ISO 10211:2017-06 (E)

Thermal bridges in building construction - Heat flows and surface temperatures - Detailed calculations

Contents

Page

Foreword v

Introduction vi

1 Scope 1

2 Normative references 1

3 Terms and definitions 2

4 Symbols and subscripts 7
4.1 Symbols 7
4.2 Subscripts 7

5 Description of the method 8
5.1 Output 8
5.2 General description 8

6 Output data and input data 8
6.1 Output data 8
6.2 Calculation time intervals 9
6.3 Input data 9

7 Modelling of the construction 9
7.1 Dimension systems 9
7.2 Rules for modelling 9
7.2.1 General 9
7.2.2 Cut-off planes for a 3-D geometrical model for calculation of total heat flow and/or surface temperatures 9
7.2.3 Cut-off planes for a 2-D geometrical model 11
7.2.4 Cut-off planes in the ground 12
7.2.5 Periodic heat flows via the ground 13
7.2.6 Adjustments to dimensions 13
7.2.7 Auxiliary planes 15
7.2.8 Quasi-homogeneous layers and materials 15
7.3 Conditions for simplifying the geometrical model 15
7.3.1 General 15
7.3.2 Conditions for adjusting dimensions to simplify the geometrical model 16
7.3.3 Conditions for using quasi-homogeneous material layers to simplify the geometrical model 17

8 Input data specifications 20
8.1 General 20
8.2 Thermal conductivities of materials 21
8.3 Surface resistances 21
8.4 Boundary temperatures 21
8.5 Thermal conductivity of quasi-homogeneous layers 21
8.6 Equivalent thermal conductivity of air cavities 21
8.7 Determining the temperature in an adjacent unheated room 22

9 Calculation method 22

9.1 Solution technique 22
9.2 Calculation rules 22
9.2.1 Heat flows between material cells and adjacent environment 22
9.2.2 Heat flows at cut-off planes 22
9.2.3 Solution of the formulae 22
9.2.4 Calculation of the temperature distribution 23

10 Determination of thermal coupling coefficients and heat flow rate from 3-D calculations23 10.1 Two boundary temperatures, unpartitioned model 23
10.2 Two boundary temperatures, partitioned model 23
10.3 More than two boundary temperatures 24

11 Calculations using linear and point thermal transmittances from 3-D calculations 25
11.1 Calculation of thermal coupling coefficient 25
11.2 Calculation of linear and point thermal transmittances 25

12 Determination of thermal coupling coefficient, heat flow rate and linear thermal transmittance from 2-D calculations 26
12.1 Two boundary temperatures 26
12.2 More than two boundary temperatures 26
12.3 Determination of the linear thermal transmittance 27
12.4 Determination of the linear thermal transmittance for wall/floor junctions 27
12.4.1 All cases 27
12.4.2 Option A 27
12.4.3 Option B 29
12.5 Determination of the external periodic heat transfer coefficient for ground floors 31

13 Determination of the temperature at the internal surface 32
13.1 Determination of the temperature at the internal surface from 3-D calculations 32
13.1.1 Two boundary temperatures 32
13.1.2 More than two boundary temperatures 32
13.2 Determination of the temperature at the internal surface from 2-D calculations 33
13.2.1 Two boundary temperatures 33
13.2.2 Three boundary temperatures 33

14 Report 33
14.1 Input data 33
14.2 Output data 34
14.2.1 General 34
14.2.2 Calculation of the heat transmission using the thermal coupling coefficient 34
14.2.3 Calculation of the surface temperatures using weighting factors 34
14.2.4 Additional output data 34
14.2.5 Estimate of error 35

Annex A (normative) Input and method selection data sheet -- Template 36

Annex B (informative) Input and method selection data sheet -- Default choices 38

Annex C (normative) Validation of calculation methods 40

Annex D (normative) Examples of the determination of the linear and point thermal transmittances 47

Annex E (normative) Determination of values of thermal coupling coefficient and temperature weighting factor for more than two boundary temperatures 50

Bibliography 55