

Lab 4. Thermal Insulation (2.5 Points)

This assignment is designed to take a more detailed approach to the calculation of the thermal performance of a wall system. The exercise will be based on a 2 x 6 wood frame wall system with wood bevel siding, 1/2" plywood sheathing on the outside and 1/2" gypsum wall board on the inside. The insulation will be a 6" R-19 batt (assume it has a fiber diameter of 0.00022" and is a true 6" when rated, but will be compressed into the 5-1/2" cavity). Please show your work and cite sources for your inputs.

Part 1. For this wall system you will calculate the overall U factor and R-value for the two conditions; one installed properly and one with several defects.

Wall A: Proper Installation -- This wall will have no voids, minimal convective looping (that will be ignored) and a framing factor of 15%.

Overall U-factor: _____

Overall R-value: _____

Wall B: With Defects -- This wall has several defects over Wall A, including a 10% void factor (use values for a 3.5" air space), a 15% increase in insulation conductance due to excessive looping caused by the voids, and a framing factor of 25%.

Overall U-factor: _____

Overall R-value: _____

Part 2. Redo the same two scenarios replacing the plywood with 1” of extruded polystyrene sheathing.

Wall A: Proper Installation

Overall U-factor: _____

Overall R-value: _____

Wall B: With Defects

Overall U-factor: _____

Overall R-value: _____

Part 3. Write a short commentary on how these proper and defect installations compare and the overall impact of the insulative sheathing on each scenario. Any surprises?