

PRACTICE EXERCISES

CIVIL-407
Energy and Comfort
in Buildings

Building
Envelope

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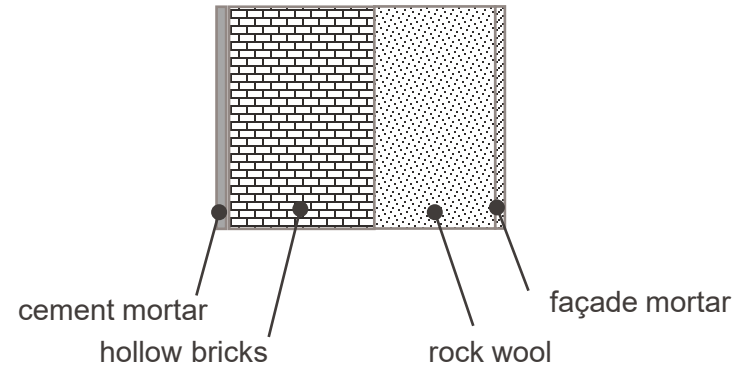


Exercise 1: Opaque Building Element

Determine the thermal transmittance of the vertical wall structure *adjacent* to exterior. The composition of the wall structure is given in the table.

1. Check whether it complies with the permissible limiting value U_{limit} for **renovation projects** per standard SIA 380
2. Determine the required thickness of the thermal insulation (rockwool) layer so that the U-value of the wall will comply with the SIA 380 requirements for **new buildings**.

	d (cm)	λ (W/mK)
cement mortar	2	1.40
hollow brick	19	0.52
rock wool	15	0.041
façade mortar	2	0.70



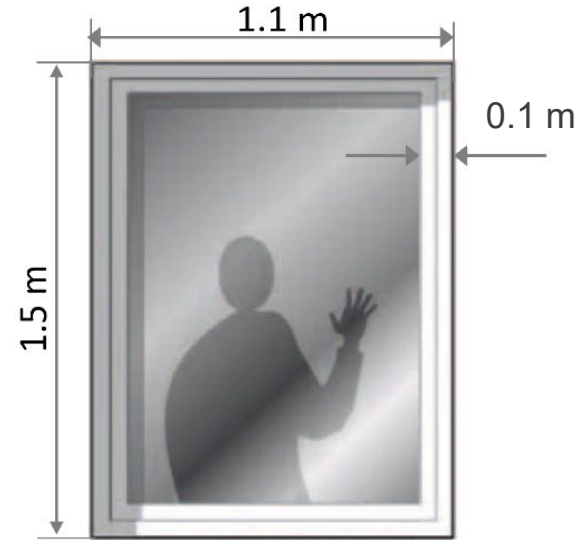
Exercise 2: Window Selection

Consider a standard window facing outdoors shown on the picture. Two options of glazing for an air-tight double-pane window (filled with air) are available:

(a) uncoated ($U_g = 2.9 \frac{W}{m^2 \cdot K}$, $g = 0.73$);

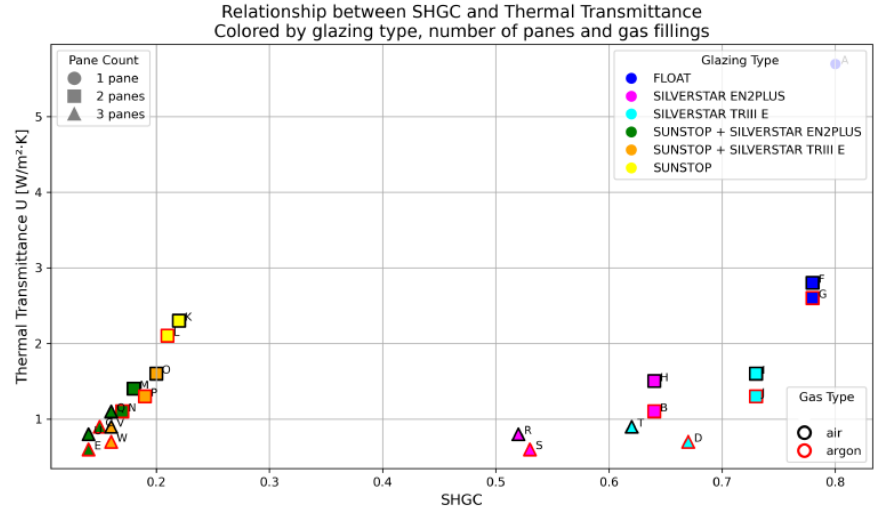
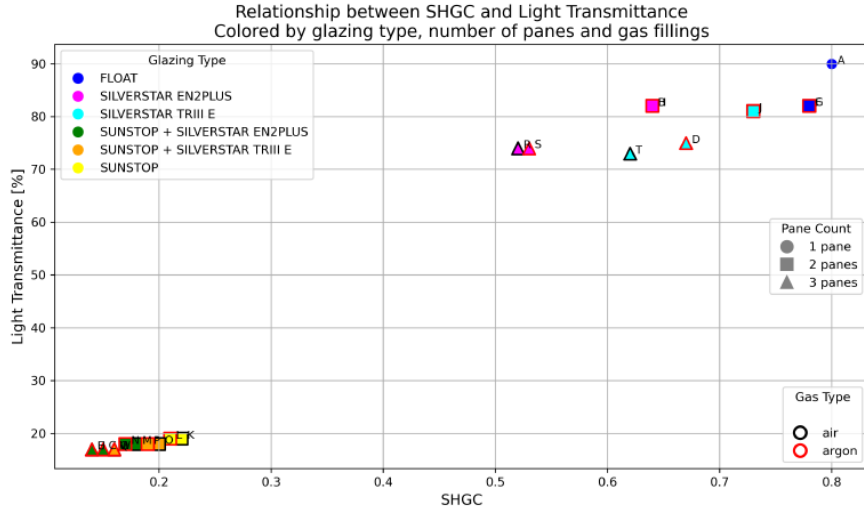
(b) coated with low-e film ($U_g = 2.0 \frac{W}{m^2 \cdot K}$, $g = 0.65$)

- Linear thermal transmittance of the glazing is $0.06 \frac{W}{m \cdot K}$ for uncoated glass and $0.08 \frac{W}{m \cdot K}$ for low-emissivity glass
- The frame is a PVC-hollow profile ($U_f = 2.0 \frac{W}{m^2 \cdot K}$)



Determine which option of the glazing provides lower thermal transmittance of the window U_w and whether it complies with:

- maximum permitted ($U_{w,max}$) values for windows per SIA 180
- the limiting value ($U_{w,limit}$) for windows per SIA 380 standard



Characteristics of various glazing types offered by the *GlasTrösch* manufacturer are shown on the plots. Based on the data shown, answer to the following questions:

1. What are the types of the glazing types that could be suitable for new buildings considering SIA 380 limiting requirements
2. What should be characteristic of the glazing (U-value and g-values) and for buildings located in different climate zone:
 - (a) cold climate, (b) hot climate, (c) temperate climate