SLOVENSKI STANDARD
SIST EN 15377-2:2008

01-december-2008

Ogrevalni sistemi v stavbah - Naļ rtovanje vodnih sistemov za ogrevanje in hlajenje, vgrajenih v gradbeno konstrukcijo - 2. del: Naļ rtovanje, dimenzioniranje in vgradnja

Heating systems in buildings - Design of embedded water based surface heating and cooling systems - Part 2: Design, dimensioning and installation

Heizungssysteme in Gebäuden - Planung von eingebetteten Flächenheiz-und -kühlsystemen mit Wasser als Arbeitsmedium - Teil 2 : Planung, Auslegung und Installation

Conception des systemes de chauffage et refroidissement par le sol, le mur et le plafond - Partie 2 : Conception, dimensionnement et Installation

Ta slovenski standard je istoveten z: **EN 15377-2**

ICS:

91.140.10	Sistemi centralnega ogrevanja	Central heating systems

SIST EN 15377-2:2008 **en,de**

EUROPEAN STANDARD

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EUROPÄISCHE NORM

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ICS 91.140.10; 91.140.30

English Version

Heating systems in buildings - Design of embedded water based surface heating and cooling systems - Part 2: Design, dimensioning and installation

Systèmes de chauffage dans les bâtiments - Conception des systèmes de chauffage et refroidissement par le sol, le mur et le plafond - Design, dimensionnement et installation

Heizungsanlagen in Gebäuden - Planung von eingebetteten Flächenheiz- und -kühlsystemen mit Wasser als Arbeitsmedium - Teil 2: Planung, Auslegung und Installation

This European Standard was approved by CEN on 22 May 2008.

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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.

CEN members are the national standards bodies of 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.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
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Foreword

This document (EN 15377-2:2008) has been prepared by Technical Committee CEN/TC 228 “Heating systems in buildings”, the secretariat of which is held by DS.

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 December 2008, and conflicting national standards shall be withdrawn at the latest by December 2008.

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

This document is based on EN 1264-3 and -4, but has been modified to include cooling and other surface systems than floor heating. When EN 1264-3 and -4 are revised, the present standard will be superseded by the revised EN 1264-3 and -4.

The subjects covered by CEN/TC 228 are the following:

— design of heating systems (water based, electrical, etc.);

— installation of heating systems;

— commissioning of heating systems;

— instructions for operation, maintenance and use of heating systems;

— methods for calculation of the design heat loss and heat loads;

— methods for calculation of the energy performance of heating systems;

— methods for design and dimensioning of embedded water based surface heating and cooling systems.

Heating systems also include the effect of attached systems such as hot water production systems.

All these standards are systems standards, i.e. they are based on requirements addressed to the system as a whole and not dealing with requirements to the products within the system.

Where possible, reference is made to other European or International Standards, a.o. product standards. However, use of products complying with relevant product standards is no guarantee of compliance with the system requirements.

The requirements are mainly expressed as functional requirements, i.e. requirements dealing with the function of the system and not specifying shape, material, dimensions or the like.

The guidelines describe ways to meet the requirements, but other ways to fulfil the functional requirements might be used if fulfilment can be proved.

Heating systems differ among the member countries due to climate, traditions and national regulations. In some cases requirements are given as classes so national or individual needs may be accommodated.

In cases where the standards contradict with national regulations, the latter should be followed.

EN 15377 *Heating systems in buildings — Design of embedded water based surface heating and cooling systems* consists of the following parts:

— *Part 1: Determination of the design heating and cooling capacity;*

— *Part 2: Design, dimensioning and installation;*

— *Part 3: Optimizing for use of renewable energy sources.*

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 the United Kingdom.

Introduction

This European Standard specifies procedures and conditions for design, dimensioning and installation. Based on heating and cooling load calculations and determination of heating and cooling performance according to EN 15377-1 and EN 1264, respectively, the present part specifies the calculation of characteristic curves, which show the relationship between heat flow intensity and the determining variables.

The water flow rate is calculated using recommended values for the temperature difference between supply and return water temperature.

Special design considerations are given for systems which are used for both heating and cooling purposes. Further, requirements related to installation are included.

1 Scope

This European Standard is applicable to water based surface heating and cooling systems in buildings as defined in EN 15377-1.

Physiological limitations are taken into account when specifying the maximum and minimum surface temperature. The design is based on performance characteristic curves and limit curves calculated in accordance with EN 15377-1 and EN 1264.

Design considerations for heating and cooling systems are specified.

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 1057, *Copper and copper alloys — Seamless, round copper tubes for water and gas in sanitary and heating applications*

EN 1254 (all parts), *Copper and copper alloys — Plumbing fittings*

EN 1264-2, *Water based surface embedded heating and cooling systems — Part 2: Floor heating: Prove methods for the determination of the thermal output of floor heating systems using calculation and test methods*

EN 12828, *Heating systems in buildings — Design for water-based heating systems*

EN 12831, *Heating systems in buildings — Method for calculation of the design heat load*

EN 15377-1:2008, *Heating systems in buildings — Design of embedded water based surface heating and cooling systems — Part 1: Determination of the design heating and cooling capacity*

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

ISO 17455, *Plastics piping systems — Multilayer pipes — Determination of the oxygen permeability of the barrier pipe*

3 Terms, definitions, symbols and units

For the purposes of this document, the terms, definitions, symbols and units given in EN 15377-1:2008 apply.

4 Basic principles

4.1 Heating or cooling medium differential temperature

The heating or cooling medium differential temperature $\Delta\theta_H$ is calculated as follows (refer to EN 15377-1):

$$\Delta\theta_H = \frac{\left| \theta_V - \theta_R \right|}{\ln \frac{\left| \theta_V - \theta_i \right|}{\left| \theta_R - \theta_i \right|}} \quad \text{(K)} \qquad (1)$$

where

θ_V is the supply temperature of heating/cooling medium in K;

θ_R is the return temperature of heating/cooling medium in K;

θ_i is the design indoor temperature in K.

In this way, the effect of the temperature drop is taken into account.

4.2 Performance characteristic curve

The performance characteristic curve describes the relationship between the heat flow intensity q of a system and the required heating or cooling medium differential temperature.

As a simplification, the heat flow intensity is taken to be proportional to the differential temperature of the heating or cooling medium:

$$q = K_H \cdot \Delta\theta_H \quad \text{(W/m²)} \qquad (2)$$

where K_H is the equivalent heat transmission coefficient determined by one of the following equations depending on the type of system:

$= B \cdot \prod_i (a_i^{m_i})$ (W/m²K) in accordance with EN 1264-2;

$= 1/(R_w + R_r + R_x + R_i)$ (W/m²K) in accordance with Annex B of EN 15377-1:2008;

$= 1/(R_{HC} + R_i)$ (W/m²K) in accordance with Annex C of EN 15377-1:2008.

K_H may also be determined by Finite Element Method or Finite Difference Method calculations according to Annex D of EN 15377-1:2008.

4.3 Field of system characteristic curves

The field of characteristic curves of a surface heating or cooling system with a specific pipe spacing, T, shall at least contain performance characteristic curves for no surface covering, $R_{\lambda,B}$ = 0, and additionally it is recommended, if applicable (floor systems), for three different values of heat conduction resistance of the surface covering, in accordance with EN 15377-1 or EN 1264-2. Further, the limit curves shall be included for floor systems (see Figure 1). If the field of characteristic curves for floor heating is based on experimental testing (EN 1264-2), it is acceptable to provide performance characteristic curves by testing for no covering, $R_{\lambda,B}$ = 0, and for heat conduction resistance of the covering, $R_{\lambda,B}$ = 0,15 m² K/W, and establish the remaining performance characteristic curves by linear interpolation.

4.4 Limit curves

The limit curves in the field of system characteristic curves describe the relationship between the heating or cooling medium differential temperature and the heat flow intensity for the limit case, with a temperature drop between supply and return water, $\Delta\theta_{water}$, and the specified maximum or minimum surface temperature,

$\theta_{S,max}$ or $\theta_{S,min}$ [1)], based on the physiologically agreed limit value for surfaces where the occupants have direct contact (like floor surface) given in Annex A of EN 15377-1:2008, is reached.

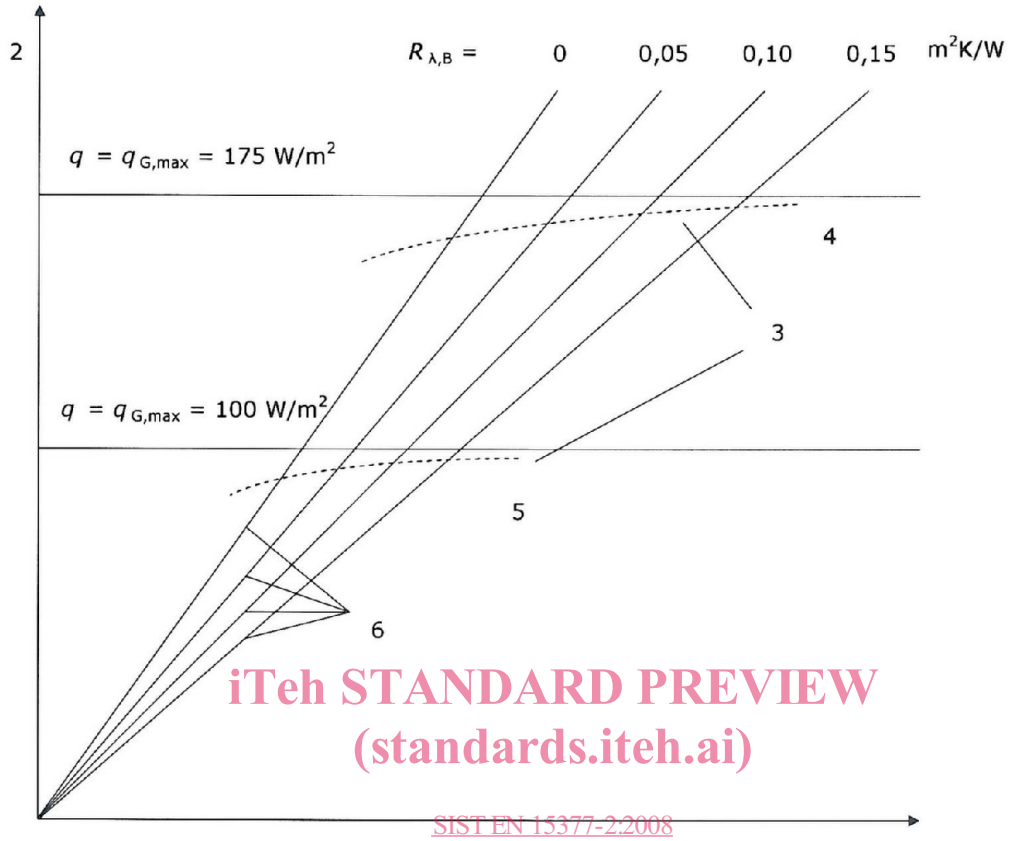
For design purposes, the limit curves apply for determination of heat flow densities and associated differential temperatures, where:

$$0\ K < \Delta\theta_{water} \leq 5\ K$$

In case the limiting surface temperature is based on an average surface temperature (e.g. heated/cooled ceiling-radiant temperature asymmetry), the limiting value is constant, i.e. represented by a vertical line in Figure 1.

The limit curves are used to specify the maximum or minimum permissible heat flow (refer also to Figure 1 for floor heating).

[1)] National regulations may limit the temperature to a lower or higher value.



Key

1 heating medium differential temperature $\Delta\theta_H$ in K

2 heat flow intensity q in W/m²

3 limit curves

4 peripheral areas $(\theta_{S,max} - \theta_i)$ = 15 K

5 occupied areas and bathrooms $(\theta_{S,max} - \theta_i)$ = 9 K

6 performance characteristic curves

Figure 1 — Field of system characteristic curves including limit curves for floor heating, for constant pipe spacing. This example is for floor heating and space temperature = 20 °C