

RESEARCH OBJECTIVES

- ① Develop a structural building monitoring system to collect data on roof loads on W. Kerr Scott Hall.
- ① Develop a framework for a stochastic design monitoring system to avoid or mitigate the impact posed by a threat. The early warning system will allow persons to use the roof again for renewable energy research.
- ① Apply monitoring system principals towards a sustainable campus building management system.

BROADER SIGNIFICANCE OF THE PROJECT

- ⦿ Identifying patterns that lead to greater certainty in the decision-making process.
- ⦿ The ability to reduce risk by the use of Early Warning Systems.
- ⦿ Processes of data collection can be extended to other areas such as monitoring differential settlement problems or natural hazards such as floods, earthquakes, landslides and avalanches.

Photovoltaics on W. Kerr Scott



Solar Thermal Water Collectors



Solar Thermal Water Collectors



Wireless Data Relay Configuration

Data Logger #1



Radio
signal



Master Station
Host Web Server

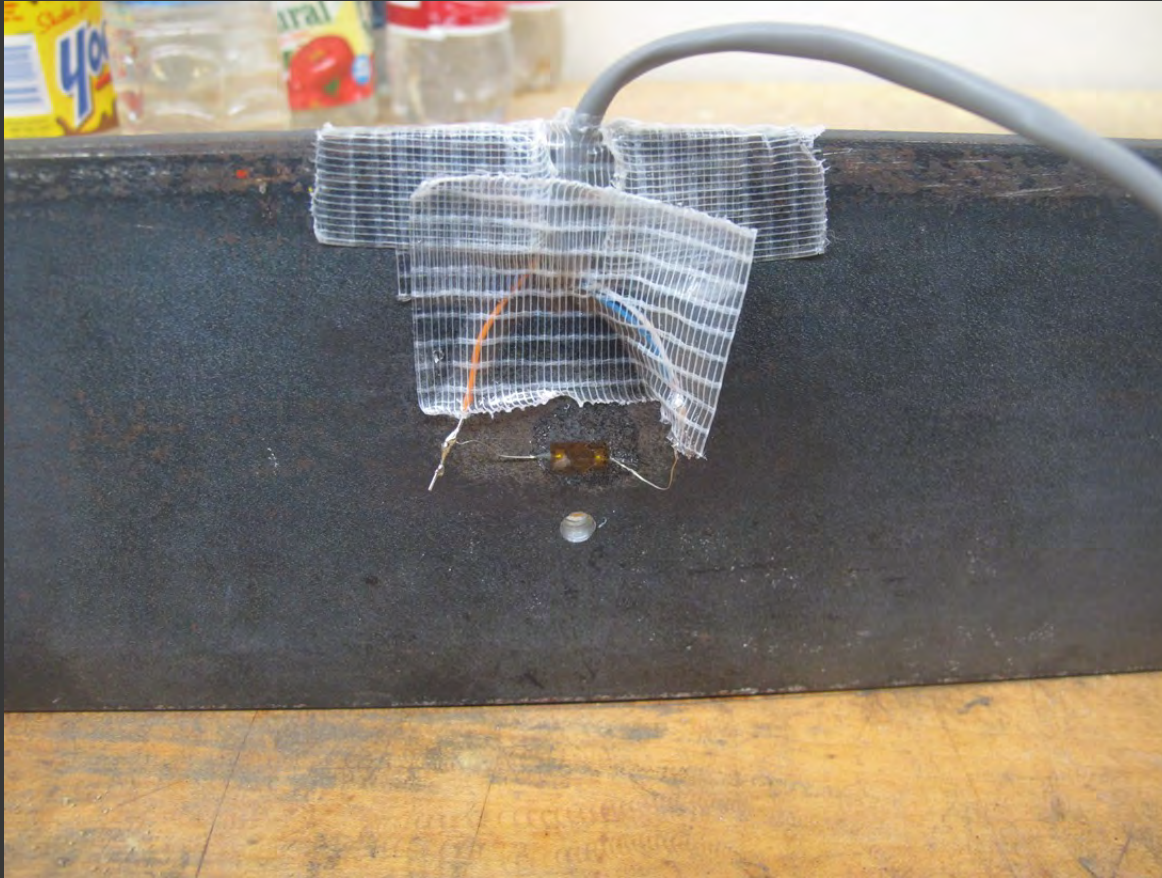
Wired

Sensors
(strain gauges and sonic sensor)

Bench Testing of Strain Gages



Bench Testing of Strain Gages



Strain Gage on Joist



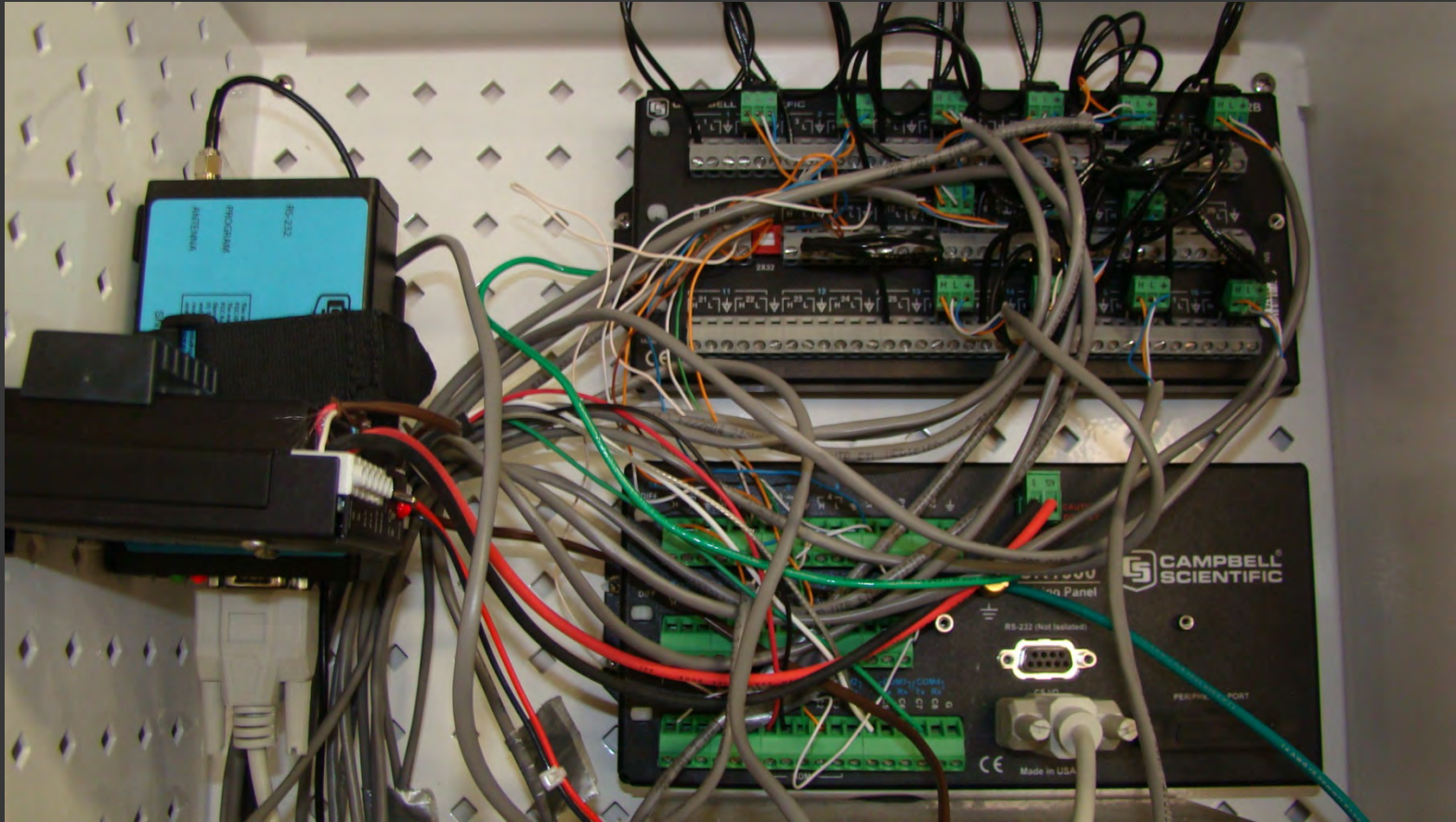
Strain Gage on Open Web Joist



Enclosure for Datalogger and Wireless Radio



Fully Wired Enclosure



Tripod on W. Kerr Scott Roof



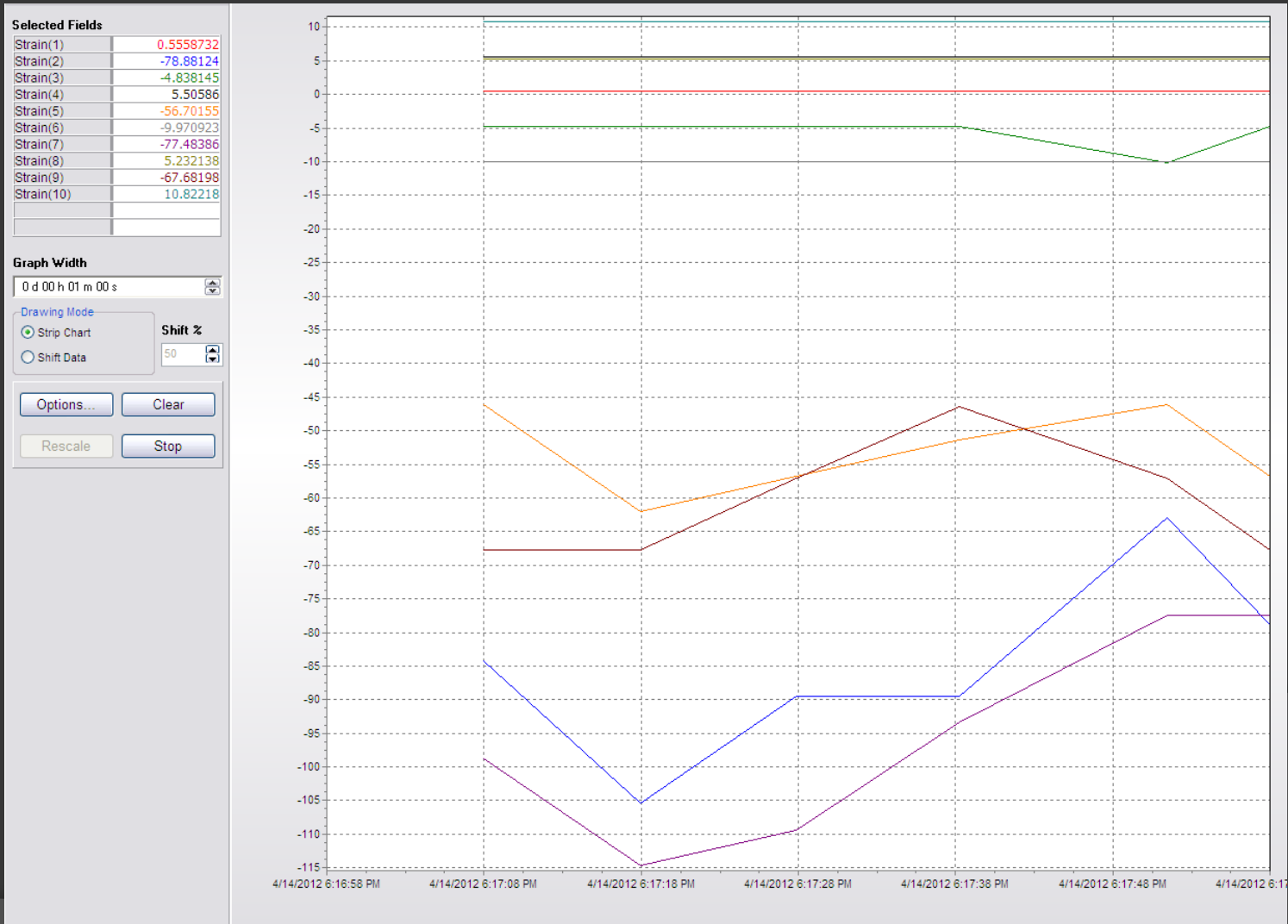
Roof Sensors and Charging Solar Panel



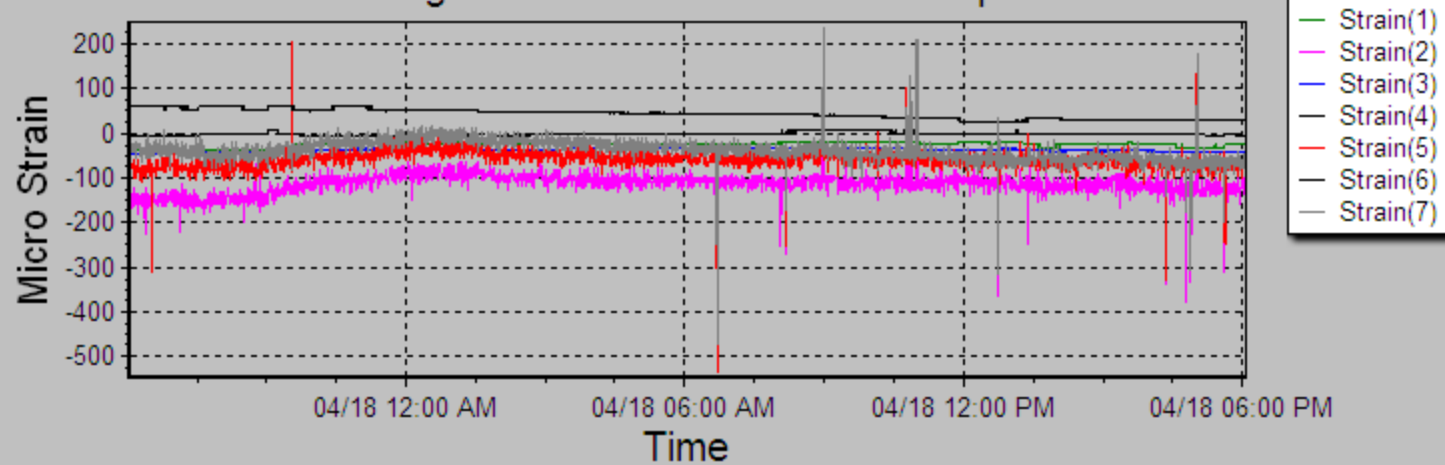
Wiring from roof to datalogger inside building



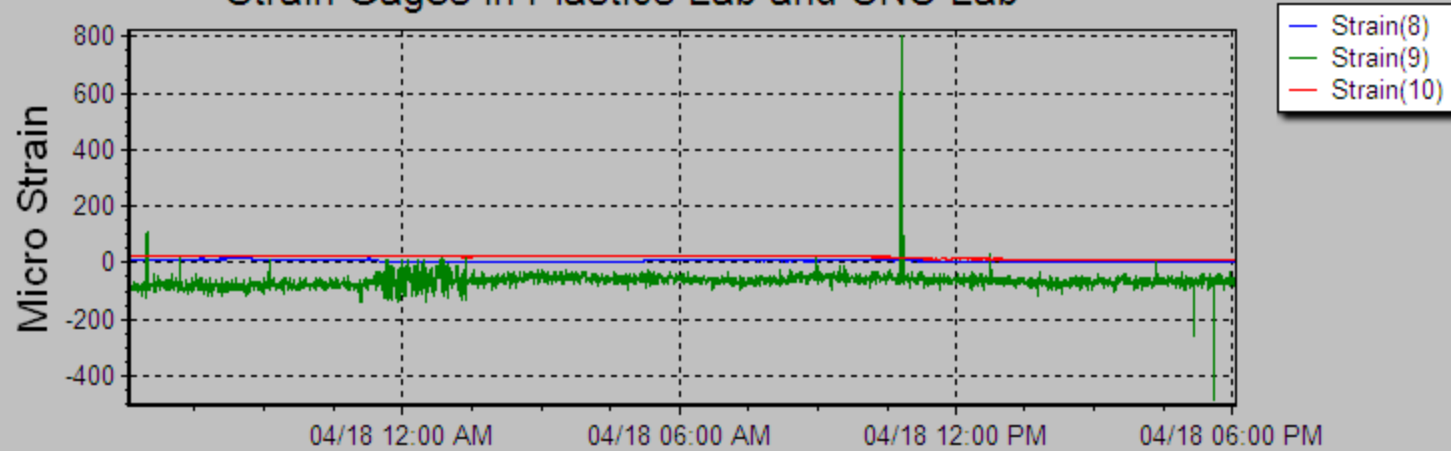
Strain gages in woodshop and CNC Lab



Strain Gages in Kerr-Scott Hall Woodshop



Strain Gages in Plastics Lab and CNC Lab



URL: <http://ok.tec.appstate.edu/structure>



The snow load for the building is rated at 30 lbs sq/ft by the NC Department of Insurance. Proposed structural loads for solar activities have been estimated and expressed as “snow load”:



Design Condition #1

- Classroom lab mode with 6 students per work area would add 2,040 pounds to a work area of about 400 sq/ft. This added load would be 5.1 lbs sq/ft (17%) for the rated building snow load, or 3.6% for the 1,875 sq/ft joist parallel to the area.

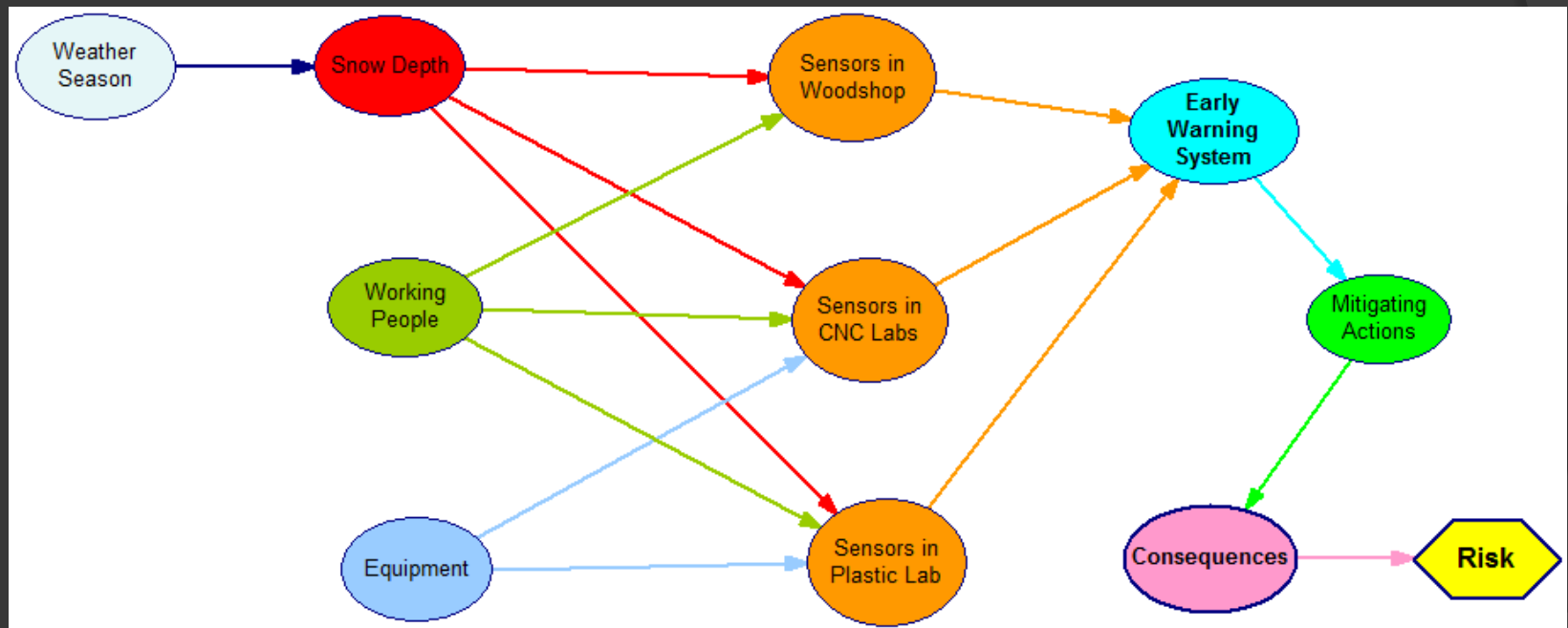
(Jeff Tiller, PE)

Design Condition #2

- Classroom demonstration mode with 20 adults in one area would add 4,840 lbs to a work area of 650 sq/ft. The added load would be 7.4 lbs sq/ft – about 25% of the snow load for the building, or 8.6% of the snow load for the 1,875 sq/ft area parallel to the joists.

- (Jeff Tiller, PE)

Bayesian Network for Warning Systems



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Questions?

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