Field Evaluation of the Thermal Performance and Energy Efficiency of Closed-cell Spray-Applied Polyurethane (ccSPF) Foam in Vented Residential Attics

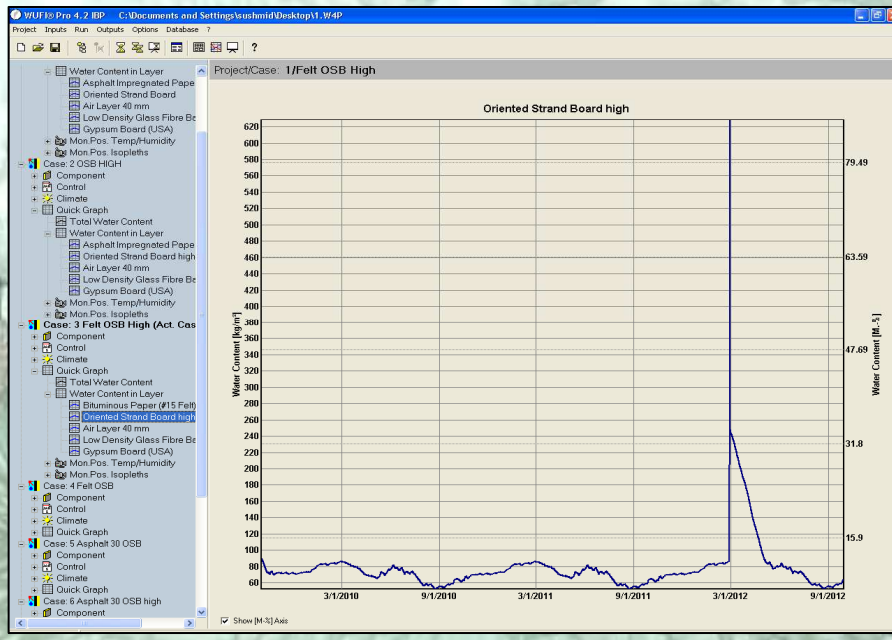
Motivation for Research:

❖Prevatt *et.al.* have shown an increase in the uplift capacity (up to 2-2.5 times) of the roofs having ccSPF installed.

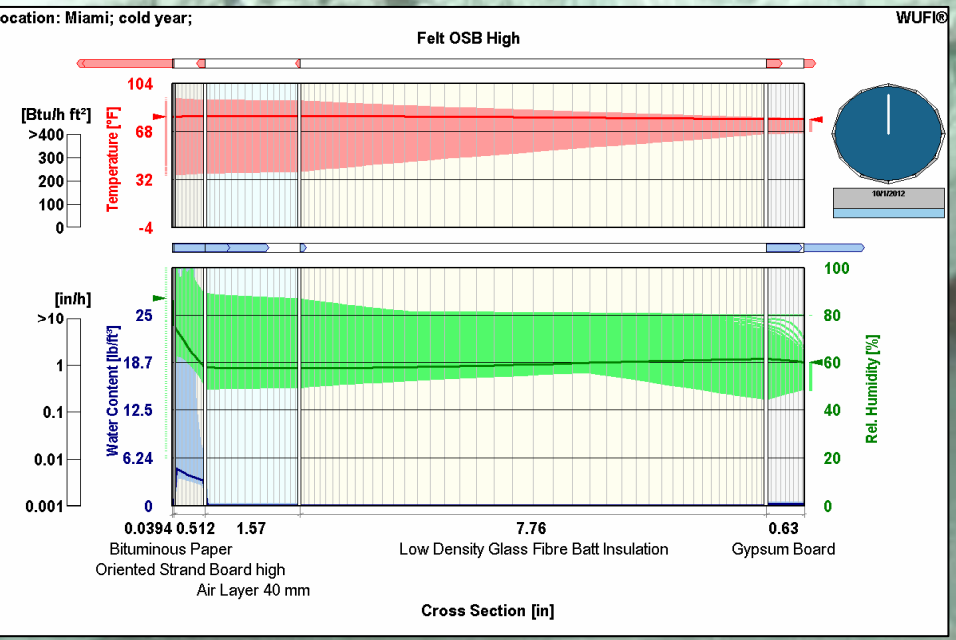
❖Being impermeable to water, ccSPF acts as a secondary water barrier that reduces water leakage if roof covering is compromised during hurricanes and also the ccSPF installation helps to reduce the Electrical energy consumption in Heating and Cooling of buildings because of its high Thermal Resistance (R Value).

❖Despite of these benefits, the use of ccSPF is very limited due to lack of knowledge regarding durability of ccSPF and its effect on the rate of wood degradation and quantifiable data on Thermal Performance.

❖This research project will evaluate compare and quantify the thermal performance and energy consumption in an existing residential home attributable to the installation (before and after) of ccSPF insulation to the underside of a wood roof deck in a vented attic configuration.



Water content plot of OSB roof sheathing from WUFI analysis.



Temperature and water content plot across the cross section of the roof from WUFI analysis.

This project involves working in close association with the Florida Sea Grant sponsored research project on Developing Design Guidelines for Retrofitting Wood Roof Sheathing using ccSPF.

Methodology:

❖Installing temperature and moisture sensors in the attic, weather station and an Energy Monitoring system in the house to monitor the energy consumption.

❖Spraying of ccSPF in the ventilated attic of the test house.

❖Monitoring energy usage before and after ccSPF installation.

❖Simulating the Roof model in WUFI Pro 1D (Wärme und Feuchte Instationär, developed by IBP, Germany and ORNL, USA) to determine the drying time of components after an accidental leakage-similar to that caused in a hurricane.

❖Drafting the Guidelines for the use of ccSPF by homeowners.

• ccSPF in the background