Second edition
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Thermal performance of buildings — Heat transfer via the ground — Calculation methods

Performance thermique des bâtiments — Transfert de chaleur par le sol — Méthodes de calcul

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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.

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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.

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ISO 13370 was prepared by Technical Committee ISO/TC 163, *Thermal performance and energy use in the built environment*, Subcommittee SC 2, *Calculation methods*.

This second edition cancels and replaces the first edition (ISO 13370:1998), which has been technically revised.

The following principal changes have been made to the first edition:

— Clause 4 contains a revised text to clarify the intention of the initial part of the former Annex A; the rest of the former Annex A is now contained in ISO 10211;

— 7.2 no longer contains a table of linear thermal transmittances: it is now recognized, as with other thermal bridging, that the wall/floor junction often needs to be calculated;

— 9.1 provides an alternative formula for well-insulated floors;

— 9.2 provides clarification for low-emissivity surfaces;

— Annex A contains formulae for cooling applications;

— Annex B has incorporated minor revisions to the text for edge-insulated floors;

— Annex D has been revised;

— Annex F (formerly Annex C) has been changed to informative status.

Introduction

This International Standard provides the means (in part) to assess the contribution that building products and services make to energy conservation and to the overall energy performance of buildings.

In contrast with ISO 6946, which gives the method of calculation of the thermal transmittance of building elements in contact with the external air, this International Standard deals with elements in thermal contact with the ground. The division between these two International Standards is at the level of the inside floor surface for slab-on-ground floors, suspended floors and unheated basements, and at the level of the external ground surface for heated basements. In general, a term to allow for a thermal bridge associated with the wall/floor junction is included when assessing the total heat loss from a building using methods such as ISO 13789.

The calculation of heat transfer through the ground can be done by numerical calculations, which also allow analysis of thermal bridges, including wall/floor junctions, for assessment of minimum internal surface temperatures.

In this International Standard, methods are provided which take account of the three-dimensional nature of the heat flow in the ground below buildings.

Thermal transmittances of floors give useful comparative values of the insulation properties of different floor constructions, and are used in building regulations in some countries for the limitation of heat losses through floors.

Thermal transmittance, although defined for steady-state conditions, also relates average heat flow to average temperature difference. In the case of walls and roofs exposed to the external air, there are daily periodic variations in heat flow into and out of storage related to daily temperature variations, but this averages out, and the daily average heat loss can be found from the thermal transmittance and daily average inside-to-outside temperature difference. For floors and basement walls in contact with the ground, however, the large thermal inertia of the ground results in periodic heat flows related to the annual cycle of internal and external temperatures. The steady-state heat flow is often a good approximation to the average heat flow over the heating season.

In addition to the steady-state part, a detailed assessment of floor losses is obtained from annual periodic heat transfer coefficients related to the thermal capacity of the soil, as well as its thermal conductivity, together with the amplitude of annual variations in monthly mean temperature.

Annex D provides a method for incorporating heat transfers to and from the ground into calculations undertaken at short time steps (e.g. one hour).

Worked examples illustrating the use of the methods in this International Standard are given in Annex K.