Determination of whole window U-value using tabulated values in BS EN ISO 10077-1:2006

1. BS EN 14351-1 allows the use of tabulated values contained in BS EN ISO 10077-1 to determine the whole window U-values.

2. BS EN ISO 10077-1 restricts the use of this method to windows only and specifically excludes vertical sliding windows from this method. Vertical sliding windows will need to be calculated by a Notified Body in accordance with BS EN ISO 10077-1 & 2.

3. Using BS EN ISO 10077-1 Annex D, determine the default U-value (U_f) of the framing material, this can be easily determined for PVC-u and Timber framing material (see accompanying sheets). Aluminium and Steel require some calculation to determine the U_f value and therefore details of frame U-values (U_f) should be obtained from the system supplier.

4. A more accurate value for U_f can be used if this is available from a system supplier or system supplier but this value must be ratified by a Notified Body. This will normally be lower than the default value in BS EN ISO 10077-1 and will normally provide an improved whole window U-value (U_W).

5. The Insulated Glass Unit (IGU) centre pane U-value (U_g) will be provided by the IGU supplier as part of his CE marking declaration. This declared value can be used without ratification by a Notified Body or formal agreement from the IGU manufacturer.

6. The whole window U-value can be looked up in BS EN ISO 10077-1, Annex F, using table F1 for IGU's with standard spacer bar or table F3 when using thermally enhanced spacer bar in the IGU.

7. Thermal transmittance of windows is classified as Attestation of Conformity (AoC) System 3 and therefore the resultant whole window U-value, determined using this method, requires the result to be verified by a Notified body. However, for those organisations determined to be micro-enterprises under the Construction Products Regulations (CPR), the AoC is reduced to System 4 and the requirement for verification by a Notified Body is removed.

8. A micro-enterprise using this relaxation of AoC must be able to demonstrate the process used to determine the whole window U-value is as robust as if

this was verified by a Notified Body. To demonstrate this, the process detailed above should be included in the Technical file along with the values used taken from BS EN ISO 10077-1.

Note: A micro-enterprise is applicable to organisations when the following conditions are met:

Less than 10 employees
Less than €2 million Euros per annum turnover
Balance sheet of less than €2 million Euros

Determination of Thermal transmittance of framing material (U_f)

Annex D – Thermal transmittance of frames

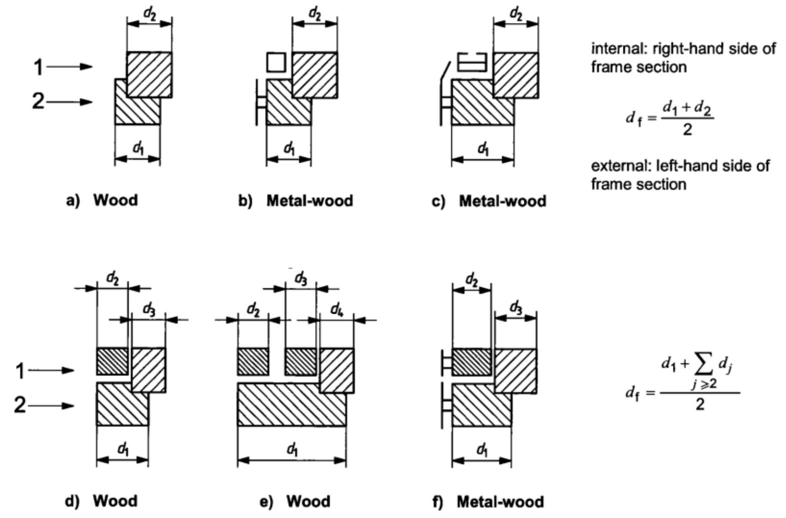
Clause D.2 Plastic frames

Frame material	**Frame type**	**U_f W/(m^2 K)**
Polyurethane	with metal core thickness of PUR >5mm	2.8
PVC hollow profiles *	two hollow chambers - reinforced	2.2
	three hollow chambers - reinforced	2.0
* With a distance between wall surfaces of each hollow chamber of at least 5mm		

Thermal transmittance for plastic frames with metal reinforcements

Extract from BS EN ISO 10077-1:2006

Clause D.3 Wood frames

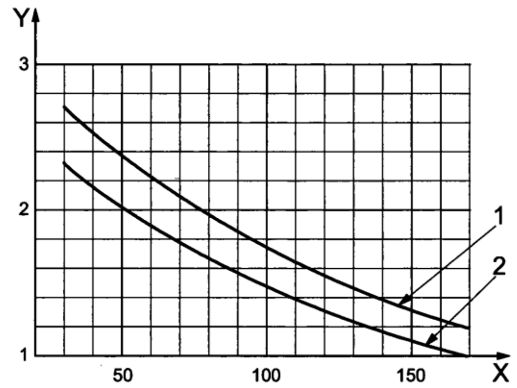


Key

1 sash

2 frame

Figure D.3 — Definition of the thickness, d_f, of the frame for various window systems



Key

X thickness of frame, d_f, expressed in millimetres

Y thermal transmittance of frame, U_f, in W/(m^2·K)

1 hardwood (density 700 kg/m^3), $\lambda = 0,18$ W/(m·K)

2 softwood (density 500 kg/m^3), $\lambda = 0,13$ W/(m·K)

Thermal transmittance for wooden frames depending on thickness and designation of type of wood

Extract from BS EN ISO 10077-1:2006

Determination of Thermal transmittance of whole window

Table F1 – Thermal transmittance of vertical window with fraction of frame area 30% of the whole window area and common types of glazing spacer bars

Type of glazing	U_g W/m^2.K	Thermal transmittance for common types of glazing spacer bars U_f W/m^2.K												
		0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.6	3.0	3.4	3.8	7.0
Single	5.7	4.2	4.3	4.3	4.4	4.5	4.5	4.6	4.7	4.8	4.9	5.0	5.1	6.1
Double or triple	3.3	2.7	2.8	2.8	2.9	2.9	3.0	3.1	3.2	3.3	3.4	3.5	3.6	4.5
	3.2	2.6	2.7	2.7	2.8	2.9	2.9	3.0	3.1	3.2	3.3	3.5	3.6	4.4
	3.1	2.6	2.6	2.7	2.7	2.8	2.9	2.9	3.0	3.1	3.3	3.4	3.5	4.3
	3.0	2.5	2.5	2.6	2.7	2.7	2.8	2.8	3.0	3.1	3.2	3.3	3.4	4.2
	2.9	2.4	2.5	2.5	2.6	2.7	2.7	2.8	2.9	3.0	3.1	3.2	3.4	4.2
	2.8	2.3	2.4	2.5	2.5	2.6	2.6	2.7	2.8	2.9	3.1	3.2	3.3	4.1
	2.7	2.3	2.3	2.4	2.5	2.5	2.6	2.6	2.7	2.9	3.0	3.1	3.2	4.0
	2.6	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.7	2.6	2.9	3.0	3.2	4.0
	2.5	2.1	2.2	2.3	2.3	2.4	2.4	2.5	2.6	2.5	2.8	3.0	3.1	3.9
	2.4	2.1	2.1	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.8	2.9	3.0	3.8
	2.3	2.0	2.1	2.1	2.2	2.2	2.3	2.4	2.5	2.4	2.7	2.8	3.0	3.8
	2.2	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.4	2.3	2.6	2.8	2.9	3.7
	2.1	1.9	1.9	2.0	2.0	2.1	2.2	2.2	2.3	2.3	2.6	2.7	2.8	3.6
	2.0	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.5	2.6	2.7	2.8	3.6
	1.9	1.8	1.8	1.9	1.9	2.0	2.1	2.1	2.3	2.4	2.5	2.5	2.7	3.6
	1.8	1.7	1.8	1.8	1.9	1.9	2.0	2.1	2.2	2.3	2.4	2.6	2.7	3.6
	1.7	1.6	1.7	1.7	1.8	1.9	1.9	2.0	2.1	2.2	2.4	2.5	2.6	3.4
	1.6	1.6	1.6	1.7	1.7	1.8	1.9	1.9	2.1	2.2	2.3	2.4	2.5	3.3
	1.5	1.5	1.5	1.6	1.7	1.7	1.8	1.8	2.0	2.1	2.2	2.3	2.5	3.3
	1.4	1.4	1.5	1.5	1.6	1.7	1.7	1.8	1.9	2.0	2.2	2.3	2.4	3.2
	1.3	1.3	1.4	1.5	1.5	1.6	1.6	1.7	1.8	2.0	2.1	2.2	2.3	3.1
	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.6	1.8	1.9	2.0	2.1	2.3	3.1
	1.1	1.2	1.3	1.3	1.4	1.4	1.5	1.6	1.7	1.8	1.9	2.1	2.2	3.0
	1.0	1.1	1.2	1.3	1.3	1.4	1.4	1.5	1.6	1.8	1.9	2.0	2.1	2.9
	0.9	1.1	1.1	1.2	1.2	1.3	1.4	1.4	1.6	1.7	1.8	1.9	2.0	2.9
	0.8	1.0	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.6	1.7	1.9	2.0	2.8
	0.7	0.9	1.0	1.0	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.8	1.9	2.7
	0.6	0.9	0.9	1.0	1.0	1.1	1.2	1.2	1.4	1.5	1.6	1.7	1.8	2.7
	0.5	0.8	0.8	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.8	2.6

Extract from BS EN ISO 10077-1:2006

Table F3 – Thermal transmittance of vertical window with fraction of frame area 30% of the whole window area, glazing spacer bars with improved thermal performance

Type of glazing	U_g W/m^2.K	Thermal transmittance for common types of glazing spacer bars												
		U_f W/m^2.K												
		0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.6	3.0	3.4	3.8	7.0
Single	5.7	4.2	4.3	4.4	4.4	4.5	4.5	4.6	4.7	4.8	4.9	5.0	5.1	6.1
Double or triple	3.3	2.7	2.7	2.8	2.9	2.9	3.0	3.0	3.1	3.2	3.4	3.5	3.6	4.4
	3.2	2.6	2.7	2.7	2.8	2.8	2.9	3.0	3.0	3.2	3.3	3.4	3.5	4.4
	3.1	2.5	2.8	2.7	2.7	2.8	2.8	2.9	3.0	3.1	3.2	3.3	3.5	4.3
	3.0	2.5	2.5	2.6	2.6	2.7	2.8	2.8	2.9	3.0	3.1	3.3	3.4	4.2
	2.9	2.4	2.5	2.5	2.6	2.6	2.7	2.8	2.8	3.0	3.1	3.2	3.3	4.2
	2.8	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.0	3.1	3.2	4.1
	2.7	2.3	2.3	2.4	2.4	2.5	2.6	2.6	2.7	2.8	2.9	3.1	3.2	4.0
	2.6	2.2	2.2	2.3	2.4	2.4	2.5	2.5	2.6	2.8	2.9	3.0	3.1	3.9
	2.5	2.1	2.2	2.2	2.3	2.4	2.4	2.5	2.6	2.5	2.8	2.9	3.0	3.9
	2.4	2.0	2.1	2.2	2.2	2.3	2.3	2.4	2.5	2.5	2.7	2.8	3.0	3.8
	2.3	2.0	2.0	2.1	2.2	2.2	2.3	2.3	2.4	2.4	2.7	2.8	2.9	3.7
	2.2	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.3	2.3	2.6	2.7	2.8	3.7
	2.1	1.8	1.9	2.0	2.0	2.1	2.1	2.2	2.3	2.2	2.5	2.6	2.8	3.6
	2.0	1.8	1.8	1.9	2.0	2.0	2.1	2.1	2.3	2.4	2.5	2.8	2.7	3.6
	1.9	1.7	1.8	1.8	1.9	2.0	2.0	2.1	2.2	2.3	2.4	2.5	2.7	3.5
	1.8	1.8	1.7	1.8	1.8	1.9	1.9	2.0	2.1	2.2	2.4	2.5	2.6	3.5
	1.7	1.6	1.6	1.7	1.8	1.8	1.9	1.9	2.0	2.2	2.3	2.4	2.5	3.4
	1.6	1.5	1.6	1.6	1.7	1.7	2.8	1.9	2.0	2.1	2.2	2.3	2.5	3.3
	1.5	1.4	1.5	1.6	1.6	1.7	1.7	1.8	1.9	2.0	2.1	2.3	2.4	3.2
	1.4	1.4	1.4	1.5	1.5	1.6	1.7	1.7	1.8	2.0	2.1	2.2	2.3	3.2
	1.3	1.3	1.4	1.4	1.5	1.5	1.6	1.7	1.8	1.9	2.0	2.1	2.2	3.1
	1.2	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.7	1.8	1.9	2.1	2.2	3.0
	1.1	1.2	1.2	1.3	1.3	1.4	1.5	1.5	1.6	1.7	1.9	2.0	2.1	3.0
	1.0	1.1	1.1	1.2	1.3	1.3	1.4	1.4	1.6	1.7	1.8	1.9	2.0	2.9
	0.9	1.0	1.1	1.1	1.2	1.3	1.3	1.4	1.5	1.6	1.7	1.8	2.0	2.8
	0.8	0.9	1.0	1.1	1.1	1.2	1.2	1.3	1.4	1.5	1.7	1.8	1.9	2.8
	0.7	0.9	0.9	1.0	1.1	1.1	1.2	1.2	1.3	1.5	1.6	1.7	1.8	2.7
	0.6	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6	1.8	2.6
	0.5	0.7	0.8	0.9	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.6	1.7	2.5

Extract from BS EN ISO 10077-1:2006