

Seismic Loads

Guide to the Seismic Load Provisions of ASCE 7-10

Finley A. Charney, Ph.D., P.E.



Seismic Loads

Other Titles of Interest

Minimum Design Loads for Buildings and Other Structures, ASCE/SEI 7-10 (ASCE, 2013): Provides requirements for general structural design and includes means for determining dead, live, soil, flood, snow, rain, atmospheric ice, earthquake, and wind loads, as well as their combinations, which are suitable for inclusion in building codes and other documents. Includes a detailed commentary with explanatory and supplementary information.

Books Related to ASCE 7-10

Significant Changes to the Seismic Load Provisions of ASCE 7-10: An Illustrated Guide by S.K. Ghosh, Ph.D.; Susan Dowty, P.E.; and Prabuddha Dasgupta, Ph.D., P.E. (ASCE, 2010): Summarizes changes to the seismic provisions of ASCE 7-10 that might affect actual practice or enforcement, including the precise wording of the change.

Significant Changes to the Wind Load Provisions of ASCE 7-10: An Illustrated Guide by T. Eric Stafford, P.E. (ASCE, 2010): Translates changes to the wind load provisions of ASCE 7-10 into a form readily accessible by structural engineers, architects, contractors, building officials and inspectors, and allied professionals.

Snow Loads: Guide to the Snow Load Provisions of ASCE 7-10 by Michael O'Rourke, Ph.D., P.E. (ASCE, 2010): Illustrates key concepts and guides for applying the provisions of ASCE 7-10 to the design of new and existing structures that could collect falling or drifting snow.

Wind Loads: Guide to the Wind Load Provisions of ASCE 7-10 by Kishor C. Mehta, Ph.D., P.E., and William Coulbourne, P.E. (ASCE, 2013): Explains the wind load provisions of ASCE/SEI 7-10 as they affect the planning, design, and construction of buildings for residential and commercial purposes.

Books on Seismic Engineering

Earthquake Protection of Building Equipment and Systems: Bridging the Implementation Gap by Jeffrey A. Gatscher, Gary L. McGavin, and Philip J. Caldwell (ASCE, 2012): Offers a framework for applying the latest earthquake engineering research to the nonstructural elements of individual building projects, concentrating on mechanical and electrical systems.

Earthquakes and Engineers: An International History by Robert K. Reitherman (ASCE, 2012): Traces the evolution of humankind's understanding of the causes and characteristics of earthquakes and the development of methods to design structures that resist seismic shocks.

Guidelines for Seismic Evaluation and Design of Petrochemical Facilities by the Task Committee on Seismic Evaluation and Design of Petrochemical Facilities (ASCE, 2011): Presents practical recommendations regarding the design and safety of petrochemical facilities during and after an earthquake, including guidance on design details and considerations that are not included in building codes.

Seismic Evaluation and Retrofit of Existing Buildings, ASCE/SEI 41-13 (ASCE, 2014): Describes deficiency-based and systematic procedures that use performance-based principles to evaluate and retrofit existing buildings to withstand the effects of earthquakes.

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Contents

Preface vii
Abbreviations and Symbols xi
Table of Conversion Factors xiii

Examples

1. Risk Category 1
2. Importance Factor and Seismic Design Category 7
3. Site Classification Procedure for Seismic Design 11
4. Determining Ground Motion Parameters 19
5. Developing an Elastic Response Spectrum 25
6. Ground Motion Scaling for Response History Analysis 29
7. Selection of Structural Systems 37
8. Combinations of Lateral Load-Resisting Systems 45
9. Horizontal Structural Irregularities 53
10. Vertical Structural Irregularities 63
11. Diaphragm Flexibility 73
12. Structural Analysis Requirements 79
13. Use of the Redundancy Factor 83
14. Accidental Torsion and Amplification of
Accidental Torsion. 89
15. Load Combinations. 97
16. Effective Seismic Weight (Mass) 105
17. Period of Vibration 115
18. Equivalent Lateral Force Analysis 123
19. Drift and P-Delta Effects 135
20. Modal Response Spectrum Analysis 147
21. Modal Response History Analysis. 165
22. Diaphragm Forces 181
Frequently Asked Questions 185

Appendices

A. Interpolation Functions.....	201
B. Using the USGS Seismic Hazards Mapping Utility.....	205
C. Using the PEER NGA Ground Motion Database.....	211
References	215
Index	219
About the Author	229

Preface

The purpose of this guide is to provide examples related to the use of the Standard ASCE/SEI 7-10, *Minimum Design Loads for Buildings and Other Structures* (often referred to as ASCE 7). The guide is also pertinent to users of the 2012 *International Building Code* (ICC, 2011) because the IBC refers directly to ASCE 7.

Sections of ASCE 7 Pertinent to the Guide

Seismic Loads: Guide to the Seismic Load Provisions of ASCE 7-10 (the *Guide*) has examples pertinent to the following chapters of ASCE 7:

- Chapter 1: General
- Chapter 2: Combinations of Loads
- Chapter 11: Seismic Design Criteria
- Chapter 12: Seismic Design Requirements for Building Structures
- Chapter 16: Seismic Response History Procedures
- Chapter 20: Site Classification Procedure for Seismic Design
- Chapter 22: Seismic Ground Motion and Long Period Maps

Seismic material excluded from the *Guide* are Chapter 13 (Nonstructural Components), Chapter 14 (Material-Specific Design and Detailing Requirements), Chapter 15 (Nonbuilding structures), Chapter 17 (Seismic Design Requirements for Seismically Isolated Structures), Chapter 18 (Seismic Design Requirements for Structures with Damping Systems), Chapter 19 (Soil-Structure Interaction for Seismic Design), and Chapter 21 (Site-Specific Procedures for Seismic Design).

The vast majority of the examples in the *Guide* relate to Chapters 1, 2, 11, 12, and 16 of ASCE 7, with buildings as the principal subject. The materials on nonstructural components and on nonbuilding structures will be expanded in a later edition of the *Guide*, or in a separate volume. The materials presented for Chapter 16 relate to the selection and scaling of ground motions for response history analysis and the use of linear response history analysis.

Chapter 14 of ASCE 7 is not included because the *Guide* focuses principally on seismic load analysis and not seismic design. The reader is referred to the Reference section of the *Guide* for resources containing design examples. The materials included in Chapters 17 through 19 are considered “advanced topics” and may be included in a future volume of examples.

The principal purpose of the *Guide* is to illustrate the provisions of ASCE 7 and not to provide background on the theoretical basis of the provisions. Hence, theoretical discussion is kept to a minimum. However, explanations are provided in a few instances. The reference section contains