INTERNATIONAL STANDARD

ISO 10211

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

Ponts thermiques dans les bâtiments — Flux thermiques et températures superficielles — Calculs détaillés

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 10211 was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 2, *Calculation methods*.

This first edition of ISO 10211 cancels and replaces ISO 10211-1:1995 and ISO 10211-2:2001, which have been technically revised.

The principal changes are as follows:

— this first edition of ISO 10211 merges the title and general contents of ISO 10211-1:1995 and ISO 10211-2:2001 into a single document;

— Clause 3 indicates that ISO 10211 now uses only temperature factor, and not temperature difference ratio;

— 5.2.2 specifies that cut-off planes are to be located at the larger of 1 m and three times the thickness of the flanking element;

— 5.2.4 contains a revised version of Table 1 to correct error for three-dimensional calculations and to clarify intentions;

— 5.2.7 specifies that acceptable criterion is either on heat flow or on surface temperature; the heat flow criterion has been changed from 2 % to 1 %;

— 6.3 specifies that surface resistance values are to be obtained from ISO 6946 for heat flow calculations and from ISO 13788 for condensation calculations; the contents of Annexes E and G of ISO 10211-1:1995 have been deleted in favour of references to ISO 13788;

— 6.6 specifies that data for air cavities is obtained from ISO 6946, EN 673 or ISO 10077-2; the contents of Annex B of ISO 10211-1:1995 have been deleted in favour of these references;

— 10.4 contains text formerly in ISO 13370, revised to specify that linear thermal transmittance values for wall/floor junctions are the difference between the numerical result and the result from using ISO 13370 (a more consistent definition);

— Annex A contains corrections to results for case 3; the conformity criterion for case 3 has been changed from 2 % of heat flow to 1 %; a new case 4 has been added;

— Annex C contains a corrected procedure;

— all remaining annexes from ISO 10211-1:1995 and ISO 10211-2:2001 have been deleted.

Introduction

Thermal bridges, which in general occur at any junction between building components or where the building structure changes composition, have two consequences compared with those of the unbridged structure:

a) a change in heat flow rate, and

b) a change in internal surface temperature.

Although similar calculation procedures are used, the procedures are not identical for the calculation of heat flows and of surface temperatures.

A thermal bridge usually gives rise to three-dimensional or two-dimensional heat flows, which can be precisely determined using detailed numerical calculation methods as described in this International Standard.

In many applications, numerical calculations based on a two-dimensional representation of the heat flows provide results of adequate accuracy, especially when the constructional element is uniform in one direction.

A discussion of other methods for assessing the effect of thermal bridges is provided in ISO 14683.

ISO 10211 was originally published in two parts, dealing with three-dimensional and two-dimensional calculations separately.

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

1 Scope

This International Standard sets out the specifications for a three-dimensional and a two-dimensional geometrical model of a thermal bridge for the numerical calculation of:

— heat flows, in order to assess the overall heat loss from a building or part of it;

— minimum surface temperatures, in order to assess the risk of surface condensation.

These specifications include the geometrical boundaries and subdivisions of the model, the thermal boundary conditions, and the thermal values and relationships to be used.

This International Standard is based upon the following assumptions:

— all physical properties are independent of temperature;

— there are no heat sources within the building element.

This International Standard can also be used for the derivation of linear and point thermal transmittances and of surface temperature factors.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 6946, *Building components and building elements — Thermal resistance and thermal transmittance — Calculation method*

ISO 7345, *Thermal insulation — Physical quantities and definitions*

ISO 13370:2007, *Thermal performance of buildings — Heat transfer via the ground — Calculation methods*

ISO 13788, *Hygrothermal performance of building components and building elements — Internal surface temperature to avoid critical surface humidity and interstitial condensation — Calculation methods*

