

NSF I/UCRC Wind Hazard and Infrastructure Performance (WHIP) Center

Center Director's Report

February 1, 2021 – January 31, 2022 (Year 3)

Kishor C. Mehta, Ph.D., NAE, Dist. M ASCE
P.W.Horn Professor of Civil, Environmental and Construction Engineering
Texas Tech University
Lubbock, Texas
(Prepared December 6, 2021)

Introduction

The WHIP Center was established on February 1, 2019. It is completing its third year. It is a collaborative Center between the two institutions, Texas Tech University and Florida International University. Florida Institute of Technology is an affiliate institute with Texas Tech.

Out of six companies that were members of the Center during the first two years one of them, Permasteelisa Group, dropped out because of change in direction of emphasis within the company. However, we were successful in adding USAA Insurance company to our membership. During the third year company members are:

- AIR-WORLDWIDE – A Verisk Business, Boston, MA
- Berkshire Hathaway – Specialty Insurance, Boston, MA
- GAF Materials, Parsippany, NJ
- SCOR – The Art & Science of Risk, Reinsurer, France
- StateFarm – Insurance, Bloomington, IL
- USAA – Insurance, San Antonio, TX

The three academic institutions (including one affiliate) and six companies provide synergy to pursue industry selected research projects. Of the six companies, four represent insurance industry, one is risk management company, and one is roofing material company.

Florida International University has the Wall of Wind (WOW) experimental facility that can test building and components from model to full scale at wind speeds up to 150 mph. This facility is also a part of NSF funded NHERI Infrastructure nationally shared facility. Texas Tech University has conducted wind engineering experimental and analytical research on effects of wind on low buildings since 1970. The research facilities at Texas Tech include VorTECH (simulating tornado), 200-m tower for atmospheric measurement, Stick-net for spatial wind measurement in hurricane, Doppler radars, and debris impact facility. The Florida Institute of Technology has Wireless Sensor Network for field monitoring of building pressures induced by hurricane winds, Portable Lidar, and Hurricane Risk modeling system. The faculty and facilities at these three institutions compliment to pursue a variety of research in wind hazard and infrastructure performance.

The pandemic of COVID-19 closed all institutions during the second year in mid-March 2020. This caused delay in completing the projects for Year 2. The four projects of Year 2 are completed and the final reports are archived in the log-in page of the website www.whipc.org.

Center Operation in the Current Year (Year 3)

The Center has completed two years. During the first two years the Industry Advisory Board (IAB) had approved four projects (all of them two-year projects) which are completed. The Year 3 annual meeting was held on April 1 – 2, 2021 on zoom platform (companies had imposed travel restrictions). The faculty of the three institutions presented 12 proposals to IAB. Of these, the IAB selected seven of them to pursue research during the year. The faculty stayed connected to the volunteer mentors from the company personnel. Mid-annual meeting was held on October 28, 2021. In addition, progress report short meetings were held on June 3, 2021; July 22, 2021; September 16, 2021; and December 16, 2021 (planned). All meetings were held online because of travel restrictions.

The pandemic of COVID-19 impact spilled over in to the current year. There were limited venues to promote the Center among companies. Professional and association conferences were held online on platform. Even with these limitations concerted efforts are made to increase industry membership for Year 4.

Annual IAB Meeting on April 1- 2, 2021

This meeting was attended by a total of 39 individuals consisting of 11 from IAB members, 10 from faculty and students from the three institutions, 16 from invited guests from companies (first day only) and 2 representing NSF. Guests from companies were invited to show them the type of research projects are being conducted in the Center and are proposed by the faculty. The guests interacted with the group of WHIP Center during the meeting. They were surveyed at the end of the meeting regarding their interest in joining the WHIP Center in the future.

The meeting agenda included progress reports on the projects of Year 2 since end dates of these projects were extended. In addition, 12 proposals for consideration in Year 3 were presented. The proposals were sent to the IAB members two weeks in advance of the meeting. NSF Program Director, Prakash Balan also presented comments on the goal and objectives of the IUCRC program.

The IAB in its executive session on the second day selected 7 research projects for pursuit in Year 3. The IAB members volunteered to act as mentors for the projects of their choice. The projects for Year 3 are:

- WHIP2021_P01-*Investigation of installation and anchor requirements of roof systems under high wind conditions*, PI: Arindam Chowdhury, Co-PI: Ioannis Zisis – Mentors: Erica Sherman and Ming Shiao – GAF – Duration Years – 2 – Budget Year 1 - \$61,352
- WHIP2021_P05-*Time related expenses model, based on combination of exterior, interior, and contents damage*, PI: Jean-Paul Pinelli – Mentors: Maurizio Savina (SCOR), Karthik Ramanathan (AIR), Daniel Diaz (USAA) – Duration Years – 1 - Budget Year 1 - \$44,975
- WHIP2021_P06-*Exploratory investigation of field damage, hazard, and institutional data for potential use in risk models*, Jean-Paul Pinelli, Co-PIs: Kishor Mehta, Ioannis Zisis, Delong Zuo – Mentors: Tim Doggett (BHSI), Eric Haefli (State Farm), Karthik Ramanathan (AIR), Maurizio Savina (SCOR) – Duration Years – 1 - Budget Year 1 - \$15,000

- WHIP2021_P07- Empirical vulnerability model to assess impact of windborne tree debris on low-rise construction, PI: Amal Elawady, Co-PI: Jean-Paul Pinelli – Mentors: Tim Johnson (AIR), Eric Haefli (State Farm) – Duration Years – 2 - Budget Year 1 - \$44,328
- WHIP2021_P10-*Probabilistic Modelling of Household Recovery after Hurricane and Wind Disaster*, PI: Brad Ewing – Mentors: Daniel Diaz (USAA) – Duration Years – 1 - Budget Year 1 - \$12,000
- WHIP2021_P11-*Development of Fragility Curves for Tornadic Loading on Low-Rise Buildings*, PI: Delong Zuo – Mentors: Tim Doggett (BHSI), Tim Johnson (AIR) – Duration Years – 2 - Budget Year 1 - \$77,310
- WHIP2021_P12-*Prediction of wind and surge damage to buildings by hurricane*, PI: Doug Smith – Mentors: Eric Haefli (State Farm), Tim Doggett (BHSI), Tim Johnson (AIR) – Duration Years – 1 - Budget Year 1 - \$50,000

Other items discussed during the meetings were changes in By-laws, election of IAB Chair-Elect, and recruiting of company members. The agenda, participant list, and the minutes of the meeting are posted in the website www.whipc.org > Minutes > April 1-2, 2021.

Mid-Annual IAB Meeting on October 28, 2021

In this meeting, conducted remotely, participants included all IAB members (6 primary and 5 additional), NSF director and assessment evaluator (2), center and site directors (3), faculty and students from three institutions (10), and invited representatives from seventeen companies (23).

The proceedings at this meeting included presentation by the IAB Chair on benefits of WHIP, comments by the NSF program director, and progress reports of the seven funded projects. In addition, a special one hour session was held to receive comments from the invited guests on the type of research that can be pursued by the WHIP Center. These comments are used to interact with the companies to attract them to join WHIP Center. The minutes, agenda, participant list, and presentations by the IAB Chair and NSF Program Directors are posted on the website www.whipc.org >Minutes > October 28, 2021.

Progress Report Meetings on June 3, July 22, September 16, and December 16, 2021

Discussions at these meetings included progress reports on the ongoing projects and questions/comments on the projects. The IAB members took active part in these meetings in asking questions and making comments. Agenda for the mid-annual meeting was also discussed in one of the meeting. Small revision in by-laws to limit no more than two votes by any company irrespective of high level of funding of fees was approved during the year. Progress report meeting on December 16, 2021 is planned during the year 3.

Promotional Effort

To publicize the WHIP Center the personnel participated in two conferences. The first one was WIND 2021 which had participants representing insurance adjustors and consultants. In 2021 it was offered as two venues, virtual during February 1 – 4, 2021 and in-person on May 24 -26, 2021 in Orlando, Florida. WHIP Center was an exhibitor in WIND 2021 Symposium Expo. The exhibitor table had information on the Center and a pop-up display. About a dozen company representatives inquired about WHIP Center.

The second one was a presentation in the General Session of the National Hurricane conference 2021 during June 14-16, 2021 in New Orleans, Louisiana. The presentation was “ ‘WHIP’ the Hurricanes”. The audience consisted of about 150 persons.

Efforts toward Growth

A data-base of more than fifty company and agency contacts is developed to inform them about WHIP IAB meetings (only when IAB agrees to open meeting) and the news of the WHIP Center. Because of the continuing pandemic COVID-19 concerns during the Year 3 it has not been possible to visit the potential companies and agencies on their home base. Once travel becomes safe the data-base will be used to visit the companies and agencies in-person. However, major efforts were made to involve company and agency representatives as guests in the meetings.

In the annual meeting on April 1, 2021 sixteen guests from seven companies and three agencies participated. They were exposed to reports on the four projects of Year 2 and twelve proposals prepared by the faculty.

In the mid-annual meeting on October 28, 2021 twenty-three guests from seventeen companies participated. This group included most of the individuals who participated in the annual meeting. This repeat participation indicates interest in the WHIP Center. In this meeting guest participants were given an opportunity to suggest the type of research projects (subjects) their company would have an interest. Dialogue is continuing with eight companies to promote for them to join WHIP in Year 4.

Unanticipated Problems and Solutions

COVID-19 caused universities to lockdown from mid-March to June 1, 2020. ‘Act of God’ provision in the By-laws allowed extension of completion dates of the research projects. Year 2 projects spilled over in to Year 3. The projects of Year 2 are completed and the final reports are submitted.

Continuing concern of travel due to COVID-19 variants has been a problem in Year 3. As a result all meetings of the WHIP center have been conducted online using zoom platform. This online meetings have worked well even when we had close to 40 persons participating in the mid-annual meeting.

During the Year 3 IAB members have taken increasing interest in the research projects by volunteering as mentors. Project PIs are staying in touch with the project mentors; this is a positive sign for viability of WHIP Center.