

Lab 5. Fenestration (2.5 Points)

This assignment is designed to take a more detailed approach to the calculation and analysis of the thermal performance of windows. You will need to go to the following website, create an account, and then download the RESFEN 5.0 software:

<http://windows.lbl.gov/software/resfen/resfen.html>

You have been asked to do an analysis of several windows for a builder in Chicago, IL. The proposed new superinsulated house is a 2-story wood-frame construction with 2400 square feet (including the basement) with gas forced-air heating and AC. For this analysis assume an air infiltration of 0.3 cfm/sf and an overhang with no internal shading. Natural gas is \$0.80/ccf and electricity is \$0.11/kWh.

You have four windows to compare:

- A) Double glazed clear with argon and in a vinyl frame; $U = 0.40$; $SHGC = 0.56$
- B) Double glazed with low solar gain low-E, argon gas in a wood frame: $U = 0.34$; $SHGC = 0.30$
- C) Double glazed with high solar gain low-E, argon gas in a wood frame: $U = 0.37$; $SHGC = 0.53$
- D) Triple glazed with modest solar gain low-E, argon gas in a fiberglass frame: $U = 0.18$; $SHGC = 0.40$

1. Compare the four windows assuming 80 square feet of windows on each orientation.

a. Which window gives the lowest heating costs and how much?

b. Which window gives the lowest cooling costs and how much?

c. Which window gives the lowest total heating and cooling costs and how much?

2. Now optimize the total window package. Try to get the lowest total heating and cooling costs within the following parameters. You can use any of the four windows above for each individual orientation. But you must have a minimum of 10% of the floor area in windows and cannot exceed 15% of the floor area in windows. Also, you must have a minimum of at least 40 square feet of window on each orientation.

a. How many square feet and which window do you have on each orientation?

	Square Feet	Window Type
South	_____ sf	of _____
West	_____ sf	of _____
North	_____ sf	of _____
East	_____ sf	of _____

b. What is the total heating and cooling costs for your optimized case?

3. How much energy and total heating and cooling costs would be saved on the base case [1c. above] if the air infiltration per square foot was cut by 50%?

a. Energy Savings = _____

b. Cost Savings = _____

4. General Thoughts and Comments: