



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 03-RC-11-13-00-05-012**

QUARTERLY REPORT No. 2
For Quarter Ended December 31, 2002

**Reporting Requirement # 4
DUE BY JANUARY 15, 2003**

PREPARED BY
THE INTERNATIONAL HURRICANE CENTER
FLORIDA INTERNATIONAL UNIVERSITY

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

QUARTERLY REPORT FOR THE PERIOD ENDED DECEMBER 31, 2002

SUMMARY

This report summarizes the activities of the International Hurricane Center (IHC), 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 # 03-RC-11-13-00-05-012 executed on August 6, 2002.

This quarterly report covers activities of the IHC research team from October 1, 2002 through December 31, 2002. This quarterly report is submitted in compliance with Reporting Requirement #4 of above referenced contract. There are no problems or circumstances currently affecting the completion date, milestones, scope of work, and cost of the project.

Ricardo A. Alvarez, Deputy Director at the IHC, is Principal Investigator (PI) and Project Director. Carolyn Anderson, Research Associate at the IHC, is responsible for project coordination.

Major activities during the period covered by this report include:

1. October 15, 2002: First quarterly report, covering activities from August 6, 2002 through September 30, 2002 was completed and delivered to DCA on schedule.
2. October 23, 2002: a working meeting of the IHC Project Team was held at the FIU Management and Advanced Research Center.
3. October 25, 2002 Ricardo Alvarez and members of the USF team met with representatives from the Florida Manufactured Home Association, the Federation

of Mobile Home Owners, and several park owners, and mobile home retailers to discuss issues related to manufactured home communities in Florida

4. October 29-31, 2003: Carolyn Anderson traveled to the Department of Community Affairs to collect data for the Hurricane Loss Mitigation Program Annual Report.
5. November 8, 2002: Amaury Caballero and several graduate students participated with Tim Reinhold in the structural testing of a house in Horry County South Carolina using similar instrumentation included in the FIU Wall Testing Apparatus.
6. November 11-15, 2002: Amaury Caballero, Carolyn Anderson, and Scott Caput attended Lab View courses conducted by National Instruments in Miami, Florida.
7. November 26, 2002: the first draft of the HLMP Annual report of activities, summarizing activities from January 1, 2002 through December 31 was completed and delivered as required by the contract.
8. Negotiations on contract language were necessary to satisfy requirements by both contractual parties because both FIU and UNT are state agencies. As such, a signed contract between FIU and UNT did not happen until some time during December. The contract is now fully executed.
9. January 10, 2003: a working meeting of the IHC Project Team was held at the FIU Management and Advanced Research Center.
10. The hiring of graduate students was finalized.

ORGANIZATIONAL/ADMINISTRATIVE ACTIVITIES

During this quarter, the final research team was assembled at both the IHC and participating universities. The assembled research team is as follows:

Principal Investigator:	Ricardo Alvarez	FIU/IHC
Project Manager:	Carolyn Anderson	FIU/IHC

Principal Researchers:

Syed Ahmed	FIU	Construction Management
Ronald Baier	FIU	Construction Management
Amaury Caballero	FIU	Construction Management
Jaime Canaves	FIU	Architecture
Jason Chandler	FIU	Architecture
Nicole Dash	UNT	Sociology
Jack Dye	FIU	Construction Management
Eugene Farmer	FIU	Construction Management
T. Trent Green	USF	Architecture
Martha Gutierrez	FIU	High Performance Database Research Center
Alex Ratensky	USF	Architecture
Timothy Reinhold	Clemson	Civil Engineering
Walt Peacock	TAMU	Landscape Architecture & Urban Planning
Edgar Polo	FIU	HCET
Stephen Schreiber	USF	Architecture
Cindy Zhang-Torres	FIU	HCET
Kang Yen	FIU	Construction Management

Research Assistants:

Christien Acosta	FIU	Construction Management
Michael DeLoach	Clemson	Civil Engineering
Carlos Escuti	FIU	Architecture
Mauricio Medina	FIU	Construction Management
Kevin Nickorick	USF	Architecture
Mary Phillips	Clemson	Civil Engineering
Scott Robinett	Clemson	Civil Engineering
Swapnali Salunkhe	USF	Architecture
George Torrente	FIU	Architecture

Undergraduate Students:

Brian Dick	Clemson	Civil Engineering
Cos Gardner	Clemson	Civil Engineering
Kyle Hardee	Clemson	Civil Engineering
Jon Lamb	Clemson	Civil Engineering

*** Other research assistants will include a minimum of 5 graduate and under graduate students located at four universities.**

Support Staff:

Kyle Campbell	USF	FCCDR
Maria Cano	FIU	IHC
Scott Caput	FIU	IHC
Regnier Jurado	FIU	IHC
Jennifer Sandford	USF	FCCDR

ACTIVITIES BY RESEARCH TOPIC

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

I. RESEARCH ACTIVITIES

1. The FIU study team has obtained a mapping of the density of manufactured housing in Florida and is working with manufacturers of mobile homes to obtain their forecast of sales, by area, for the next five years. Additionally, the team has researched the model national building codes as well as the Florida Building Code and the Florida Statutes for information and requirements concerning the installation of manufactured housing. Individual Building Officials in selected jurisdictions have been interviewed (in person and telephonically) to ascertain the inspections, permit requirements, licensing requirements, etc., pertaining to the installation of manufactured housing in their jurisdictions. The compilation of this data provides a solid basis for the assessment of data from the case study areas.
2. A database has been compiled of all licensed building officials in the State and the members of the Building Officials Association of Florida. A survey has been constructed to be used in surveying Building Officials throughout the State, and is being tested/validated by distribution to a small number of Building Officials. When the validation process is completed, the survey will be distributed to the mailing list generated from the database of Building Officials.
3. The USF team researched newspaper articles, public records, and other documents to find mobile home parks that are in the process of closing. Through this process 10 mobile home parks in Pinellas County and 1 in Hillsborough County were identified. Several research studies on recently closed mobile home parks were identified during the literature search.
4. The USF team developed a questionnaire to ask mobile home parks and residents regarding the relocation process.

5. The FIU team has also obtained reference materials detailing, for all of the states, the agency responsible for regulating the installation of manufactured housing and is surveying these organizations.
6. On October 28, Alex Ratensky and Kevin Nickorick, from the USF team, met with Ricardo Alvarez and representatives from the Florida Manufactured Home Association, the Federation of Mobile Home Owners, and several park owners, and mobile home retailers, including: Kurt Disch (Florida Manufactured Home Association), Nick Ferraro (Licensed Real Estate Broker and Mobile Home Dealer), Don Hazelton (Federation of Manufactured Home Owners of Florida, Inc.), Dave Hughey (Florida Manufactured Home Owners Association), Bill Turney (Florida Manufactured Housing Association), and Stephen Weis (Weis Group Real Estate Company).

The group discussed possible sites for the case studies for the team's analyses (issues of replatting and studies of closed parks). The group discussed a wide range of issues including:

- The goal of governments in Pinellas County to redevelop existing parks.
- The obstacles to upgrading mobile homes in existing parks
- Alternatives to rehabilitating older mobile homes
- Possibility of fine tuning wind zones

The manufactured home industry representatives agree to provide specific contact information for examples of communities that can be used as "case studies" in our research on "barriers".

II. Preliminary Findings

1. The productive meeting at USF identified many of the barriers to upgrading mobile home communities and the unforeseen consequences of upgrading.
2. It will be difficult to track mobile home park residents in the process of relocating during the contract period. Different methodologies have been identified.

Development of a Replacement Program for Existing Older Mobile Homes

I. Research activities

1. An extensive literature and Internet search was conducted during this quarter. Approved product lists for installation of mobile homes were obtained from the State of Florida, Department of Highway Safety and Motor Vehicles, Division of Motor Vehicles, Bureau of Mobile Home and Recreational Vehicle Construction. The Affordable Housing Study Commission Annual Report 2002, Florida Housing Finance Corporation Strategic Plan, and the report on the "Recommendations of the Manufactured Home Task Force: Follow Up Actions and Policy Considerations" were also acquired.

2. A letter from James M. Dale to Ricardo Alvarez regarding the importance of rehabilitation of older mobile homes was obtained.
3. Blanchards Mobile Home Removals & Transport, Inc., a mobile home contractor located in Hollywood, FL, was selected as the primary contractor for this project. The company agreed to provide 3 single-wide mobile homes for free and transport these units to HCET's test facility in Miami, FL at a cost of \$450 per unit. Demolition of the mobile homes and segregation of the materials generated from demolition will also be performed by Blanchards Mobile Home Removals & Transport at \$1,100 per unit excluding waste disposal, which will be handled by HCET (Figure 1). ATC associates Inc. was given the contract for asbestos inspection at a cost of \$350 per unit (Figure 2). Advanced Industrial Hygiene Services, Inc was selected as the lead-based paint (LBP) inspector at \$500 per unit.
4. In December 2002, three singlewide mobile homes were delivered to the HCET test facility with entire contents of the mobile homes, including the add-ons that were attached to the mobile homes. HCET staff removed the trash and documented the nearly 6,100 lbs of waste collected from the three homes. LBP and asbestos inspections were subsequently performed on December 20, 2002 and December 26, 2002 respectively.
5. In addition to Miami-Dade and Broward counties, HCET also contacted more than 10 contractors located in three counties in the west central region of Florida: Hillsborough, Polk and Pinellas counties. However, they were not able to find a contractor that was willing to work on this project. It was decided to conduct the entire study in South Florida, where supportive contractors are available. A double-wide unit transported to the test facility from Rexmere Village in Davie, FL. The owner of Rexmere Village, Mr. Michael Campbell, is very cooperative and flexible in meeting the needs of our study. With the additional two units (a double-wide unit is equivalent to two single-wide units), HCET will have 5 units in total for the pilot study.

II. PRELIMINARY FINDINGS

1. It appears that the focus of the replacement component of the overall research project needs to be adjusted. This adjustment is based on conversations with representatives of the Florida Mobile Home Association and Florida Mobile Home Owners organization.
2. A new focus of the research is to concentrate on the current building code that requires all new mobile homes in a county to meet the strictest wind requirement. As research looking into the wind zones in Florida show, there are three wind zones in Florida.
 - i. For those counties in the highest wind zone, any replacement of older mobile homes with new mobile homes must meet the strictest wind requirement.

- ii. Mobile homes that meet the strictest wind zones are not regularly manufactured, and are prohibitively expensive. Very few, if any, exist on the pre-owned market.
 - iii. However, there are affordable Zone 2 mobile homes available on the pre-owned market that would be a better alternative to pre-1976 mobile homes.
 - iv. Statute doesn't allow these Zone 2 Mobile homes to be brought into Zone 3 locations
 - v. A new focus of this research is to investigate the possibility of changing statute language to allow Zone 2 Mobile Homes to replace pre-1976 mobile homes in Zone 3 Counties.
 - vi. Result may not be the most wind resistant mobile homes in Zone 3, but considerably better mobile homes would replace those that are known to be particularly vulnerable.
3. We have found some serious interest in the idea of rehabbing older mobile homes. Rehabilitation may cost between \$500 and \$10,000. Older mobile homes tend to leak, and these leaks can cause significant problems with flooring. Contact has been made with a group that does rehabilitation. While they argue that rehabilitation is a viable alternative to summarily deciding all pre-1976 mobile homes should be eliminated, there is no evidence currently that rehabilitation would help make these units more structurally sound in regards to wind protection.
 4. No Lead Based Paint (LBP) was found in any of the three mobile homes inspected during the HCET pilot study and an asbestos report is pending.
 5. After talking to several mobile home contractors in Miami-Dade and Broward counties, we concluded that very few mobile home parks would allow onsite demolition due to the liability involved in such activities. It is much cheaper to dispose of the waste at a local landfill than recycle. Due to this situation, the researchers at HCET decided to use an HCET outdoor test facility at FIU's College of Engineering as an offsite demolition facility during the period of this study. We will hire a mobile home contractor to transport mobile homes to the test facility where the homes would be inspected for asbestos and LBP.

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

I. Research activities

1. After researching the medium homes in the state of Florida and examining the variations of roof top architectural features, Jason Chandler designed a medium home for wind testing. On November 14, 2002 the design of this home was sent to other members of the DCA Hurricane Loss Mitigation Program for review and their comments were incorporated into the design. It was decided the best way

to test the differences in roofs was to build two models, one with architectural features and without architectural features.

2. Carlos Escuti and George Torrente built the two models (Figure 3). The models were sent to Clemson University on December 30, 2002. Jason Chandler traveled to Clemson January 2, 2003 to January 5, 2003 to modify and set up the models and observe the testing. Plans of the models locating all the taps were produced.
3. Research activities conducted during the quarter include the detailed design of the contraction for use in the TAS 100 wind driven water test facility. The order information for the Stainless Steel to be used in construction of this contraction has been prepared. Agricultural spray nozzles have been investigated for use in generating the water flow.
4. Results obtained in the previous year from the roof-to-wall testing of wood stud walls have been compiled into a Masters of Engineering report that was successfully defended in December 2002.
5. The roofing wind tunnel has been completed, including the support structure for the test specimen, the inverter drive has been hooked up and all that remains is for power to be connected to the fans.
6. Agreements have been reached to allow instrumentation of the flat roof on the FIU EAS Building. Details of the instrumentation layout and access for the computer logger and cabling are currently being worked out. Materials for the construction of eight sensors are in the process of being purchased.
7. Space has been acquired for the initial setup of the Structural Testing Laboratory at FIU.
8. Two initial Boundary Layer Wind Tunnel models have been designed and built by FIU students and faculty and initial testing has been completed in the BLWT at Clemson University.
9. An insulated room for roof specimen conditioning has been built and all that remains is procurement of the heater and temperature control system for the room.
10. Amaury Caballero and a student participated with Tim Reinhold in structural testing of a house in Horry County South Carolina using similar instrumentation to that included in the FIU Wall Testing Apparatus.
11. A mason has been identified and detailed designs are being prepared for the construction of the masonry walls to be used in this year's roof-to-wall testing. Modifications have been designed to allow movement of the reaction frame

around a test pad so that multiple masonry walls can be tested in a timely fashion without having to move the walls in and out of the test apparatus. Orders for the equipment necessary to allow movement of the test apparatus have been prepared.

12. A second draft for the Statewide Homeowner's survey was completed after several telephone conference were held between Walt Peacock, Hugh Gladwin, Jim Rivers, Ricardo Alvarez and Carolyn Anderson. Walt Peacock and Doug Buck also conducted two telephone conferences regarding the statewide survey. This survey is aimed to establishing a benchmark to measure the overall effect the Hurricane Loss Mitigation Program is having in developing awareness among interest groups and the general population about hurricane mitigation and in motivating acceptance and behavioral change with respect to the same.
13. A first draft of the targeted survey was completed. The target survey is necessary for the purpose of measuring the effectiveness of selected specific components of the HLMP in meeting stated objectives. It was decided that that telephone survey would be more effective than the initial mail out survey. IPOR will conduct the telephone survey.

II. PRELIMINARY FINDINGS

1. It has been demonstrated that a vector type of load combination can be used in the design of two common types of hurricane straps used in wood frame walls. This has been documented in a Masters of Engineering Report prepared by a graduate student at Clemson University. The equation is:

$$\left[\left(\frac{\text{Uplift Load}}{\text{Allowable Uplift}} \right)^2 + \left(\frac{\text{Shear Load}}{\text{Allowable Shear}} \right)^2 + \left(\frac{\text{Pressure Load}}{\text{Allowable Out-of-Plane Load}} \right)^2 \right]^{1/2} < 1.0$$



Figure 1. Three single-wide mobile homes acquired for the study



Figure 2. Inspector collecting samples on the roof of one mobile home for asbestos analysis

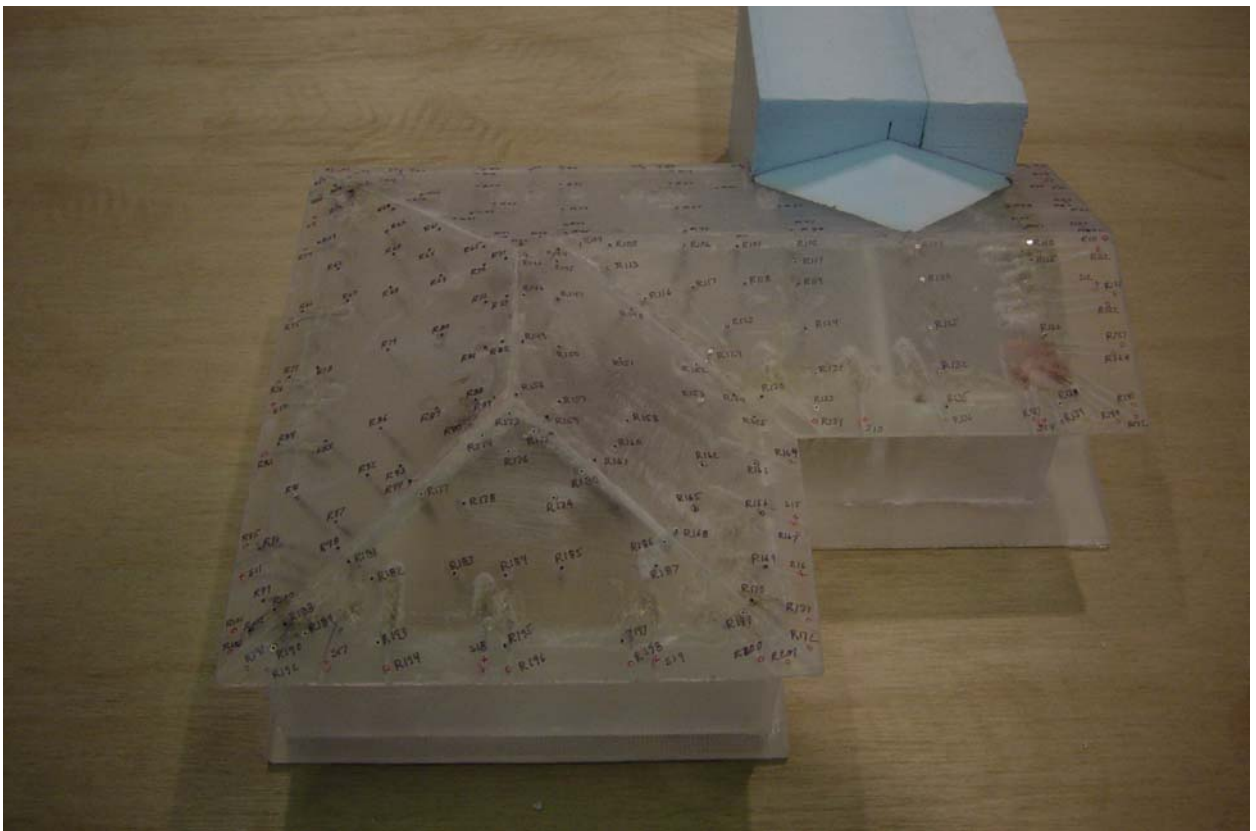


Figure 3. Home model design for wind testing.