Experimental determination of the R-value of a wall.

Description of experiment

In class we used a micro-house with XPS insulated floor (2" thick) and ceiling (4" thick) warmed with a radiator type space heater regulated with a thermostat. This space heater's energy use was tracked as was the temperature inside the micro-house and outside the micro-house. The energy use was tracked after the heat flow in the house reached steady state with the walls of the house in two different configurations:

1. Walls without insulation (3.5" of air)
2. Walls with 2" of XPS insulation (and 1.5" of air)

The walls of the micro house had studs 16" OC, ½" plywood sheathing, and ½ gypsum board interior walls.

Use the observations collected to

- Calculate the rate of heat flow out of the micro-house for both wall configurations ($\dot{Q}_1$ and $\dot{Q}_2$). Explain clearly how you have modeled this and be explicit about the units you are using.
- Calculate the heat flux out of the micro-house for both wall configurations (ϕ_1 and ϕ_2). Clearly explain how you have modeled this including differing assumptions between the two wall configurations. Again be explicit about the units you are using.
- Calculate the net R-value for the walls in each configuration. Report your R value in imperial units.
- Compare your R-values for the two configurations, and to the R-values for air-filled walls, plastic foam filled walls, and wood filled walls (from the notes and your homework). Speculate on the reason for the discrepancies you find.