EESTI STANDARD

EVS-EN 15026:2007

HOONE ELEMENTIDE JA PIIRDETARINDITE SOOJUS- JA NIISKUSTEHNILINE TOIMIVUS. NIISKUSLEVI HINDAMINE NUMBRILISE MODELLEERIMISEGA

Hygrothermal performance of building components and building elements - Assessment of moisture transfer by numerical simulation

EESTI STANDARDIKESKUS
ESTONIAN CENTRE FOR STANDARDISATION

EVS-EN 15026:2007

EESTI STANDARDI EESSÕNA

NATIONAL FOREWORD

See Eesti standard EVS-EN 15026:2007 sisaldab Euroopa standardi EN 15026:2007 ingliskeelset teksti.	This Estonian standard EVS-EN 15026:2007 consists of the English text of the European standard EN 15026:2007.
Standard on jõustunud sellekohase teate avaldamisega EVS Teatajas.	This standard has been endorsed with a notification published in the official bulletin of the Estonian Centre for Standardisation.
Euroopa standardimisorganisatsioonid on teinud Euroopa standardi rahvuslikele liikmetele kättesaadavaks 11.04.2007.	Date of Availability of the European standard is 11.04.2007.
Standard on kättesaadav Eesti Standardikeskusest.	The standard is available from the Estonian Centre for Standardisation.

Tagasisidet standardi sisu kohta on võimalik edastada, kasutades EVS-i veebilehel asuvat tagasiside vormi või saates e-kirja meiliaadressile standardiosakond@evs.ee.

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English Version

Hygrothermal performance of building components and building elements - Assessment of moisture transfer by numerical simulation

Performance hygrothermique des composants et parois de
bâtiments - Evaluation du transfert d'humidité par
simulation numérique

Wärme- und feuchtetechnisches Verhalten von Bauteilen
und Bauelementen - Bewertung der Feuchteübertragung
durch numerische Simulation

This European Standard was approved by CEN on 28 February 2007.

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. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the CEN Management Centre has the same status as the official versions.

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

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Foreword

This document (EN 15026:2007) 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 European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by October 2007, and conflicting national standards shall be withdrawn at the latest by October 2007.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard : Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Introduction

This standard defines the practical application of hygrothermal simulation software used to predict one-dimensional transient heat and moisture transfer in multi-layer building envelope components subjected to non steady climate conditions on either side. In contrast to the steady-state assessment of interstitial condensation by the Glaser method (as described in EN ISO 13788), transient hygrothermal simulation provides more detailed and accurate information on the risk of moisture problems within building components and on the design of remedial treatment. While the Glaser method considers only steady-state conduction of heat and vapour diffusion, the transient models covered in this standard take account of heat and moisture storage, latent heat effects, and liquid and convective transport under realistic boundary and initial conditions. The application of such models has become widely used in building practice in recent years, resulting in a significant improvement in the accuracy and reproducibility of hygrothermal simulation.

The following examples of transient, one-dimensional heat and moisture phenomena in building components can be simulated by the models covered by this standard:

- drying of initial construction moisture;

- moisture accumulation by interstitial condensation due to diffusion in winter;

- moisture penetration due to driving rain exposure;

- summer condensation due to migration of moisture from outside to inside;

- exterior surface condensation due to cooling by longwave radiation exchange;

- moisture-related heat losses by transmission and moisture evaporation.

The factors relevant to hygrothermal building component simulation are summarised below. The standard starts with the description of the physical model on which hygrothermal simulation tools are based. Then the necessary input parameters and their procurement are dealt with. A benchmark case with an analytical solution is given for the assessment of numerical simulation tools. The evaluation, interpretation and documentation of the output form the last part.

Inputs

- Assembly, orientation and inclination of building components

- Hygrothermal material parameters and functions

- Boundary conditions, surface transfer for internal and external climate

- Initial condition, calculation period, numerical control parameters

Outputs

- Temperature and heat flux distributions and temporal variations

- Water content, relative humidity and moisture flux distributions and temporal variations

Post processing

- Energy use, economy & ecology

- Biological growth, rot and corrosion

- Moisture related damage and degradation

The post processing tools are not part of this standard. As far as possible references to publications dealing with these tools is given.

1   Scope

This standard specifies the equations to be used in a simulation method for calculating the non steady transfer of heat and moisture through building structures.

It also provides a benchmark example intended to be used for validating a simulation method claiming conformity with this standard, together with the allowed tolerances.

The equations in this standard take account of the following storage and one-dimensional transport phenomena:

- heat storage in dry building materials and absorbed water;

- heat transport by moisture-dependent thermal conduction;

- latent heat transfer by vapour diffusion;

- moisture storage by vapour sorption and capillary forces;

- moisture transport by vapour diffusion;

- moisture transport by liquid transport (surface diffusion and capillary flow).

The equations described in this standard account for the following climatic variables:

- internal and external temperature;

- internal and external humidity;

- solar and longwave radiation;

- precipitation (normal and driving rain);

- wind speed and direction.

The hygrothermal equations described in this standard shall not be applied in cases where:

- convection takes place through holes and cracks;

- two-dimensional effects play an important part (e.g. rising damp, conditions around thermal bridges, effect of gravitational forces);

- hydraulic, osmotic, electrophoretic forces are present;

- daily mean temperatures in the component exceed 50 °C.

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.

EN 12664, *Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Dry and moist products of medium and low thermal resistance*

EN 12667, *Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Products of high and medium thermal resistance*

EN 12939, *Thermal performance of building materials and products — Determination of thermal resistance by means of guarded hot plate and heat flow meter methods — Thick products of high and medium thermal resistance*

EN ISO 7345, *Thermal insulation – Physical quantities and definitions (ISO 7345:1987)*

prEN ISO 9346:2005, *Hygrothermal performance of buildings and building materials - Mass transfer - Physical quantities and definitions (ISO/DIS 9346:2005)*

prEN ISO 10456, *Building materials and products - Hygrothermal properties -Tabulated design values and procedures for determining declared and design thermal values (ISO/DIS 10456:2005)*

EN ISO 12571, *Hygrothermal performance of building materials and products – Determination of hygroscopic sorption properties (ISO 12571:2000)*

EN ISO 12572, *Hygrothermal performance of building materials and products – Determination of water vapour transmission properties (ISO 12572:2001)*

prEN ISO 15927-3, *Hygrothermal performance of buildings - Calculation and presentation of climatic data - Part 3: Calculation of a driving rain index for vertical surfaces from hourly wind and rain data (ISO/DIS 15927-3:2006)*

3 Terms, definitions, symbols and units

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in prEN ISO 9346:2005 and EN ISO 7345 apply. Other terms used are defined in the relevant clauses of this standard.

3.2 Symbols and units

Symbol	Quantity	Unit
c_m	specific heat capacity of dry material	J/(kg·K)
c_w	specific heat capacity of liquid water	J/(kg·K)
D_w	moisture diffusivity	m^2/s
E_{sol}	total flux density of incident solar radiation	W/m^2