U-values of door panels

When we talk about U-values of door blanks, we mean how much heat transfer there is per second and per degree celcius on average through a square meter of this door blank. With emphasis on 'average' because with composite door blanks which consist of frame with filling (core), the heat transmission flux between core and frame can vary considerably.

This heat flow or flux is defined at a temperature difference of 1K, or 1 ° C. The value of 1 Kelvin and 1 ° C is the same with the proviso that the Kelvin scale starts at approximately 273 degrees Celcius below the zero point of the Celsius scale. This is called the absolute 0 point or 0 K(elvin) with the words 'degree' or 'degrees' never being used as a prefix. For example: 288K ≈ 15 ° C and 319K ≈ 46 ° C (≈ means: 'corresponds approximately to')

Mill Panel has therefore divided its U-values of door panels into U-values at the location of the frame (wood) and U-values at the location of the insulated part of a door blank. These two values are added to each other on the basis of their specific surface area and U-value and divided by the total area of the door blank. The result is the average weighted U-value of the panel, Up.

door blanks is the same everywhere: there is no frame wood or filling. This sounds complicated but the following example describes this in a simple way:

Suppose a door blank has a U-value of 2.0W / (m^2.K) for the foam core area and 0.7W / (m^2.K) at the location of the stiles and rails. The surface area of the insulated part is 1.6125 m^2 and the area of the peripheral wood is 0.62 m^2. The average weighted U value will be then:

$$\frac{(0{,}62\ m^2 \times 2{,}0 W/(m^2.K)) + (1{,}6125\ m^2 \times 0{,}7 W/(m^2.K))}{1{,}6125\ m^2 + 0{,}62\ m^2}$$

The result is: U = 1,06 W/(m^2.K)

Question *Why is (m2.K) inbetween brackets?*

Answer *Sharing and multiplying have an equal priority on the basis of calculation. The (m2.K) belong together, which is why these are inbetween brackets.*

U-value *is also called heat transfer coefficient (old: k-value).*

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U-values of door panels

You may wonder why the aforementioned example has been taken with such specific surface values. Well, this is a composite door blank of which the edge wood (rails as well as door stiles) has a width of 10 cm while the size of the door leaf is 235 x 95 cm.

It follows that the surface of the edge wood is 0.62 m2 and the area of the insulated part is 1.6125 m2. The total area will then be 2.2325 m2.

How does a U-value come about?

A U-value is established, inter alia, by a specific arithmetic operation of Lambda values. Each solid has its specific Lambda value and is expressed in W/(m*K). These Lambda values can be determined physically with specific heat flux measuring equipment.
This part is not taken into consideration here, because then subjects such as transition resistances must be explained. Since this is not relevant for the conceptualisation of this subject, this is not dealt with.

U-value and ψ (pronouncing as psi)-value van isoglass

HR^{++} glass often has a U-value 1,1 W/(m^2.K)

Question *What is W(att)*
Answer *Watt = Joule/s (s = second)*

There is, however, one important point to place with this U-value and this is that the glass edges (glass edges are the thermal bridges of isoglass) are left out of consideration here. The heat transfer, or actual heat loss, of isoglass edges is indicated by the ψvalue. This value is expressed in watts per meter of glass edge or W/m.

The mean ψvalue for HR++ glass is 0.06 W/m. This does not seem like much, but if one has a glass plate of, for example, 40 x 120 cm, this means that the average weighted U-value for this panel rises to 1.5W / (m^2.K). This answer follows from the following calculation.

The width and height of the window is 1.2 + 0.4 + 1.2 + 0.4 = 3.2 m. From this follows > 3.2 x 0.06 = 0.192 Watt (J/s). This means that this 'heat count' must be added to the heat loss of the insulated part of the glass. The thermal insulation value of the pane is 1.1 W / (m^2.K) x (0.4 m x 1.2 m) = 0.528 W. If we add these two values together, we arrive at 0.192 Watt + 0.528 Watt = 0.72 watts. This applies to an area of 0.48 m^2 1 m^2 is that 1.5 watts. **The U-value of this glass panel, compensated by the heat leakage of the edges, thus comes to 1.5W / (m^2.K).**

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From the aforementioned calculation we can draw the following conclusions:

If glass is placed with the above technical specifications, U = 1.1W / (m^2.K) and = 0.06 W / m in the door's insulation part of which the U-value is equal or lower than 1.1W/m.K), the average thermal insulation of the glazed door panel will decrease and therefore the average U-value willincrease.

Note that a higher U-value gives a lower thermal insulation.

In almost all cases one can say that, if isoglass is placed at the location of the insulated part of the door blank, the average weighted U-value of the door panel increases and thus the thermal insulation deteriorates. Only in the case of large doors, said glass ensures a reduction of the average weighted U-value and therefore these glazed door panels can give a higher thermal insulation (= resistance).

Dutch Building decree

The Dutch Building Decree of 2013 and more recently, requires for door frame combinations to have a maximum U-value of 1.65 W/(m^2.K). This means that you always have to choose a door panel, provided that this is a hard specification, where the average weighted U-value is below this value. If the door panel has a U-value that is only 0.1 or 0.2 W / (m^2.K) higher than the value of 1.65, it is practically impossible to provide a door-frame combination with an average U-value below 1.65 W / (m^2.K).

Question *Why is this practically impossible? I can still choose a good insulating frame?*

Answer *Is that it would theoretically be possible, but in the vast majority of cases the surface of the frame is smaller than the area of the door panel. As a result, the U-value of the door panel will weigh heavily in the total calculation of the average weighted U-value of the door frame combination.*

Technical data sheets of Mill Panel door panels

AluPlex®
https://millpanel.com/_file/24/datasheet_aluplex_nl_v6.pdf

AluCork®
https://millpanel.com/_file/40/datasheet_alucork_nl_v5.pdf

AluCorkPlex®
https://millpanel.com/_file/47/datasheet_alufire_nl_v4.pdf

AluLight®
https://millpanel.com/_file/92/datasheet_alulight_nl_v8.pdf

AluPassive®
https://millpanel.com/_file/93/datasheet_alupassive_nl_v4.pdf

AluTherm®
https://millpanel.com/_file/53/datasheet_alutherm_nl_v5.pdf

AluProfile®
https://millpanel.com/_file/55/datasheet_aluprofile_nl_v9.pdf

AluCoya®
https://millpanel.com/_file/207/datasheet_alucoya_nl_mei2020.pdf

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