SLOVENSKI STANDARD
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Toplotne značilnosti stavb - Preskušanje dokončanih stavb na mestu vgradnje - 1. del: Zbiranje podatkov za preskus skupne toplotne izgube

Thermal performance of buildings - In situ testing of completed buildings - Part 1: Data collection for aggregate heat loss test

Thermische Leistung von Gebäuden - In-situ-Tests von fertiggestellten Gebäuden - Teil 1: Datenerfassung für den Gesamtwärmeverlusttest

Ta slovenski standard je istoveten z: **prEN 17887-1**

ICS:

91.120.10	Toplotna izolacija stavb	Thermal insulation of buildings

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Thermal performance of buildings - In situ testing of completed buildings - Part 1: Data collection for aggregate heat loss test

Wärmetechnisches Verhalten von Gebäuden - In-situ-Prüfung an fertiggestellten Gebäuden - Teil 2: Auswertung stationärer Daten für die Prüfung des Gesamtwärmeverlustes

This draft European Standard is submitted to CEN members for enquiry. It has been drawn up by the Technical Committee CEN/TC 89.

If this draft becomes a European Standard, CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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Recipients of this draft are invited to submit, with their comments, notification of any relevant patent rights of which they are aware and to provide supporting documentation.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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European foreword

This document (prEN 17887-1:2022) has been prepared by Technical Committee CEN/TC 89 Thermal performance of buildings and building components, the secretariat of which is held by SIS.

This document is currently submitted to the CEN Enquiry.

Introduction

The world's energy resources are being consumed at a significant rate that will result in the depletion of non-renewable resources and increased carbon dioxide emissions. It is imperative that energy be conserved. The building sector, through its use of energy, represents up to 40 % of total energy consumption (in mild climates, where heating and cooling correspond to the major energy demand in buildings). Conservation of energy in buildings can result in a slowing down of non-renewable resource usage and consequently of the build-up of greenhouse gases.

A critical contribution to the conservation of energy in buildings is made by minimizing the heat loss from a building. This is achieved by creating building envelopes that are both airtight and highly insulated. Standardized test methods exist for establishing the *in situ* air permeability or air leakage rate of a building (EN ISO 12569 and EN ISO 9972). This document provides a method for measuring the total *in situ* heat loss from a building. The total heat loss is a combination of the heat lost through air infiltration and envelope heat transfer, and since the air infiltration rate can be measured and the heat loss associated with this approximated, the value for envelope heat transfer can be estimated, together with their combined uncertainty.

In the design process for new buildings, and increasingly for refurbishment, an energy consumption calculation is carried out; normally this uses a calculated value for total heat loss based upon assumptions regarding air infiltration rates and calculated U-values for the external plane building elements and openings, and Ψ values for thermal bridges at the junctions with the plane elements (e.g. openings, intermediate floors). The assumptions on air infiltration can be confirmed by testing to standardized methodologies and the design calculation is often adjusted after testing to include the actual measured air permeability or air leakage rate of the building that is achieved once construction is complete. This document provides a test methodology that will allow the actual *in situ* completed building aggregate heat loss to be quantified. It will reflect the influence of design and workmanship on the constructed building and its constituent parts. Specially constructed test samples representing single construction elements are outside the scope of this document.

By the inclusion of further measurements, outside the scope of this test methodology, it will be possible to disaggregate the total heat loss figure to the individual plane building elements. This level of information is not required for the general confirmation of energy performance, as might be required by the building certifier or consumer, but will allow for diagnostic examination of the completed building and confirmation of the actual *in situ* performance of building elements. This will in turn inform further studies that could be undertaken to determine the realized thermal performance of particular construction methods, techniques and components under realistic installation circumstances and enable a comparison to be made between the measured *in situ* values and the calculated values that are currently used.

Without a completed building aggregate heat loss test methodology, it is only possible to use calculated values as the basis for the design of the building, and there is little chance to confirm that the values predicted in the calculation are delivered *in situ*. The inability to be able to check and confirm actual performance *in situ* may lead to the adoption of practices in both design and workmanship that make the calculated values invalid or inappropriate. In addition, wider scale assumptions regarding the potential reductions in energy consumption that could be achieved through the provision of new and refurbished energy efficient buildings, will be made on the basis of calculated building performance that is not validated by confirmation of actual *in situ* performance.

This test methodology can be used as a sample confirmation methodology for large volume production, confirmation of prototypes, confirmation of the performance of particularly significant buildings and potentially as a diagnostic tool to identify the indicative performance of individual elements within a building and inform further investigation and action.

This document is highly linked with prEN 17887-2:2022 *Thermal performance of buildings — In situ testing of completed buildings — Part 2: Steady-state data analysis for aggregate heat loss test*, to which it applies exclusively. It is also complimentary to prEN 17888-1:2022 *Thermal performance of buildings — In situ measurement of building structures especially built for testing — Part 1: Data collection for aggregate heat loss test*, which deals exclusively with opaque building structures especially built for the purpose of *in situ* testing.

1 Scope

This document specifies a test method for the *in situ* measurement of the thermal performance of buildings, both newly built and existing.

This document specifies the data to be collected during and after the test.

NOTE The analysis of the data and the reporting format for the analysis are referred to in prEN 17887-2:2022 *Thermal performance of buildings — In situ testing of completed buildings — Part 2: Steady-state data analysis for aggregate heat loss test*.

This document is applicable to domestic scale detached buildings and attached domestic scale buildings, such as semi-detached houses, terraced houses and apartments.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

EN IEC 62053-21, *Electricity metering equipment — Particular requirements — Part 21: Static meters for AC active energy (classes 0,5, 1 and 2) (IEC 62053-21)*

EN ISO 7345, *Thermal performance of buildings and building components — Physical quantities and definitions(ISO 7345)*

EN ISO 9229, *Thermal insulation — Vocabulary (ISO 9229)*

EN ISO 9972:2015, *Thermal performance of buildings — Determination of air permeability of buildings — Fan pressurization method (ISO 9972:2015)*

EN ISO 13789:2017, *Thermal performance of buildings — Transmission and ventilation heat transfer coefficients — Calculation method (ISO 13789:2017)*

EN ISO 15927-1, *Hygrothermal performance of buildings — Calculation and presentation of climatic data — Monthly means of single meteorological elements*

ISO 9060, *Solar energy — Specification and classification of instruments for measuring hemispherical solar and direct solar radiation*

ISO 9869-1, *Thermal insulation — Building elements — In-situ measurement of thermal resistance and thermal transmittance — Part 1: Heat flow meter method*

3 Terms, definitions, symbols and units

For the purposes of this document, the terms and definitions given in EN ISO 7345, EN ISO 9229 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at https://www.electropedia.org/

— ISO Online browsing platform: available at https://www.iso.org/obp

3.1 Terms and definitions

3.1.1
aggregate heat loss
total rate of heat loss attributable to an entire building fabric obtained by measurement of the aggregate heat loss rates from plane elements, thermal bridges and air infiltration

3.1.2
aggregate heat loss test
metric of a building's thermal performance capable of measuring the heat loss attributable to a building fabric according to this test standard

3.1.3
aggregate heat transfer coefficient (H_{agg})
sum of the transmission (H_{tr}) and infiltration component of the ventilation heat transfer coefficient (H_V) based upon measurement according to this test standard (according to prEN 17887-2)

3.1.4
air leakage rate
air flow rate across the building envelope

Note 1 to entry: This movement includes flow though joints, cracks and porous surfaces, or a combination thereof, induced naturally or by air-moving equipment.

[SOURCE: EN ISO 9972:2015, 3.1.1]

3.1.5
air permeability
air leakage rate per envelope area at the test reference pressure differential across the building envelope

Note 1 to entry: The test reference pressure differential is usually 50 Pa.

[SOURCE: EN ISO 9972:2015, 3.1.4]

3.1.6
external (internal) temperature
temperature of the external (internal) air measured by external (internal) air temperature sensor

3.1.7
habitable room
room that is continuously used for living, working, meeting, amusement and other purposes similar thereto

Note 1 to entry: Spaces such as bathroom, washroom, toilet, entrance hall or corridor are excluded.

3.1.8
heat transfer coefficient (*H*)
heat flow rate divided by temperature difference between two environments; specifically used for heat transfer coefficient by transmission or ventilation

3.1.9
infiltration air
uncontrolled passage of air into a space through leakage paths in the building envelope

3.1.10
internal room temperature
air temperature measured at the geometric centre of the room

3.1.11
internal building temperature
mean air temperature of all of the measured internal room temperatures

3.1.12
temperature difference ΔT
difference between the internal building temperature and external air temperature

3.1.13
test set point internal temperature
internal building air temperature required to achieve the minimum ΔT for the duration of the test

3.1.14
quasi steady-state
state under which the internal conditions within the test building are maintained constant, whilst the external conditions are allowed to vary. In such a state, transient stages within the test building are minimised

3.1.15
solar heat gain
heat provided by solar radiation entering, directly or indirectly after absorption in building elements, into the building through windows, opaque walls and roofs, or passive solar devices such as sunspaces, transparent insulation and solar walls

[SOURCE: ISO 52000-1:2017, 3.6.10]

3.1.16
test building
building where the test is being performed

3.1.17
thermal envelope
elements of a building that enclose conditioned spaces through which thermal energy is transferred to or from the external environment or to or from unconditioned spaces

3.1.18
transmission heat transfer coefficient (H_{tr})
heat flow rate due to thermal transmission through the fabric of a building, divided by the difference between the environment temperatures on either side of the construction

Note 1 to entry: By convention, if the heat is transferred between a conditioned space and the external environment, the sign is positive if the heat flow is from the space to outside (heat loss).

3.1.19
ventilation heat transfer coefficient (H_V)
heat flow rate due to air entering a conditioned space by infiltration or ventilation, divided by the temperature difference between the internal air and the supply air temperature

[SOURCE: EN ISO 13789:2017, 3.7]