<table><tr><td>physibel</td><td>REPEATING THERMAL BRIDGING ACCORDING TO EN ISO 10211</td></tr></table>

1. Introduction

A massive brickwork wall is internally insulated. The thermal insulation is interrupted by a wooden stud at regular distances, causing a thermal bridge effect. This thermal bridge effect is quantified using the programs BISCO and TRISCO (2D).

2. Case study 1

TRISCO data wall_internal_insulation_1_T.trc
TRISCO 2D data wall_internal_insulation_1_T.tr2
BISCO data wall_internal_insulation_1_B.bsc

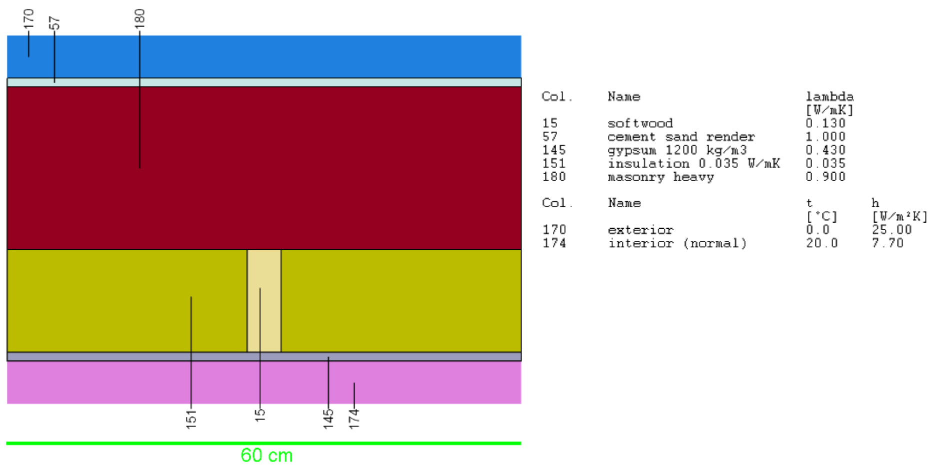

Figure 1: horizontal section of a brickwork wall with internal insulation

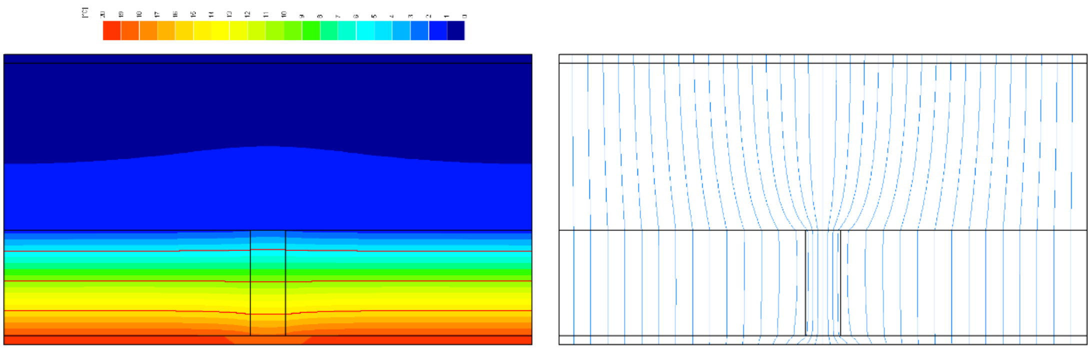

Figure 2: isotherms and heat flow lines (increment 0.1 W/m)

Figure 1 shows the data of case study 1. Figure 2 shows the graphic results as obtained by TRISCO or BISCO.

Because the thermal bridge is repeating, the mean thermal transmittance of the wall, including the thermal bridge effect can be derived.

$$U_{wall} = \frac{L^{2D}}{b} \qquad L^{2D} = \frac{Q^{2D}}{\Delta\theta_{ie}}$$

ψ	linear thermal transmittance [W/mK]
L^{2D}	thermal coupling coefficient [W/mK]
Q^{2D}	total simulated heat loss [W/m]
$\Delta\theta_{ie}$	indoor-outdoor temperature difference [K]
U_{wall}	effective thermal transmittance of the wall [W/m^{2}K]
b	width of the considered wall part [m] = 0.6 m

U_{wall} = 3.584 / (20 x 0.6) = **0.299 W/m^{2}K**

It could be meaningful to also know the linear thermal transmittance ψ of the wooden stud. This value is almost independent of the stud distance and could be used to calculate the effective thermal transmittance of the wall in case of irregular stud distances.

The ψ-value can be calculated from:

$$\psi = L^{2D} - U_w b$$

ψ	linear thermal transmittance [W/mK]
L^{2D}	thermal coupling coefficient [W/mK]
U_w	thermal transmittance of the undisturbed wall [W/m^{2}K]
b	width of the considered wall part [m] = 0.6 m

ψ = 3.584 / 20 – 0.260 x 0.6 **= 0.023 W/mK**

To calculate the effective thermal transmittance of a wall with surface S and containing L running meter of studs, the following formula can be used.

$$U_{wall} = \frac{U_w S + \psi L}{S}$$

3. Case study 2

TRISCO data wall_internal_insulation_2_T.trc

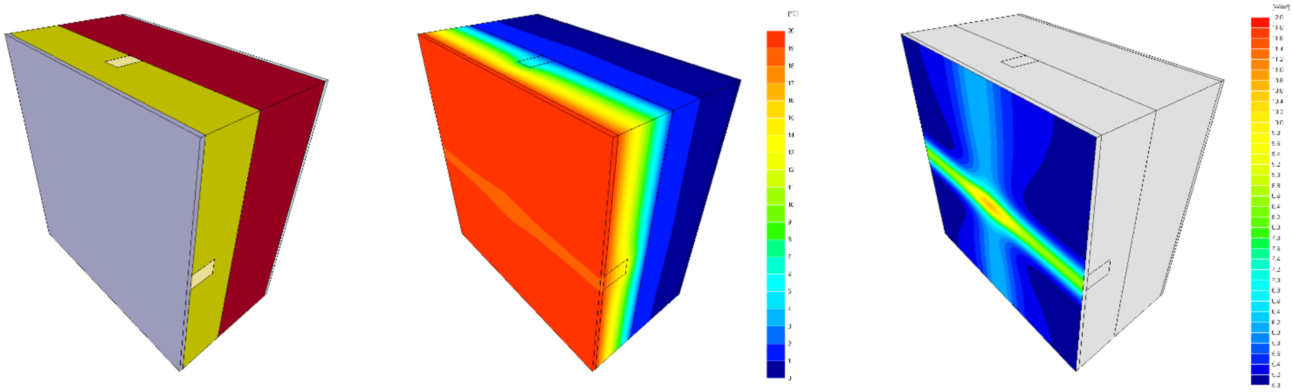

Figure 3: material geometry, isotherms and heat flow densities for case 2

Figure 3 (left) shows a wall almost identical to the one of case study 1, in which a vertical stud each 60 cm is combined with a horizontal stud each 60 cm.

Again the thermal bridging is repeating, and therefore the mean thermal transmittance of the wall, including the thermal bridge effect can be derived.

$$U_{wall} = \frac{L^{3D}}{b} \qquad L^{3D} = \frac{Q^{3D}}{\Delta\theta_{ie}}$$

U_{wall}	effective thermal transmittance of the wall [W/m^{2}K]
L^{3D}	thermal coupling coefficient [W/K]
Q^{3D}	total simulated heat loss [W]
$\Delta\theta_{ie}$	indoor-outdoor temperature difference [K]
S	area of the considered wall part [m] = 0.6 m x 0.6 m

U_{wall} = 2.073 / (20 x 0.36) = **0.288 W/m^{2}K**