

Critical Moss

Is a moss wall an effective insulator?

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Hypothesis

A 4" layer of moss placed on the exterior envelope of a building can provide an R-value of at least 3, which is equal to that of a leading manufacturer of green walls. This will prove that a moss wall is an adequate alternative to explore further for green wall materials.



1. A 20" x 30" x 4" wood frame was constructed to hold the moss in place. 1/4" stainless steel mesh was nailed across one side of the frame and 4" thick moss (from the cliffs bordering Franklin Blvd. near I-5) was lain evenly across it. Chicken wire was used on the moss-facing side of the frame for its minimal surface area.

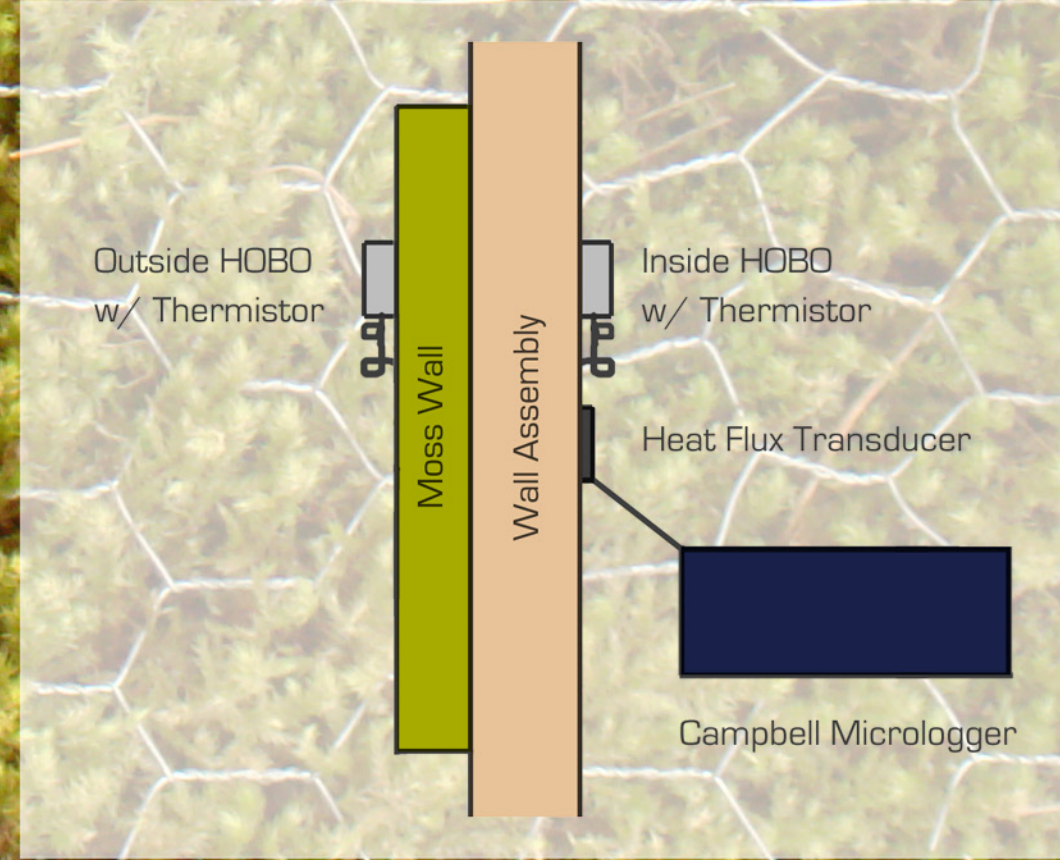
2. Using the Campbell Scientific Micrologger, the Heat Flux Transducer was programmed to record heat flux data every minute over a 5mV range. The patch was then taped to the interior wall of Hugh's room opposite an area of the exterior wall receiving no direct sunlight.

3. Two Onset HOBO data loggers were connected to thermistors and programmed to record temperature in degrees F every one minute. One HOBO was placed inside next to the HFT, while the other was positioned opposite it on the exterior wall. Thermistors were taped to the wall surface and small shading devices were added to reduce solar heat gains.

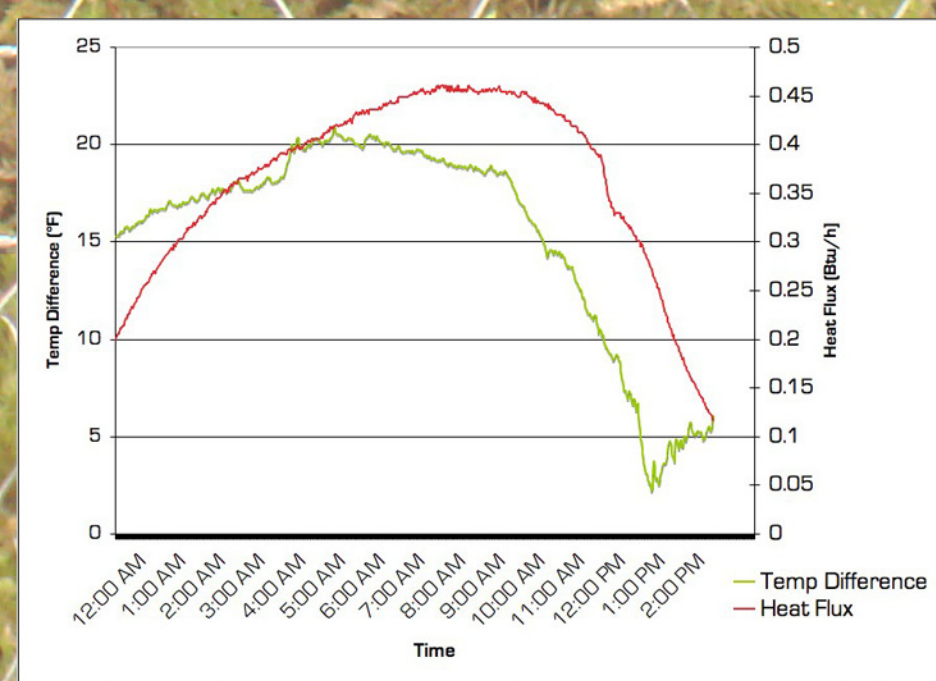
4. Following 18 hrs. of testing, data was recorded and the exterior HOBO removed.

5. Using nails to support the frame, the moss wall was placed flush to Hugh's outside wall opposite the HFT. Duct tape was used to keep the frame in place. The exterior HOBO was attached to the moss wall and testing was repeated.

6. For the final test, the moss wall was placed within an open 20"x30" window in Hugh's room. Duct tape was used to seal the sides and the HFT and HOBO's were again placed opposite each other. Data was recorded for 12 hrs.



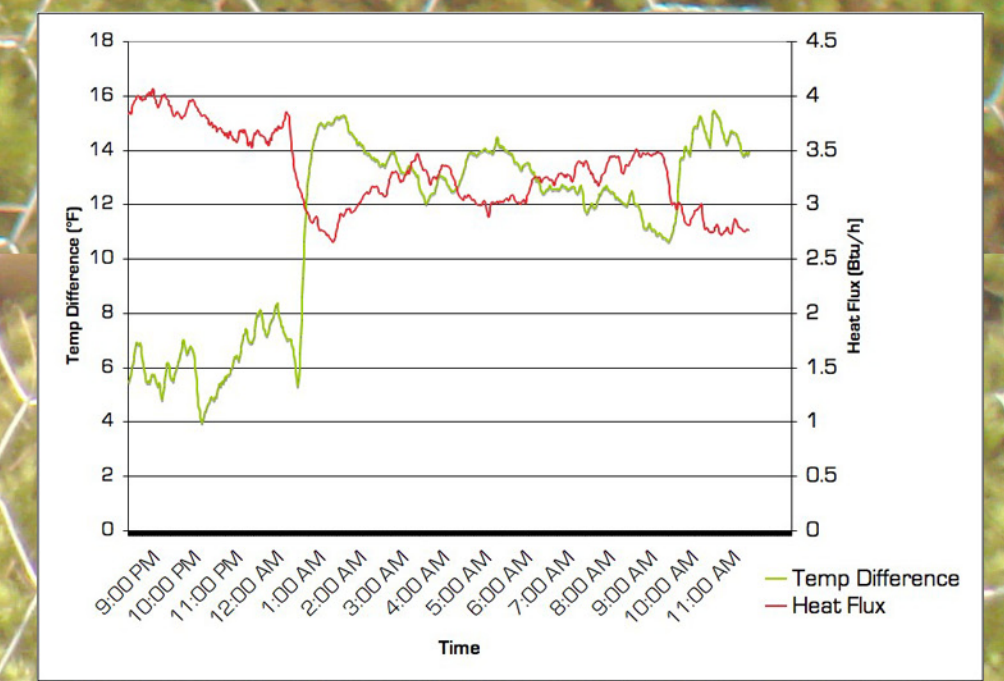
Wall Only



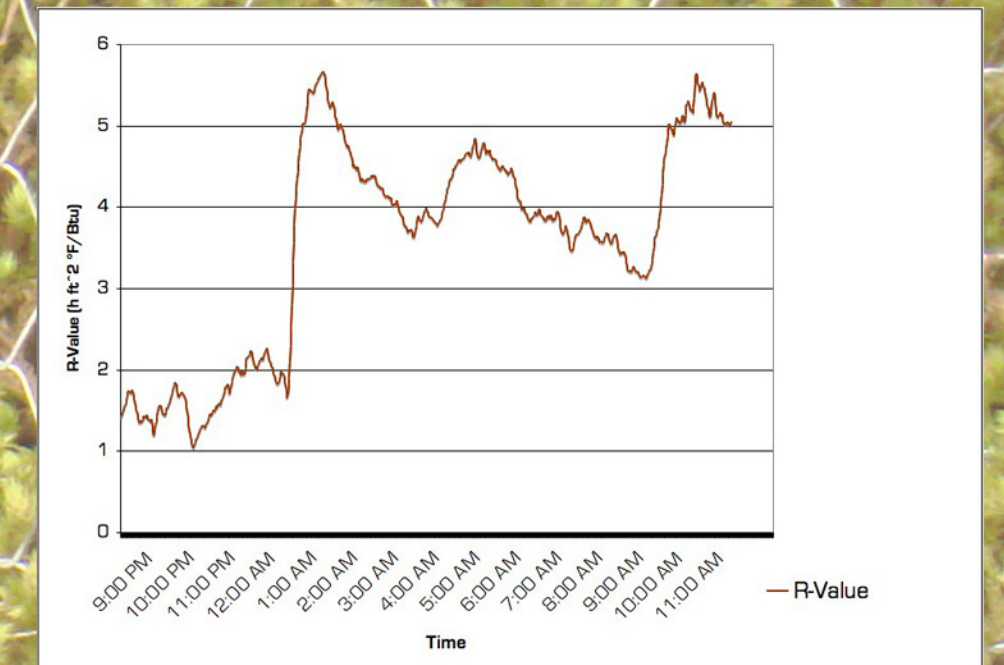
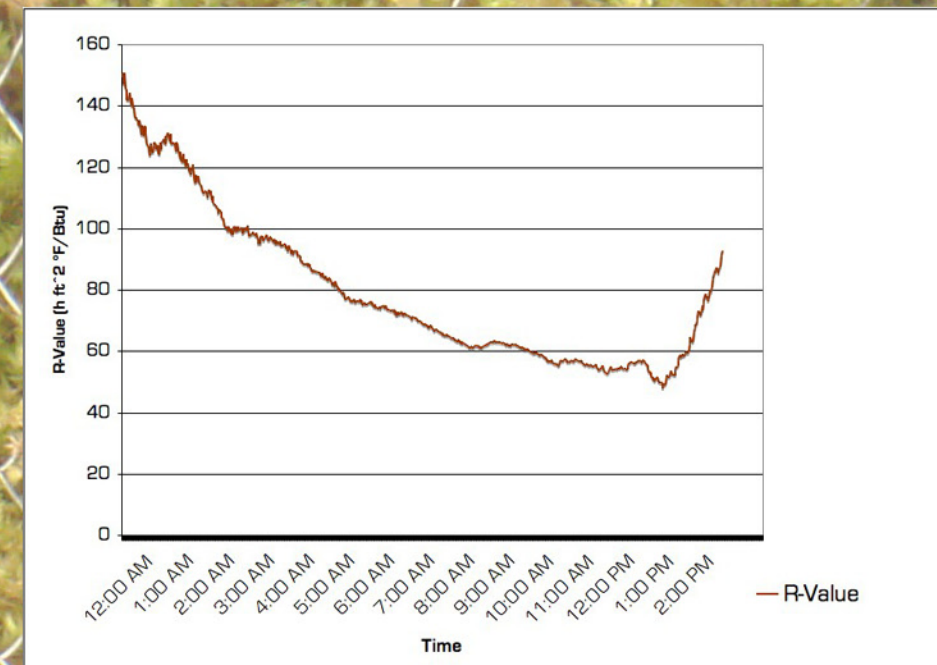
Wall and Moss



Moss Only



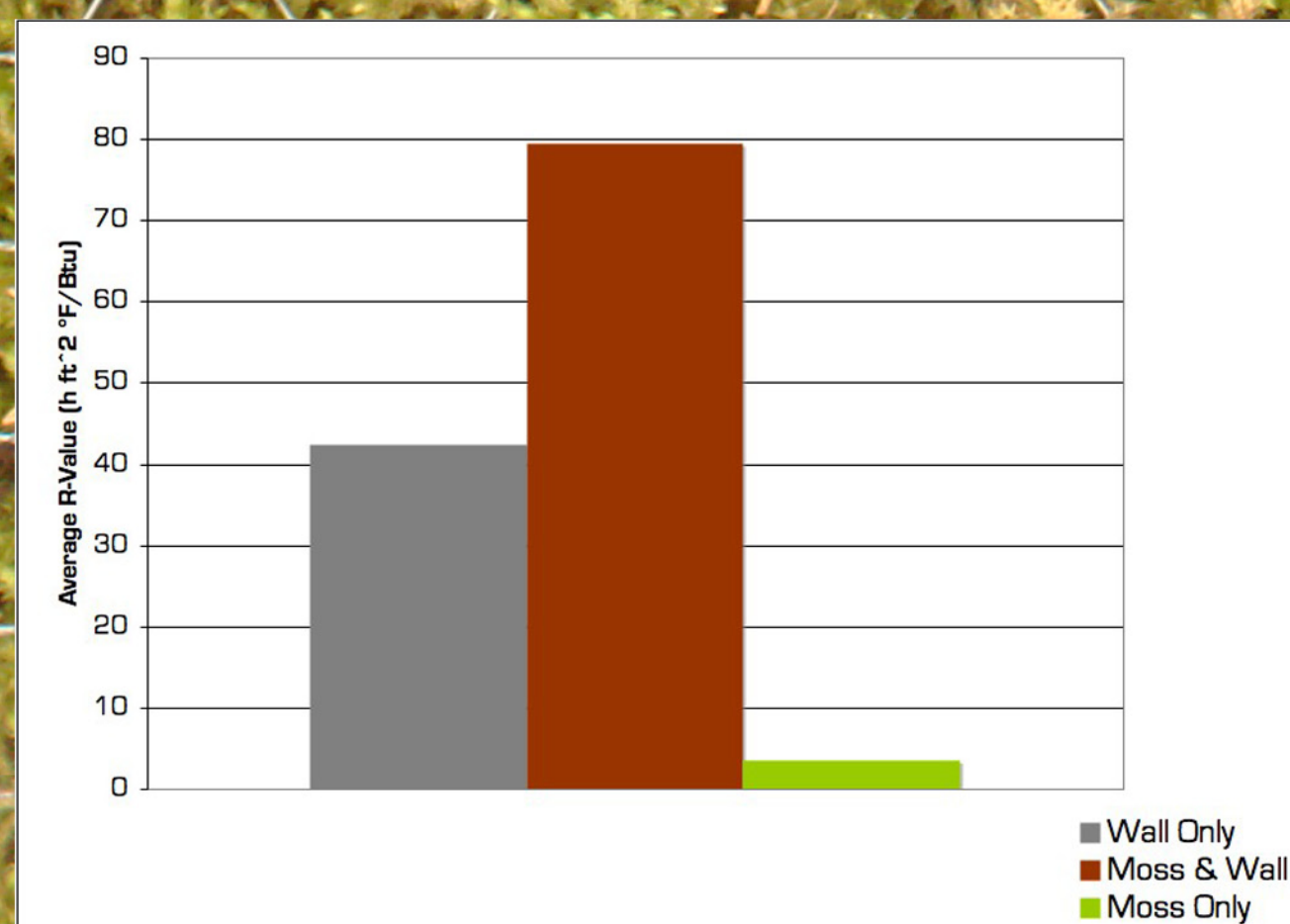
Relationship between change in temperature and heat flux.



Measured R-Value over time.

The Heat Flux Transducer gave us the heat flux of the wall in Btu/hr which we used in the equation for heat flux $Q = U \cdot \text{Area} \cdot \text{Change in Temperature}$. We then inverted U to get an R-Value. We averaged the R-Values for all of the series of data in order to obtain the most accurate number for R possible. The results for the wall alone and the wall with the moss wall attached yield an improvement of 100%. This clearly inaccurate, but at least we see an improvement in the insulation. We decided to take another sampling of data from just the moss wall installed in a window. The average R-Value of the moss wall alone was 3.56, which is a more reasonable number and we believe this is accurate to the actual R-Value.

R-Value
3.56



Average R-Values

Our hypothesis was that the moss wall would have an R-Value of 3 or more, equaling that of a leading brand of green walls and therefore warranting more study on the implementation of moss walls. The R-Value we obtained for a moss wall was 3.56 which is enough that we believe a moss wall would be an adequate option to use as a green wall.