WINDOWS, GLAZING, DOORS,
BLINDS AND SHUTTERS DIRECTION

THERMAL STUDY REPORT N° BV16-1235
ON A MONOBLOCK DOOR

It comprizes 8 pages.

REQUESTED BY : TEHNI SA - PANTELOS
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AIM OF THE STUDY

The purpose of this study is to calculate the thermal transmittance U_D of a monoblock door.

Plans sections and nature of materials have been passed by the company TEHNI SA - PANTELOS and are appended at the end of this report.

This study focuses solely on the thermal performance of the process and has no bearing whatsoever on their fitness for purpose.

REFERENCE TEXTS

- NF EN ISO 10077-1 - Thermal performance of windows, doors and shutters - Calculation of thermal transmittance - Part 1: General (June 2012);
- NF EN ISO 10077-2 - Thermal performance of windows, doors and shutters — Calculation of thermal transmittance — Part 2: Numerical method for frames (March 2013);
- Th-Bât Th-U (September 2015).

OBJECT SUBMITTED FOR TESTING

• Product reference	Monoblock door
• Case number	16-036
• Date of study	October 27, 2016
• Engineer in charge of the case	Aurélie DELAIRE

Made in Marne-la-Vallée, 27/10/16

The report writer

Aurélie DELAIRE

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1. DESCRIPTION OF THE PROCESS

A description of the process studied is appended.

2. METHODS

2.1. Principles

The calculation of thermal transmittance coefficients of door frames shall be carried out using a 2D numerical method conforming to standard NF EN ISO 10077-2 (March 2013).
The calculation of thermal transmittance coefficient of the door shall be carried out according to standard NF EN ISO 10077-1 (June 2012).

2.2. Model hypotheses and boundary limits

2.2.1. Geometry

The dimensions requested by company TEHNI SA - Pantelos match overall dimensions and are given in the following table:

Door	**Dimensions** (H x L) in m²
Monoblock door	2,10 x 1,10

2.2.2. Material

Material	**Thermal conductivity W/(m.K)**	**Source**
EPDM	0,25	Th-U fascicule 2/5 Edition 2015
Insulation panel	0,035	
Aluminium	160	
Extruded polystyrene	0,041	
Stainless steel	17	
Polyamide 6.6 with 25% glass fibre	0,30	
Polypropylene solid	0,22	
Pile weather stripping	0,14	
Silicone	0,35	

2.2.3. Boundary conditions

Interior	**Exterior**
R_{si} = 0,13 m².K/W (Normal) R_{si} = 0,20 m².K/W (Reduced) T_i = 20°C	R_{se} = 0,04 m².K/W T_e = 0°C

2.3. Formulas

2.3.1. Calculation of thermal transmittance

The thermal transmittance of a door, U_D, shall be calculated using the following equation:

$$U_D = \frac{U_f \times A_f + U_g \times A_g + l_g \times \psi_g + U_p \times A_p}{A_g + A_f}$$

where :

- $\mathbf{U_g}$ is the thermal transmittance of the glazing, in W/(m².K),
- $\mathbf{U_f}$ is the thermal transmittance of frame, in W/(m².K),
- $\mathbf{U_p}$ is the thermal transmittance of opaque panel, in W/(m².K),
- $\mathbf{A_f}$ is the larger of the two projected areas seen from both sides, in m²,
- ψ_g is the linear thermal transmittance due to combined thermal effects of glazing, spacer and frame, in W/(m.K),
- $\mathbf{A_g}$ is the smaller of the visible areas of glass seen from both sides, in m²,
- $\mathbf{l_g}$ is the sum of the visible perimeter of the glass panes in the window, in m,
- $\mathbf{A_p}$ is the smaller of the visible areas of opaque panels seen from both sides, in m².

As part of this study, the linear heat loss coefficient ψ_p due to the junction between the panel and the frame was integrated into U_{fi} coefficient that is why it does not appear in the formula for calculating the coefficient U_D.

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3. RESULTS

3.1. Thermal transmittance of opaque panel U_p

	U_p (W/(m².K))
Composition of the opaque panel : *Internal facing 1,5 mm aluminum* *Extruded polystyrene insulation 47,5 mm* *External facing 1,5 mm aluminum*	0,75

3.2. Thermal transmittance of door frame U_f

Door frame	Projected width of the frame section (m)	U_{fi} (W/(m².K))
Threshold	0,050	9,6
Top and side edges	0,072	3,6

3.3. Geometrical data

A_p (m²)	1,8890
A_f (m²)	0,4210
A_g (m²)	0
l_g (m)	0

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3.4. Thermal transmittance of door U_g

Designation	U_p (W/(m².K))	U_f W/(m².K)	Overall dimensions 2,10 m (H) x 1,10 m (L) Thermal transmittance coefficient U_D en W/(m².K)
Monoblock door	0,75	4,3	**1,4**

ANNEXES

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ANNEXE 1 : PLAN 1

A-A (1 : 1)

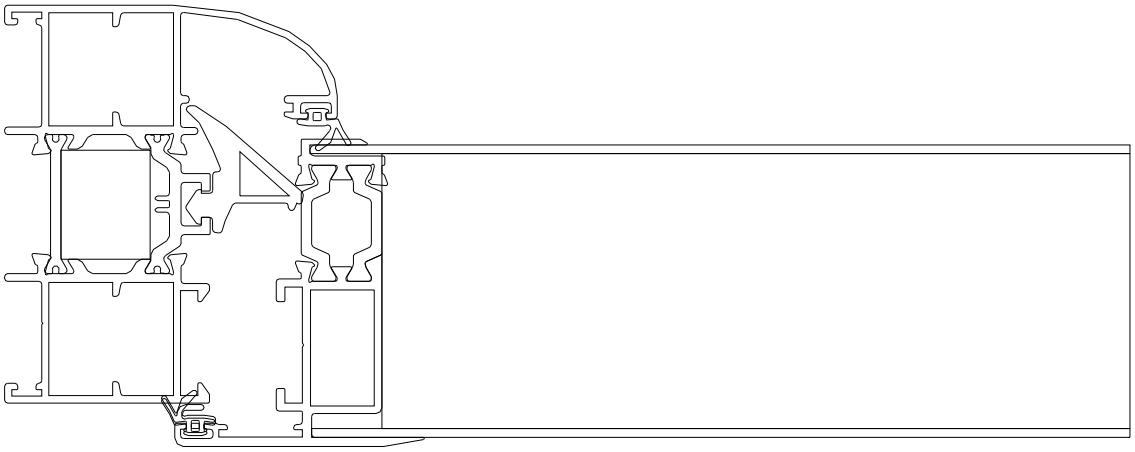

Figure 1 : Top and side edges

B-B (1 : 1)

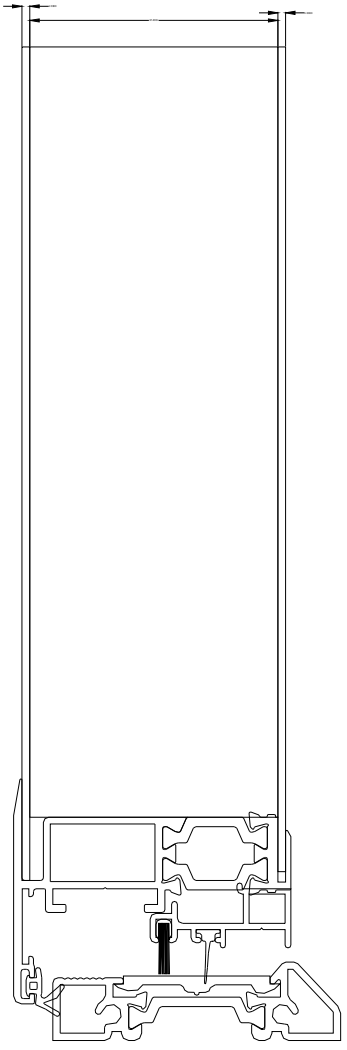

Figure 2 : Threshold

END OF REPORT