A Resource of the State of Florida

HURRICANE LOSS REDUCTION FOR HOUSING IN FLORIDA

A Research Project Funded by
The State of Florida Department of Community Affairs
Through Contract # 04-RC-11-13-00-05-001

QUARTERLY REPORT No. 3

For Quarter Ended March 31, 2004

Reporting Requirement # 4
DUE BY April 15, 2004

PREPARED BY
THE LABORATORY FOR STRUCTURAL MITIGATION
THE INTERNATIONAL HURRICANE RESEARCH CENTER
FLORIDA INTERNATIONAL UNIVERSITY

HURRICANE LOSS REDUCTION FOR HOUSING IN FLORIDA
A RESEARCH PROJECT UNDERTAKEN BY
THE INTERNATIONAL HURRICANE RESEARCH CENTER
At Florida International University

QUARTERLY REPORT FOR THE PERIOD ENDED MARCH 31, 2004

SUMMARY

This report summarizes the activities of the International Hurricane Research Center (IHRC), at Florida International University (FIU), and its research team related to the project designated as *Hurricane Loss Reduction for Housing in Florida* (hereinafter Project) being funded by the Florida Department of Community Affairs (DCA) under contract # 04-RC-11-13-00-05-001 executed on November 12, 2003.

This quarterly report covers activities of the IHRC research team from January 1, 2004 through March 31, 2004. This quarterly report is submitted in compliance with Reporting Requirement #5 of the above referenced contract. As a result of the final grant contract being executed in November the IHRC Team is working under extremely tight project timelines, but no major problems or circumstances that may affect the completion date, milestones, scope of work or cost of the project are foreseen at this time. The Principal Investigator will monitor the progress of the research agenda and will inform the funding agency should any difficulties arise.

Ricardo A. Alvarez, Director of the Laboratory for Structural Mitigation at the IHRC, is Principal Investigator (PI) and Project Director. Carolyn Robertson, Research Associate at the IHRC, is responsible for project coordination.

Major activities during the period covered by this report include:

1. January 9, 2004: the IHRC Project Team held a working meeting at the FIU University Park Campus.

2. January 15, 2004: The second quarterly report for the Hurricane Loss Reduction Project, (also known as Reporting Requirement #4), covering activities from October 1, 2003 through December 31, 2003 completed and delivered to DCA.

3. January 23, 2004: a request for authorization to purchase a pick-up truck to solve various materials and personnel transportation needs associated with the current scope of work submitted to DCA – Division of Emergency Management.

4. January 30, 2004: Roofing tile tests under simulated hurricane wind conditions were conducted at the outdoor testing facility at FIU Engineering Center in Miami, FL.

5. February 27, 2004: Tim Reinhold traveled to FIU University Park Campus to present a lecture on Wind Tunnel Testing as a Tool for Building Design and Construction.

6. March 24, 2004: CBS Channel 4 South Florida visited FIU to shoot footage of the roof sheathing testing for the up-coming hurricane season. Testing for the roof sheathing nailing schedules is on-going. Two types of nails are being compared for areas located Outside the High Velocity Hurricane Zone, 8d common nails currently prescribed by the Florida Building Code and 8d ring shank nails. In addition retrofitting studies for pre- and post-1994 South Florida Building Code roofing installations are also being conducted.

ORGANIZATIONAL/ADMINISTRATIVE ACTIVITIES

The IHRC Research Team assembled for 2003-2004 includes researchers, graduate research assistants, other students and support staff from six academic institutions in addition to the IHRC. The IHRC Research Team includes the individuals listed below:

Principal Investigator:	Ricardo Alvarez	FIU/IHRC
Project Coordinator:	Carolyn Robertson	FIU/IHRC

Deleted: Manager

Principal Researchers:

Ronald Baier	FIU	Construction Management
Jamie Canaves	FIU	Architecture
Jason Chandler	FIU	Architecture
Nicole Dash	UNT	Sociology/Anthropology
Hugh Gladwin	FIU	IPOR
Francis McAfee	FAU	Electronic Communication
Betty Morrow	FIU	Sociology/Anthropology
Diane Newman	FAU	Electronic Communication
Vivek Patel	FAU	Electronic Communication
Walt Peacock	TAMU	Landscape Architecture & Urban Planning
Edgar Polo	FIU	HCET
Alfredo Ravinet	FIU	HCET
Timothy Reinhold	Clemson	Civil Engineering
James Rivers	FIU	IHRC
Stephen Schreiber	USF	Architecture
Edmund Skellings	FAU	Electronic Communication

Research Assistants:

Lilia Cunningham	FIU	Sociology/Anthropology
Claudia Blandon	FIU	Sociology/Anthropology
Carlos Escuti	FIU	Architecture
Michael Figueredo	FIU	Architecture
Zuzana Hlavacova	FIU	IHRC
Dierdra Hazeley	FIU	Sociology/Anthropology
Emily Hogue	FIU	Sociology/Anthropology
Janita Mainster	FIU	Sociology/Anthropology
Kevin Nickorick	USF	Architecture

Michael Olivero	FIU	Computer Science
Anthony Peguero	FIU	Sociology/Anthropology
Robert Perez	FIU	Architecture
Amy Reid	FIU	Sociology/Anthropology
Goldia Robinson-Taylor	FIU	Education
Brian Saponaro	FIU	Architecture
Myron Strong	UNT	Sociology/Anthropology
George Torrente	FIU	Architecture
Hsin Ju Yang	FAU	Electronic Communication

Undergraduate Students:

Victor Camps	FIU	Architecture
Jon Lamb	Clemson	Civil Engineering
Brie Losego	FIU	Architecture

Deleted: Basora

Support Staff:

Scott Caput	FIU	IHRC
Regnier Jurado	FIU	IHRC

ACTIVITIES BY RESEARCH TOPIC

Eliminating State and Local Barriers to Upgrading Existing Mobile Homes and Communities

1. The research team continues to explore the role rehabilitation ("rehabbing") of mobile homes may contribute to an upgrading of the mobile home park itself and to the strengthening of individual units. During this quarter, the team met with the El Portal Village Counsel and mobile home park resident advocate and achieved an agreement that (a) the village hall would be available for interviewing residents, and (b) the resident advocate would broker meetings with mobile home park owners. Aerial maps of the El Portal (Figure 1) were obtained and possible residents were identified as being included in the survey sample. A Notice to Residents was developed and the survey instrument was distributed to the resident advocate for review and comment.

2. The project also continues to investigate mobile home park closings in the Tampa area. Currently two mobile home park closings being studied in detail and include: 1) Westshore Mobile Home Park which is an older waterfront park in South Tampa, where property values are rising resulting in private sector pressure for closing so that developers can build market rate housing;

3. 2) End Gate Mobile Home Park, in East Tampa, which is an area notorious for its sub-standard mobile home parks resulting in the public sector forcing the closure of parks for health, safety issues, with mayor's pledge to renovate the area. Additional literature reviews and interviews will continue into the final quarter.

Development of a Replacement Program for Existing Older Mobile Homes

1. During this past quarter mobile home manufactures and vendors were identified and contacted in order to obtain quote ranges of prices for new mobile homes. Research to identify and list local, state, and federal organization that would be interested in funding the replacement program for existing mobile homes continues.

2. A limited by-application-only subsidized program to replace dilapidated or abandoned mobile home units from mobile home parks was drafted. Research into policy alternatives and potential funding sources for such limited program was initiated with the objective of drafting a white paper outlining such policy alternatives and potential funding mechanism.

Research and Development of Hurricane Loss Reduction Devices and Techniques for Site-built Housing

1. Various house models and neighborhood models were created to be used in wind tunnel tests to investigate the influence of community layout and planning on wind loads (Figure 2). Last quarter it was decided that several instrumented house models would be tested in suburban settings with several different densities and heights of surrounding buildings. The Plexiglas model of the zero lot line house has been built and was being outfitted with pressure tabs for testing in a boundary-layer wind tunnel. A three-dimensional computer model has also been made for this house. The Coral Gables neighborhood, FIU base model and zero lot line neighborhood have been built and made ready for testing in the boundary-layer wind tunnel. The Cul-de-sac neighborhood model is 75% complete and is scheduled for delivery at the beginning of April. Jason Chandler, Carlos Escuti, Martin Pesen and Robert Perez will travel to Clemson University April 7, 2004 to test the four test houses in the three neighborhood configurations.

2. The fabrication of the 10 m wind tower continues into the third quarter (Figure 3). The tower will be based on enhancements to the design currently used for similar towers deployed under the *Coastal Monitoring Program*. Enhancements will include the addition of two satellite 5-meter towers to better assess the characteristics of surface-winds over the wider area, and equipping the main 10-meter tower with broad-band-capable wireless telephony and digital video cameras to capture visual images to co-relate with data acquired by the instrumentation. The construction for the base of the trailer is complete with minor work being conducted to attach the hitch. It is anticipated that the structure will be ready for paint in the beginning of April. All instrumentation for the tower has been ordered and received. The computers and data acquisition hardware will also be order by the beginning of April. This tower will be used to provide an open-field source of meteorological data for the measurements taken by the sensors deployed on the flat roof of the engineering building at FIU's Engineering Center. Such open-field data is needed to calibrate wind data taken over the roof of the building that is influenced by the building itself.

3. Testing on roofing tile was performed on January 30, 2004 while four cameras collected footage of the flying debris (Figure 4). This footage was later analyzed, by slowing it down to a frame by frame rate, and used to create a digital simulation of roofing tiles reaction to hurricane force winds demonstrating how tiles would fly through the air. Further impact testing has been scheduled for the end of April. Results of this testing will be included in the final digital simulation that will show how a flying tile may impact a neighborhood. It is hoped that this visualization technique will demonstrate to

the general public the severe impact airborne tile can cause during a tropical cyclone event. This test is also being used to create a mathematical model to represent the parameters and characteristics of flight for roofing tiles under hurricane winds.

4. The design for the "wall of wind" continues. The main objective of this study was to allow the testing of full scale housing components and assemblies in order to develop new effective applications for hurricane loss mitigation methods and techniques applicable to site-built housing. During this quarter it was decided that a smaller "wall of wind" should be constructed using model airplane propellers and motors before a large investment was made for full scale testing. Currently researchers have designed a reduced-scale model 2 foot by 4 foot structure to be outfitted with eight pusher propellers powered by eight motors. This type of fabrication should allow researchers to generate hurricane strength winds that closely replicate the wind shear and other elements found in natural winds.

5. The research team completed 50 tests of common bright nails to examine the role of various fasteners and fastening schedules in the performance of connection of roof sheathing panels to their supporting structure under hurricane wind conditions outside the High Velocity Hurricane Zone. Within the next two weeks this testing will be expanded to include the testing of ring shank nails. In addition research students at FIU continue to construct 200 roof-sheathing panels to perform a retrofitting study for pre and post-1994 South Florida Building Code prescribed nailing schedules.

Deleted: were conducted

6. Sixteen sensors built to instrument flat roof housing units to gather empirical data on wind pressure stresses induced by hurricane conditions were sent to Clemson University to be recalibrated for the new hurricane season. Designs for improving the casing for the sensors have been underway and new instrumentation to compliment the existing sensors has been ordered including a rain gauge, thermocouple, and humidity meter.

Deleted: 16

Deleted: prepared to test

7. During the second quarter of this project the Florida Coastal Monitoring Program was identified as the focus of this year's target survey. Since the identification of the program researchers have been gathering information to describe and evaluate the technical and information flow relationships that produce and deliver the benefits of the Coastal Monitoring Program to improve wind protection on roofing and other building structures. Following initial interviews in February and March, a list of people for detailed personal and telephone interviews in April and May is being compiled. The principal objective of the interviews is to describe the way research products of the RCMP will be utilized and build a framework for evaluation of their use when

data is received from instrumented houses and wind measuring towers. Areas to be covered in the interviews are:

- different modeling and wind testing activities and their coordination
- formulation and communication of research results under different scenarios corresponding to different model change outcomes
- information flow and content from model research to potential policy and regulatory decision makers.

8. The mail survey based on Florida Mobile Home Registrations continued into the third quarter of this project. The goal of the survey is to get an accurate location of the mobile home, and to gauge the willingness for owners to mitigate their units if affordable mitigation options were available. 3,500 registrations were randomly selected from the 338,655 sub-set provided by the Department of Transportation using SPSS software (Figure 5). Of the 3,500 in the sample, surveys were sent to 3,404 households across the United States. The focus of the survey included:

    - Location of mobile home
    - Confirmation of ownership
    - Interest in mitigation options for mobile home
    - Willingness to invest in mitigation of mobile home
    - Willingness to participate in other programs

    The first mailing was prepared during the first 2 weeks of March. To date 226 surveys have been returned completed and 787 envelopes have been returned undeliverable due to a variety of reasons including death of recipient, bad address data or moved with forwarded address.

9. The Incentives Analysis Workshop is scheduled for April 1, 2004 and will include representatives from all organizations that participated in the 1999 'Homeowner's Incentive Team'. The 1999 HIT recommendations and participant list were used as a framework for designing the workshop. Data analysis of three surveys will be presented and include: 1) the FIU/Wharton Survey, conducted 1999, 2) the Hurricane Loss Mitigation Survey, conducted in 2003, and 3) the Hurricane Andrew 10 Years Later Survey, conducted in 2002. Scheduled speakers include Walt Peacock of TAMU and Charles McCool of FL DCA. It is anticipated that 20 professionals from the building, banking, and insurance sector will participate.

FIGURES

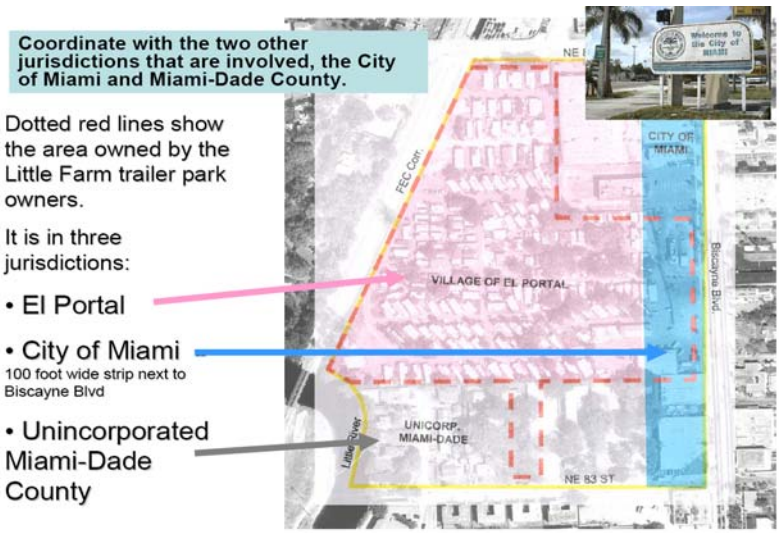

Figure 1. Mobile Home Park Case Study at the Village of El Portal.

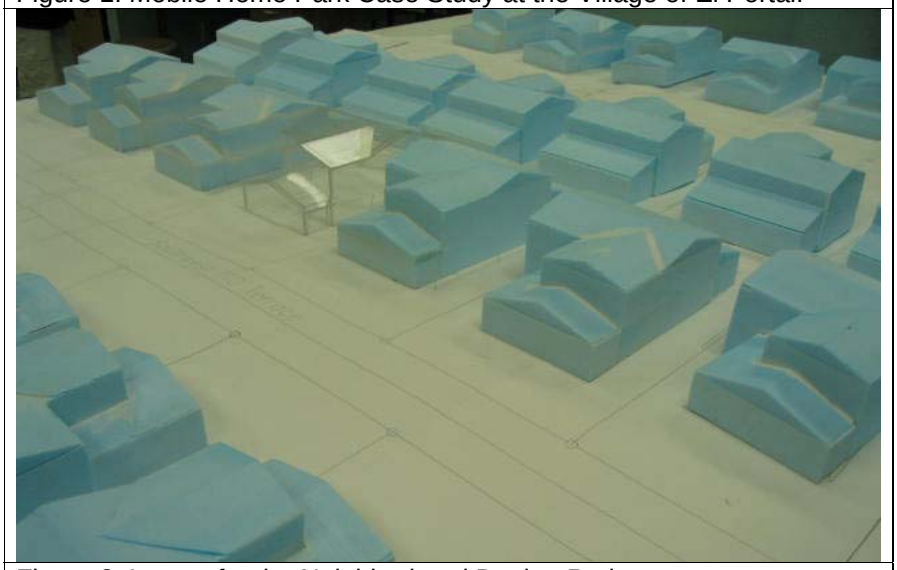

Figure 2. Layout for the Neighborhood Design Project.

Figure 3. 10 meter Wind Tower Currently under Construction.

Figure 4. Tile Simulation Testing.

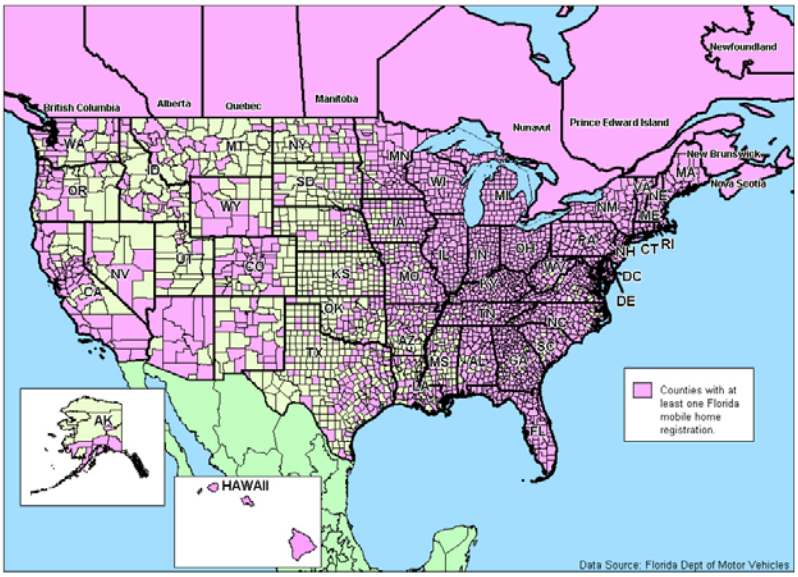

Figure 5. Dispersion of Florida Mobile Home Registrations in the US and Canada.