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Byggnadsprojektering med miljöhänsyn – Projektering, dimensionering, installation och reglering av inbyggda strålningsverkande värme- och kylsystem –
Del 1: Definition, symboler och kriterier för komfort
(ISO 11855-1:2012)

Building environment design – Design, dimensioning, installation and control of embedded radiant heating and cooling systems –
Part 1: Definition, symbols, and comfort criteria
(ISO 11855-1:2012)

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Europastandarden EN ISO 11855-1:2015 gäller som svensk standard. Detta dokument innehåller den officiella engelska versionen av EN ISO 11855-1:2015.

Denna standard ersätter SS-EN 15377-1:2008, utgåva 1 och SS-ISO 11855-1:2012, utgåva 1.

The European Standard EN ISO 11855-1:2015 has the status of a Swedish Standard. This document contains the official English version of EN ISO 11855-1:2015.

This standard supersedes the Swedish Standard SS-EN 15377-1:2008, edition 1 and SS-ISO 11855-1:2012, edition 1.

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.

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Denna standard är framtagen av kommittén för Installationer, SIS/TK 189/AG 3.

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EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN ISO 11855-1

August 2015

ICS 91.140.10; 91.140.30

Supersedes EN 15377-1:2008

English Version

Building environment design - Design, dimensioning, installation and control of embedded radiant heating and cooling systems - Part 1: Definition, symbols, and comfort criteria (ISO 11855-1:2012)

Conception de l'environnement des bâtiments - Conception, construction et fonctionnement des systèmes de chauffage et de refroidissement par rayonnement - Partie 1: Définition, symboles et critères de confort (ISO 11855-1:2012)

Umweltgerechte Gebäudeplanung - Planung, Auslegung, Installation und Steuerung flächenintegrierter Strahlheizungs- und -kühlsysteme - Teil 1: Definitionen, Symbole und Komfortkriterien (ISO 11855-1:2012)

This European Standard was approved by CEN on 30 July 2015.

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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-CENELEC Management Centre has the same status as the official versions.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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CEN-CENELEC Management Centre: Avenue Marnix 17, B-1000 Brussels

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European foreword

The text of ISO 11855-1:2012 has been prepared by Technical Committee ISO/TC 205 “Building environment design” of the International Organization for Standardization (ISO) and has been taken over as EN ISO 11855-1:2015 by Technical Committee CEN/TC 228 “Heating systems and water based cooling systems in buildings” the secretariat of which is held by DIN.

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 February 2016, and conflicting national standards shall be withdrawn at the latest by February 2016.

This standard is applicable for design, construction and operation of radiant heating and cooling systems. The methods defined in part 2 are intended to determine the design heating or cooling capacity used for the design and evaluation of the performance of the system.
For identifying product characteristics by testing and proving the thermal output of heating and cooling surfaces embedded in floors, ceilings and walls the standard series EN 1264 can be used.

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 supersedes EN 15377-1:2008.

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Endorsement notice

The text of ISO 11855-1:2012 has been approved by CEN as EN ISO 11855-1:2015 without any modification.

Introduction

The radiant heating and cooling system consists of heat emitting/absorbing, heat supply, distribution, and control systems. The ISO 11855 series deals with the embedded surface heating and cooling system that directly controls heat exchange within the space. It does not include the system equipment itself, such as heat source, distribution system and controller.

The ISO 11855 series addresses an embedded system that is integrated with the building structure. Therefore, the panel system with open air gap, which is not integrated with the building structure, is not covered by this series.

The ISO 11855 series shall be applied to systems using not only water but also other fluids or electricity as a heating or cooling medium.

The object of the ISO 11855 series is to provide criteria to effectively design embedded systems. To do this, it presents comfort criteria for the space served by embedded systems, heat output calculation, dimensioning, dynamic analysis, installation, operation, and control method of embedded systems.

Building environment design — Design, dimensioning, installation and control of embedded radiant heating and cooling systems —

Part 1:
Definition, symbols, and comfort criteria

1 Scope

This part of ISO 11855 specifies the basic definitions, symbols, and a comfort criteria for radiant heating and cooling systems.

The ISO 11855 series is applicable to water based embedded surface heating and cooling systems in residential, commercial and industrial buildings. The methods apply to systems integrated into the wall, floor or ceiling construction without any open air gaps. It does not apply to panel systems with open air gaps which are not integrated into the building structure.

The ISO 11855 series also applies, as appropriate, to the use of fluids other than water as a heating or cooling medium. The ISO 11855 series is not applicable for testing of systems. The methods do not apply to heated or chilled ceiling panels or beams.

2 Normative references

ISO 7726:1998, *Ergonomics of the thermal environment — Instruments for measuring physical quantities*

ISO 7730:2005, *Ergonomics of the thermal environment — Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria*

ISO 13731:2003, *Ergonomics of the thermal environment — Vocabulary and symbols*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
additional thermal resistance
thermal resistance representing layers added to the building structure and acting mostly as thermal resistances because of their own low thermal inertia

EXAMPLE Carpets, moquette, and suspended ceilings.

2.2
average specific thermal capacity of the internal walls
thermal capacity related to one square metre of the internal walls

NOTE Since internal walls are shared with other rooms, then just half of the total specific thermal capacity of the wall must be taken into account, since the second half is influenced by the opposite rooms that are considered to be at the same thermal conditions as the one under consideration.

2.3
average surface temperature
$\theta_{s,m}$
average value of all surface temperatures in the occupied or peripheral area

2.4
basic characteristic curve
curve or formula reflecting the relationship between the heat flux and the mean surface temperature difference

NOTE This depends on heating/cooling and surface (floor/wall/ceiling) but not on the type of embedded system.

2.5
calculation time step
length of time considered for the calculation of the temperatures and heat flows in the room and slab

NOTE This is typically assumed to equal 3 600 s.

2.6
circuit
section of system connected to a distributor which can be independently switched and controlled

2.7
circuit total thermal resistance
thermal resistance representing the circuit as a whole, determining a straight connection between the water inlet temperature and the mean temperature at the pipe level

NOTE It includes the water flow thermal resistance, the convection thermal resistance at the pipe inner side, the pipe thickness thermal resistance, and the pipe level thermal resistance.

2.8
clothing insulation
basic clothing insulation that is the resistance of a uniform layer of insulation covering the entire body that has the same effect on sensible heat flow as the actual clothing under standardized (static, wind-still) conditions

NOTE The definition of clothing insulation also includes the uncovered parts of the body, e.g. the head. It is described as the intrinsic insulation from the skin to the clothing surface, not including the resistance provided by the air layer around the clothed body, and is expressed in the clo unit or in m^2K/W; 1 clo = 0,155 m^2K/W.

2.9
conductive region of the slab
region of the slab that includes the pipes with thermal conductivities of the layers higher than 0,8 W/(m·K)

NOTE Due to the subdivision of the slab into an upper slab and a lower slab, the conductive region is also subdivided into an upper conductive region and a lower conductive region.

2.10
convection thermal resistance at the pipe inner side
thermal resistance associated to the convection heat transfer taking place between the water flowing in the pipe and the pipe inner side, thus connecting the mean water temperature along the circuit with the mean temperature of the pipe inner side

2.11
convective heating and cooling system
system that directly conditions the air in the room for the purpose of heating and cooling

2.12
convective peak load
maximum cooling load to be extracted by a virtual convective system used to keep comfort conditions in the room

2.13
daily average temperature of the conductive region of the slab
average temperature of the conductive region of the slab during the day

2.14
design cooling capacity
$Q_{H,c}$
thermal output by a cooling surface at design conditions

2.15
design cooling load
$Q_{N,c}$
required thermal output necessary to achieve the specified design conditions in outside summer design conditions

2.16
design sensible cooling load
required sensible thermal output necessary to achieve the specified design conditions in outside summer design conditions

2.17
design dew point
$\theta_{Dp,des}$
dew point determined for the design

2.18
design supply temperature of heating/cooling medium
$\theta_{V,des}$
value of flow water temperature with the thermal resistance of the chosen floor covering, at maximum value of heat flux q_{max}

NOTE The flow and the supply temperature are the same throughout the EN 1264 series.

2.19
design heat flux
q_{des}
heat flow divided by the heating or cooling surface, taking into account the surface temperature required to reach the design thermal capacity of a surface heated or cooled space, Q_H, reduced by the thermal capacity of any supplementary heating or cooling equipment, if applicable

2.20
design heating capacity
$Q_{H,h}$
thermal output from a heating surface at design conditions

2.21
design heating load
$Q_{N,h}$
required thermal output necessary to achieve the specified design conditions in outside winter design conditions

NOTE When calculating the value of the design heat load, the heat flow from embedded heating systems into neighbouring rooms is not taken into account.

2.22
design heating/cooling medium differential temperature
$\Delta\theta_{H,des}$
temperature difference at design heat flux

2.23
design heating medium differential supply temperature
$\Delta\theta_{V,des}$
temperature difference between the design supply medium temperature and indoor temperature at design heat flux

2.24
design heating/cooling medium flow rate
m_H
mass flow rate in a circuit which is needed to achieve the design heat flux