Envelope and Coatings Department

Hygrothermal Engineering of Structures Division

Project No.: 12-047A

October 26th, 2012

Ref. DER/HTO 2012-260-BB/LS

CALCULATING THE THERMAL BRIDGE COEFFICIENTS OF WALL-WOODWORK INTERSECTIONS BY INCORPORATING MOULDINGS WITH 25MM-THICK PROFILES

Version 2

This study report is 11 pages long, including 5 pages of appendices.

In case of doubt or dispute, the French version only is valid.

CONTENTS

I. OBJECTIVE OF THE STUDY

The purpose of this study is to calculate, on behalf of NMC, the thermal impact of mouldings on the thermal bridge of the wall-woodwork intersection.

The technical elements on which the study is based were provided by NMC and can be found in an appendix to this report.

It is important to remember that the results shown here only relate to the thermal aspect of the procedure and do not provide any indication of suitability for use.

II. BRIEF DESCRIPTION

A study of the thermal impact of Domostyl customised profiles (polystyrene moulding) on the wall-woodwork intersection's thermal bridge (for panels and for lintels).

The woodwork is to be installed on the inside in line with the wall (without insulation return).

The wall insulated from the outside is made up of 1cm of plaster + 10cm of insulation + 10cm of concrete.

The mouldings are assumed to be bonded to the wall using adhesive. Cases without Domostyl customised profiles and with Domostyl customised profiles for a profile thickness equal to 25mm will be studied.

Two densities of polystyrene are used; d=60kg/m3 for the polystyrene used to support the opening, and d=24kg/m3 for the polystyrene used for the rest of the surround.

III. METHODOLOGY

III.1 Principle

The coefficients Ψ of the intersection thermal bridges are obtained by a 2D numeric calculation from a simple section of the intersection between a wall insulated from the outside and the frame of a window. The window frame is considered adiabatic because its impact is already taken into account in the window's Uw coefficient.

III.2 Calculation Rules

All simulations were carried out in compliance with the rules of Th-Bât 2005.

III.3   Hypotheses

III.3.1 Geometry

No specific geometric simplification to report.

III.3.2 Thermal Conductivity of the Materials

Materials	Usable thermal conductivity W/(m.K)	Sources
Aluminium	160	Th-U rules
Concrete	2	
Plaster	0.25	
Insulation	0.035	
Polystyrene (d=60kg/m³)	0.033	NMC [1]
Polystyrene (d=24 kg/m³)	0.035	

[1]: Value provided by NMC, used here for informational purposes.
All values retained must be verified in accordance with the Th-U rules

Table 1 – Thermal conductivity of the materials

III.3.3 Boundary conditions

Boundary conditions	Room temperature (°C))	Surface exchange coefficient (W/m².K)
Indoor environment with horizontal flow	20	7.7
Outside environment	0	25

Table 2 – Boundary conditions

III.4   Formulas

The linear transmission coefficient Ψi of the intersection between a window frame and an opaque wall is calculated based on the following relationship:

$$\Psi_i = \frac{\varphi_T}{\Delta T} - U_p \times H_p$$

Ψ_i the linear transmission coefficient of the intersection between two walls, expressed in W/(m.K),

φ_T the total flow moving through the model and obtained by numeric calculation, expressed in W/m,

ΔT the temperature difference between the two warm and cold environments, expressed in K

U_p the surface coefficient of the wall's heat transfer in $W/(m^2.K)$,

H_p the height of the wall, in m.

IV. RESULTS

The values for Ψ_i shown above are only valid for the hypotheses set out in §III.3.

	Coefficient Ψ_i in W/(m.K)		% increase
	Without Domostyl customised profile	With Domostyl customised profile (thk= 25mm)	With Domostyl customised profile (thk= 25mm)
Intersection with the Opening Support	0.77	0.11	86%
Intersection with the Lintel (or panel) of the opening support	0.46	0.10	78%

The woodwork is to be installed on the inside in line with the wall (without insulation return).

Table 3 – Values for the coefficients Ψ_i of the intersections between opening woodwork and a wall insulated from the outside

The presence of moulding reduces the value of the thermal bridge of the intersection by 86%.

V. APPENDICES

APPENDIX 1: Diagram of the intersection between the woodwork
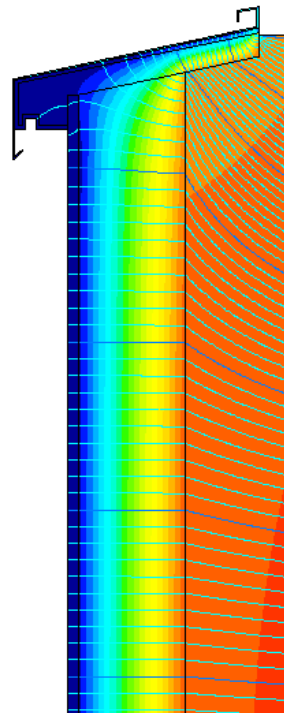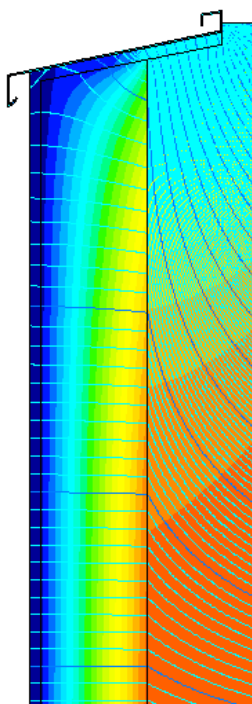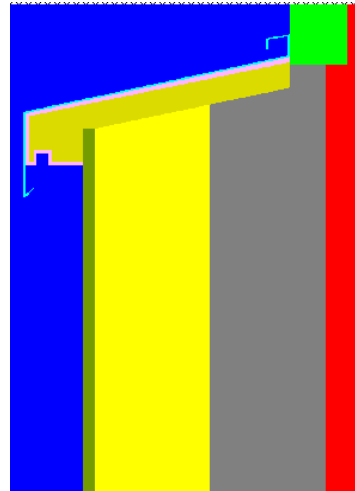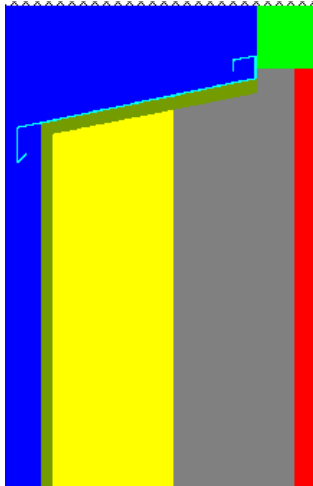and a wall without the Domostyl customised profile

100   100

30

20
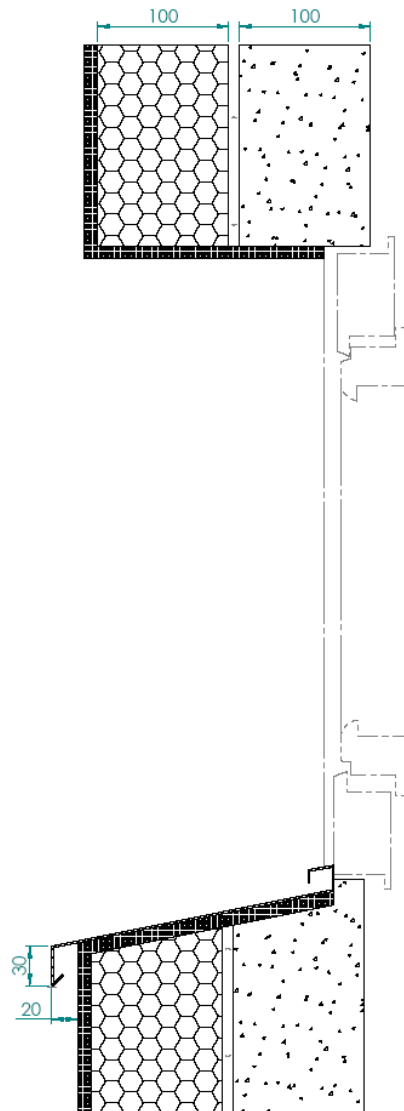
APPENDIX 2: Diagram of the intersection between the woodwork
and a wall with the Domostyl customised profile (thk=25mm)
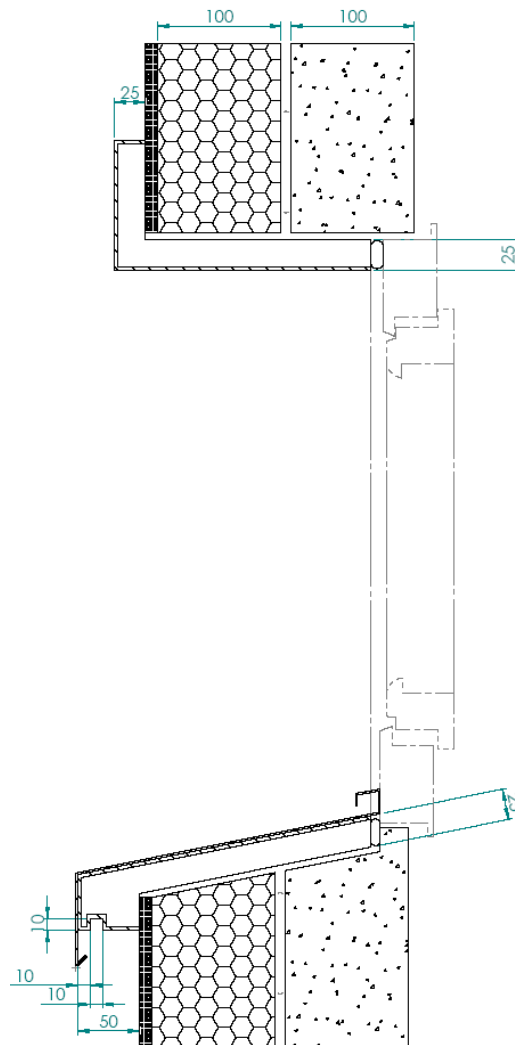
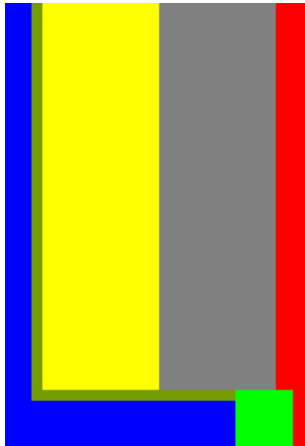APPENDIX 3: Intersection at the woodwork-wall support

Without the Domostyl customised profile

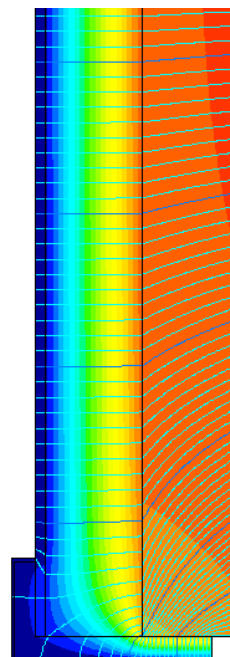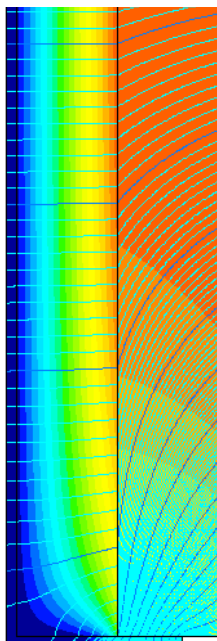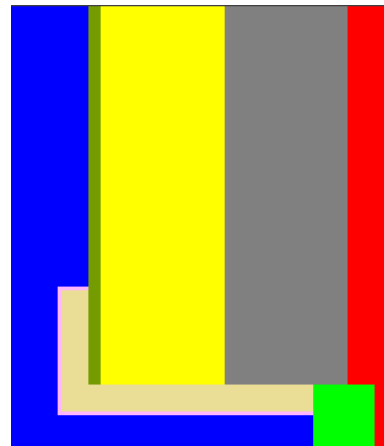With the Domostyl customised profile (thk=25mm)

APPENDIX 4: Intersection at the lintel (or table) of the woodwork-wall

Without the Domostyl customised profile

With the Domostyl customised profile (thk=25mm)

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CALCULATING THE THERMAL BRIDGE COEFFICIENTS OF WALL-WOODWORK INTERSECTIONS BY INCORPORATING MOULDINGS WITH 40MM-THICK PROFILES

*V*ersion 2

Study Sponsor:

NMC
Gert-Noël-Straße
B - 4731 Eynatten
BELGIUM

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The wall insulated from the outside is made up of 1cm of plaster + 10cm of insulation + 10cm of concrete.

The mouldings are assumed to be bonded to the wall using adhesive. Cases without Domostyl customised profiles and with Domostyl customised profiles for a profile thickness equal to 40 mm will be studied.

Two densities of polystyrene are used; $d=60$ kg/m^3 for the polystyrene used to support the opening, and $d=24$ kg/m^3 for the polystyrene used for the rest of the surround.

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IV. RESULTS

The values for Ψ_i shown above are only valid for the hypotheses set out in §III.3.

|	Coefficient Ψ_i in W/(m.K)		% increase
	Without Domostyl customised profile	With Domostyl customised profile (th= 45 mm)	With Domostyl customised profile (th= 45 mm)
Intersection with the Opening Support	0.77	0.07	91%
Intersection with the Lintel (or panel) of the opening support	0.46	0.07	85%

The woodwork is to be installed on the inside in line with the wall (without insulation return).

Table 3 – Values for the coefficients Ψ_i of the intersections between opening woodwork and a wall insulated from the outside
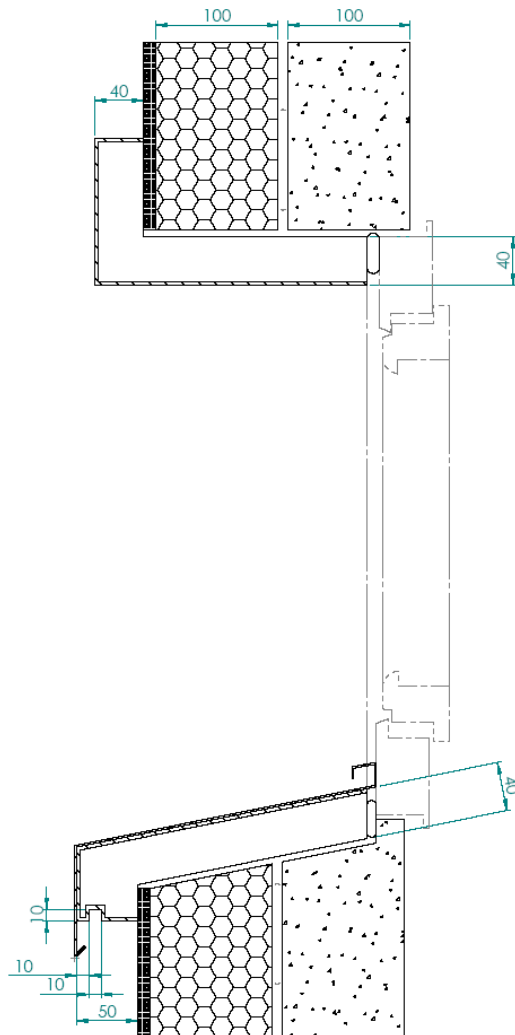
The presence of moulding reduces the value of the thermal bridge of the intersection by 91%.

V. APPENDICES

**APPENDIX 1: Diagram of the intersection between the woodwork
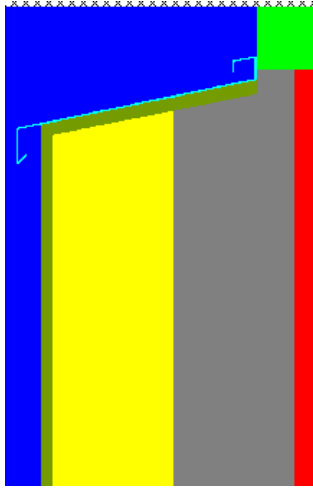and a wall without the Domostyl customised profile**
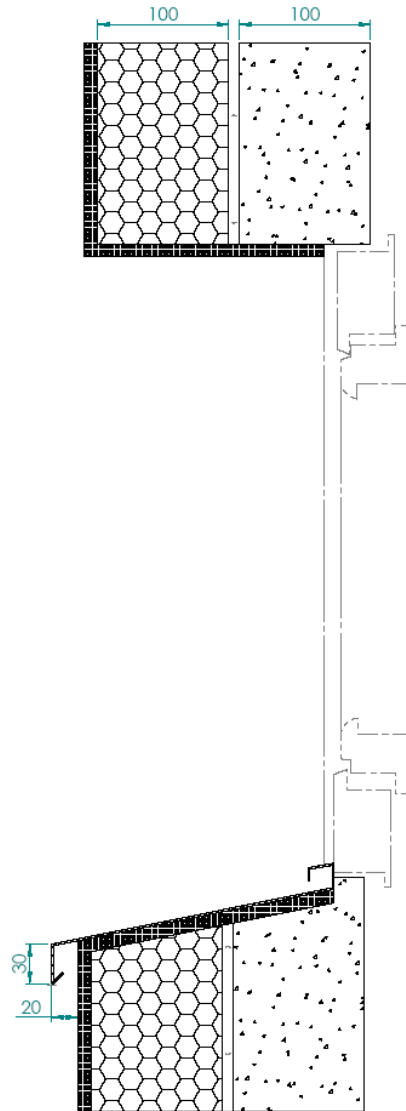
APPENDIX 2: Diagram of the intersection between the woodwork
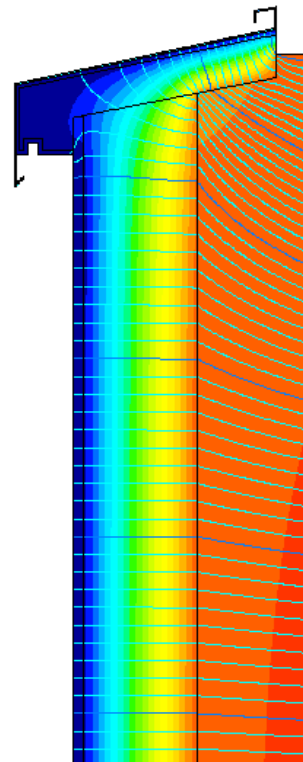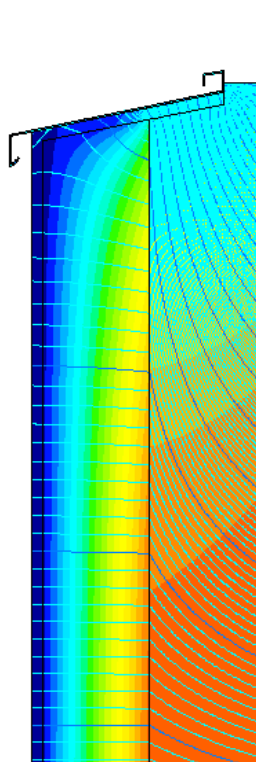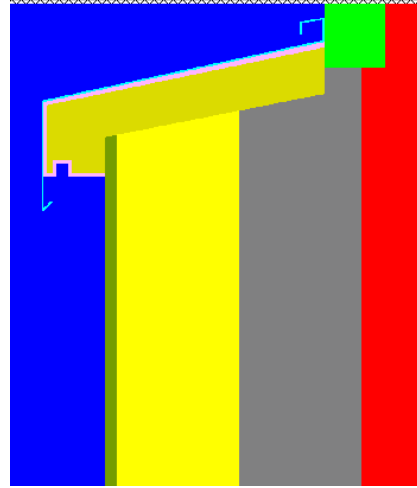and a wall with the Domostyl customised profile (th= 40 mm)

APPENDIX 3: Intersection at the woodwork-wall support
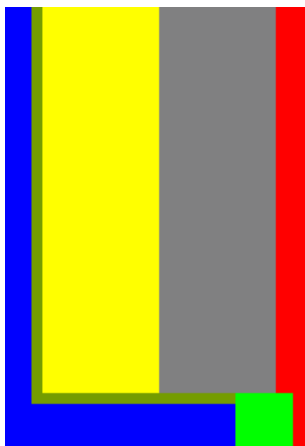
Without the Domostyl customised profile

With the Domostyl customised profile (th=40 mm)

APPENDIX 4: Intersection at the lintel (or table) of the woodwork-wall

Without the Domostyl customised profile

With the Domostyl customised profile (th=40 mm)