Aug 20th, 12:00 PM - 2:00 PM

Façade evaluation facility

Suresh Sadineni  
*University of Nevada, Las Vegas*

Wendell Cocina  
*University of Nevada, Las Vegas*

Robert F. Boehm  
*University of Nevada, Las Vegas*, bob.boehm@unlv.edu

Repository Citation
https://digitalscholarship.unlv.edu/nvrec/2010/aug20/10

This Event is brought to you for free and open access by Digital Scholarship@UNL. It has been accepted for inclusion in Nevada Renewable Energy Consortium Meeting by an authorized administrator of Digital Scholarship@UNL. For more information, please contact digitalscholarship@unlv.edu.
Objective
The purpose of the Façade Evaluation Facility (FEF) is to evaluate several types of façade configurations, such as a conventional double pane window, a triple pane window, and building integrated photovoltaic (BIPV) panels. The facility will simulate one side of a building’s exterior. Characteristics along with the effects that different panels have on the building energy will be determined from the experimental data.

Experimental Setup
A steel shipping container is used as the controlled space and is mounted on a carousel to allow the adjustment of orientation as shown in figure 1.

Polystyrene insulation was installed on the walls of the container to reduce the associated heat gains which is displayed in figure 2. The insulation was staggered to avoid infiltration and produce a tight seal.

Meteorological data will be analyzed using the weather station setup shown in figure 4. The sensors required are ambient temperature probes, wind speed, and wind direction sensors. Data gathered here will be used to determine the effects the surrounding weather has on the setup.

Precision spectral pyranometers shown in figure 5 will allow the measurement of transmittance and albedo of the façade. The amount of solar irradiation directed towards the façade will also be measured.

Figure 3 – Personnel Door
Figure 3 depicts a personnel door with a corresponding sealing plug to allow access inside the facility. This is located on the opposite side of the façade.

Figure 4 – Weather Station

Figure 5 – Precision Spectral Pyranometer

Figure 6 – Equipment Setup of Facility
Figure 6 shows the data logging equipment, A/C unit, and power setup. A mini split ductless A/C system was chosen to minimize infiltration. The condenser unit is located on the exterior while the interior houses the air handler. This grants the ability to control the interior temperature and reproduce standard building conditions. The data acquisition system will record the measurements from the sensors previously discussed in addition to the following: temperature, relative humidity, heat flux and power measurements. Power consumed by the A/C unit will be measured using wattmeters and current transformers. Surface temperatures and heat flux of the walls will be measured. All these measurements will be used to determine a proper energy balance of the setup.

Approaches
Currently, a fully insulated setup will be tested as shown in figure 7. This will determine the amount of heat gained by the setup with no existing facade. The results obtained will be compared to a double pane window setup shown in figure 8. The difference in energy gain between the fully insulated setup and the double pane window setup will be the amount the façade allows into the system. Orientation of the setup can be adjusted during testing. BIPV panels are under consideration for testing.