A Resource of the State of Florida

Hurricane Loss Reduction

FOR

HOUSING IN FLORIDA:

EDUCATION AND OUTREACH

A Research Project Funded by

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PREPARED BY
THE INTERNATIONAL HURRICANE RESEARCH CENTER
FLORIDA INTERNATIONAL UNIVERSITY

PROGRAMS OF EDUCATION AND OUTREACH TO CONVEY THE BENEFITS OF HURRICANE LOSS MITIGATION DEVICES AND TECHNIQUES

The education and outreach components initiated this year built on the foundation of research and work predominately conducted during the 2003/2004 grant period. The research team participated in several venues where the work of the IHRC under the Hurricane Loss Mitigation Program (HLMP) could be showcased and shared with others as a way of promoting hurricane loss mitigation. Efforts this year were made to increase the level of awareness among the general public regarding the need for decreasing the vulnerability of building structures to hurricane-force winds. Partnerships were also made with local and statewide organizations to coordinate interrelated activities and ensure cooperation among parties implementing hurricane loss reduction activities. In addition the team continues to maintain a web page for the Laboratory for Wind Engineering Research under the URL: ***http://www.ihrc.fiu.edu/lwer/***.

Outreach initiatives were achieved through several platforms including conferences, organized presentations and scientific displays. The following is an account of those activities

Conferences

Outreach was conducted at two statewide conferences to ensure that businesses, organizations, and agencies were aware of on-going research activities conducted through the HLMP program and the applications of this research to personal mitigation strategies. The conferences included the South Florida Hurricane Conference in June 2004 and the Governor's Hurricane Conference in May 2004. Participation in these programs was by way of chairing workshops and delivering presentations focusing on hurricane loss mitigation. An exhibit booth complemented these presentations with IHRC staff present to answer questions and distribute information about research initiatives related to the topic of hurricane loss mitigation.

Meetings and Special Presentations

Researchers from the IHRC had continuous interaction and participation in the activities of the Miami-Dade County Local Mitigation Strategy (LMS) Working Group. IHRC representatives made several presentations throughout the year on issues related to hurricane loss mitigation, in general, and to the HLMP, in particular. On March 16, 2005 the IHRC hosted the LMS meeting at Florida International University. Approximately 100 participants including community leaders, researchers, policy makers, and blue-collar workers discussed the mitigation strategies implemented during 2004 in Miami-Dade County.

In addition, the IHRC hosted various groups, media representatives and schools to demonstrate research being conducted under the HLMP.

Weather Expos

On October 7, 2004, the IHRC attended the Miami Middle School Weather Expo and on October 26, 2004 attended the Palm Springs Weather Expo. At these venues the IHRC presented several FIU hurricane loss reduction research programs, including the ring shank nail and Wall of Wind research.

Hurricane Warning Project

"Hurricane Warning! Project" is a planned learning center where citizens can experience and understand the effects of a hurricane event. The learning center, still in the process of being developed, will be located in a 50,000-square-foot building in Deerfield Beach, Florida. Presently the Hurricane Warning Project is located in the former State Farm Safe House. During the development stage, the IHRC has donated a tabletop wind tunnel and several educational posters. This information will be utilized to teach visitors the importance of decreasing the vulnerability of homes to hurricane force winds.

Sherlock Project: Weather & Technology

Broward County Public Schools filmed the IHRC conducting impact tests on November 17, 2004 for a piece entitled "The Sherlock Project: Weather & Technology". This segment was shown to all Broward County public schools as an interactive science lesson. This segment of the Sherlock Project investigated the process of technology research as it is applied to hurricanes. The Sherlock team visited the IHRC to see scientific investigations being conducted on test models, and to learn about the scientific process in research. The program was also be joined by the Information Director of the Emergency Operation Center of Broward County to answer questions about technology use in keeping communities safe during the hurricane season. Florida Sunshine State Standards Benchmarks covered included SC.B.1.3.3, SC.B.2.3.1, SC.H.1.3.1, SC.H.1.3.4, SC.H.1.3.6, SC.H.3.3.1, SC.H.3.3.7.

Animation: Wind Pressure Visualization

As part of a collaborative initiative between FIU, Florida Atlantic University (FAU), and Clemson University, a visualization of wind tunnel-generated peak roof pressures was conducted for three prototype houses. In 2003, researchers and students at Clemson University's Wind Load Test Facility conducted wind tunnel tests on residential building models in the atmospheric boundary layer wind tunnel. The main focus of this research was to better understand the pressure variability on typical houses located in suburban locations.

During this research year, Clemson was tasked to provide contour maps to FAU showing the simultaneous wind pressure distribution over the roofs of three houses.

Three houses were selected that have typical configurations of residential construction from the state of Florida. Clemson constructed the 1:50 scale model houses using Perspex sheet and installed pressure taps in the roof surfaces. The immediate surroundings for 250 ft circles for two of the buildings (see Figure 1 and 2) were modeled and the third building in open terrain with no surrounding obstructions. Brief descriptions of the three models are provided in Table 1.

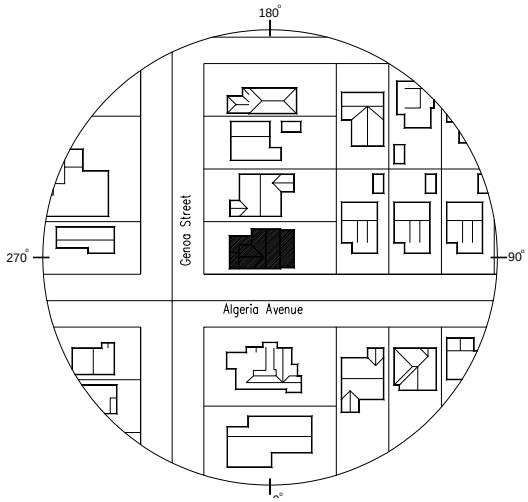


Figure 1: Houses in the Surrounding Neighborhood Used for the FIU-1 Model.

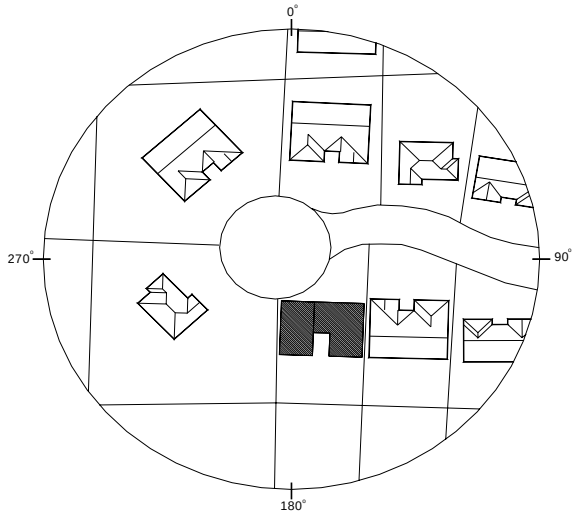
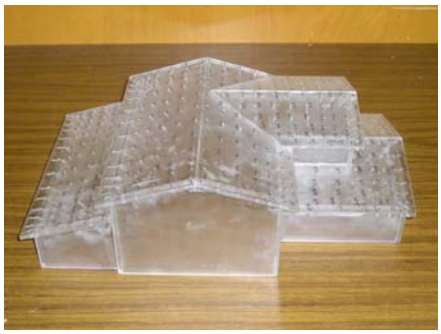


Figure 2: Houses in the Surrounding Neighborhood Used for the FIU-3 Model.

Table 1 Description of the Tested Models and Surroundings

Model	**Terrain and Surroundings Overall Dimensions**
	FIU -1 61ft x 37ft x 18.8ft Suburban Terrain Medium Density Surrounding Building with Trees 455 Pressure Taps on Roof
	FIU - 2 56ft x 44ft x 12.6ft Open Country – No Surrounding Buildings 147 Pressure Taps on Roof
	FIU - 3 60ft x 42ft x 20ft Suburban Terrain – Sparse Density Surrounding Buildings 427 Pressure Taps on Roof

Clemson simulated winds on the 1:50 scale models for 36 wind directions at 10-degree intervals around the building. Each test duration lasted about 150 seconds. Clemson measured the pressure variations on the roofs of the models and converted these to pressure coefficients, normalized using the reference pressure at mean roof height for each building for 3-second gust wind speed.

The pressure coefficient time history for each wind direction were generated, and a statistical analysis of the directional data to determine the peak minimum pressure coefficients on the roofs was performed. Using a MATLAB program by Clemson, a smoothing and plotting algorithm to generate the contour plots provided Figures 3, 4, and 5.

Jpeg files of the contour plots were delivered to FAU where a team of animators modeled the neighborhoods and houses in Maya 6.0, a 3d software package by Alias. An image was provided for every ten degrees of rotation around the house (36 images per house), showing how the pressure maps changed with the change of wind direction. These images were mapped onto the model homes and animated using a “ramp shader” in Maya to blend one jpeg into the next time-lapsed to create an animated pressure map. A camera was constrained to the wind direction allowing the viewer to rotate around the house, with the changing wind direction, to see the pressure changes as the wind shifts.

Supplemental graphics (a pressure coefficient chart and arrow indicating wind direction) were added to provide clarity to the viewers. In the 4th animation, all three houses are rotated simultaneously on screen so that visual comparisons between the differing architecture can be made more easily. Final renders of the houses and environments were composited with their graphic elements, titles and credits in Shake 2.5. Sound effects were mixed in ProTools, added to the video and sent to tape with Premiere 6.0.

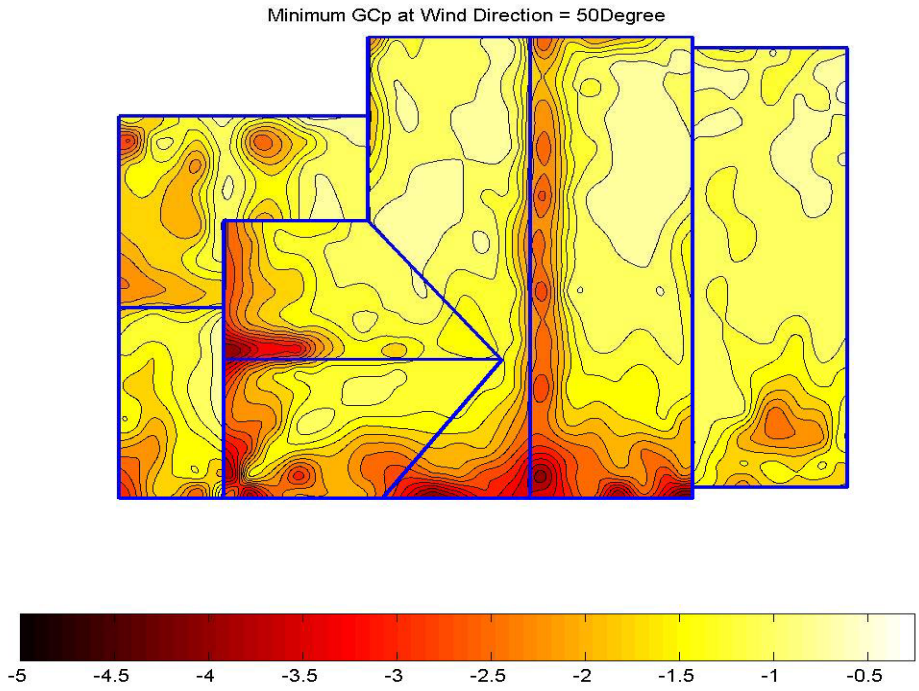


Figure 3: Typical Contour Plot Showing the Peak Minimum Pressure Coefficients for FIU-1. (Note: the pressure coefficients are normalized to reference pressure at mean roof height for a 3-second averaging time).

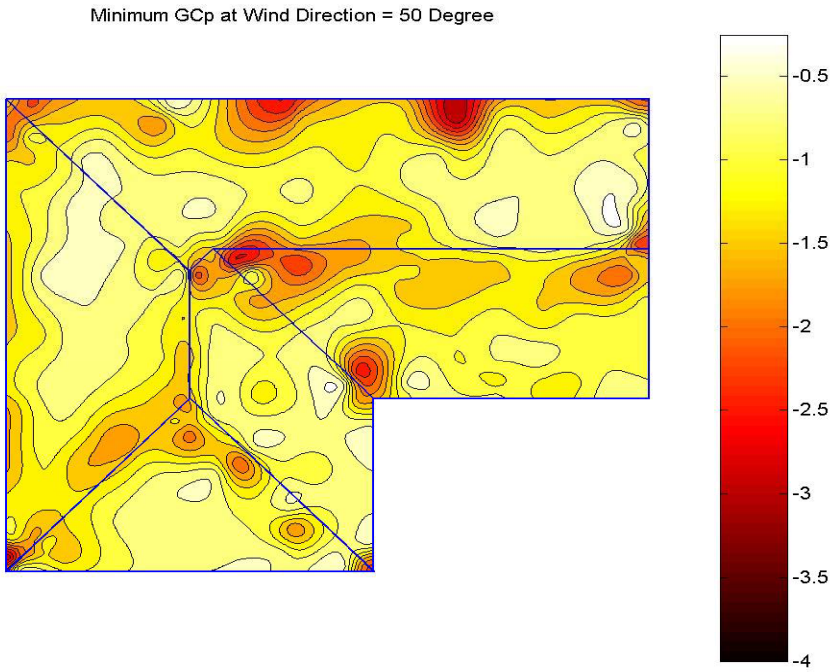


Figure 4: Typical Contour Plot Showing the Peak Minimum Pressure Coefficients for FIU-2. (Note: the pressure coefficients are normalized to reference pressure at mean roof height for a 3-second averaging time).

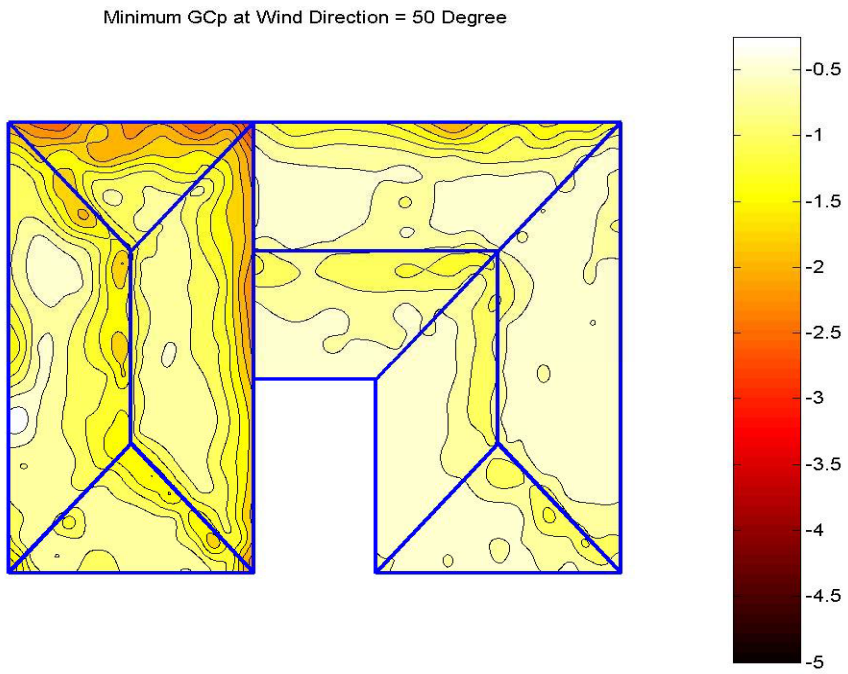


Figure 5: Typical Contour Plot Showing the Peak Minimum Pressure Coefficients for FIU-3. (Note: the pressure coefficients are normalized to reference pressure at mean roof height for a 3-second averaging time).