GOOD PRACTICES IN SME

Replacing windows

Designed by freepik

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What are the signs that the windows should be replaced?

In traditional buildings, heat losses through windows constitute as much as 30% of the total heat losses. To limit these loses we can replace the windows, with windows with a lower heat transfer coefficient U $[\frac{W}{m^2 \cdot K}]$. Signs that heat losses through windows could be relatively significant:

- perceivable draught from the windows or moisture appearing on the windowsill due to window leakage,
- cracked window,
- perceivable lower temperature along the frame due to thermal bridging.

Which window parameters are important?

The most important parameter for a window is its heat transfer coefficient U $[\frac{W}{m^2 \cdot K}]$. The lower it is, the better the windows are at insulating. Older window models have a heat transfer coefficient of about 1,3 $\frac{W}{m^2 \cdot K}$. It is assumed that energy efficient windows have a heat transfer coefficient U lower than 1,0 $\frac{W}{m^2 \cdot K}$, and passive windows have a heat transfer coefficient U no larger than 0,8 $\frac{W}{m^2 \cdot K}$.

Current norms require windows in new buildings to have a U coefficient lower or equal to 1,1 $\frac{W}{m^2 \cdot K}$. From 2021 the requirements increase and the maximal heat transfer coefficient U for new windows will be 0,9 $\frac{W}{m^2 \cdot K}$.

What does the heat transfer coefficient of windows depend on?

For windows, their heat transfer coefficient depends on its construction and the materials used. Three pane windows are characterized by better insulation than two pane windows. It is also important what fills the pane chambers. Usually they are filled with a noble gas – argon. Some windows are filled with the better insulating krypton. Vacuum windows, which will achieve the lowest U coefficients are also available. Moreover, the shape and material of the frame also affects the U coefficient.

Pic. 2 PAWBRAM: section of a two pane window

Pic. 1 Internorm: section of a three pane window

Example comparison between windows with different heat transfer coefficients

Let us estimate the heat losses during the heating season for a window with a total area A=20m^2. Old windows have a heat transfer coefficient of about U=1,3 $\frac{W}{m^2 \cdot K}$, while new windows of about U= 0,8$\frac{W}{m^2 \cdot K}$.

Let us assume that the building is heated for t=120 days a year, with an average outside temperature of T_I= 0°C and the inside temperature of T_O=22°C, while the cost of 1 kWh of heat for the building is about 0,20 PLN.

Heat losses are defined with the formula: $Q = U \cdot A \cdot (T_I - T_O) \cdot t$

Heat losses for old windows: $Q = 1{,}3 \ \frac{W}{m^2 \cdot K} \cdot 20m^2 \cdot (22°\text{C} - 0°\text{C}) \cdot 120 \cdot 24\text{h} = 1\ 647\ \text{kWh}$

Heat losses for new windows: $Q = 0{,}8 \ \frac{W}{m^2 \cdot K} \cdot 20m^2 \cdot (22°\text{C} - 0°\text{C}) \cdot 120 \cdot 24\text{h} = 1\ 014\ \text{kWh}$

Difference in cost during the heating season:

$$(1\ 647\ \text{kWh} - 1\ 014\ \text{kWh}) \cdot 0{,}20 \frac{PLN}{\text{kWh}} = 1\ 444{,}20\ \text{PLN}$$

Source: KAPE