RESEARCH in Progress

Coalition for Advanced Wood Structures
a university, industry, government partnership

Performance of Wood Roofs Under Dynamic Wind Loads

Safety levels of wood sheathing panels on roofs subjected to high-wind events, such as hurricanes, vary with the location of the panel on the roof. Typically, panels on roof edges are blown off at lower wind speeds than are panels near the roof center. Once a roof panel is lost, costly damage to the structure often results as wind-driven rain penetrates the broken envelope. Appropriately strengthening the fasteners of various roof panels would equalize panel reliability and eliminate "weak spots" on the roof.

Background

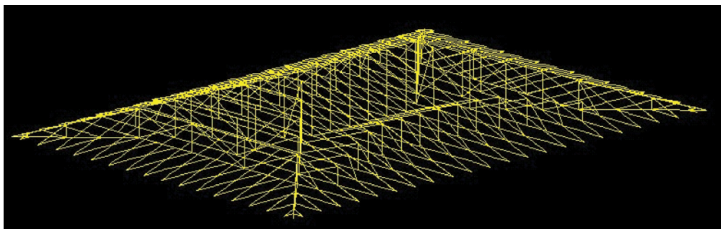
Recent experimental results have shown significant differences in critical structural responses when roofs are excited with actual wind load data (dynamic load varying spatially and over time) rather than the uniform, static, code-based wind load model typically applied for roof analysis and design. Moreover, refined analyses have demonstrated shortcomings in load distribution assumptions for simplified code-specified procedures. This discrepancy between actual wind load effect and assumed load for design purposes contributes to the varying level of reliability for wood roof panels.

Objectives

The performance of wood roofs using actual dynamic wind load data will be studied to identify deficiencies in current design recommendations and ultimately to suggest new design guidelines that may provide an adequate and more uniform level of roof sheathing reliability.

Approach

A finite element model of a full-scale, instrumented wood roof research house in Florida will be constructed. This model will be loaded with actual wind load pressures recorded from recent hurricanes and used to determine the performance, as measured by reliability index, of different wood roof panels on the roof.



Finite element analysis model of roof truss structure (sheathing panels removed for clarity).

Expected Outcomes

This research will result in safety level measurements of various wood sheathing panels on the roof, as determined from actual dynamic wind load data and a refined analysis model. This information will be used to recommend changes to current wood roof design methods (such as fastener schedules for various roof panels) that will provide a more uniform level of reliability for wood roof panels.

Timeline

The literature search and background research have been completed. The finite element roof model will be constructed by fall 2006. The reliability model will be constructed and the reliability of wood roof panels

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computed by spring 2007. Recommendations for revising current wood roof design methods will be offered by May 2007.

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