

## **Retrofitting Historic Operable Shutters as a Means of Windborne Debris Protection**

Presented to the

Florida Building Commission  
State of Florida Department of Business and Professional Regulation

by

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Project Lead: Forrest Masters

### **1. Issues**

- The 8/4/2014 letter from Ken Cureton, Senior Preservation Architect at the Department of State, describes the research needs and expected outcomes (see Appendix)
- FBC Staff requested that we provide third-party technical input and overall coordination of the research project
- This project will be carried out in conjunction with “Project 5 - Investigation of Fastening of Wood Structural Panels for Opening Protection (Phase 2)” should it be funded

### **2. Relevant Sections of the Code (and related documents)**

- 2010 Florida Building Code – Building
  - 1609.1.2 – Protection of Openings
  - Chapter 17 - Structural Tests and Special Inspections
- 2010 Florida Building Code – Existing Building
  - 1103.2(6) - Historic Preservation Objectives
  - 1104 – Equivalency
  - 1105 – Compliance
  - Appendix B – The Secretary of the Interior’s Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings

### **3. Statement of Work**

- Coordinate with stakeholder groups to develop an experimental research plan that evaluates retrofit options for a representative group of shutter systems for historic buildings (e.g., louvered and plank panels)
- Assess the resistance to windborne debris and component and cladding loads following the experimental approach described in the FY2013-2014 FBC sponsored project entitled, “Investigation of Fastening of Wood Structural Panels for Opening Protection.”
- Interpret results and produce a report that explains the results and implications for the Code. The specific deliverables are as follows (from the 8/4/2014 letter):
  - Design alternatives for retrofit methods that meet the criteria previously set forth to include both written and graphic support material including drawings and specifications for each installation method. Such support material should be of

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sufficient quality and quantity to facilitate installation of the retrofits by both construction professionals as well as laypeople.

- Engineering and testing data of each method sufficient to demonstrate compliance with 2010 Florida Building Code – Existing Building Section 1104(1) – Equivalency. Such documentation should contain sufficient supporting data, conditions and limitations of each method and formatted to provide to building officials for their evaluation and acceptance.
- Photographic documentation of mock-ups of each Design Alternative indicating attachment to the applicable historic shutter substrate and mounted in both open and deployed positions. Such documentation should be of sufficient detail and quality to allow Historic Preservation Officials to make a determination of appropriateness and Secretary of Interior’s Standards compliance for each retrofit method.

**4. Budget**

Table 1. Budget

<b>Budget</b>	<b>Amount</b>
Salaries	\$16,318
Fringe Benefits	\$4,177
Equipment	\$0
Utilities	\$0
Travel	\$0
Misc. (M&S, Tuition)	\$10,000
Indirect Cost/Overhead	\$3,050
<b>TOTAL</b>	<b>\$33,545</b>

The miscellaneous cost includes \$10,000 for materials and supplies to build the test specimens and mounting frames.

Research personnel time and will be reported and certified using a “loaded” rate computed from the following table. Note that the indirect cost shown in Table 1 is computed from the indirect cost in Table 2 + the indirect cost associated with the travel and miscellaneous categories.

Table 2. Breakdown of the hourly compensation rate

<b>Person</b>	<b>Hours</b>	<b>Hourly Rate</b>	<b>Fringe</b>	<b>Tuition</b>	<b>IDC</b>	<b>Total</b>
F. Masters	120	\$73.18	\$20	\$0.00	\$9	\$12,346
D. Prevatt	0	\$63.47	\$18	\$0.00	\$8	\$0
K. Gurley	0	\$65.93	\$18	\$0.00	\$8	\$0
Lab Staff*	160	\$29.19	\$9	\$0.00	\$4	\$6,770
Admin Asst	20	\$23.30	\$11	\$0.00	\$3	\$746
Grad. Students	0	\$21.00	\$3	\$10.90	\$2	\$0
Undergrad. Students	240	\$10.00	\$0	\$0.00	\$1	\$2,682

\*Multiple lab staff may be used. Maximum anticipated hourly rate shown

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The personnel time in Table 2 reflects the estimated time commitment to this deliverable, however the UF professors (Gurley, Masters, Prevatt) work in a team. These hours may be used to support other projects supported by the sponsor during 2014-2015.

### **5. Deliverables**

- A report providing technical information on the problem background, results and implications to the Code submitted to the Program Manager by June 1, 2015
- A breakdown of the number of hours or partial hours, in increments of fifteen (15) minutes, of work performed and a brief description of the work performed. The Contractor agrees to provide any additional documentation requested by the Department to satisfy audit requirements

6. Appendix—Letter from the Florida Department of State



FLORIDA DEPARTMENT of STATE

RICK SCOTT  
Governor

KEN DETZNER  
Secretary of State

**Research Proposal for Consideration by the Florida Building Commission  
For  
Retrofitting Historic Operable Shutters as a Means of Windborne Debris Protection**

Proposed by the Florida Department of State, Division of Historical Resources Bureau of  
Historic Preservation  
Kenneth H. Cureton, Preservation Architect  
Richard L. Hilburn, Preservation Architect

August 4, 2014

The following proposal to the Commission is in response to the research topic presented and approved for recommendation by the Special Occupancy TAC during the June 6, 2014 TAC meeting for Florida Building Commission funded research.

**Problem Statement**

In response to the wind velocities and airborne debris present during a tropical storm or hurricane, protection of the fenestration components of historic buildings is critical to prevent the effects of over-pressurization and moisture intrusion due to a breach in the building envelope. In historic preservation, the effects of adding temporary or permanently installed window and door impact protection products that are currently on the market are typically aesthetically inappropriate or physically detrimental to the historic fabric of the building.

In an attempt to meet the current protection requirements called for in the Code, preservation architects and contractors have begun to retrofit the historic operable wood shutters with impact protection so that the historic element, originally used as a protection device, can continue to effectively be used. Such retrofits are currently specifically designed for each project, and are of various materials and configurations that meet the Code required Standards for Rehabilitation with varying degrees of effectiveness.

The Department feels that standardizing historic wood shutter retrofits would benefit the Preservation Community by providing architects, engineers, contractors and building officials uniform guidance for such retrofits that would ensure consistency with the Standards and meet the intent of the Code for windborne debris protection.



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**Florida Building Code Sections Relevant to the Issue**

2010 Florida Building Code – Building  
*1609.1.2 – Protection of Openings*  
*Chapter 17 - Structural Tests and Special Inspections*

2010 Florida Building Code – Existing Building  
*1103.2(6) - Historic Preservation Objectives*  
*1104 – Equivalency*  
*1105 – Compliance*  
*Appendix B – The Secretary of the Interior’s Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings*

**Objective**

The salient objective of the research is to provide guidance and standardization for attaining a retrofit of historic operable wood shutters for doors and windows that equally meets the intent of structural protection requirements of FBC-B Chapter 16 and historic preservation requirements of The Secretary of the Interior’s Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings.

**Proposed Research**

Requirements of this objective would include structural testing of various materials used and methods of construction of retrofit components, comparative performance evaluation of retrofit methods on different substrates analogous to historic wood shutters and evaluation of compliance of retrofit methods with the Appendix B Standards.

It is anticipated that research would involve retrofit materials engineering, wind load and missile impact testing, input and mock-ups from the construction industry for materials and methods and evaluation and input from architectural historians / historic preservation professionals for appropriateness and compliance with best preservation practices. Testing laboratories or research entities such as universities are envisioned as the best suited for providing such research. It was noted that institutions such as the University of Florida that has programs for Architecture, Historic Preservation, Building Construction and Engineering, as well as testing facilities on site would be the most economical and best suited to conduct this study.

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**Expected Outcomes**

Outcomes expected from this research would be a collection of viable methods of retrofit for various types and configurations of historic operable wood shutters for protection of windows and doors of historic buildings. These methods should meet the following criteria:

- Make use of off the shelf materials and hardware so that a manufactured product or system is not the user's only option for retrofit
- Configure the retrofit methods so that not only construction professionals but also laypeople may be able to perform the retrofit
- Design of the retrofit to utilize a variety of materials such as plywood, dimensional lumber, fiber reinforced resin or acrylic sheet goods, metals, etc. so that alternatives are available for application in multiple conditions and settings
- Multiple designs of retrofit variations that would adequately perform in varying wind zones, windborne debris regions and high velocity hurricane zones. Each design should have accompanying engineering and testing data supporting its compliance with the Florida Building Code for its respective wind zone location
- Incorporate common fastening systems that do not require specialized hardware, tools or knowledge
- Installation should not subject the historic substrate to modification or damage in order to be installed
- Retrofit cannot affect the operability of the shutter
- Retrofit installation must be fully reversible so as not to permanently modify the substrate if the retrofit is removed
- Retrofit is not visible when the shutters are not deployed
- Retrofit is aesthetically compatible with historic wood shutter types

**Research Costs**

Due to the required testing, engineering subject matter and nature of this research, The Department of State Division of Historical Resources is unable to provide an estimated cost.

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**Deliverables**

The following deliverables are anticipated for this research:

1. Design alternatives for retrofit methods that meet the criteria previously set forth to include both written and graphic support material including drawings and specifications for each installation method. Such support material should be of sufficient quality and quantity to facilitate installation of the retrofits by both construction professionals as well as laypeople.
2. Engineering and testing data of each method sufficient to demonstrate compliance with 2010 Florida Building Code – Existing Building Section 1104(1) – Equivalency. Such documentation should contain sufficient supporting data, conditions and limitations of each method and formatted to provide to building officials for their evaluation and acceptance.
3. Photographic documentation of mock-ups of each Design Alternative indicating attachment to the applicable historic shutter substrate and mounted in both open and deployed positions. Such documentation should be of sufficient detail and quality to allow Historic Preservation Officials to make a determination of appropriateness and Secretary of Interior’s Standards compliance for each retrofit method.

If there are any questions regarding this proposal, please forward them to me at (850) 245-6343 or [Kenneth.cureton@dos.myflorida.com](mailto:Kenneth.cureton@dos.myflorida.com).

Respectfully Submitted



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Florida Department of State, Division of Historical Resources