LINEAR THERMAL TRANSMITTANCE OF A WALL-FLOOR JUNCTION

1. Introduction

The linear thermal transmittance of a wall-floor junction is calculated according to EN ISO 10211 using the program TRISCO.

2. Data

TRISCO data wall_floor_1.trc

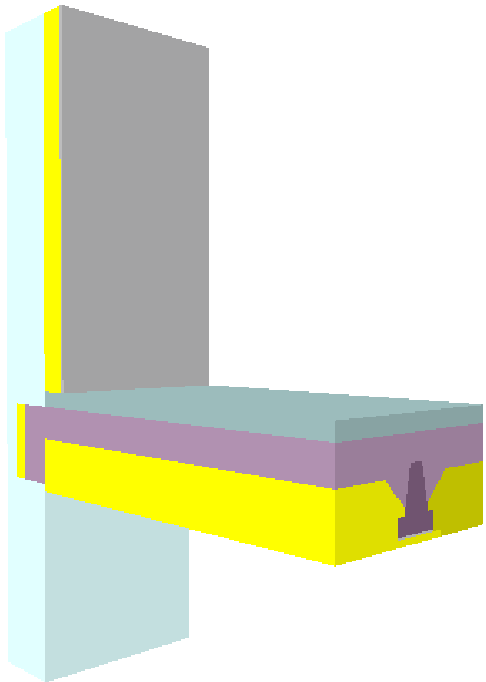

Figure 1: perspective view of wall-floor junction

Figure 1 shows a concrete wall (thickness 200 mm) with internal thermal insulation (thickness 80 mm) and plastering layer (10 mm) connected to a floor above an unheated space (strongly ventilated). The floor is built up of concrete beams, thermal insulation blocks and concrete.

Because of symmetry a section of width b = 500 mm can be considered. As the heat transmission in the floor (not in junction with the wall) is 2D, the calculation of the thermal transmittance of the floor U_{fl} is required before calculating the linear thermal transmittance ψ of the junction.

3. Calculation of the floor thermal transmittance U_{fl}

TRISCO data Floor_2.trc ; BISCO data Floor_1.bsc

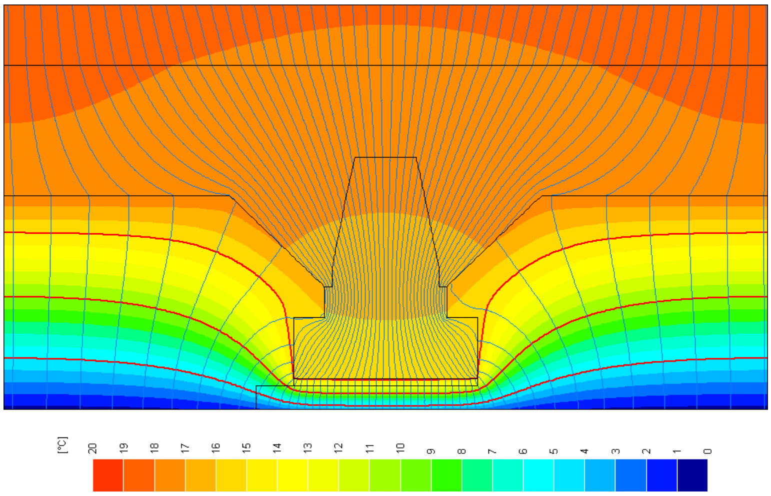

Figure 2: isotherms (line increment 5 °C, colour increment 1 °C) and heat flow lines (increment 0.1 W/m)

Figure 2 shows the graphic results of a 2D steady state analysis using BISCO.

The floor thermal transmittance is U_{fl} = 0.513 W/m²K.

When using TRISCO, using a rectangular approach of the geometry, the floor thermal transmittance is U_{fl} = 0.515 W/m²K.

4. The linear thermal transmittance ψ of the floor-wall junction

TRISCO data wall_floor_1.trc

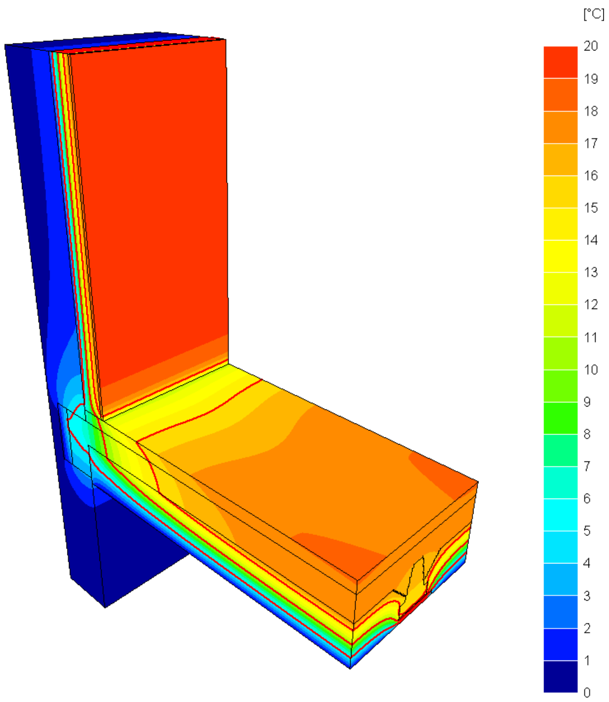

Figure 3: isotherms (line increment 5 °C, colour increment 1 °C)

Figure 3 shows the graphic results of a 3D steady state analysis using TRISCO. The total heat loss is 13.636 W. The linear transmittance can be calculated using the following formula. All values used in the formula, except U_f i.e. the result of the 2D calculation above, can be retrieved from TRISCO (windows U-values, Areas).

$$\psi = \frac{L_{3D} - U_w S_w - U_{fl} S_{fl}}{b}$$

Using internal dimensions, the linear thermal transmittance of the junction is:

$$\psi = \frac{13.636/20 - 0.381 \times 0.495 - 0.515 \times 0.455}{0.5} = 0.518\, W/mK$$

5. Extra: floor heating

TRISCO data wall_floor_1_with_floor_heating.trc

In a next step a floor heating system is added. Warm water (30°C) tubes are installed with an intermediate distance of 15cm (see Figure 4). This results in the temperature distribution depicted in Figure 5.

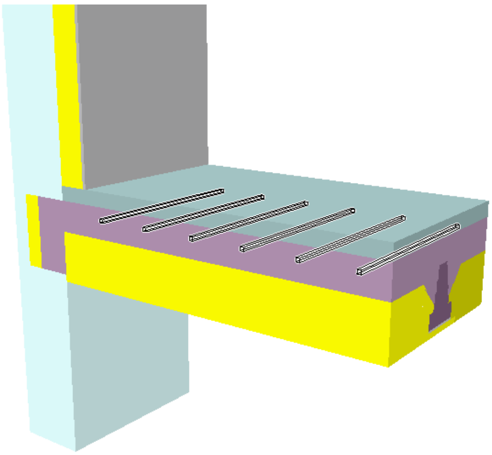

Figure 4: model with floor heating tubes

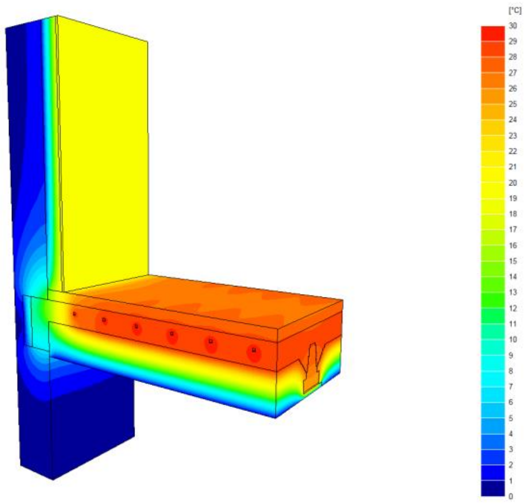

Figure 5: isotherms with floor heating

More information on modelling floor heating systems can be found in Physibel Knowledge Base document 'A-4Validation of the program BISCO according to EN ISO 11855-2:2015'.