} (g)	0.83	0.98	1.23	1.38	1.43	1.35	1.18	1.08	1.43
S_{D1} (g)	0.32	0.37	0.52	0.75	1.02	1.31	1.82	2.31	1.31

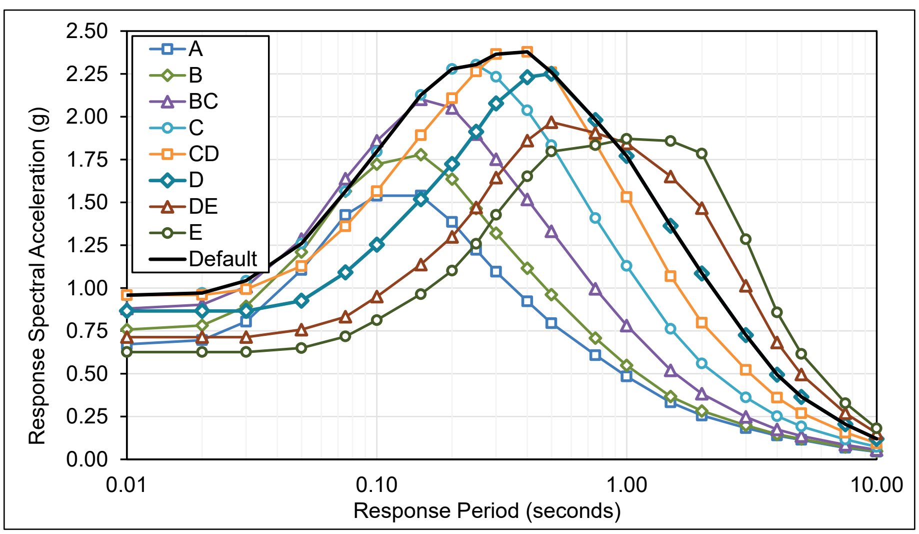


Figure E.3-12 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Oakland Site.

Table E.3-13 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Concord Site

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.878	0.991	1.148	1.227	1.186	1.038	0.841	0.725	1.227
0.01	0.883	0.996	1.154	1.241	1.210	1.050	0.841	0.725	1.241
0.02	0.920	1.034	1.192	1.261	1.210	1.050	0.841	0.725	1.261
0.03	1.071	1.190	1.337	1.357	1.258	1.068	0.848	0.725	1.357
0.05	1.492	1.634	1.716	1.645	1.430	1.134	0.848	0.729	1.645
0.08	1.932	2.120	2.188	2.038	1.714	1.328	0.999	0.841	2.038
0.10	2.082	2.330	2.480	2.332	1.959	1.510	1.101	0.923	2.332
0.15	2.067	2.389	2.808	2.756	2.352	1.804	1.291	1.067	2.756
0.20	1.842	2.173	**2.722**	2.957	2.616	2.036	1.457	1.200	2.957
0.25	1.618	1.938	2.510	3.007	2.835	2.273	1.653	1.371	3.007
0.30	1.441	1.737	2.303	2.909	2.977	2.482	1.855	1.560	2.977
0.40	1.189	1.439	1.956	2.613	2.980	2.664	2.098	1.803	2.980
0.50	1.008	1.220	1.690	2.319	2.803	2.679	2.219	1.963	2.803
0.75	0.767	0.893	1.257	1.772	2.293	2.388	2.176	2.039	2.388
1.0	0.599	0.679	**0.967**	1.395	1.876	2.119	2.133	2.116	2.119
1.5	0.387	0.427	0.606	0.887	1.238	1.559	1.856	2.065	1.559
2.0	0.284	0.313	0.424	0.620	0.881	1.194	1.606	1.950	1.194
3.0	0.189	0.209	0.267	0.391	0.562	0.787	1.107	1.383	0.787
4.0	0.135	0.148	0.184	0.268	0.381	0.529	0.736	0.915	0.529
5.0	0.104	0.114	0.138	0.196	0.274	0.374	0.513	0.632	0.374
7.5	0.063	0.068	0.080	0.110	0.148	0.194	0.256	0.311	0.194
10	0.042	0.045	0.052	0.069	0.089	0.113	0.144	0.170	0.113
S_{MS} (g)	1.66	1.96	2.45	2.71	2.68	2.41	2.00	1.77	2.71
S_{M1} (g)	0.60	0.68	0.97	1.40	1.88	2.15	2.99	3.73	2.15
S_{DS} (g)	1.11	1.30	1.63	1.80	1.79	1.61	1.33	1.18	1.80
S_{D1} (g)	0.40	0.45	0.64	0.93	1.25	1.43	1.99	2.49	1.43

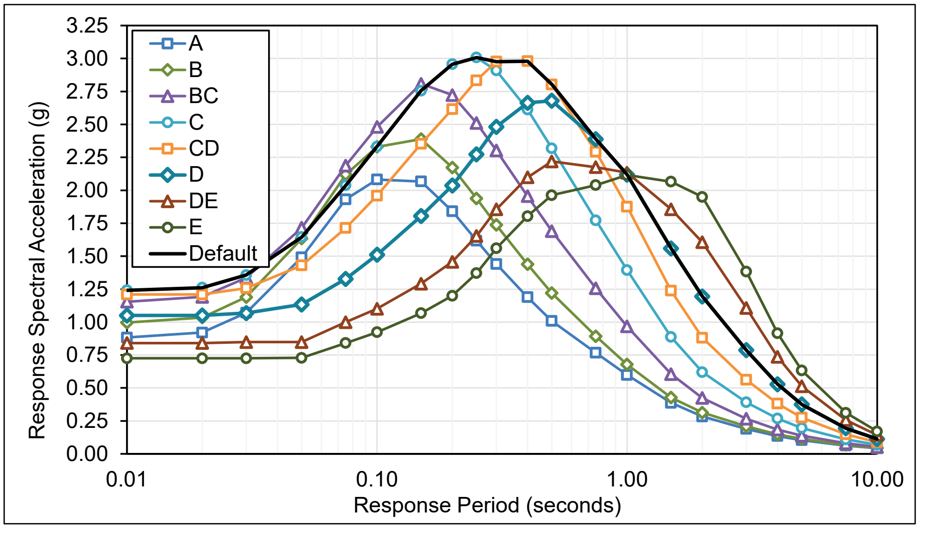


Figure E.3-13 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Concord Site.

Table E.3-14 **MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Monterey Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.490	0.550	0.644	0.729	0.786	0.789	0.761	0.679	0.789
0.01	0.493	0.553	0.648	0.733	0.791	0.794	0.767	0.679	0.794
0.02	0.509	0.569	0.662	0.742	0.794	0.795	0.764	0.679	0.795
0.03	0.595	0.653	0.739	0.801	0.834	0.813	0.760	0.679	0.834
0.05	0.840	0.902	0.968	1.003	0.992	0.928	0.824	0.709	1.003
0.08	1.082	1.171	1.258	1.290	1.256	1.168	0.920	0.789	1.290
0.10	1.161	1.285	1.431	1.500	1.481	1.390	1.056	0.905	1.500
0.15	1.145	1.303	1.568	1.727	1.765	1.682	1.265	1.074	1.765
0.20	1.023	1.186	**1.502**	1.789	1.904	1.873	1.435	1.220	1.904
0.25	0.893	1.047	1.369	1.736	1.951	1.978	1.613	1.386	1.978
0.30	0.790	0.930	1.243	1.626	1.940	2.035	1.781	1.555	2.035
0.40	0.643	0.761	1.041	1.411	1.805	1.990	1.954	1.750	1.990
0.50	0.543	0.645	0.898	1.244	1.644	1.888	2.013	1.857	1.888
0.75	0.402	0.460	0.649	0.919	1.259	1.512	1.700	1.825	1.512
1.0	0.311	0.344	**0.490**	0.705	0.989	1.242	1.473	1.651	1.242
1.5	0.212	0.225	0.318	0.464	0.664	0.883	1.138	1.353	0.883
2.0	0.167	0.176	0.234	0.340	0.489	0.671	0.916	1.140	0.671
3.0	0.120	0.126	0.154	0.224	0.324	0.449	0.627	0.793	0.449
4.0	0.095	0.099	0.117	0.169	0.241	0.330	0.456	0.572	0.330
5.0	0.081	0.085	0.096	0.136	0.190	0.257	0.349	0.433	0.257
7.5	0.060	0.061	0.066	0.090	0.121	0.159	0.208	0.254	0.159
10	0.042	0.045	0.048	0.063	0.083	0.105	0.134	0.159	0.105
S_{MS} (g)	0.92	1.07	1.35	1.61	1.76	1.83	1.81	1.67	1.83
S_{M1} (g)	0.31	0.34	0.49	0.71	0.99	1.24	1.69	2.14	1.24
S_{DS} (g)	0.61	0.71	0.90	1.07	1.17	1.22	1.21	1.11	1.22
S_{D1} (g)	0.21	0.23	0.33	0.47	0.66	0.83	1.13	1.43	0.83

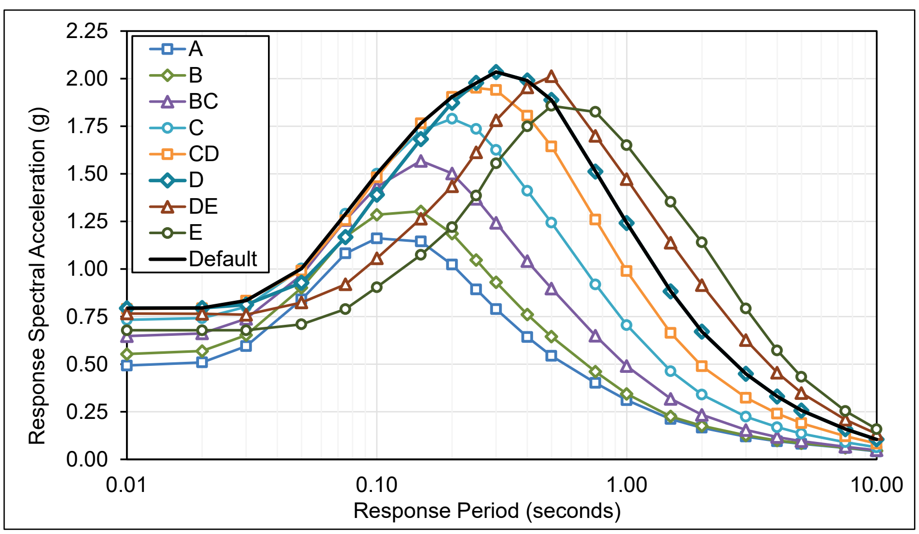


Figure E.3-14 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Monterey Site.

Table E.3-15 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Sacramento Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.221	0.248	0.290	0.334	0.377	0.403	0.420	0.435	0.403
0.01	0.222	0.249	0.291	0.336	0.379	0.405	0.423	0.438	0.405
0.02	0.229	0.256	0.297	0.339	0.379	0.405	0.422	0.434	0.405
0.03	0.263	0.288	0.327	0.364	0.398	0.415	0.422	0.429	0.415
0.05	0.357	0.384	0.419	0.450	0.471	0.474	0.467	0.464	0.474
0.08	0.456	0.494	0.543	0.580	0.602	0.602	0.592	0.591	0.602
0.10	0.495	0.550	0.624	0.684	0.724	0.736	0.737	0.724	0.736
0.15	0.493	0.564	0.682	0.788	0.874	0.921	0.950	0.875	0.921
0.20	0.442	0.516	**0.655**	0.806	0.936	1.021	1.082	1.010	1.021
0.25	0.388	0.460	0.603	0.780	0.951	1.074	1.175	1.153	1.074
0.30	0.347	0.415	0.554	0.739	0.939	1.097	1.239	1.301	1.097
0.40	0.287	0.347	0.474	0.653	0.874	1.065	1.258	1.398	1.065
0.50	0.247	0.301	0.418	0.587	0.808	1.013	1.228	1.391	1.013
0.75	0.189	0.222	0.311	0.445	0.626	0.809	1.013	1.192	0.809
1.0	0.149	0.168	**0.238**	0.346	0.494	0.655	0.850	1.024	0.655
1.5	0.105	0.115	0.161	0.237	0.343	0.468	0.634	0.791	0.468
2.0	0.085	0.092	0.123	0.179	0.259	0.356	0.490	0.625	0.356
3.0	0.061	0.066	0.082	0.120	0.173	0.238	0.329	0.423	0.238
4.0	0.047	0.051	0.062	0.091	0.128	0.174	0.238	0.304	0.174
5.0	0.040	0.043	0.051	0.073	0.101	0.135	0.181	0.229	0.135
7.5	0.032	0.034	0.039	0.054	0.073	0.094	0.123	0.155	0.094
10	0.026	0.029	0.033	0.044	0.057	0.072	0.091	0.112	0.072
S_{MS} (g)	0.40	0.46	0.59	0.73	0.86	0.99	1.13	1.26	0.99
S_{M1} (g)	0.15	0.17	0.24	0.35	0.49	0.66	0.89	1.14	0.66
S_{DS} (g)	0.27	0.31	0.39	0.48	0.57	0.66	0.75	0.84	0.66
S_{D1} (g)	0.10	0.11	0.16	0.23	0.33	0.44	0.59	0.76	0.44

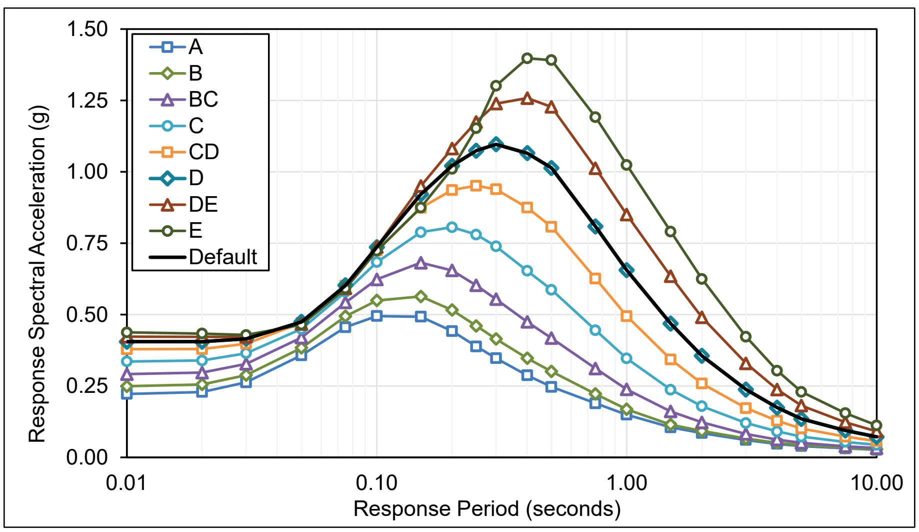


Figure E.3-15 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Sacramento Site.

Table E.3-16 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, San Francisco Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.519	0.586	0.683	0.753	0.768	0.718	0.629	0.564	0.768
0.01	0.522	0.589	0.686	0.757	0.775	0.729	0.636	0.564	0.775
0.02	0.539	0.606	0.702	0.767	0.776	0.729	0.636	0.564	0.776
0.03	0.620	0.689	0.780	0.823	0.808	0.729	0.636	0.564	0.823
0.05	0.846	0.926	0.995	0.998	0.924	0.788	0.644	0.574	0.998
0.08	1.088	1.195	1.269	1.245	1.123	0.938	0.743	0.649	1.245
0.10	1.173	1.313	1.437	1.431	1.297	1.086	0.861	0.754	1.431
0.15	1.173	1.356	1.612	1.684	1.569	1.325	1.047	0.914	1.684
0.20	1.062	1.253	**1.573**	1.791	1.739	1.505	1.204	1.055	1.791
0.25	0.936	1.121	1.454	1.792	1.844	1.653	1.355	1.202	1.844
0.30	0.839	1.011	1.343	1.729	1.903	1.774	1.501	1.353	1.903
0.40	0.706	0.854	1.163	1.568	1.880	1.865	1.664	1.538	1.880
0.50	0.609	0.737	1.021	1.412	1.774	1.858	1.733	1.646	1.858
0.75	0.462	0.538	0.760	1.074	1.424	1.593	1.628	1.619	1.593
1.0	0.368	0.417	**0.600**	0.859	1.172	1.397	1.524	1.593	1.397
1.5	0.261	0.288	0.410	0.600	0.839	1.086	1.348	1.540	1.086
2.0	0.207	0.228	0.309	0.452	0.640	0.877	1.192	1.458	0.877
3.0	0.152	0.167	0.214	0.314	0.449	0.632	0.889	1.111	0.632
4.0	0.120	0.132	0.164	0.238	0.339	0.471	0.653	0.815	0.471
5.0	0.100	0.109	0.132	0.188	0.263	0.359	0.492	0.607	0.359
7.5	0.063	0.068	0.080	0.110	0.148	0.194	0.256	0.311	0.194
10	0.042	0.045	0.052	0.069	0.089	0.113	0.144	0.170	0.113
S_{MS} (g)	0.96	1.13	1.42	1.61	1.71	1.68	1.56	1.48	1.71
S_{M1} (g)	0.37	0.42	0.60	0.86	1.22	1.71	2.40	3.00	1.71
S_{DS} (g)	0.64	0.75	0.94	1.07	1.14	1.12	1.04	0.99	1.14
S_{D1} (g)	0.25	0.28	0.40	0.57	0.81	1.14	1.60	2.00	1.14

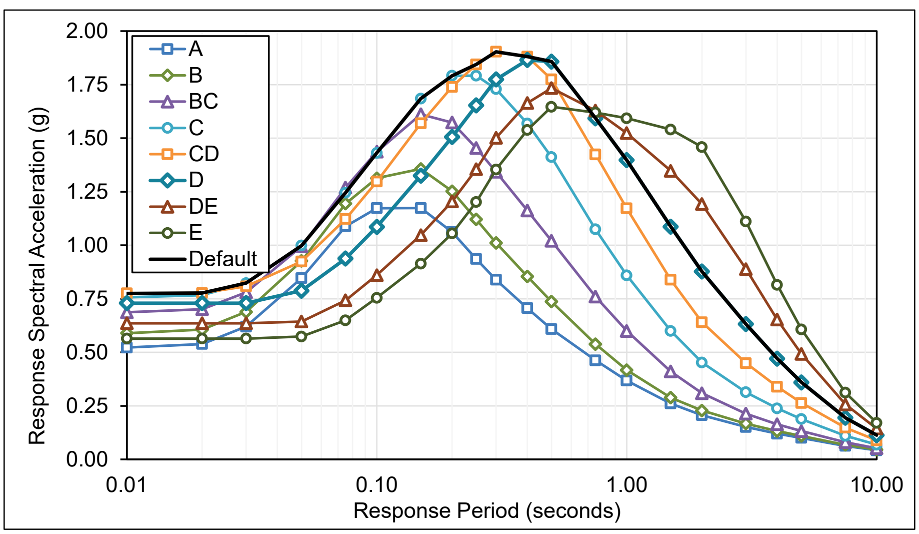


Figure E.3-16 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, San Francisco Site.

Table E.3-17 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, San Mateo Site

Period T (s)	5%-Damped Response Spectral Acceleration (g)								
	A	B	BC	C	CD	D	DE	E	Default
0.00	0.678	0.765	0.889	0.965	0.958	0.865	0.726	0.637	0.965
0.01	0.682	0.769	0.893	0.970	0.974	0.880	0.726	0.637	0.974
0.02	0.706	0.794	0.916	0.986	0.975	0.880	0.726	0.637	0.986
0.03	0.815	0.906	1.022	1.058	1.008	0.880	0.726	0.637	1.058
0.05	1.120	1.226	1.303	1.277	1.145	0.939	0.769	0.660	1.277
0.08	1.443	1.584	1.659	1.586	1.379	1.107	0.845	0.729	1.586
0.10	1.556	1.742	1.881	1.819	1.585	1.271	0.964	0.825	1.819
0.15	1.557	1.799	2.126	2.152	1.916	1.539	1.154	0.979	2.152
0.20	1.403	1.655	**2.077**	2.308	2.136	1.749	1.319	1.118	2.308
0.25	1.249	1.496	1.946	2.335	2.296	1.941	1.493	1.278	2.335
0.30	1.128	1.360	1.816	2.286	2.401	2.110	1.672	1.452	2.401
0.40	0.964	1.166	1.603	2.121	2.421	2.272	1.895	1.684	2.421
0.50	0.839	1.016	1.428	1.936	2.327	2.297	2.008	1.834	2.327
0.75	0.654	0.761	1.094	1.520	1.938	2.067	1.989	1.914	2.067
1.0	0.528	0.599	**0.875**	1.240	1.636	1.879	1.957	1.918	1.879
1.5	0.372	0.411	0.588	0.862	1.173	1.490	1.804	1.918	1.490
2.0	0.292	0.322	0.436	0.638	0.892	1.212	1.637	1.918	1.212
3.0	0.211	0.232	0.297	0.436	0.626	0.877	1.234	1.542	0.877
4.0	0.164	0.180	0.223	0.325	0.462	0.640	0.891	1.109	0.640
5.0	0.134	0.147	0.177	0.253	0.353	0.482	0.660	0.814	0.482
7.5	0.081	0.087	0.103	0.141	0.189	0.249	0.328	0.398	0.249
10	0.054	0.057	0.066	0.087	0.113	0.143	0.183	0.217	0.143
S_{MS} (g)	1.26	1.49	1.87	2.10	2.18	2.07	1.81	1.65	2.18
S_{M1} (g)	0.53	0.60	0.87	1.24	1.69	2.37	3.33	4.16	2.37
S_{DS} (g)	0.84	0.99	1.25	1.40	1.45	1.38	1.20	1.10	1.45
S_{D1} (g)	0.35	0.40	0.58	0.83	1.13	1.58	2.22	2.77	1.58

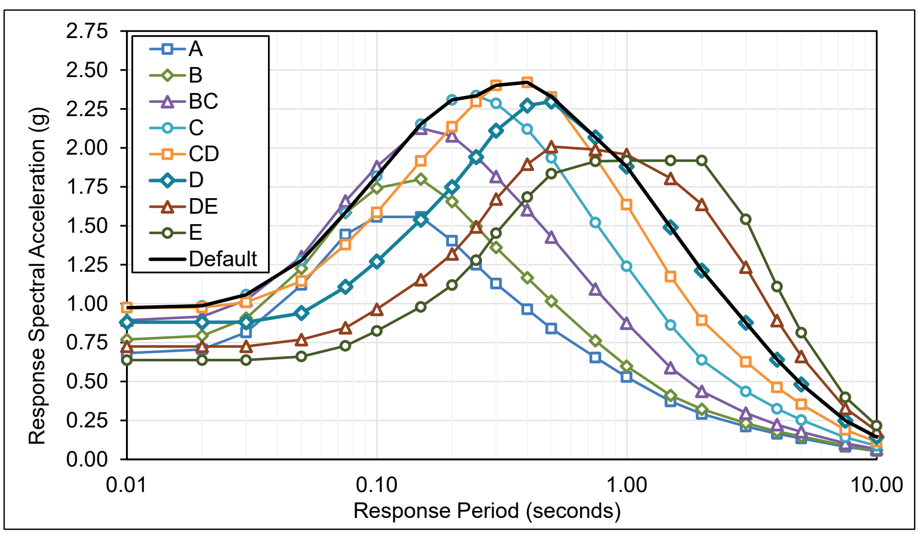


Figure E.3-17 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, San Mateo Site.

Table E.3-18 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, San Jose Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.811	0.888	0.955	0.958	0.888	0.758	0.620	0.551	0.958
0.08	1.040	1.142	1.214	1.193	1.076	0.900	0.713	0.624	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.825	0.724	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.002	0.875	1.606
0.20	1.012	1.194	**1.500**	1.710	1.662	1.440	1.153	1.010	1.710
0.25	0.897	1.075	1.397	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.810	0.976	1.299	1.665	1.829	1.705	1.443	1.301	1.829
0.40	0.689	0.833	1.138	1.525	1.823	1.802	1.607	1.484	1.823
0.50	0.598	0.724	1.009	1.385	1.734	1.803	1.681	1.596	1.803
0.75	0.460	0.536	0.760	1.067	1.407	1.566	1.598	1.589	1.566
1.0	0.368	0.417	**0.600**	0.859	1.168	1.388	1.512	1.578	1.388
1.5	0.261	0.288	0.410	0.600	0.839	1.086	1.348	1.540	1.086
2.0	0.207	0.228	0.309	0.452	0.640	0.877	1.192	1.458	0.877
3.0	0.152	0.167	0.214	0.314	0.449	0.632	0.889	1.111	0.632
4.0	0.120	0.132	0.164	0.238	0.339	0.471	0.655	0.815	0.471
5.0	0.100	0.109	0.132	0.188	0.263	0.359	0.492	0.607	0.359
7.5	0.063	0.068	0.080	0.110	0.148	0.194	0.256	0.311	0.194
10	0.042	0.045	0.052	0.069	0.089	0.113	0.144	0.170	0.113
S_{MS} (g)	0.91	1.07	1.35	1.54	1.65	1.62	1.51	1.44	1.65
S_{M1} (g)	0.37	0.42	0.60	0.86	1.22	1.71	2.40	3.00	1.71
S_{DS} (g)	0.61	0.72	0.90	1.03	1.10	1.08	1.01	0.96	1.10
S_{D1} (g)	0.25	0.28	0.40	0.57	0.81	1.14	1.60	2.00	1.14

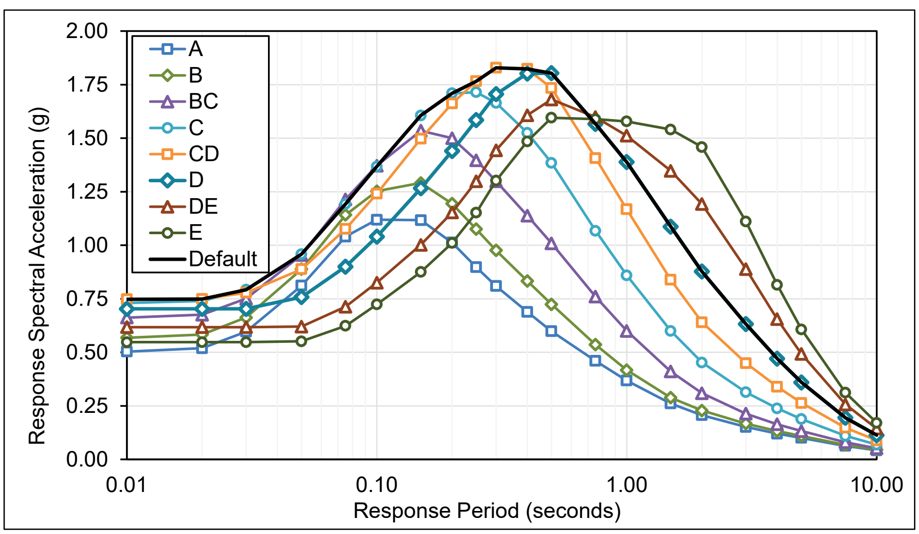


Figure E.3-18 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, San Jose Site.

Table E.3-19 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Santa Cruz Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.544	0.615	0.716	0.789	0.805	0.753	0.659	0.592	0.805
0.01	0.547	0.618	0.720	0.793	0.812	0.765	0.667	0.592	0.812
0.02	0.565	0.635	0.735	0.804	0.814	0.765	0.667	0.592	0.814
0.03	0.649	0.722	0.817	0.863	0.846	0.765	0.667	0.592	0.863
0.05	0.886	0.970	1.042	1.045	0.968	0.825	0.675	0.601	1.045
0.08	1.138	1.250	1.328	1.303	1.175	0.982	0.778	0.680	1.303
0.10	1.227	1.373	1.503	1.497	1.357	1.136	0.901	0.790	1.497
0.15	1.226	1.417	1.684	1.761	1.641	1.386	1.096	0.956	1.761
0.20	1.110	1.309	**1.645**	1.873	1.819	1.575	1.260	1.104	1.873
0.25	0.979	1.172	1.521	1.875	1.930	1.730	1.418	1.258	1.930
0.30	0.878	1.059	1.406	1.811	1.994	1.858	1.573	1.418	1.994
0.40	0.740	0.896	1.219	1.644	1.972	1.956	1.745	1.612	1.972
0.50	0.639	0.763	1.067	1.473	1.863	1.950	1.819	1.728	1.950
0.75	0.479	0.546	0.777	1.097	1.477	1.674	1.711	1.701	1.674
1.0	0.372	0.411	**0.591**	0.851	1.176	1.438	1.603	1.675	1.438
1.5	0.252	0.269	0.382	0.558	0.795	1.036	1.312	1.542	1.036
2.0	0.198	0.210	0.281	0.409	0.587	0.799	1.086	1.351	0.799
3.0	0.142	0.150	0.186	0.271	0.391	0.542	0.756	0.958	0.542
4.0	0.114	0.119	0.142	0.205	0.291	0.399	0.550	0.692	0.399
5.0	0.098	0.102	0.116	0.164	0.230	0.310	0.420	0.523	0.310
7.5	0.063	0.068	0.077	0.104	0.140	0.183	0.240	0.292	0.183
10	0.042	0.045	0.052	0.069	0.089	0.113	0.144	0.170	0.113
S_{MS} (g)	1.00	1.18	1.48	1.69	1.79	1.76	1.64	1.55	1.79
S_{M1} (g)	0.37	0.41	0.59	0.85	1.18	1.46	2.04	2.59	1.46
S_{DS} (g)	0.67	0.79	0.99	1.12	1.20	1.17	1.09	1.04	1.20
S_{D1} (g)	0.25	0.27	0.39	0.57	0.78	0.98	1.36	1.72	0.98

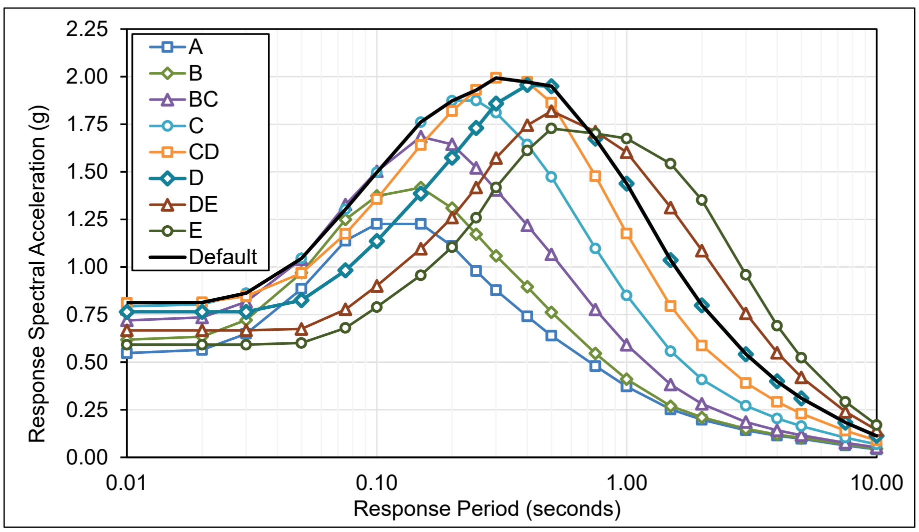


Figure E.3-19 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Santa Cruz Site.

Table E.3-20 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Vallejo Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.748	0.844	0.978	1.047	1.015	0.890	0.721	0.622	1.047
0.01	0.752	0.849	0.984	1.059	1.033	0.899	0.721	0.622	1.059
0.02	0.783	0.880	1.014	1.075	1.033	0.899	0.721	0.622	1.075
0.03	0.909	1.010	1.135	1.154	1.072	0.914	0.725	0.622	1.154
0.05	1.258	1.378	1.449	1.392	1.214	0.965	0.725	0.623	1.392
0.08	1.623	1.781	1.842	1.720	1.451	1.127	0.849	0.716	1.720
0.10	1.748	1.956	2.087	1.967	1.658	1.282	0.938	0.787	1.967
0.15	1.741	2.012	2.367	2.330	1.995	1.536	1.102	0.913	2.330
0.20	1.560	1.841	**2.307**	2.510	2.228	1.739	1.248	1.030	2.510
0.25	1.379	1.652	2.140	2.566	2.424	1.949	1.420	1.180	2.566
0.30	1.237	1.491	1.977	2.499	2.562	2.139	1.602	1.347	2.562
0.40	1.040	1.258	1.710	2.285	2.609	2.333	1.837	1.578	2.609
0.50	0.895	1.083	1.500	2.057	2.489	2.376	1.964	1.736	2.489
0.75	0.692	0.806	1.134	1.599	2.069	2.148	1.955	1.830	2.148
1.0	0.552	0.625	**0.890**	1.283	1.727	1.944	1.947	1.924	1.944
1.5	0.373	0.403	0.573	0.836	1.184	1.476	1.775	1.925	1.476
2.0	0.280	0.299	0.404	0.587	0.842	1.145	1.550	1.924	1.145
3.0	0.186	0.198	0.247	0.360	0.520	0.722	1.008	1.279	0.722
4.0	0.139	0.146	0.174	0.251	0.358	0.492	0.679	0.854	0.492
5.0	0.114	0.118	0.135	0.192	0.269	0.363	0.493	0.613	0.363
7.5	0.068	0.074	0.085	0.115	0.156	0.204	0.268	0.326	0.204
10	0.045	0.049	0.056	0.074	0.096	0.121	0.155	0.183	0.121
S_{MS} (g)	1.40	1.66	2.08	2.31	2.35	2.14	1.77	1.56	2.35
S_{M1} (g)	0.55	0.62	0.89	1.28	1.73	2.06	2.79	3.46	2.06
S_{DS} (g)	0.94	1.10	1.38	1.54	1.57	1.43	1.18	1.04	1.57
S_{D1} (g)	0.37	0.42	0.59	0.86	1.15	1.37	1.86	2.31	1.37

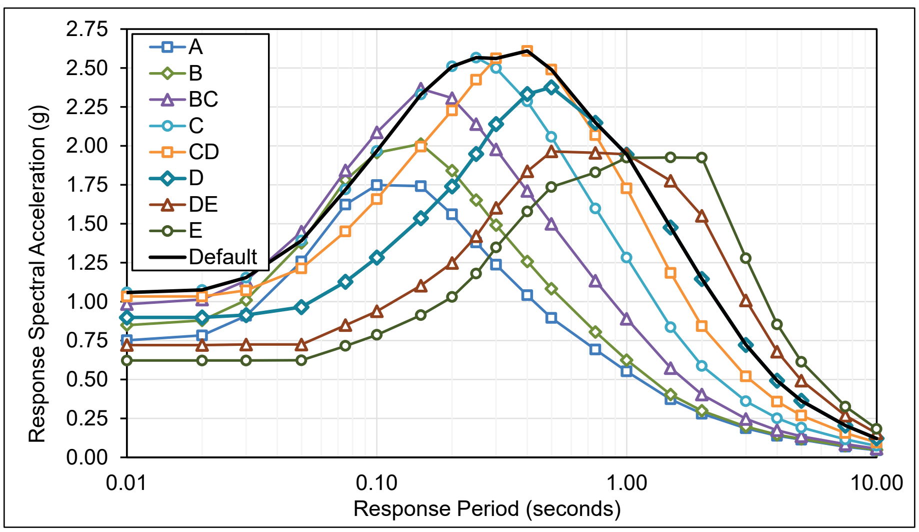


Figure E.3-20 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Vallejo Site.

Table E.3-21 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Santa Rosa Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.897	1.013	1.174	1.260	1.224	1.076	0.874	0.754	1.260
0.01	0.903	1.019	1.181	1.272	1.244	1.085	0.874	0.754	1.272
0.02	0.938	1.054	1.215	1.291	1.244	1.085	0.874	0.754	1.291
0.03	1.086	1.206	1.357	1.383	1.289	1.103	0.875	0.754	1.383
0.05	1.496	1.638	1.725	1.663	1.454	1.160	0.875	0.754	1.663
0.08	1.925	2.112	2.188	2.050	1.735	1.353	1.021	0.863	2.050
0.10	2.071	2.318	2.477	2.343	1.983	1.539	1.130	0.950	2.343
0.15	2.067	2.388	2.811	2.777	2.389	1.847	1.332	1.105	2.777
0.20	1.860	2.194	**2.750**	3.001	2.675	2.098	1.513	1.251	3.001
0.25	1.656	1.983	2.572	3.075	2.917	2.355	1.724	1.436	3.075
0.30	1.497	1.805	2.398	3.019	3.094	2.594	1.950	1.645	3.094
0.40	1.281	1.550	2.115	2.811	3.189	2.859	2.259	1.944	3.189
0.50	1.118	1.353	1.883	2.568	3.083	2.939	2.435	2.154	3.083
0.75	0.878	1.022	1.449	2.031	2.603	2.697	2.458	2.307	2.697
1.0	0.712	0.807	**1.160**	1.662	2.213	2.483	2.458	2.428	2.483
1.5	0.479	0.516	0.733	1.069	1.514	1.869	2.321	2.428	1.869
2.0	0.358	0.383	0.516	0.751	1.077	1.465	1.983	2.428	1.465
3.0	0.239	0.253	0.316	0.461	0.665	0.924	1.289	1.636	0.924
4.0	0.178	0.187	0.223	0.321	0.458	0.629	0.868	1.092	0.629
5.0	0.145	0.152	0.173	0.245	0.343	0.464	0.631	0.785	0.464
7.5	0.098	0.100	0.108	0.147	0.199	0.261	0.343	0.418	0.261
10	0.070	0.071	0.076	0.100	0.131	0.166	0.212	0.252	0.166
S_{MS} (g)	1.67	1.97	2.47	2.77	2.87	2.64	2.19	1.94	2.87
S_{M1} (g)	0.71	0.81	1.16	1.66	2.21	2.64	3.57	4.42	2.64
S_{DS} (g)	1.12	1.32	1.65	1.85	1.91	1.76	1.46	1.29	1.91
S_{D1} (g)	0.47	0.54	0.77	1.11	1.48	1.76	2.38	2.94	1.76

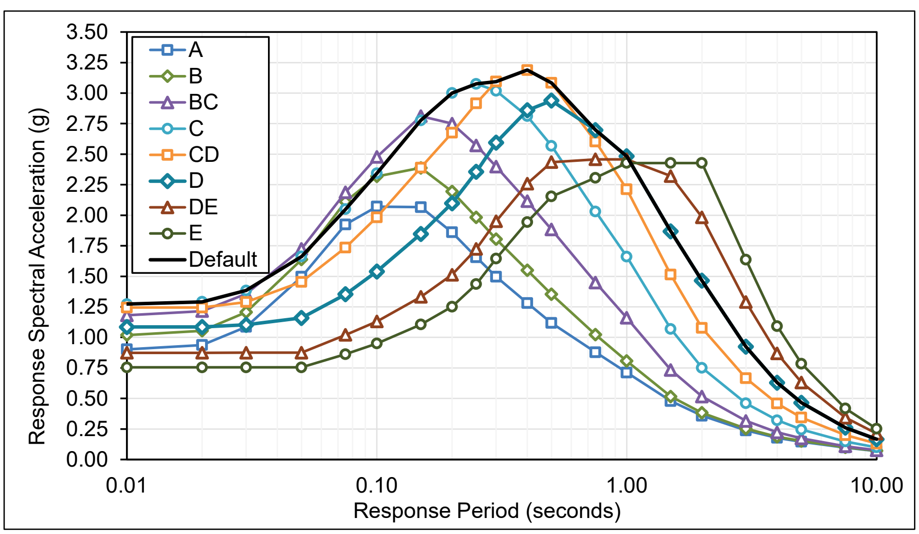


Figure E.3-21 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Santa Rosa Site.

Table E.3-22 **MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Seattle Site**

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.629	0.698	0.787	0.853	0.889	0.884	0.748	0.657	0.889
0.01	0.631	0.701	0.789	0.854	0.889	0.884	0.748	0.657	0.889
0.02	0.715	0.764	0.845	0.903	0.927	0.906	0.748	0.657	0.927
0.03	0.820	0.867	0.937	0.972	0.974	0.906	0.748	0.657	0.974
0.05	1.086	1.143	1.167	1.147	1.090	0.965	0.791	0.680	1.147
0.08	1.402	1.499	1.545	1.525	1.412	1.135	0.868	0.749	1.525
0.10	1.586	1.751	1.875	1.858	1.622	1.302	0.989	0.847	1.858
0.15	1.505	1.723	2.003	2.160	1.960	1.576	1.184	1.005	2.160
0.20	1.274	1.504	**1.862**	2.153	2.187	1.794	1.355	1.150	2.187
0.25	1.105	1.336	1.718	2.138	2.342	1.993	1.535	1.315	2.342
0.30	0.983	1.203	1.586	2.056	2.340	2.171	1.721	1.496	2.340
0.40	0.816	1.010	1.362	1.840	2.200	2.316	1.960	1.742	2.316
0.50	0.682	0.849	1.170	1.618	2.006	2.182	2.085	1.905	2.182
0.75	0.506	0.625	0.877	1.245	1.601	1.814	2.013	1.981	1.814
1.0	0.400	0.494	**0.705**	1.030	1.353	1.598	1.867	2.009	1.598
1.5	0.260	0.321	0.461	0.683	0.963	1.204	1.523	1.910	1.204
2.0	0.192	0.238	0.336	0.499	0.710	0.950	1.275	1.675	0.950
3.0	0.122	0.151	0.209	0.313	0.445	0.601	0.819	1.087	0.601
4.0	0.088	0.109	0.149	0.221	0.308	0.409	0.548	0.725	0.409
5.0	0.069	0.085	0.112	0.163	0.223	0.291	0.383	0.503	0.291
7.5	0.045	0.054	0.070	0.100	0.132	0.167	0.213	0.282	0.167
10	0.037	0.044	0.056	0.077	0.098	0.120	0.148	0.190	0.120
S_{MS} (g)	1.15	1.35	1.68	1.94	2.11	2.08	1.88	1.71	2.11
S_{M1} (g)	0.40	0.49	0.71	1.03	1.35	1.71	2.30	3.01	1.71
S_{DS} (g)	0.76	0.90	1.12	1.29	1.41	1.39	1.25	1.14	1.41
S_{D1} (g)	0.27	0.33	0.47	0.69	0.90	1.14	1.53	2.01	1.14

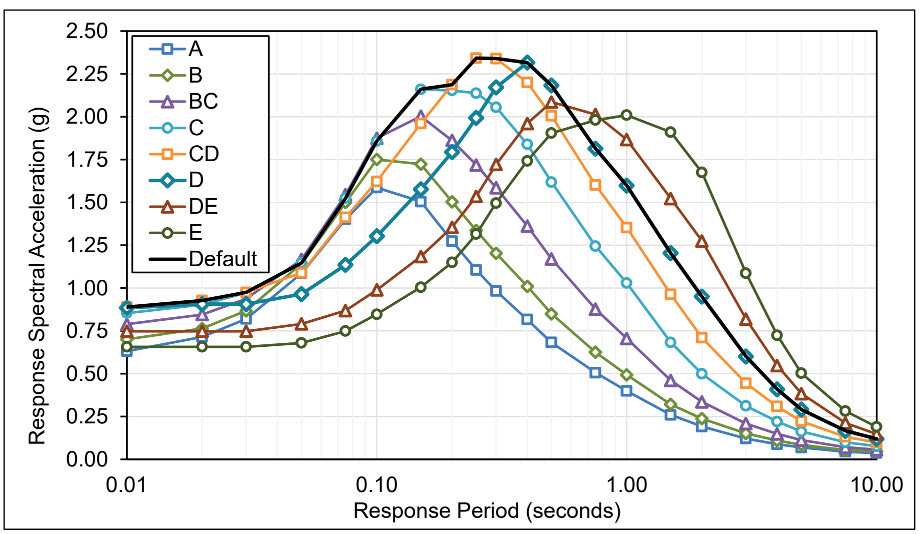


Figure E.3-22 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Seattle Site.

Table E.3-23 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Tacoma Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.811	0.888	0.955	0.958	0.888	0.758	0.620	0.551	0.958
0.08	1.040	1.142	1.214	1.193	1.076	0.900	0.713	0.624	1.193
0.10	1.119	1.252	1.371	1.368	1.241	1.040	0.825	0.724	1.368
0.15	1.117	1.291	1.535	1.606	1.497	1.266	1.002	0.875	1.606
0.20	1.012	1.194	**1.500**	1.710	1.662	1.440	1.153	1.010	1.710
0.25	0.897	1.075	1.397	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.783	0.960	1.265	1.645	1.829	1.705	1.443	1.301	1.829
0.40	0.624	0.774	1.044	1.405	1.755	1.802	1.607	1.484	1.802
0.50	0.506	0.633	0.872	1.198	1.557	1.796	1.681	1.596	1.796
0.75	0.357	0.444	0.622	0.874	1.183	1.414	1.598	1.589	1.414
1.0	0.275	0.343	**0.490**	0.706	0.981	1.211	1.466	1.578	1.211
1.5	0.181	0.226	0.325	0.482	0.682	0.880	1.133	1.441	0.880
2.0	0.136	0.170	0.240	0.358	0.509	0.682	0.918	1.213	0.682
3.0	0.088	0.110	0.153	0.229	0.326	0.439	0.598	0.795	0.439
4.0	0.065	0.081	0.111	0.165	0.230	0.305	0.408	0.541	0.305
5.0	0.052	0.064	0.085	0.123	0.168	0.219	0.289	0.380	0.219
7.5	0.035	0.042	0.054	0.077	0.102	0.129	0.164	0.218	0.129
10	0.029	0.035	0.044	0.060	0.077	0.094	0.115	0.149	0.094
S_{MS} (g)	0.91	1.07	1.35	1.54	1.65	1.62	1.51	1.44	1.65
S_{M1} (g)	0.28	0.34	0.49	0.71	0.98	1.23	1.65	2.18	1.23
S_{DS} (g)	0.61	0.72	0.90	1.03	1.10	1.08	1.01	0.96	1.10
S_{D1} (g)	0.18	0.23	0.33	0.47	0.65	0.82	1.10	1.46	0.82

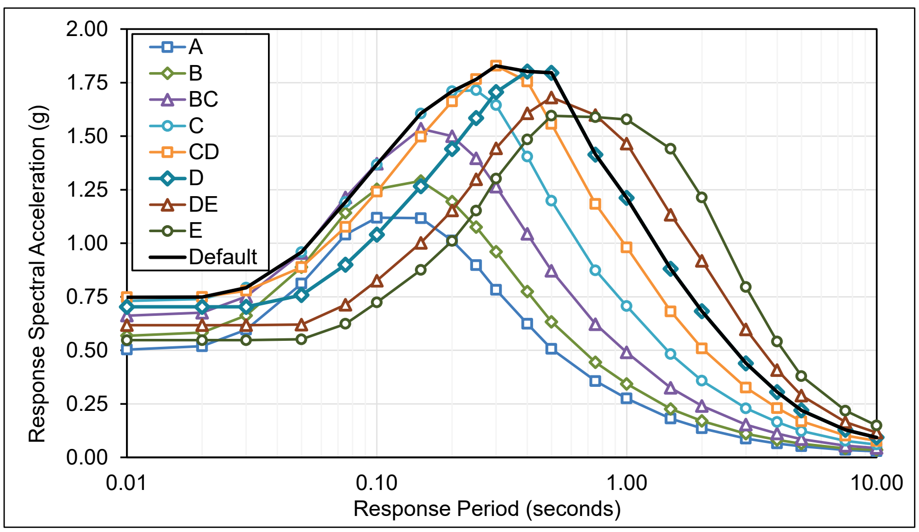


Figure E.3-23 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Tacoma Site.

Table E.3-24 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Everett Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.484	0.538	0.607	0.665	0.707	0.719	0.622	0.547	0.719
0.01	0.486	0.540	0.608	0.665	0.707	0.718	0.622	0.547	0.718
0.02	0.553	0.589	0.653	0.705	0.740	0.742	0.622	0.547	0.742
0.03	0.630	0.665	0.721	0.760	0.778	0.757	0.622	0.547	0.778
0.05	0.824	0.867	0.893	0.894	0.870	0.811	0.662	0.567	0.894
0.08	1.067	1.141	1.190	1.198	1.173	0.957	0.728	0.628	1.198
0.10	1.218	1.343	1.453	1.513	1.375	1.100	0.832	0.724	1.513
0.15	1.157	1.325	1.545	1.704	1.664	1.333	1.002	0.875	1.704
0.20	0.979	1.157	**1.431**	1.684	1.837	1.512	1.153	1.010	1.837
0.25	0.834	1.010	1.298	1.623	1.852	1.675	1.299	1.153	1.852
0.30	0.730	0.896	1.180	1.526	1.812	1.815	1.443	1.301	1.815
0.40	0.593	0.735	0.991	1.323	1.653	1.829	1.615	1.484	1.829
0.50	0.487	0.610	0.839	1.141	1.482	1.689	1.700	1.596	1.689
0.75	0.351	0.437	0.613	0.848	1.149	1.356	1.568	1.589	1.356
1.0	0.276	0.344	**0.491**	0.695	0.965	1.177	1.420	1.601	1.177
1.5	0.182	0.227	0.325	0.483	0.683	0.871	1.120	1.424	0.871
2.0	0.136	0.170	0.240	0.358	0.509	0.683	0.920	1.215	0.683
3.0	0.088	0.110	0.153	0.229	0.326	0.440	0.599	0.796	0.440
4.0	0.065	0.082	0.111	0.165	0.231	0.305	0.408	0.541	0.305
5.0	0.052	0.064	0.085	0.123	0.169	0.220	0.289	0.380	0.220
7.5	0.035	0.042	0.055	0.077	0.102	0.129	0.165	0.218	0.129
10	0.029	0.035	0.044	0.060	0.077	0.094	0.116	0.149	0.094
S_{MS} (g)	0.88	1.04	1.29	1.52	1.67	1.65	1.53	1.44	1.67
S_{M1} (g)	0.28	0.34	0.49	0.69	0.96	1.23	1.66	2.19	1.23
S_{DS} (g)	0.59	0.69	0.86	1.01	1.11	1.10	1.02	0.96	1.11
S_{D1} (g)	0.18	0.23	0.33	0.46	0.64	0.82	1.10	1.46	0.82

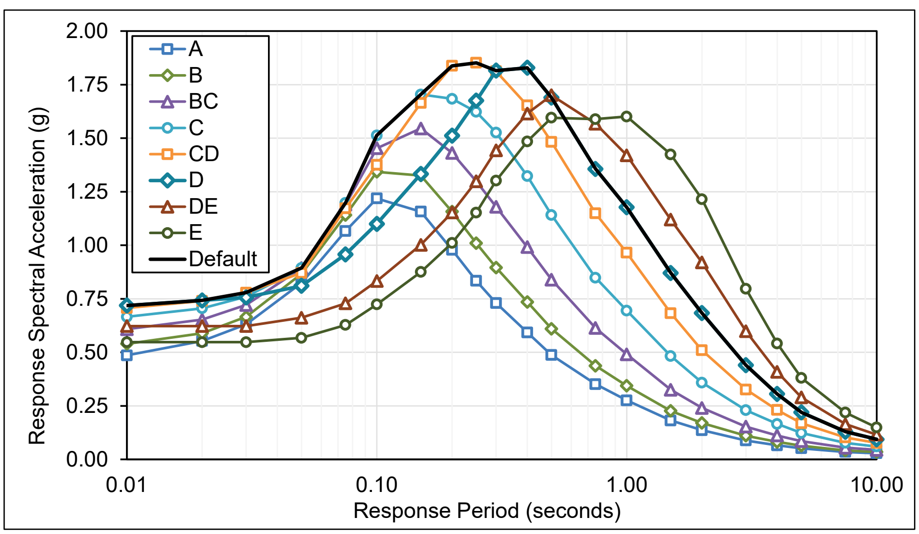


Figure E.3-24 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Everett Site.

Table E.3-25 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Portland Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.340	0.378	0.425	0.462	0.488	0.495	0.487	0.497	0.495
0.01	0.341	0.379	0.425	0.462	0.488	0.494	0.487	0.496	0.494
0.02	0.372	0.404	0.445	0.476	0.495	0.495	0.480	0.479	0.495
0.03	0.417	0.447	0.481	0.502	0.510	0.498	0.472	0.463	0.510
0.05	0.530	0.559	0.575	0.574	0.558	0.524	0.478	0.460	0.574
0.08	0.674	0.723	0.753	0.757	0.736	0.694	0.638	0.621	0.757
0.10	0.770	0.850	0.916	0.947	0.944	0.906	0.851	0.845	0.947
0.15	0.751	0.862	1.001	1.097	1.136	1.121	1.077	1.069	1.136
0.20	0.648	0.767	**0.949**	1.107	1.200	1.225	1.213	1.214	1.225
0.25	0.553	0.673	0.864	1.079	1.225	1.291	1.318	1.379	1.291
0.30	0.488	0.604	0.793	1.036	1.220	1.325	1.387	1.494	1.325
0.40	0.399	0.502	0.673	0.917	1.136	1.282	1.398	1.540	1.282
0.50	0.331	0.422	0.577	0.806	1.043	1.215	1.367	1.558	1.215
0.75	0.245	0.315	0.437	0.627	0.850	1.027	1.206	1.447	1.027
1.0	0.194	0.253	**0.358**	0.530	0.736	0.916	1.120	1.382	0.916
1.5	0.137	0.180	0.258	0.386	0.544	0.706	0.912	1.177	0.706
2.0	0.105	0.139	0.199	0.298	0.422	0.562	0.756	1.014	0.562
3.0	0.070	0.092	0.131	0.197	0.279	0.374	0.505	0.680	0.374
4.0	0.053	0.070	0.097	0.145	0.202	0.265	0.352	0.472	0.265
5.0	0.042	0.055	0.075	0.109	0.148	0.192	0.251	0.333	0.192
7.5	0.029	0.037	0.049	0.070	0.092	0.116	0.147	0.198	0.116
10	0.026	0.032	0.041	0.056	0.071	0.087	0.107	0.138	0.087
S_{MS} (g)	0.58	0.69	0.85	1.00	1.10	1.19	1.26	1.40	1.19
S_{M1} (g)	0.19	0.25	0.36	0.54	0.76	1.01	1.36	1.84	1.01
S_{DS} (g)	0.39	0.46	0.57	0.66	0.73	0.80	0.84	0.93	0.80
S_{D1} (g)	0.13	0.17	0.24	0.36	0.51	0.67	0.91	1.22	0.67

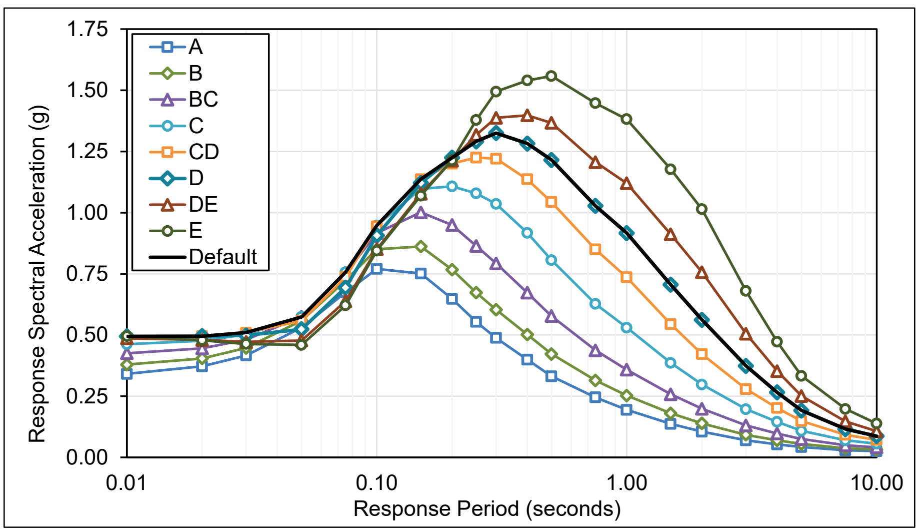


Figure E.3-25 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Portland Site.

Table E.3-26 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Salt Lake City Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.559	0.625	0.727	0.803	0.833	0.799	0.732	0.694	0.833
0.01	0.562	0.629	0.731	0.807	0.838	0.804	0.738	0.694	0.838
0.02	0.584	0.651	0.751	0.820	0.843	0.806	0.735	0.694	0.843
0.03	0.689	0.754	0.842	0.886	0.883	0.820	0.725	0.677	0.886
0.05	0.988	1.056	1.106	1.105	1.041	0.924	0.795	0.722	1.105
0.08	1.277	1.377	1.437	1.416	1.308	1.152	0.929	0.800	1.416
0.10	1.365	1.508	1.638	1.646	1.536	1.365	1.063	0.909	1.646
0.15	1.341	1.524	1.812	1.906	1.828	1.647	1.273	1.079	1.906
0.20	1.191	1.378	**1.739**	1.999	1.986	1.820	1.451	1.229	1.999
0.25	1.059	1.239	1.616	2.004	2.062	1.939	1.638	1.401	2.062
0.30	0.952	1.119	1.492	1.920	2.081	2.022	1.825	1.584	2.081
0.40	0.795	0.935	1.279	1.717	2.040	2.072	1.943	1.814	2.072
0.50	0.680	0.800	1.115	1.534	1.913	2.026	1.964	1.936	2.026
0.75	0.512	0.585	0.829	1.169	1.549	1.716	1.762	1.821	1.716
1.0	0.401	0.445	**0.638**	0.917	1.264	1.468	1.612	1.734	1.468
1.5	0.260	0.280	0.397	0.580	0.823	1.069	1.310	1.526	1.069
2.0	0.197	0.210	0.282	0.410	0.589	0.802	1.088	1.352	0.802
3.0	0.133	0.140	0.174	0.254	0.367	0.509	0.710	0.901	0.509
4.0	0.099	0.104	0.124	0.179	0.256	0.351	0.484	0.608	0.351
5.0	0.082	0.085	0.097	0.138	0.193	0.261	0.354	0.440	0.261
7.5	0.056	0.057	0.062	0.084	0.114	0.149	0.197	0.239	0.149
10	0.040	0.041	0.044	0.058	0.076	0.096	0.123	0.147	0.096
S_{MS} (g)	1.07	1.24	1.57	1.80	1.87	1.86	1.77	1.74	1.87
S_{M1} (g)	0.40	0.45	0.64	0.92	1.26	1.47	1.96	2.43	1.47
S_{DS} (g)	0.71	0.83	1.04	1.20	1.25	1.24	1.18	1.16	1.25
S_{D1} (g)	0.27	0.30	0.43	0.61	0.84	0.98	1.31	1.62	0.98

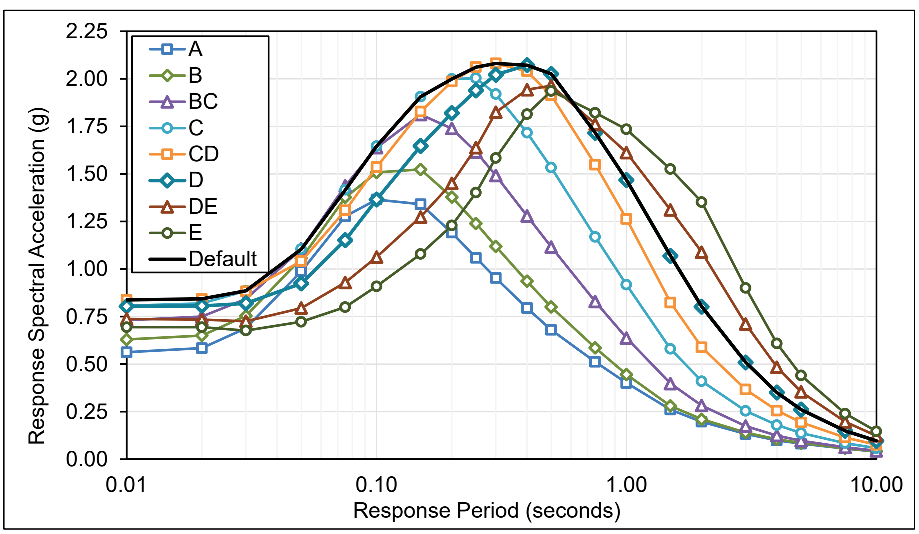


Figure E.3-26 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Salt Lake City Site.

Table E.3-27 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Boise Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.108	0.122	0.143	0.164	0.184	0.195	0.201	0.206	0.195
0.01	0.109	0.122	0.144	0.165	0.185	0.196	0.202	0.207	0.196
0.02	0.112	0.126	0.147	0.168	0.186	0.197	0.202	0.206	0.197
0.03	0.130	0.144	0.164	0.182	0.197	0.203	0.204	0.205	0.203
0.05	0.178	0.193	0.212	0.227	0.236	0.235	0.227	0.224	0.236
0.08	0.228	0.248	0.273	0.291	0.299	0.295	0.284	0.280	0.299
0.10	0.247	0.275	0.312	0.340	0.355	0.355	0.348	0.346	0.355
0.15	0.247	0.283	0.342	0.393	0.429	0.444	0.447	0.451	0.444
0.20	0.223	0.261	**0.331**	0.404	0.461	0.493	0.511	0.525	0.493
0.25	0.193	0.229	0.299	0.385	0.462	0.512	0.549	0.576	0.512
0.30	0.169	0.203	0.270	0.358	0.449	0.516	0.571	0.613	0.516
0.40	0.135	0.163	0.222	0.303	0.400	0.482	0.559	0.620	0.482
0.50	0.113	0.136	0.189	0.265	0.360	0.448	0.537	0.608	0.448
0.75	0.083	0.097	0.136	0.193	0.270	0.348	0.433	0.508	0.348
1.0	0.063	0.071	**0.100**	0.144	0.205	0.273	0.353	0.423	0.273
1.5	0.042	0.046	0.064	0.094	0.136	0.185	0.252	0.313	0.185
2.0	0.033	0.035	0.047	0.069	0.099	0.137	0.190	0.240	0.137
3.0	0.023	0.025	0.031	0.045	0.065	0.090	0.125	0.159	0.090
4.0	0.018	0.019	0.023	0.033	0.047	0.064	0.089	0.112	0.064
5.0	0.015	0.016	0.019	0.026	0.037	0.049	0.067	0.084	0.049
7.5	0.012	0.013	0.015	0.021	0.028	0.036	0.047	0.060	0.036
10	0.010	0.011	0.013	0.017	0.022	0.028	0.035	0.044	0.028
S_{MS} (g)	0.20	0.23	0.30	0.36	0.42	0.46	0.51	0.56	0.46
S_{M1} (g)	0.06	0.07	0.10	0.14	0.21	0.27	0.35	0.43	0.27
S_{DS} (g)	0.13	0.16	0.20	0.24	0.28	0.31	0.34	0.37	0.31
S_{D1} (g)	0.04	0.05	0.07	0.10	0.14	0.18	0.24	0.29	0.18

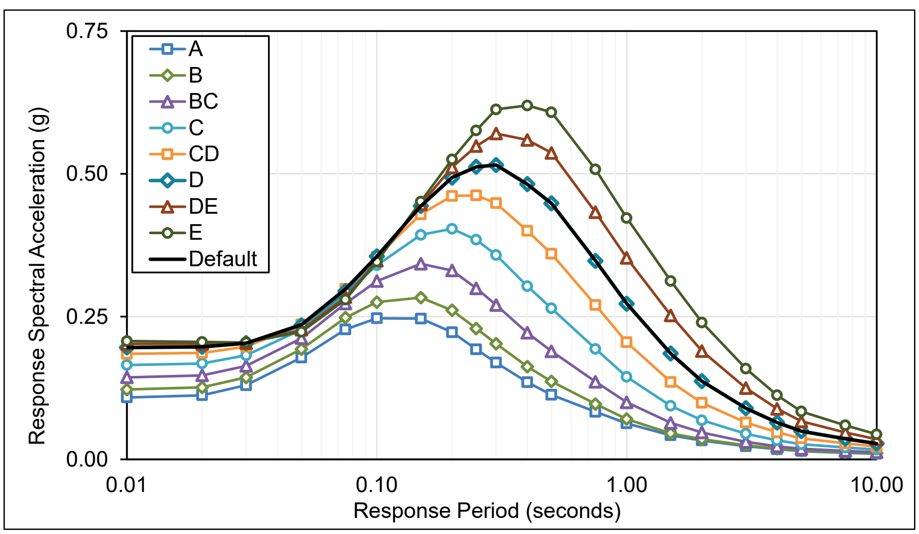


Figure E.3-27 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Boise Site.

Table E.3-28 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Reno Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.501	0.565	0.658	0.726	0.741	0.694	0.607	0.547	0.741
0.01	0.503	0.568	0.662	0.730	0.748	0.703	0.617	0.547	0.748
0.02	0.519	0.583	0.676	0.739	0.749	0.703	0.617	0.547	0.749
0.03	0.596	0.662	0.750	0.792	0.778	0.703	0.617	0.547	0.792
0.05	0.823	0.901	0.964	0.961	0.888	0.758	0.620	0.551	0.961
0.08	1.073	1.177	1.244	1.214	1.088	0.905	0.714	0.624	1.214
0.10	1.165	1.304	1.420	1.405	1.265	1.054	0.832	0.728	1.405
0.15	1.165	1.346	1.596	1.658	1.535	1.290	1.016	0.886	1.658
0.20	1.037	1.223	**1.537**	1.739	1.681	1.451	1.159	1.015	1.739
0.25	0.897	1.075	1.397	1.714	1.766	1.584	1.299	1.153	1.766
0.30	0.810	0.976	1.299	1.665	1.829	1.705	1.443	1.301	1.829
0.40	0.689	0.833	1.138	1.525	1.823	1.802	1.607	1.484	1.823
0.50	0.598	0.720	1.002	1.385	1.734	1.803	1.681	1.596	1.803
0.75	0.443	0.511	0.723	1.023	1.379	1.566	1.598	1.589	1.566
1.0	0.335	0.375	**0.537**	0.774	1.074	1.313	1.512	1.578	1.313
1.5	0.214	0.232	0.330	0.482	0.687	0.901	1.147	1.365	0.901
2.0	0.159	0.173	0.233	0.340	0.488	0.666	0.906	1.138	0.666
3.0	0.104	0.112	0.142	0.208	0.299	0.414	0.575	0.735	0.414
4.0	0.075	0.080	0.098	0.142	0.202	0.276	0.378	0.480	0.276
5.0	0.059	0.063	0.075	0.106	0.148	0.198	0.268	0.337	0.198
7.5	0.035	0.038	0.044	0.061	0.081	0.105	0.137	0.173	0.105
10	0.025	0.028	0.032	0.043	0.056	0.070	0.088	0.109	0.070
S_{MS} (g)	0.93	1.10	1.38	1.57	1.65	1.62	1.51	1.44	1.65
S_{M1} (g)	0.33	0.37	0.54	0.77	1.07	1.31	1.63	2.05	1.31
S_{DS} (g)	0.62	0.73	0.92	1.04	1.10	1.08	1.01	0.96	1.10
S_{D1} (g)	0.22	0.25	0.36	0.52	0.72	0.88	1.09	1.37	0.88

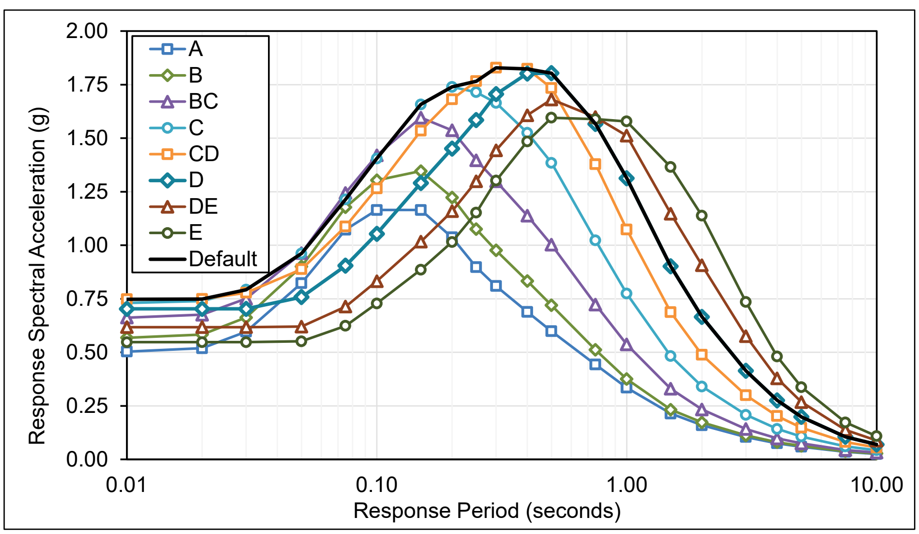


Figure E.3-28 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Reno Site.

Table E.3-29 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Las Vegas Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.225	0.254	0.297	0.335	0.360	0.363	0.354	0.350	0.363
0.01	0.227	0.255	0.298	0.336	0.362	0.365	0.356	0.352	0.365
0.02	0.236	0.265	0.307	0.343	0.366	0.368	0.356	0.349	0.368
0.03	0.275	0.304	0.345	0.374	0.387	0.378	0.356	0.345	0.387
0.05	0.383	0.415	0.449	0.466	0.460	0.431	0.392	0.374	0.466
0.08	0.488	0.532	0.574	0.589	0.572	0.531	0.483	0.462	0.589
0.10	0.527	0.586	0.653	0.683	0.672	0.631	0.582	0.562	0.683
0.15	0.521	0.598	0.718	0.790	0.808	0.779	0.734	0.718	0.808
0.20	0.470	0.550	**0.696**	0.823	0.880	0.875	0.843	0.836	0.880
0.25	0.405	0.481	0.628	0.791	0.894	0.919	0.912	0.921	0.919
0.30	0.354	0.423	0.564	0.737	0.878	0.938	0.960	0.988	0.938
0.40	0.279	0.334	0.457	0.620	0.788	0.890	0.962	1.016	0.890
0.50	0.230	0.276	0.385	0.534	0.706	0.832	0.933	1.010	0.832
0.75	0.167	0.193	0.273	0.387	0.532	0.656	0.772	0.871	0.656
1.0	0.124	0.138	**0.198**	0.285	0.400	0.515	0.638	0.739	0.515
1.5	0.080	0.086	0.122	0.178	0.256	0.345	0.460	0.559	0.345
2.0	0.061	0.065	0.087	0.126	0.182	0.250	0.345	0.433	0.250
3.0	0.041	0.043	0.053	0.077	0.112	0.156	0.218	0.275	0.156
4.0	0.030	0.032	0.038	0.055	0.078	0.107	0.147	0.185	0.107
5.0	0.024	0.026	0.029	0.042	0.058	0.079	0.107	0.134	0.079
7.5	0.018	0.019	0.022	0.030	0.041	0.053	0.070	0.087	0.053
10	0.015	0.016	0.018	0.024	0.032	0.040	0.051	0.063	0.040
S_{MS} (g)	0.42	0.50	0.63	0.74	0.80	0.84	0.87	0.91	0.84
S_{M1} (g)	0.12	0.14	0.20	0.29	0.40	0.51	0.64	0.78	0.51
S_{DS} (g)	0.28	0.33	0.42	0.49	0.54	0.56	0.58	0.61	0.56
S_{D1} (g)	0.08	0.09	0.13	0.19	0.27	0.34	0.43	0.52	0.34

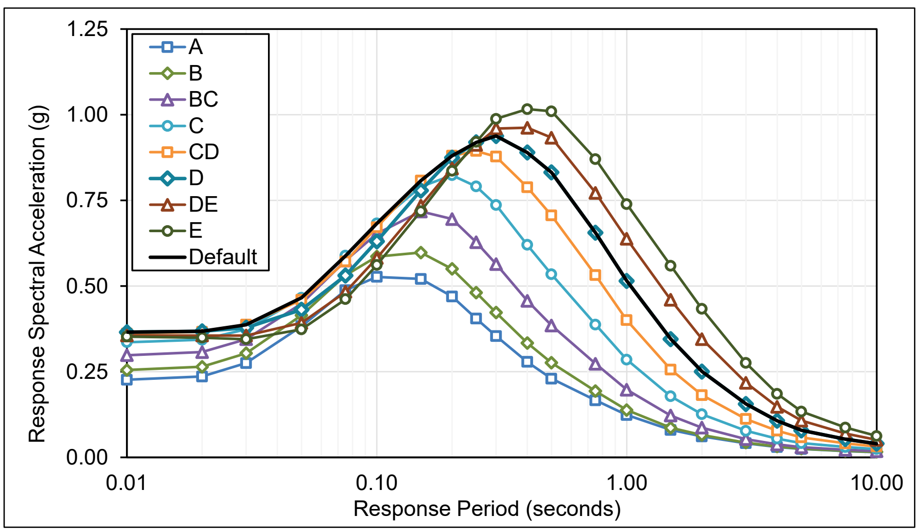


Figure E.3-29 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Las Vegas Site.

Table E.3-30 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, St. Louis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.213	0.239	0.280	0.323	0.363	0.389	0.406	0.420	0.389
0.01	0.214	0.240	0.281	0.324	0.365	0.391	0.408	0.422	0.391
0.02	0.221	0.246	0.286	0.327	0.366	0.391	0.407	0.418	0.391
0.03	0.254	0.278	0.316	0.352	0.384	0.401	0.407	0.414	0.401
0.05	0.345	0.370	0.405	0.434	0.455	0.458	0.450	0.448	0.458
0.08	0.440	0.477	0.523	0.559	0.581	0.581	0.571	0.570	0.581
0.10	0.477	0.530	0.601	0.659	0.698	0.710	0.711	0.719	0.710
0.15	0.475	0.544	0.657	0.760	0.843	0.889	0.917	0.875	0.889
0.20	0.427	0.498	**0.632**	0.777	0.903	0.985	1.044	1.010	0.985
0.25	0.367	0.435	0.565	0.738	0.918	1.036	1.133	1.153	1.036
0.30	0.323	0.386	0.507	0.687	0.892	1.058	1.195	1.297	1.058
0.40	0.260	0.314	0.417	0.591	0.811	1.001	1.214	1.348	1.001
0.50	0.219	0.267	0.356	0.520	0.735	0.933	1.158	1.312	0.933
0.75	0.161	0.189	0.249	0.379	0.550	0.716	0.915	1.076	0.716
1.0	0.123	0.139	**0.182**	0.286	0.422	0.564	0.744	0.896	0.564
1.5	0.083	0.091	0.123	0.187	0.282	0.387	0.529	0.660	0.387
2.0	0.065	0.070	0.094	0.137	0.206	0.285	0.395	0.503	0.285
3.0	0.047	0.050	0.063	0.092	0.132	0.182	0.252	0.323	0.182
4.0	0.036	0.039	0.048	0.069	0.098	0.133	0.182	0.232	0.133
5.0	0.030	0.033	0.039	0.056	0.077	0.103	0.139	0.175	0.103
7.5	0.024	0.026	0.030	0.041	0.056	0.072	0.094	0.118	0.072
10	0.020	0.022	0.025	0.033	0.044	0.055	0.070	0.086	0.055
S_{MS} (g)	0.38	0.45	0.57	0.70	0.83	0.95	1.09	1.21	0.95
S_{M1} (g)	0.12	0.14	0.18	0.29	0.42	0.56	0.74	0.91	0.56
S_{DS} (g)	0.26	0.30	0.38	0.47	0.55	0.63	0.73	0.81	0.63
S_{D1} (g)	0.08	0.09	0.12	0.19	0.28	0.38	0.50	0.60	0.38

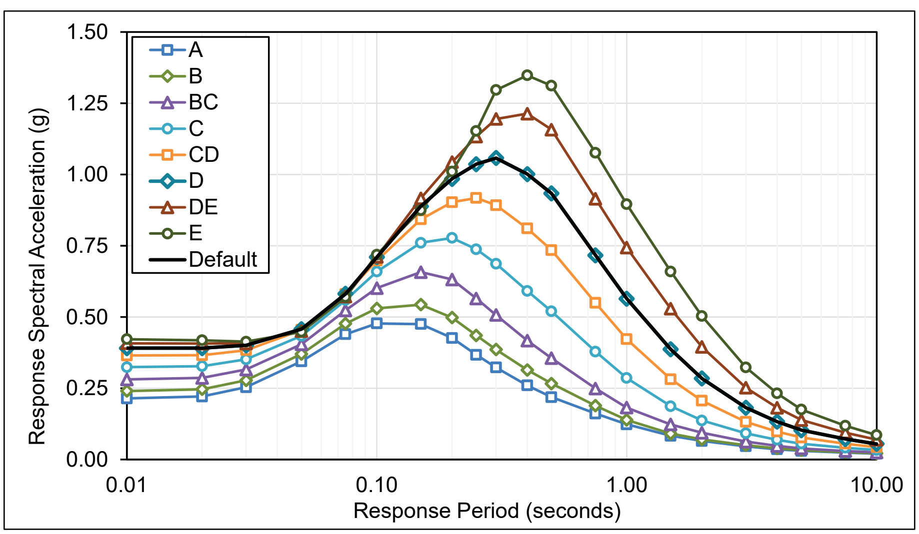


Figure E.3-30 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, St. Louis Site.

Table E.3-31 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Memphis Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.425	0.477	0.559	0.633	0.682	0.685	0.607	0.547	0.685
0.01	0.428	0.480	0.562	0.636	0.686	0.689	0.617	0.547	0.689
0.02	0.442	0.494	0.574	0.644	0.689	0.690	0.617	0.547	0.690
0.03	0.516	0.567	0.641	0.695	0.723	0.703	0.617	0.547	0.723
0.05	0.729	0.782	0.840	0.870	0.861	0.758	0.620	0.551	0.870
0.08	0.939	1.016	1.091	1.120	1.076	0.900	0.713	0.624	1.120
0.10	1.007	1.115	1.242	1.302	1.241	1.040	0.825	0.724	1.302
0.15	0.993	1.131	1.361	1.499	1.497	1.266	1.002	0.875	1.499
0.20	0.888	1.029	**1.304**	1.553	1.653	1.440	1.153	1.010	1.653
0.25	0.762	0.894	1.161	1.471	1.693	1.584	1.299	1.153	1.693
0.30	0.665	0.784	1.033	1.351	1.655	1.705	1.443	1.301	1.705
0.40	0.530	0.627	0.838	1.136	1.498	1.691	1.607	1.484	1.691
0.50	0.440	0.522	0.704	0.976	1.334	1.577	1.681	1.596	1.577
0.75	0.315	0.361	0.486	0.687	0.980	1.225	1.398	1.522	1.225
1.0	0.238	0.263	**0.353**	0.509	0.747	0.983	1.181	1.323	0.983
1.5	0.157	0.167	0.229	0.334	0.479	0.676	0.879	1.044	0.676
2.0	0.120	0.127	0.169	0.245	0.353	0.501	0.688	0.857	0.501
3.0	0.086	0.091	0.111	0.162	0.233	0.324	0.452	0.572	0.324
4.0	0.069	0.072	0.085	0.122	0.174	0.238	0.329	0.413	0.238
5.0	0.059	0.061	0.069	0.098	0.137	0.185	0.251	0.313	0.185
7.5	0.043	0.044	0.048	0.065	0.088	0.115	0.150	0.183	0.115
10	0.032	0.033	0.035	0.046	0.060	0.076	0.096	0.115	0.076
S_{MS} (g)	0.80	0.93	1.17	1.40	1.52	1.53	1.51	1.44	1.53
S_{M1} (g)	0.24	0.26	0.35	0.51	0.75	0.98	1.24	1.54	0.98
S_{DS} (g)	0.53	0.62	0.78	0.93	1.02	1.02	1.01	0.96	1.02
S_{D1} (g)	0.16	0.18	0.24	0.34	0.50	0.66	0.83	1.03	0.66

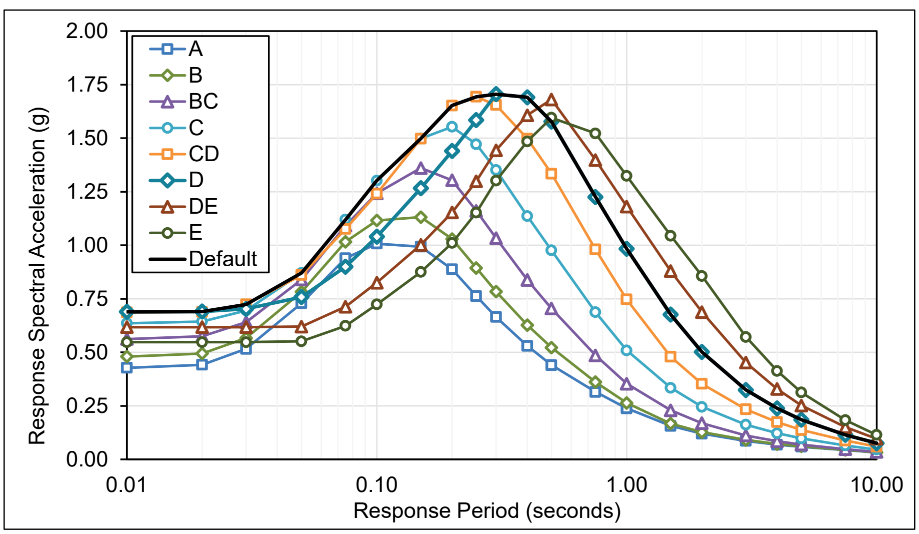


Figure E.3-31 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Memphis Site.

Table E.3-32 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Charleston Site

Period	5%-Damped Response Spectral Acceleration (g)								
***T* (s)**	**A**	**B**	**BC**	**C**	**CD**	**D**	**DE**	**E**	**Default**
0.00	0.522	0.585	0.682	0.763	0.809	0.798	0.756	0.735	0.809
0.01	0.525	0.589	0.686	0.767	0.814	0.803	0.761	0.742	0.814
0.02	0.544	0.607	0.703	0.779	0.819	0.805	0.759	0.733	0.819
0.03	0.639	0.700	0.788	0.842	0.860	0.822	0.753	0.717	0.860
0.05	0.906	0.972	1.033	1.053	1.019	0.933	0.829	0.779	1.053
0.08	1.172	1.266	1.344	1.353	1.287	1.170	1.045	0.932	1.353
0.10	1.257	1.392	1.533	1.576	1.518	1.395	1.244	1.062	1.576
0.15	1.240	1.412	1.688	1.822	1.813	1.699	1.476	1.250	1.822
0.20	1.100	1.276	**1.612**	1.889	1.957	1.874	1.661	1.409	1.957
0.25	0.933	1.084	1.415	1.774	2.007	1.981	1.837	1.579	2.007
0.30	0.806	0.932	1.245	1.616	1.938	2.042	1.977	1.729	2.042
0.40	0.631	0.722	0.988	1.334	1.711	1.917	2.041	1.846	1.917
0.50	0.515	0.583	0.813	1.123	1.489	1.756	1.934	1.913	1.756
0.75	0.357	0.382	0.541	0.765	1.046	1.315	1.530	1.699	1.315
1.0	0.263	0.268	**0.383**	0.551	0.768	1.025	1.265	1.440	1.025
1.5	0.164	0.169	0.240	0.350	0.500	0.660	0.895	1.072	0.660
2.0	0.121	0.129	0.171	0.249	0.358	0.490	0.670	0.834	0.490
3.0	0.083	0.087	0.107	0.156	0.225	0.312	0.435	0.551	0.312
4.0	0.062	0.065	0.077	0.111	0.158	0.217	0.300	0.377	0.217
5.0	0.051	0.053	0.061	0.086	0.120	0.163	0.221	0.275	0.163
7.5	0.036	0.037	0.040	0.055	0.075	0.098	0.129	0.157	0.098
10	0.027	0.028	0.030	0.039	0.051	0.065	0.084	0.100	0.065
S_{MS} (g)	0.99	1.15	1.45	1.70	1.81	1.84	1.84	1.72	1.84
S_{M1} (g)	0.26	0.27	0.38	0.55	0.77	1.02	1.26	1.50	1.02
S_{DS} (g)	0.66	0.77	0.97	1.13	1.20	1.23	1.22	1.15	1.23
S_{D1} (g)	0.18	0.18	0.26	0.37	0.51	0.68	0.84	1.00	0.68

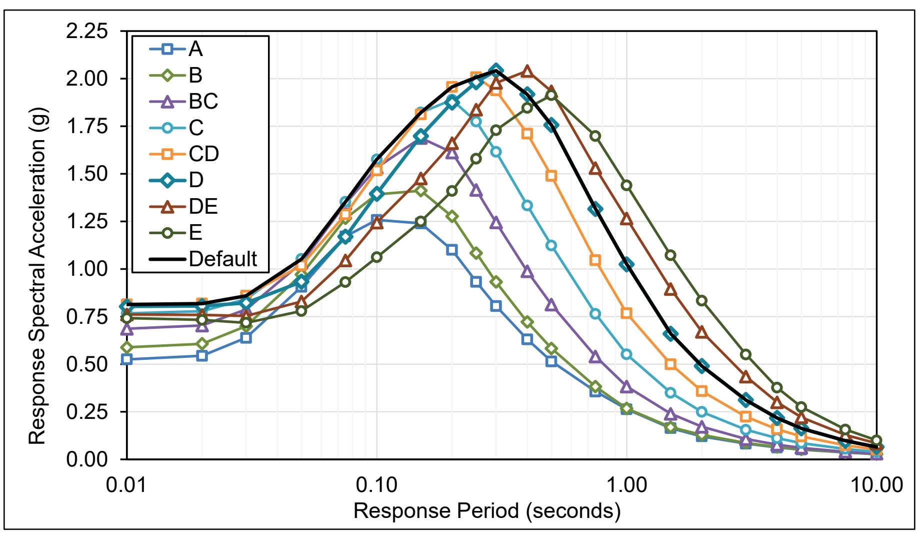


Figure E.3-32 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Charleston Site.

Table E.3-33 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, Chicago Site

Period	5% -Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.052	0.058	0.068	0.078	0.088	0.095	0.099	0.102	0.095
0.01	0.052	0.058	0.068	0.079	0.089	0.095	0.099	0.103	0.095
0.02	0.054	0.060	0.070	0.080	0.089	0.095	0.099	0.102	0.095
0.03	0.062	0.068	0.077	0.085	0.093	0.097	0.099	0.101	0.097
0.05	0.084	0.090	0.098	0.105	0.111	0.111	0.109	0.109	0.111
0.08	0.107	0.116	0.127	0.136	0.141	0.141	0.139	0.139	0.141
0.10	0.116	0.129	0.146	0.160	0.170	0.173	0.173	0.175	0.173
0.15	0.116	0.132	0.160	0.185	0.205	0.216	0.223	0.229	0.216
0.20	0.104	0.121	**0.154**	0.189	0.220	0.239	0.254	0.264	0.239
0.25	0.093	0.111	0.146	0.187	0.223	0.252	0.276	0.293	0.252
0.30	0.085	0.102	0.138	0.181	0.224	0.257	0.290	0.315	0.257
0.40	0.073	0.088	0.123	0.165	0.215	0.258	0.295	0.328	0.258
0.50	0.064	0.078	0.112	0.152	0.203	0.251	0.296	0.335	0.251
0.75	0.051	0.060	0.088	0.120	0.163	0.209	0.256	0.302	0.209
1.0	0.041	0.047	**0.070**	0.096	0.132	0.174	0.222	0.268	0.174
1.5	0.030	0.033	0.047	0.068	0.095	0.129	0.174	0.217	0.129
2.0	0.025	0.027	0.036	0.053	0.074	0.101	0.139	0.177	0.101
3.0	0.018	0.019	0.024	0.035	0.051	0.070	0.097	0.125	0.070
4.0	0.014	0.015	0.018	0.027	0.038	0.051	0.070	0.090	0.051
5.0	0.012	0.013	0.015	0.021	0.030	0.040	0.053	0.068	0.040
7.5	0.009	0.010	0.012	0.016	0.021	0.028	0.036	0.046	0.028
10	0.008	0.008	0.010	0.013	0.017	0.021	0.027	0.033	0.021
S_{MS} **(g)**	0.09	0.11	0.14	0.17	0.20	0.23	0.27	0.30	0.23
S_{M1} **(g)**	0.05	0.05	0.07	0.10	0.14	0.19	0.26	0.34	0.19
S_{DS} **(g)**	0.06	0.07	0.09	0.11	0.13	0.15	0.18	0.20	0.15
S_{D1} **(g)**	0.03	0.03	0.05	0.06	0.09	0.13	0.17	0.22	0.13

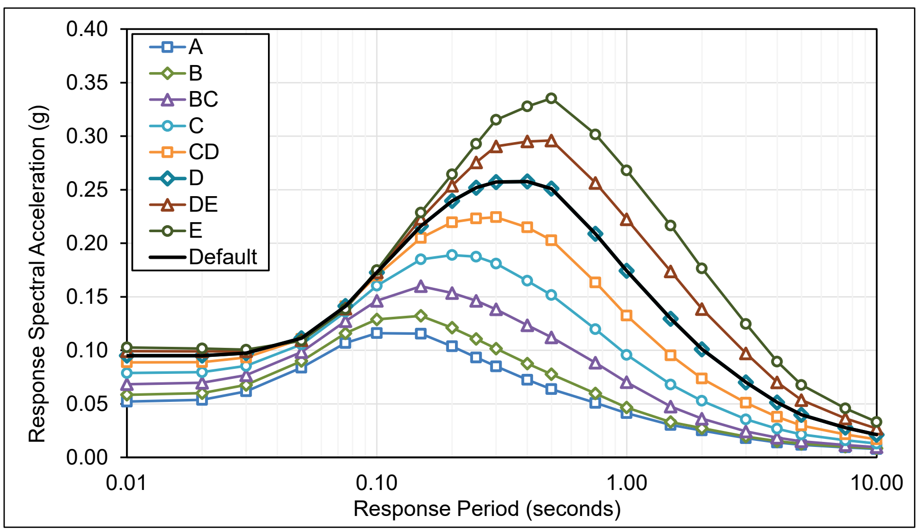


Figure E.3-33 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, Chicago Site.

Table E.3-34 MCE$_R$ Ground Motions: (1) Multi-Period Response Spectra (MPRS); and (2) Values of Design Parameters S_{MS}, S_{M1}, S_{DS} and S_{D1} Derived from Parameters S_S, S_1, T_L in Accordance with the Methods of Chapter 3, New York Site

Period	5%-Damped Response Spectral Acceleration (g)								
T (s)	A	B	BC	C	CD	D	DE	E	Default
0.00	0.088	0.099	0.117	0.134	0.150	0.159	0.164	0.168	0.159
0.01	0.089	0.100	0.117	0.135	0.151	0.160	0.165	0.169	0.160
0.02	0.092	0.103	0.120	0.137	0.152	0.161	0.165	0.168	0.161
0.03	0.106	0.117	0.134	0.149	0.161	0.166	0.166	0.167	0.166
0.05	0.146	0.158	0.173	0.185	0.193	0.191	0.185	0.182	0.193
0.08	0.186	0.203	0.223	0.237	0.244	0.240	0.232	0.228	0.244
0.10	0.202	0.225	0.255	0.277	0.290	0.290	0.284	0.283	0.290
0.15	0.201	0.231	0.280	0.321	0.350	0.362	0.365	0.368	0.362
0.20	0.182	0.213	**0.270**	0.330	0.377	0.403	0.417	0.429	0.403
0.25	0.152	0.180	0.232	0.297	0.377	0.418	0.448	0.470	0.418
0.30	0.129	0.154	0.200	0.264	0.348	0.421	0.466	0.500	0.421
0.40	0.098	0.117	0.151	0.207	0.285	0.367	0.430	0.506	0.367
0.50	0.078	0.095	0.121	0.169	0.238	0.322	0.393	0.470	0.322
0.75	0.053	0.062	0.076	0.108	0.153	0.222	0.288	0.353	0.222
1.0	0.038	0.042	**0.050**	0.072	0.103	0.159	0.218	0.270	0.159
1.5	0.023	0.025	0.032	0.047	0.068	0.093	0.139	0.174	0.093
2.0	0.017	0.018	0.024	0.034	0.050	0.068	0.095	0.120	0.068
3.0	0.012	0.012	0.015	0.022	0.032	0.045	0.062	0.080	0.045
4.0	0.009	0.009	0.011	0.017	0.024	0.032	0.044	0.056	0.032
5.0	0.007	0.008	0.009	0.013	0.018	0.025	0.033	0.042	0.025
7.5	0.006	0.006	0.007	0.010	0.014	0.018	0.023	0.030	0.018
10	0.005	0.005	0.006	0.009	0.011	0.014	0.018	0.022	0.014
S_{MS} (g)	0.16	0.19	0.24	0.30	0.34	0.38	0.42	0.46	0.38
S_{M1} (g)	0.04	0.04	0.05	0.07	0.10	0.16	0.22	0.27	0.16
S_{DS} (g)	0.11	0.13	0.16	0.20	0.23	0.25	0.28	0.30	0.25
S_{D1} (g)	0.03	0.03	0.03	0.05	0.07	0.11	0.15	0.18	0.11

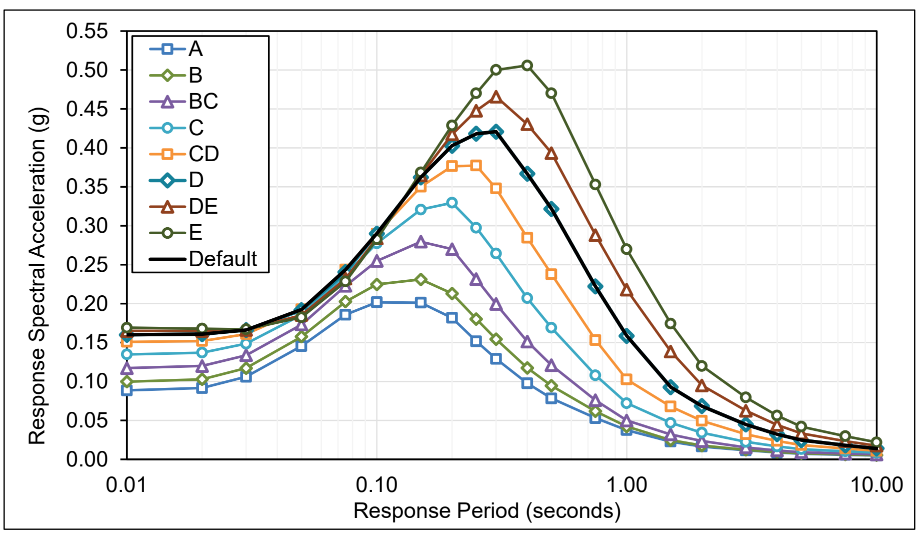


Figure E.3-34 Plots of MCE$_R$ multi-period response spectra (MPRS) derived from parameters S_S, S_1, T_L in accordance with the methods of Chapter 3, New York Site.

References

Aagaard, B.T., Brocher, T.M., Dolenc, D., Dreger, D., Graves, R.W., Harmsen, S., Hartzell, S., Larsen, S., McCandless, K., Nilsson, S., Petersson, N.A., Rodgers, A., Sjögreen B., and Zoback, M.L., 2008, "Ground-motion modeling of the 1906 San Francisco earthquake, part II: Ground motion estimates for the 1906 earthquake and scenario events," *Bulletin of the Seismological Society of America*, 98, 1012–1046.

Abrahamson, N.A., Gregor, N., and Addo, K., 2016, "BC Hydro ground motion prediction equations for subduction earthquakes," *Earthquake Spectra*, 32(1), 23-44.

Abrahamson, N.A., Silva, W.J., and Kamai, R., 2014, "Summary of the ASK14 ground motion relation for active crustal regions," *Earthquake Spectra*, 30(3), 1025-1055.

Al Atik, L., 2015, *NGA-East: Ground-Motion Standard Deviation Models for Central and Eastern North America*, PEER Report No. 2015/07, Pacific Earthquake Engineering Research Center, Berkeley, California.

ASCE, 2010, *Minimum Design Loads for Buildings and Other Structures*, ASCE/SEI 7-10, American Society of Civil Engineers, Reston, Virginia.

ASCE, 2016, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, ASCE/SEI 7-16, American Society of Civil Engineers, Reston, Virginia.

Atkinson, G.M., and Boore, D.M., 2003, "Empirical ground-motion relations for subduction-zone earthquakes and their application to Cascadia and other regions," *Bulletin of the Seismological Society of America*, 93(4), 1703-1729.

Atkinson, G.M., and Boore, D.M., 2008, "Erratum to empirical ground-motion relations for subduction zone earthquakes and their application to Cascadia and other regions," *Bulletin of the Seismological Society of America*, 98(5), 2567-2569.

Atkinson, G.M., and Macias, M., 2009, "Predicted ground motions for great interface earthquakes in the Cascadia subduction zone," *Bulletin of the Seismological Society of America*, 99, 1552–1578.

Boore, D.M., Stewart, J.P., Seyhan, E., and Atkinson, G.M., 2014, "NGA-West2 equations for predicting PGA, PGV, and 5% damped PSA for shallow crustal earthquakes," *Earthquake Spectra*, 30(3), 1057-1085.

Campbell, K.W., and Bozorgnia, Y., 2014, "NGA-West2 ground motion model for the average horizontal components of PGA, PGV, and 5% damped linear acceleration response spectra," *Earthquake Spectra*, 30(3), 1087–1115.

Chiou, B., and Youngs, R.R., 2014, "Update of the Chiou and Youngs NGA model for the average horizontal component of peak ground motion and response spectra," *Earthquake Spectra*, 30(3), 1117-1153.

Crouse, C.B, Leyendecker, E.V., Somerville, P.G., Power, M., and Silva, W.J., 2006, "Development of Seismic Ground-Motion Criteria for the ASCE 7 Standard," *Proceedings of the 8th U.S. National Conference on Earthquake Engineering*, San Francisco, California.

FEMA, 2015, *NEHRP Recommended Seismic Provisions for New Buildings and Other Structures*, FEMA P-1050, prepared by the Building Seismic Safety Council of the National Institute of Building Sciences for the Federal Emergency Management Agency, Washington, D.C.

Field, E.H., Arrowsmith, R.J., Biasi, G.P., Bird, P., Dawson, T.E., Felzer, K.R., Jackson, D.D., Johnson, K.M., Jordan, T.H., Madden, C., and Michael, A.J., 2014, "Uniform California earthquake rupture forecast, version 3 (UCERF3) – The time-independent model," *Bulletin of the Seismological Society of America*, 104(3), 1122-1180.

Goulet, C.A., Bozorgnia, Y., Abrahamson, N.A., Kuehn, N., Al Atik, L., Youngs, R.R., Graves, R.W., and Atkinson, G., 2018, *Central and Eastern North America Ground-Motion Characterization – NGA-East Final Report*, PEER Report No. 2018/08, Pacific Earthquake Engineering Research Center, Berkeley, California.

Goulet, C.A., Bozorgnia, Y., Kuehn, N., Al Atik, L., Youngs, R.R., Graves, R.W., and Atkinson G.M., 2017, *NGA-East Ground-Motion Models for the U.S. Geological Survey National Seismic Hazard Maps*, PEER Report No. 2017/03, Pacific Earthquake Engineering Research Center, Berkeley, California.

Idriss, I.M., 2014, "An NGA-West2 empirical model for estimating the horizontal spectral values generated by shallow crustal earthquakes," *Earthquake Spectra*, 30(3), 1155-1177.

Jaiswal, K.S., Bausch, D., Chen, R., Bouabid, J., and Seligson, H., 2015, "Estimating annualized earthquake losses for the conterminous United States," *Earthquake Spectra*, 31(S1), S221–S243.

Kircher & Associates, 2015, *Investigation of an Identified Shortcoming in the Seismic Design Procedures of ASCE 7-10 and Development of Recommended Improvements for ASCE 7-16*, prepared for the Building Seismic Safety Council of the National Institute of Building Sciences, Washington, D.C.

Lee, E., Chen, P., Jordan, T.H., Maechling, P.J., Denolle, M., and Beroza, G.C., 2014, "Full-3-D tomography for crustal structure in southern California based on the scattering-integral and the adjoint-wavefield methods," *Journal of Geophysical Research*, 119, 6421–6451.

Magistrale, H., Olsen, K.B., and Pechmann, J.C., 2008, *Construction and Verification of a Wasatch Front Community Velocity Model*, U.S. Geological Survey Technical Report (06HQGR0012).

NIBS, 2019, *Development of the Next Generation of Seismic Design Value Maps for the 2020 NEHRP Provisions*, BSSC Project 17 Final Report, Building Seismic Safety Council, National Institute of Building Sciences, Washington, D.C.

PEER, 2015, *NGA-East: Adjustments to Median Ground-Motion Models for Central and Eastern North America*, PEER Report No. 2015/08, Pacific Earthquake Engineering Research Center, Berkeley, California.

Petersen, M.D., Shumway, A.M., Powers, P.M., Mueller, C.S., Moschetti, M.P., Frankel, A.D., Rezaeian, S., McNamara, D.E., Luco, N., Boyd, O.S., Rukstales, K.S., Jaiswal, K.S., Thompson, E.M., Hoover, S.M., Clayton, B.S., Field, E.H., and Zeng, Y., 2020, "The 2018 update of the U.S. National Seismic Hazard Model: Overview of model and implications," *Earthquake Spectra*, 36(1), 5-41, DOI:10.1177 /8755293019878199.

Seyhan, E., 2014, "Weighted Average of 2014 NGA WEST-2 GMPEs," Excel file, Pacific Earthquake Engineering Research Center, Berkeley, California, https://peer.berkeley.edu/research/data -sciences/databases, accessed August 6, 2020.

Shahi, S.K., and Baker, J.W., 2013, *NGA-West2 Models for Ground-Motion Directionality*, PEER Report 2013/10, Pacific Earthquake Engineering Research Center, Berkeley, California.

Shahi, S.K., and Baker, J.W., 2014, “NGA-West2 models for ground motion directionality,” *Earthquake Spectra*, 30, 1285–1300.

Stephenson, W.J., 2007, *Velocity and Density Models Incorporating the Cascadia Subduction Zone for 3D Earthquake Ground Motion Simulations*, USGS Open-File Report 2007-1348, U.S. Geological Survey, Reston, Virginia.

Stewart, J.P., Parker, G.A., Atkinson, G.M., Boore, D.M., Hashash, Y.M.A., and Silva, W.J., 2020, “Ergodic site amplification model for central and eastern North America,” *Earthquake Spectra*, 36(1), 42-68, https://doi.org/10.1177/8755293019878185.

Stewart, J.P., Parker, G.A., Harmon, J.P., Atkinson, G.M., Boore, D.M., Darragh, R.B., Silva, W.J., and Hashash, Y.M.A., 2017, *Expert Panel Recommendations for Ergodic Site Amplification in Central and Eastern North America*, PEER Report No. 2017/04, Pacific Earthquake Engineering Research Center, Berkeley, California.

U.S. Census Bureau, 2012, “2010 TIGER/Line Shape files,” [machine-readable data files] prepared by the U.S. Census Bureau.

USGS, 2015, “2015 NEHRP Web Service,” https://earthquake.usgs.gov/ws/designmaps/nehrp-2015.html, accessed August 6, 2020.

Wald, D.J., and Allen, T.I., 2007, “Topographic slope as a proxy for seismic site conditions and amplification,” *Bulletin of the Seismological Society of America*, 97, 1379–1395.

Wills, C.J., and Clahan, K.B., 2006, “Developing a map of geologically defined site-condition categories for California,” *Bulletin of the Seismological Society of America*, 96(4A), 1483–1501.

Zhao, J.X., Zhang, J., Asano, A., Ohno, Y., Oouchi, T., Takahashi, T., Ogawa, H., Irikura, K., Thio, H.K., Somerville, P.G., and Fukushima, Y., 2006, “Attenuation relations of strong ground motion in Japan using site classification based on predominant period,” *Bulletin of the Seismological Society of America*, 96, 898–913.

Project Participants

Federal Emergency Management Agency

Mai (Mike) Tong (Task Monitor)
Federal Emergency Management Agency
400 C Street, SW
Washington, D.C. 20472

Robert D. Hanson (Technical Monitor)
5885 Dunabbey Loop
Dublin, Ohio 3017

Applied Technology Council

Jon A. Heintz (Editor)
Applied Technology Council
201 Redwood Shores Parkway, Suite 240
Redwood City, California 94065

Consultants

Charles A. Kircher (Author)
Kircher & Associates
1121 San Antonio Road, Suite D-202
Palo Alto, California 94303

Sanaz Rezaeian (Author)
U.S. Geological Survey
1711 Illinois Street
Golden, Colorado 80401

Nicolas Luco (Author)
U.S. Geological Survey
1711 Illinois Street
Golden, Colorado 80401

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