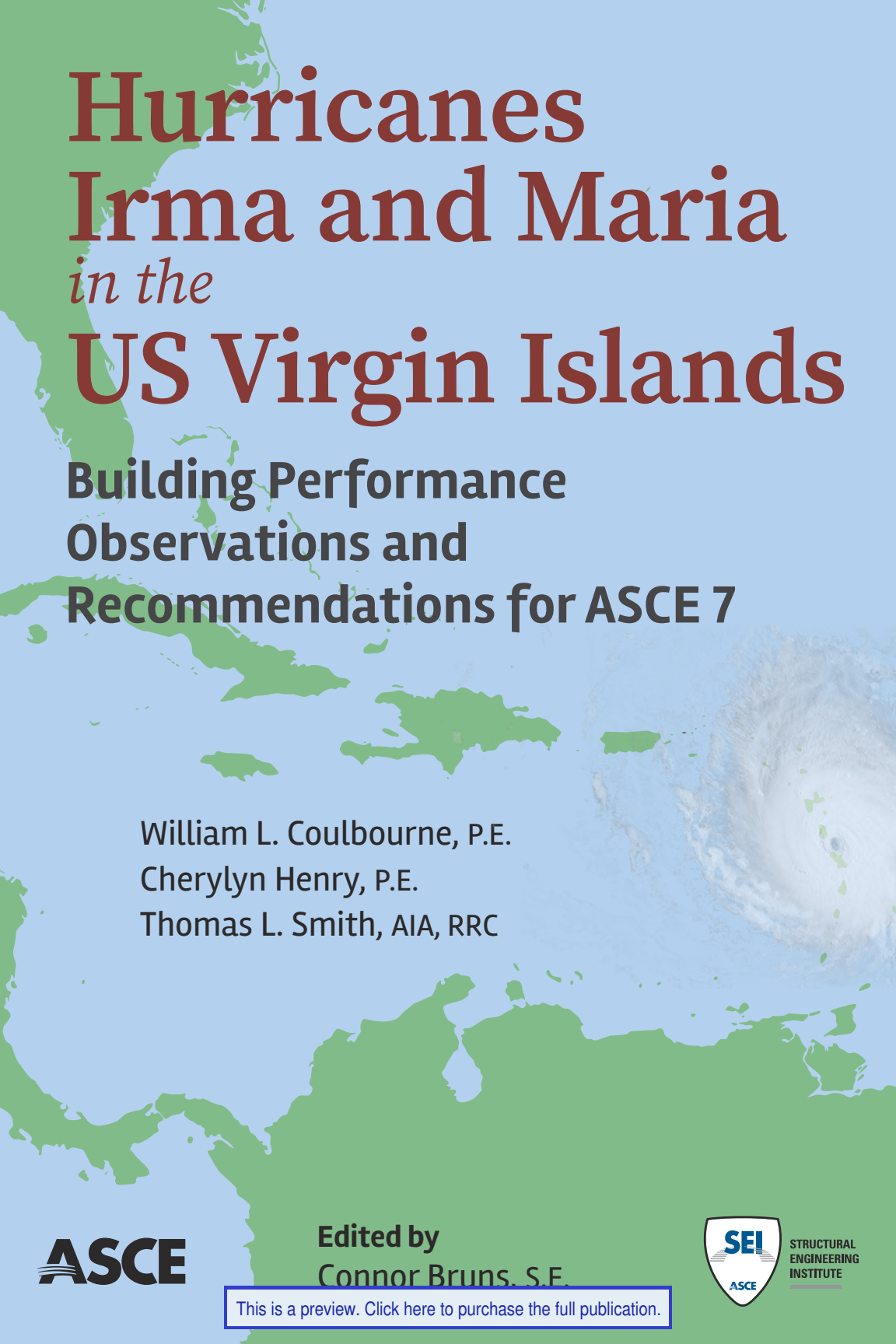




Hurricanes Irma and Maria *in the* US Virgin Islands

Building Performance Observations and Recommendations for ASCE 7

William L. Coulbourne, P.E.

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Thomas L. Smith, AIA, RRC



Edited by
Connor Bruns, S.E.



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Library of Congress Cataloging-in-Publication Data

Names: Coulbourn, William L., author. | Henry, Cherylyn, author. | Smith, Thomas Lee, 1948– author. | Bruns, Connor, editor.
Title: Hurricanes Irma and Maria in the US Virgin Islands : building performance observations and recommendations for ASCE 7 / William L. Coulbourn, P.E., F.SEI, F.ASCE, Cherylyn Henry, P.E., F.SEI, M.ASCE, Thomas L. Smith, AIA, RRC, F.SEI.
Description: Reston, Virginia : American Society of Civil Engineers, [2021] | Includes bibliographical references and index. | Summary : “Hurricanes Irma and Maria in the US Virgin Islands : building performance observations and recommendations for ASCE 7 examines the wind effects of hurricanes Irma and Maria on engineered buildings and compares them to the relevant wind design provisions of ASCE 7”– Provided by publisher.
Identifiers: LCCN 2020046882 | ISBN 9780784415689 (paperback) | ISBN 9780784483299 (adobe pdf)
Subjects: LCSH: Building, Stormproof–United States Virgin Islands. | Wind–pressure. | Hurricane Maria, 2017. | Hurricane Irma, 2017.
Classification: LCC TH1096 .C68 2021 | DDC 693.8–dc23
LC record available at <https://lccn.loc.gov/2020046882>

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

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Errata: Errata, if any, can be found at <http://dx.doi.org/10.1061/9780784415689>.

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All Rights Reserved.
ISBN 978-0-7844-1568-9 (soft cover)
ISBN 978-0-7844-8329-9 (PDF)

Manufactured in the United States of America.
27 26 25 24 23 22 21 1 2 3 4 5

Cover photo credits:

Front: GOES-16 Image of Hurricane Irma. Photo by NOAA NESDIS, September 5, 2017.
Back top: Rooftop PV panel damage, St. Thomas, US Virgin Islands. Photo by Bill Coulbourn, October 25, 2017.
Back left: Post office damage, St. Thomas, US Virgin Islands. Photo by Cherylyn Henry, October 25, 2017.
Back right: Single-family residence damage, St. Thomas, US Virgin Islands. Photo by Bill Coulbourn, October 25, 2017.

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Preface

The 2017 Atlantic hurricane season produced 17 named storms, 10 hurricanes, and six major hurricanes, which caused catastrophic damage and fatalities from high winds, rainfall, and storm surges. The most damaging to the United States were Hurricanes Maria, Harvey, and Irma.

ASCE's Structural Engineering Institute (ASCE/SEI) supported a reconnaissance trip to study the wind effects of Hurricanes Maria and Irma and to compare those effects with some of the wind design provisions in ASCE Standard 7-16, *Minimum Design Loads and Associated Criteria for Buildings and Other Structures*, including the design wind speeds for the affected regions.

This report summarizes the findings and recommendations from an ASCE/SEI investigation in St. Thomas, US Virgin Islands, following Hurricanes Irma and Maria. This report studies the wind effects of the hurricanes on engineered buildings under extreme wind conditions and compares those effects to the relevant wind design provisions of ASCE 7. The impact of the hurricanes and other named storms on non-engineered buildings, and in other Caribbean islands and US regions, are not discussed in this report.

Appendix D includes a summary of preliminary findings of assessments of 2017's Harvey in southeastern Texas and Irma in Florida, based on the limited information presented at the January 12, 2018, meeting of the ASCE 7 Wind Loads Subcommittee in Reston, Virginia, and subsequent presentations at the 2018 SEI Congress in Fort Worth, Texas, on April 19–21, 2018.

Disclaimer: The opinions and views expressed by the authors in this report are theirs alone and do not represent the view of any funding agencies. All information in this report is believed by the authors to be factually correct, but readers should use any information contained herein at their own risk.

Acknowledgments

The authors would like to acknowledge ASCE and SEI for their support in this project.

The team is appreciative of the invaluable logistical support, advice, and site access made available by the US Army Corps of Engineers, particularly Mike Ornella, who escorted the team around the island, and Katie Archer and her infrastructure assessment team, for on-site knowledge that was critical to the ASCE/SEI effort.

Thanks to Peter Vickery, Principal Engineer with Applied Research Associates, for providing preliminary peak gust wind speed maps following the hurricanes.

Thanks to the following organizations for supporting investigations referenced in this book:

Auburn University

FEMA

NIST

NSF

University of Florida

Thanks to Jennifer Goupil, Tim Reinhold, Frank Lombardo, and David Roueche for peer reviewing the book.

Thanks also to Connor Bruns for his tireless effort in editing the publication, securing permissions to use copy-written material, and preparing the manuscript for final ASCE publishing efforts.

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Acronyms and Abbreviations

ANSI	American National Standards Institute
ARA	Applied Research Associates, Inc.
ASD	Allowable stress design
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASTM	ASTM International
C&C	Components and cladding
CMU	Concrete masonry unit
ES	Edge systems
FBC	Florida Building Commission
FEMA	Federal Emergency Management Agency
FM	FM Global
HVAC	Heating, ventilation, and air conditioning
IBC	International Building Code
ICBO	International Council of Building Officials
LPS	Lightning protection system
MAT	Mitigation assessment team
MRI	Mean recurrence interval
MWFRS	Main wind force resisting system
NESDIS	National Environmental Satellite, Data, and Information Service
NHC	National Hurricane Center
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NSF	National Science Foundation
PBWD	Performance-based wind design
PV	Photovoltaic
RAPID	Rapid Response Research
RRC	Registered Roof Consultant
SPF	Sprayed polyurethane foam
SPRI	Single Ply Roofing Industry
TPO	Thermoplastic polyolefin
UBC	Uniform Building Code
USACE	US Army Corps of Engineers
USVI	US Virgin Islands