



Snow Loads

*Guide to the Snow Load Provisions
of ASCE 7-16*

Michael O'Rourke, Ph.D., P.E.

This is a preview. [Click here to purchase the full publication.](#)

ASCE
PRESS

Snow Loads

Other Titles of Interest

ASCE 7 Hazard Tool

Delivers a quick, efficient way to look up key design parameters specified by Standard ASCE/SEI 7-10 and Standard ASCE/SEI 7-16 through a Web-based application that retrieves load data for each of seven hazards, visualizes them on a map, and generates a unified report of results. (ASCE 2016) (<http://ascetools.online>)

Minimum Design Loads and Associated Criteria for Buildings and Other Structures, ASCE/SEI 7-16

Provides requirements for general structural design and includes means for determining dead, live, soil, flood, wind, snow, rain, atmospheric ice, and earthquake loads and their combinations that are suitable for inclusion in building codes and other documents. A detailed commentary of explanatory and supplementary information is included. (ASCE Standard 2016) (ISBN 978-0-7844-1424-8)

Snow Loads: Guide to the Snow Load Provisions of ASCE 7-10

BY MICHAEL O'ROURKE, PH.D., P.E.

Sets forth a detailed and authoritative interpretation of the snow load provisions of *Minimum Design Loads for Buildings and Other Structures*, Standard ASCE/SEI 7-10. (ASCE Press 2010) (ISBN 978-0-7844-1111-7)

Snow Loads on Solar-Paneled Roofs

MICHAEL O'ROURKE, PH.D., P.E., AND NICHOLAS ISYUMOV, PH.D., P.E.

Offers guidance for structural engineers regarding the snow load conditions that result from the presence of solar panels on a roof, focusing on the structural design of roof beams, roof girders, and columns that support solar panels. (ASCE 2016) (ISBN 978-0-7844-8024-3)

Snow-Related Roof Collapse during the Winter of 2010–2011: Implications for Building Codes

MICHAEL O'ROURKE, PH.D., P.E., AND JENNIFER WIKOFF

Summarizes an investigation of nearly 500 damaged structures to determine whether the collapses and poor roof performance were the result of snow loads exceeding what was prescribed in building codes or the result of structural capacity that was significantly less than required by the building codes. (ASCE 2014) (ISBN 978-0-7844-7824-0)

Snow Loads

Guide to the Snow Load Provisions of ASCE 7-16

Michael O'Rourke, Ph.D., P.E.



This is a preview. [Click here to purchase the full publication.](#)

Library of Congress Cataloging-in-Publication Data

Names: O'Rourke, Michael J., author. | American Society of Civil Engineers.
Title: Snow loads : guide to the snow load provisions of ASCE 7-16 / Michael O'Rourke, Ph.D., P.E.
Description: Reston, Virginia : American Society of Civil Engineers, [2017] |
Includes bibliographical references and index.
Identifiers: LCCN 2017005716 | ISBN 9780784414569 (soft cover : alk. paper) |
ISBN 9780784480121 (ebook) | ISBN 9780784480854 (epub)
Subjects: LCSH: Snow loads. | Structural dynamics. |
Structural engineering--Standards--United States.
Classification: LCC TA654.4 .O76 2017 | DDC 690/.15--dc23 LC record available at
<https://lccn.loc.gov/2017005716>

Published by American Society of Civil Engineers
1801 Alexander Bell Drive
Reston, Virginia, 20191-4382
www.asce.org/bookstore | ascelibrary.org

Any statements expressed in these materials are those of the individual authors and do not necessarily represent the views of ASCE, which takes no responsibility for any statement made herein. No reference made in this publication to any specific method, product, process, or service constitutes or implies an endorsement, recommendation, or warranty thereof by ASCE. The materials are for general information only and do not represent a standard of ASCE, nor are they intended as a reference in purchase specifications, contracts, regulations, statutes, or any other legal document. ASCE makes no representation or warranty of any kind, whether express or implied, concerning the accuracy, completeness, suitability, or utility of any information, apparatus, product, or process discussed in this publication, and assumes no liability therefor. The information contained in these materials should not be used without first securing competent advice with respect to its suitability for any general or specific application. Anyone utilizing such information assumes all liability arising from such use, including but not limited to infringement of any patent or patents.

ASCE and American Society of Civil Engineers—Registered in U.S. Patent and Trademark Office.

Photocopies and permissions. Permission to photocopy or reproduce material from ASCE publications can be requested by sending an e-mail to permissions@asce.org or by locating a title in the ASCE Library (<http://ascelibrary.org>) and using the “Permissions” link.

Errata: Errata, if any, can be found at <https://doi.org/10.1061/9780784414569>.

Copyright © 2017 by the American Society of Civil Engineers.
All Rights Reserved.
ISBN 978-0-7844-1456-9 (print)
ISBN 978-0-7844-8021-2 (PDF)
ISBN 978-0-7844-8085-4 (ePUB)
Manufactured in the United States of America.

24 23 22 21 20 19 18 17 1 2 3 4 5

Contents

Preface *ix*

Unit Conversions *xi*

Chapter 1 Introduction 1

Chapter 2 Ground Snow Loads 5

2.1 The Map: Influence of Latitude, Elevation, and Coastlines 8

2.2 The Map: Site-Specific Case Studies 9

2.3 State Tables 9

Example 2-1. Ground Snow Loads 11

Chapter 3 Flat Roof Snow Loads 13

3.1 Measured Conversion Factors 13

3.2 Flat Roof Snow Load 17

3.3 Exposure Factor 18

3.4 Thermal Factor 19

3.5 Importance Factor 20

3.6 Minimum Snow Loads for Low-Sloped Roofs 21

3.7 Snow Load for Near Ground Surfaces 22

Example 3-1. Roof Exposure 22

Chapter 4 Sloped Roof Snow Loads 25

4.1 Snow Sliding 25

4.2 Air-Supported Structures 31

4.3 Overall Comparison with Observations 32

Example 4-1. Uniform Roof Snow Load, Monoslope Roof (1 on 12) 33

Example 4-2. Uniform Roof Snow Load, Monoslope Roof (4 on 12) 34

Example 4-3. Uniform Roof Snow Load, Wide Gable Roof 35

Chapter 5	Partial Loads	37
5.1	Continuous-Beam Systems	37
5.2	Other Structural Systems	40
	Example 5-1. Uniform and Partial Snow Loads, Monoslope Roof with Overhang	41
	Example 5-2. Partial Snow Load, Continuous Purlins in Gable Roof (1 on 12)	44
	Example 5-3. Partial Snow Load, Continuous Purlins in Gable Roof (3 on 12)	45
	Example 5-4. Partial Snow Load, Cantilevered Roof Girder System	46
Chapter 6	Unbalanced Loads	49
6.1	Hip and Gable Roofs	49
6.2	Curved Roofs	53
6.3	Sawtooth-Type Roofs	54
6.4	Domes	55
	Example 6-1. Unbalanced Snow Load, Narrow Gable Roof	55
	Example 6-2. Unbalanced Snow Load, Wide Gable Roof	55
	Example 6-3. Unbalanced Snow Load, Asymmetric Gable Roof	56
	Example 6-4. Balanced and Unbalanced Snow Loads, Curved Roof	58
	Example 6-5. Unbalanced Snow Load, Sawtooth Roof	60
Chapter 7	Drifts on Lower Roofs	63
7.1	Leeward Drift	65
7.2	Windward Drift	70
7.3	Adjacent Roofs	72
7.4	Roof Steps in Series	72
	Example 7-1. Roof Step Drift Load	73
	Example 7-2. Roof Step Drift, Limited Height	75
	Example 7-3. Roof Step Drift, Low Ground Snow Load	76
	Example 7-4. Roof Step Drift, Adjacent Structure	78
	Example 7-5. Roof Steps in Series	79
Chapter 8	Roof Projections	81
	Example 8-1. Parapet Wall Drift	84
	Example 8-2. Rooftop Unit Drift	87
	Example 8-3. Parapet Wall Drift, Low Ground Snow Load	88
	Example 8-4. Elimination of RTU Drift	90
Chapter 9	Sliding Snow Loads	91
9.1	Adjacent Roofs	91

9.2 Separated Roofs 93

Example 9-1. Sliding Snow Load, Residential Gable Roof
(4 on 12) 94

Example 9-2. Sliding Snow Load, Commercial Gable Roof
(1 on 12) 95

Example 9-3. Sliding Load, Separated Roof 97

Chapter 10 Rain-on-Snow Surcharge Loads 99

Example 10-1. Uniform Design Snow Load, Monoslope Roof
(1/4 on 12) 103

Example 10-2. Uniform Design Snow Load, Gable Roof
(1/4 on 12) 103

Chapter 11 Ponding Instability and Existing Roofs 105

11.1 Ponding Instability 105

11.2 Existing Roofs 107

Example 11-1. Susceptible Bays Purlin-Parallel Geometry 108

Example 11-2. Susceptible Bays Purlin-Perpendicular Geometry 108

Chapter 12 Open-Frame Equipment Structures 109

12.1 Floor-Level Snow Loads 109

12.2 Snow Load on Piping and Cable Trays 110

Example 12-1. Isolated Cable Tray 110

Example 12-2. Adjacent Cable Trays 111

Chapter 13 Design Examples 113

Design Example 1 113

Design Example 2 119

Design Example 3 125

Chapter 14 Frequently Asked Questions 131

References 157

Index 159

About the Author 163

This page intentionally left blank

Preface

This guide provides practicing structural engineers with a detailed description of the snow load provisions of Standard ASCE/SEI 7-16, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, published by the American Society of Civil Engineers. The intent of this guide is to present the research and philosophy that underpins the provisions and to illustrate the application of the provisions through numerous examples. Readers and users of this guide will know how to use the provisions, as well as the reasoning behind them. In this fashion, users may be able to address nonroutine snow loading issues that are not explicitly covered in ASCE 7-16.

This guide introduces provisions that are new to ASCE 7-16, including ground snow load tables for selected western states and New Hampshire as well as snow load requirements for Open Frame Equipment Support structures.

Every effort has been made to make the illustrative example problems in this guide correct and accurate. The author welcomes comments regarding inaccuracies, errors, or different interpretations. The views expressed and the interpretation of the snow load provisions made in this guide are those of the author and not of the ASCE 7 Standards Committee or the ASCE organization.

Acknowledgments

The author would like to acknowledge the past and present members of the Snow and Rain Loads Committee of ASCE 7. Without their comments, questions, and discussions, the development of Chapter 7 in ASCE/SEI Standard 7-16, and subsequently this guide, would not have been possible.

As with any document of this type, many individuals have contributed their hard work and effort. The author acknowledges the work and effort extended by the administrative staff of the Department of Civil and Environmental Engineering at Rensselaer Polytechnic Institute, who assisted in the word processing and preparation of the narrative. The author also would like to acknowledge the sketch work prepared by Christopher Keado, American Institute of Architects, who graciously contributed the hand-drawn illustrations associated with each chapter.

This page intentionally left blank