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Thermal insulation — Building elements — *In-situ* measurement of thermal resistance and thermal transmittance —

Part 2: Infrared method for frame structure dwelling

Isolation thermique — Éléments de construction — Mesurage in situ de la résistance thermique et du coefficient de transmission thermique —

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Foreword

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This document was prepared by ISO/TC 163, *Thermal performance and energy use in the built environment*, SC 1, *Test and measurement methods*.

A list of all parts in the ISO 9869 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

The ISO 9869 series describes the in-situ measurement of the thermal transmission properties of plane building components, primarily consisting of opaque layers perpendicular to the heat flow and having no significant lateral heat flow. The thermal transmittance of a building element (*U*-value) is defined in ISO 7345 as the "Heat flow rate in the steady state condition divided by area and by the temperature difference between the surroundings on each side of a system". Since steady state conditions are never encountered on a site in practice, such a simple measurement is not possible and thereby some statistical methods are introduced. One of the simplest methods is using the mean values over a sufficiently long period of time. The required time for observation for reliable measurements depends on the thermal properties of the building components and the natures of the temperature difference between the surroundings on each side of them.

ISO 9869-1 describes the method which is used to estimate the thermal steady-state properties of a building element from heat flow meter (HFM) measurements through plane building components. Annex B describes the statistical methods of simple mean and the sophisticated method of dynamic analysis method for steady state properties. This document, describes the calculation method for the density of heat flow rate through both the evaluation of the internal surface thermal resistance and the measuring of the temperature difference between the indoor surface temperature of the building element and the indoor environmental temperature using an infrared camera (thermo-viewer). It also describes the statistical methods of simple mean with less observing duration considering night observation and building components with light heat capacity.

This document provides a preliminary and handy measuring method for the in-situ measurement of the thermal transmission properties of plane building components and thereby the further simplifications are applied compared with the method described in ISO 9869-1. The method described in this document is expected as a method of a handy diagnostic method of the thermal transmission properties of plane building components with light heat capacity such as those in frame structure dwelling.

The thermal performance of a part of the building element is evaluated by obtaining the heat absorption (heat penetration) at the part of the indoor surface by multiplying the indoor total heat transfer coefficient of the part surface by the difference between the part indoor surface temperature and the indoor environmental temperature. The thermal transmittance (*U*-value) of the building components for steady state condition can be obtained with the averages of the observed values over the certain period of time.

The indoor surface temperature distribution of the building component is measured using an IR camera. The indoor environmental temperature is measured by installing the environmental temperature sensor (ET sensor) on the surface of the building component, and the indoor total heat transfer coefficient of the surface of the building component is measured using a heat transfer coefficient sensor. Even the indoor measurement is intended to be carried on with less influence of solar radiation so the standard can be used on building elements on which indoor sides are not exposed to direct sunlight through adjacent windows.