Calculation of the temperature factor f_{RSI}, as far as of the linear thermal transmittance ψ of a roller shutter box in a built-in situation; here: Brickwork with core insulation and brick frontage

I.   Details concerning the roller shutter box

1.   Specification: **CBR 205x255 N**

2.   Report number: 15 624-09-EN

3.   Client: BeClever Sp. zo.o.
                                                           u.l. Malinowa 1
                                                           62-300 Września

4.   Assignment: Examination of the thermal process technology characteristics of the above mentioned roller shutter box in a built-in situation (brickwork with core insulation and brick frontage)

5.   Basis of calulation: All calculations concerning the roller shutter box are based on the original drafts of the client

6.   Method of analysis: Software: BISCO computer program to calculate two-dimensional steady state heat transfer in free-form objects; Version 11.0w

7.   Rules / Standards: DIN 4108 Bbl 2: 2006-03
                                                           DIN EN ISO 10077-2:2012-06
                                                           DIN EN ISO 10211:2008-04

                                                           List of specified criteria for buildings A Part 1

                                                           2015/2

8.   Spec. material values (roller shutter box):   According to declaration of the client
                                                           PVC: λ = 0,170 W/(mK)
                                                           Heat insulation: λ = 0,032 W/(mK)

II.   Calculation results

The roller shutter box complies with the proof of equivalency corresponding to image 63 DIN 4108 Bbl 2: 2006-03 in accordance with the conditions and construction materials mentioned on page 2

Temperature factor: **Psi-value:**
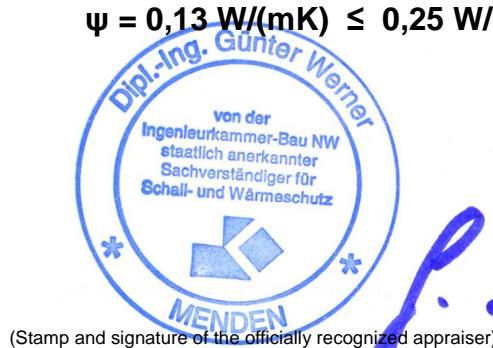
$f_{RSI} = 0,74 \geq 0,70$ $ψ = 0,13 \text{ W/(mK)} \leq 0,25 \text{ W/(mK)}$

III.   Signature

Unna, 22.09.16
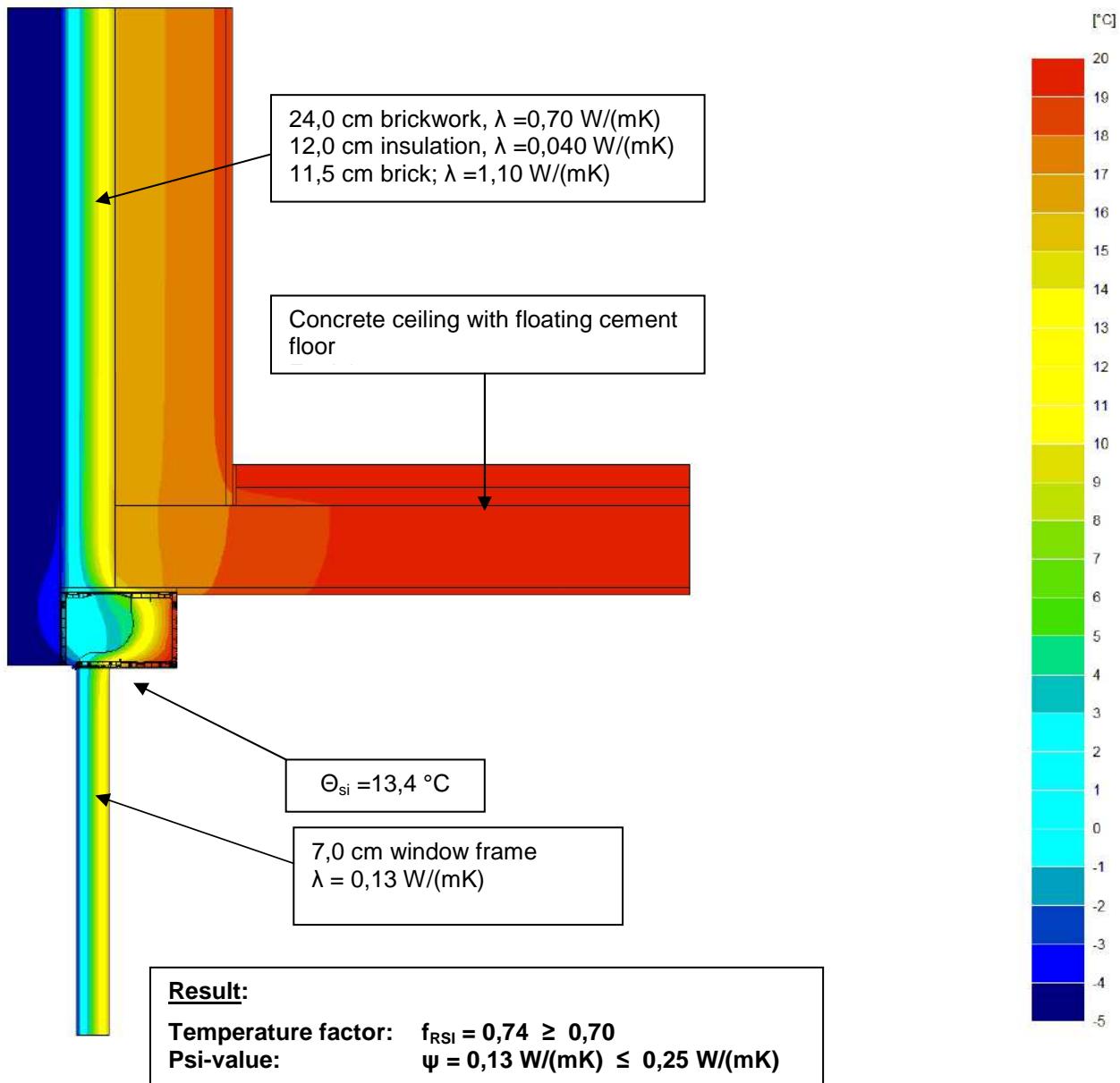
(Stamp and signature of the officially recognized appraiser)

Image 1: Temperature gradation; brickwork with core insulation and brick frontage
Conditions: f_{RSI}: $R_{se} = 0,04$ (m²K)/W, $\theta_e = -5°C$; $R_{si} = 0,13$ (m²K)/W resp. 0,25 (m²K)/W; $\theta_i = 20°C$ ψ-value: $R_{se} = 0,04$ (m²K)/W; $f_e = 0$; $R_{si} = 0,13$ (m²K)/W; $f_i = 1$

24,0 cm brickwork, λ =0,70 W/(mK)
12,0 cm insulation, λ =0,040 W/(mK)
11,5 cm brick; λ =1,10 W/(mK)

Concrete ceiling with floating cement floor

$\Theta_{si} = 13,4$ °C

7,0 cm window frame
λ = 0,13 W/(mK)

Result:

Temperature factor: $f_{RSI} = 0,74 \geq 0,70$
Psi-value: ψ = 0,13 W/(mK) ≤ 0,25 W/(mK)

Notes:

The number of nodes in this calculation amounts to 194230.

a) The roller shutter cavity is assumend non-ventilated. The air cells inside the box sections are non-ventilated cavities and acc. to DIN ISO 10077-2 are calculated seperately. The λ-value of the roller shutter cavity is 0,701 (W/mK).

b) The emission grade for the surface has been considered 0,9.