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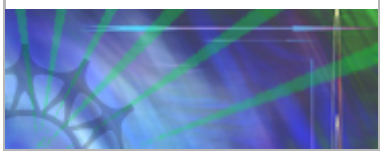

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Award Abstract #1761461

RAPID: Coordinated Structural Engineering Reconnaissance for 2017 Hurricane Irma

NSF Org:	CMMI Div Of Civil, Mechanical, & Manufact Inn
Initial Amendment Date:	September 21, 2017
Latest Amendment Date:	September 21, 2017
Award Number:	1761461
Award Instrument:	Standard Grant
Program Manager:	Joy Pauschke CMMI Div Of Civil, Mechanical, & Manufact Inn ENG Directorate For Engineering
Start Date:	October 1, 2017
End Date:	September 30, 2018 (Estimated)
Awarded Amount to Date:	$80,110.00
Investigator(s):	Tracy Kijewski-Correa tkijewsk@nd.edu (Principal Investigator)
Sponsor:	University of Notre Dame 940 Grace Hall NOTRE DAME, IN 46556-5708 (574)631-7432
NSF Program(s):	Hurricane Irma 2017
Program Reference Code(s):	036E, 039E, 040E, 1057, 7231, 7914, 9102, CVIS
Program Element Code(s):	074Y

ABSTRACT

Post-disaster, rapid response research reconnaissance is one of the most powerful means to understand the effects of natural hazards on the nation's built environment. The structural engineering community's ability to advance windstorm design and construction methodologies is greatly informed by systematically documenting the performance of residential homes, buildings, and other civil infrastructure under actual hazard conditions. The 2017 hurricane season has been an especially unprecedented venue for such

investigations. The season included Hurricane Irma, the most powerful Atlantic Hurricane on record, sustaining 185-mph winds and Category 5 status longer than any prior storm. Irma left a path of considerable destruction across the Caribbean. The U.S. Virgin Islands and Puerto Rico were exposed to Irma's full Category 5 strength, claiming three lives and compromising basic infrastructure in Puerto Rico, while delivering staggering damage to the U.S. Virgin Islands. Irma eventually made its first landfall in the continental U.S. on Cudjoe Key in southern Florida early on Sunday, September 10, 2017, passing just 20 miles from Key West with Category 4 winds that reached 130 miles per hour. Irma downgraded to a Category 3 storm as it made its second landfall later that afternoon on Marco Island, just south of Naples on Florida's Gulf Coast, with sustained winds near 120 miles per hour. Irma continued to move northward along Florida's Gulf Coast, weakening to a Category 2 storm and eventually to a Tropical Storm. Even in its weakened state, Irma claimed 26 lives, crippled power infrastructure, destroyed roofs, and instigated structural failures across the state of Florida, including the widely publicized failures of multiple construction cranes in Miami. The widespread infrastructure damage from Irma provides a valuable real-world testbed for structural wind and coastal engineers, as well as the building industry as a whole, to document infrastructure performance and damage data to advance understanding of hurricane-resistant design and construction practices in the United States. Under this Grant for Rapid Response Research (RAPID), a central coordination node at the University of Notre Dame will link a network of regional nodes at universities across Florida and Puerto Rico (Florida Institute of Technology, Florida International University, University of Florida, and University of Puerto Rico, Mayaguez), to orchestrate a wide-spread structural wind and coastal engineering reconnaissance effort in the weeks following Hurricane Irma to capture this valuable perishable damage data. Data obtained from this field work will be organized and documented, through a data node at Auburn University, and then shared with other researchers through the NSF-supported Natural Hazards Engineering Research Infrastructure (NHERI) Data Depot (https://www.designsafe-ci.org).

In this RAPID study, teams of researchers and students will form around each regional node to survey and document structural damage and other storm impacts from Hurricane Irma in four waves targeting Florida's Atlantic Coast, its Gulf Coast, its Keys, and the U.S. territories of Puerto Rico and the U.S. Virgin Islands. The extensive domestic footprint of this investigation will allow researchers to study a range of hurricane-driven hazards from Category 5 to Tropical Storm intensities in order to respond to critical questions surrounding: (1) the performance of distinctive construction practices in these regions for a range of building and infrastructure classes, paying particular attention to the performance of Floridian practices regarded as a leader in resilient coastal construction, (2) the effectiveness of current mitigation strategies and enhanced building design methods, (3) the impact of recurring storm events on failure probabilities for homes exposed to both Hurricanes Matthew (2016) and Irma (2017), and (4) the performance of new building envelope technologies against water intrusion. This effort will further build the capacity of the structural wind engineering research community to rapidly organize and deploy post-disaster investigation teams by developing: (1) policies and data standards for effective geographically-distributed reconnaissance, (2) digital workflows that can enable the swift capture and curation of perishable data, and (3) public engagement mechanisms to crowdsource damage assessments.

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