Iterative Hurricane Shutter Design

Carlos Rios
Discipline: Architecture
Faculty Mentor: Michael Kuenstle

Providing adequate protection for openings in the building envelope remains a critical issue for resilient design in coastal regions subject to high winds and wind-borne debris associated with the land-fall of tropical storms. While some minor improvements have been made to the standard “hurricane shutter” used in single family dwellings, these important building components are mostly crude appropriations of standard light gauge aluminum decking, roll-up type doors, corrugated plastics and even pre-cut sheets of plywood stored on site and installed temporarily for the storm event. This ongoing design research project explores an alternative approach to the design of a standard “hurricane shutter” through the application of computer simulation modeling and digital fabrication techniques. The comparative studies generated with the prototyping process are analyzed and evaluated using the following performance criteria; stress/pressure distribution and surface optimization, the integration of connections between each component and the component assembly to the building, the mitigation of high winds and wind-borne debris, provide for visual connectivity between interior and exterior for natural lighting and security during and after the storm event, constructability and potential for mass customization and future possibilities for 3D printing full size components. The ability of the component design to adapt to other conditions is an important measure for the design.