

SVENSK STANDARD

SS-EN 15377-2:2008

Fastställt/Approved: 2008-07-04

Publicerad/Published: 2008-09-01

Utgåva/Edition: 1

Språk/Language: engelska/English

ICS: 91.140.10; 91.140.30

Värmesystem i byggnader – Inbyggda vattenburna system för värme och kyla – Del 2: Design, dimensionering och installation

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

This preview is downloaded from www.sis.se. Buy the entire standard via <https://www.sis.se/std-66791>



SWEDISH
STANDARDS
INSTITUTE

Hitta rätt produkt och ett leveranssätt som passar dig

Standarder

Genom att följa gällande standard både effektiviserar och säkrar du ditt arbete. Många standarder ingår dessutom ofta i paket.

Tjänster

Abonnemang är tjänsten där vi uppdaterar dig med aktuella standarder när förändringar sker på dem du valt att abonnera på. På så sätt är du säker på att du alltid arbetar efter rätt utgåva.

e-nav är vår online-tjänst som ger dig och dina kollegor tillgång till standarder ni valt att abonnera på dygnet runt. Med e-nav kan samma standard användas av flera personer samtidigt.

Leveranssätt

Du väljer hur du vill ha dina standarder levererade. Vi kan erbjuda dig dem på papper och som pdf.

Andra produkter

Vi har böcker som underlättar arbetet att följa en standard. Med våra böcker får du ökad förståelse för hur standarder ska följas och vilka fördelar den ger dig i ditt arbete. Vi tar fram många egna publikationer och fungerar även som återförsäljare. Det gör att du hos oss kan hitta över 500 unika titlar. Vi har även tekniska rapporter, specifikationer och "workshop agreement".

Matriser är en översikt på standarder och handböcker som bör läsas tillsammans. De finns på sis.se och ger dig en bra bild över hur olika produkter hör ihop.

Standardiseringsprojekt

Du kan påverka innehållet i framtida standarder genom att delta i någon av SIS ca 400 Tekniska Kommittéer.

Find the right product and the type of delivery that suits you

Standards

By complying with current standards, you can make your work more efficient and ensure reliability. Also, several of the standards are often supplied in packages.

Services

Subscription is the service that keeps you up to date with current standards when changes occur in the ones you have chosen to subscribe to. This ensures that you are always working with the right edition.

e-nav is our online service that gives you and your colleagues access to the standards you subscribe to 24 hours a day. With e-nav, the same standards can be used by several people at once.

Type of delivery

You choose how you want your standards delivered. We can supply them both on paper and as PDF files.

Other products

We have books that facilitate standards compliance. They make it easier to understand how compliance works and how this benefits you in your operation. We produce many publications of our own, and also act as retailers. This means that we have more than 500 unique titles for you to choose from. We also have technical reports, specifications and workshop agreements.

Matrices, listed at sis.se, provide an overview of which publications belong together.

Standardisation project

You can influence the content of future standards by taking part in one or other of SIS's 400 or so Technical Committees.

Europastandarden EN 15377-2:2008 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN 15377-2:2008.

The European Standard EN 15377-2:2008 has the status of a Swedish Standard. This document contains the official English version of EN 15377-2:2008.

© Copyright/Upphovsrätten till denna produkt tillhör SIS, Swedish Standards Institute, Stockholm, Sverige. Användningen av denna produkt regleras av slutanvändarlicensen som återfinns i denna produkt, se standardens sista sidor.

© Copyright SIS, Swedish Standards Institute, Stockholm, Sweden. All rights reserved. The use of this product is governed by the end-user licence for this product. You will find the licence in the end of this document.

Upplysningar om sakinnehållet i standarden lämnas av SIS, Swedish Standards Institute, telefon 08-555 520 00.

Standarder kan beställas hos SIS Förlag AB som även lämnar allmänna upplysningar om svensk och utländsk standard.

Information about the content of the standard is available from the Swedish Standards Institute (SIS), tel +46 8 555 520 00.

Standards may be ordered from SIS Förlag AB, who can also provide general information about Swedish and foreign standards.

SIS Förlag AB, SE 118 80 Stockholm, Sweden. Tel: +46 8 555 523 10. Fax: +46 8 555 523 11.

E-mail: sis.sales@sis.se Internet: www.sis.se

EUROPEAN STANDARD
NORME EUROPÉENNE
EUROPÄISCHE NORM

EN 15377-2

June 2008

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 -kühlssystemen mit Wasser als Arbeitsmedium - Teil 2: Planung, Auslegung und Installation

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

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.

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
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Contents	Page
Foreword.....	3
Introduction	5
1 Scope	6
2 Normative references	6
3 Terms, definitions, symbols and units	6
4 Basic principles	6
4.1 Heating or cooling medium differential temperature	6
4.2 Performance characteristic curve	7
4.3 Field of system characteristic curves	7
4.4 Limit curves	7
5 Boundary conditions and limits	10
5.1 Supply pipes to adjacent rooms	10
5.2 Backing thermal insulation	10
6 Design	12
6.1 Design heat flow intensity	12
6.2 Required length of the heating or cooling circuit	13
6.3 Procedure for determining the design supply temperature	14
6.3.1 System only for heating	14
6.3.2 System only for cooling	16
6.4 Procedure for determining the design heating or cooling medium flow rate	16
7 Peripheral areas by floor heating	17
8 Installation	18
Annex A (informative) Installation	19
A.1 General.....	19
A.2 Equipment	19
A.2.1 General.....	19
A.2.2 Safety	19
A.2.3 Stop valves and balancing devices	19
A.2.4 Control	19
A.2.5 Piping (pipes and couplings).....	20
A.3 Installation of piping.....	20
A.3.1 Storage and transport	20
A.3.2 Bending radius.....	20
A.3.3 Couplings	20
A.3.4 Joints	20
A.3.5 Holes in the embedded surface.....	21
A.4 Leak test	21
A.5 Initial heating up	21
Annex B (informative) Recommended minimum thermal resistance for floor heating systems	22
Bibliography	23

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.

SS-EN 15377-2:2008 (E)

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.

SS-EN 15377-2:2008 (E)

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):

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

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:

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

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

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

$$= 1/(R_w + R_r + R_x + R_i) \quad (\text{W/m}^2\text{K}) \text{ in accordance with Annex B of EN 15377-1:2008;}$$

$$= 1/(R_{HC} + R_i) \quad (\text{W/m}^2\text{K}) \text{ in accordance with Annex C of EN 15377-1:2008.}$$

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, $R_{\lambda,B} = 0,15 \text{ m}^2 \text{ KW}$, 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, $\Delta\theta_{\text{water}}$, and the specified maximum or minimum surface temperature,