Technical Environmental Solutions/ Submission no.8/
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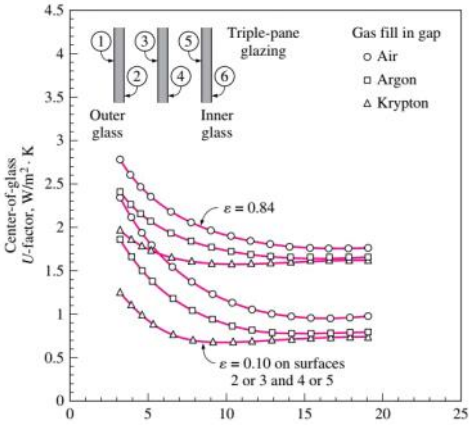
Task no.1

Using the diagrams given in the presentation calculate how much (%) is the effect of applying different modifications (changing the gas, adding an extra pane, using a low emissivity coating) on the U value with respect to a benchmark case of double layer with air and no coating ? (keep the gap thickness to be 13 mm)



In case of a double pane window, with a air space of 13 mm, and emissivity = 0.84
the u factor is = 2.8 (from the graph)
If we changed the gas to krypton, the u value is = 1.7
the reduction is equal to 0.3 %

In case of the reduction of emissivity to 0.1, the u value is = 1.2 (air)
The reduction is equal to 50%

Task no.2

Consider the house that we analyzed in the last two examples, calculate the heating and cooling load of the other windows whi ch are fixed 14.4 m2 on the west, fixed 3.6 m2 on the south and an operable 3.6 m2 on the south (the same window and frame type). How much does the total value change if I change the frame of the window from wooden one to aluminum ?

- **West window (fixed)**

Cooling loads

$$Q_{window_{west}} = CF_{windwo_{west}} \times A_{window_{west}}$$

$$CF_{fen} = U(\Delta t - 0.46\,DR) + PXI \times SHGC \times IAC \times FF_s$$
$$CF_{fen} = 2.84(7.9 - 0.46 \times 11.9) + 747 \times 0.54 \times 1 \times 0.56 = 231.9$$
$$Q_{window_{west}} = 231.9 \times 14.4 = 3339.5\,w$$

Heating loads

$$HF_{window_{west}} = U_{window_{west}} \times \Delta T_{heating} = 2.84 * 24.8 = 70.4$$
$$Q_{window_{west}} = HF_{window_{west}} \times A_{window_{west}} = 70.4 * 14.4 = 1014.2\ W$$

- **South window (fixed)**

Cooling loads

$$Q_{window_{south}} = CF_{window_{south}} \times A_{window_{south}}$$

$$CF_{fen} = U(\Delta t - 0.46\,DR) + PXI \times SHGC \times IAC \times FF_s$$
$$CF_{fen} = 2.84(7.9 - 0.46 \times 11.9) + 557 \times 0.54 \times 1 \times 0.47 = 148.25$$
$$Q_{window_{south}} = 148.25 \times 3.6 = 533.7\ W$$

Heating loads

$$HF_{window_{south}} = U_{window_{south}} \times \Delta T_{heating} = 2.84 * 24.8 = 70.4$$
$$Q_{window_{south}} = HF_{window_{south}} \times A_{window_{south}} = 70.4 * 3.6 = 253.55\ W$$

- **South window (operable)**

Cooling loads

$$Q_{window_{south}} = CF_{window_{south}} \times A_{window_{south}}$$

$$CF_{fen} = U(\Delta t - 0.46\,DR) + PXI \times SHGC \times IAC \times FF_s$$
$$CF_{fen} = 2.87(7.9 - 0.46 \times 11.9) + 557 \times 0.46 \times 1 \times 0.47 = 127.3$$
$$Q_{window_{south}} = 127.3 \times 3.6 = 458.28\ w$$

Heating loads

$$HF_{window_{south}} = U_{window_{south}} \times \Delta T_{heating} = 2.87 * 24.8 = 71.17$$
$$Q_{window_{south}} = HF_{window_{south}} \times A_{window_{south}} = 71.17 * 3.6 = 256.212\ W$$
