
**Načrtovanje okolja v stavbah - Vgrajeni hladilni in ogrevalni sistemi - 1. del:
Definicije, simboli in merila za ugodje (ISO/DIS 11855-1:2020)**

Building environment design - Embedded radiant heating and cooling systems - Part 1:
Definitions, symbols, and comfort criteria (ISO/DIS 11855-1:2020)

Umweltgerechte Gebäudeplanung - Flächenintegrierte Strahlheizungs- und -
kühlssysteme - Teil 1: Begriffe, Symbole und Komfortkriterien (ISO/DIS 11855-1:2020)

Conception de l'environnement des bâtiments - Systèmes intégrés de chauffage et de
refroidissement par rayonnement - Partie 1: Définitions, symboles et critères de confort
(ISO/DIS 11855-1:2020)

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Ta slovenski standard je istoveten z: prEN ISO 11855-1

ICS:

91.140.10	Sistemi centralnega ogrevanja	Central heating systems
91.140.30	Prezračevalni in klimatski sistemi	Ventilation and air-conditioning systems

oSIST prEN ISO 11855-1:2020 **en,fr,de**

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DRAFT INTERNATIONAL STANDARD

ISO/DIS 11855-1

ISO/TC 205

Secretariat: ANSI

Voting begins on:
2020-03-16Voting terminates on:
2020-06-08

Building environment design — Embedded radiant heating and cooling systems —

Part 1: Definitions, symbols, and comfort criteria

Conception de l'environnement des bâtiments — Systèmes intégrés de chauffage et de refroidissement par rayonnement —

Partie 1: Définitions, symboles et critères de confort

ICS: 91.040.01

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Reference number
ISO/DIS 11855-1:2020(E)

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Published in Switzerland

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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

ISO 11855-1 was prepared by Technical Committee ISO/TC 205, *Building environment design*.

ISO 11855 consists of the following parts, under the general title *Building environment design — Design, dimensioning, installation, control and input parameters for the energy calculation of embedded radiant heating and cooling systems*:

- Part 1: *Definitions, symbols, and comfort criteria*
- Part 2: *Determination of the design and heating and cooling capacity*
- Part 3: *Design and dimensioning*
- Part 4: *Dimensioning and calculation of the dynamic heating and cooling capacity of Thermo Active Building Systems (TABS)*
- Part 5: *Installation*
- Part 6: *Control*
- Part 7: *Input parameters for the energy calculation*

Part 1 specifies the comfort criteria which should be considered in designing embedded radiant heating and cooling systems, since the main objective of the radiant heating and cooling system is to satisfy thermal comfort of the occupants. Part 2 provides steady-state calculation methods for determination of the heating and cooling capacity. Part 3 specifies design and dimensioning methods of radiant heating and cooling systems to ensure the heating and cooling capacity. Part 4 provides a dimensioning and calculation method to design Thermo Active Building Systems (TABS) for energy-saving purposes, since radiant heating and cooling systems can reduce energy consumption and heat source size by using renewable energy. Part 5 addresses the installation process for the system to operate as intended. Part 6 shows a proper control method of the radiant heating and cooling systems to ensure the maximum performance which was intended in the design stage when the system is actually being operated in a building. Part 7 presents a calculation method for input parameters to ISO 52031.

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, control method of embedded systems, and input parameters for the energy calculations.

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Building environment design — Embedded radiant heating and cooling systems —

Part 1: Definitions, symbols, and comfort criteria

1 Scope

This part of ISO 11855 specifies the basic definitions, symbols, and comfort criteria for embedded 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 (standards.iteh.ai)

- ISO 7726:1998, *Ergonomics of the thermal environment — Instruments for measuring physical quantities*
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- 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 13731:2001, *Ergonomics of the thermal environment — Vocabulary and symbols*

3 Terms and definitions

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

3.1

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.

3.2

average specific thermal capacity of the internal walls

thermal capacity related to one square metre of the internal walls

Note 1 to entry: 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.

3.3

average surface temperature

$\theta_{s,m}$

average value of all surface temperatures in the occupied or peripheral area

ISO/DIS 11855-1:2020(E)**3.4****basic characteristic curve**

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

Note 1 to entry: This depends on heating/cooling and surface (floor/wall/ceiling) but not on the type of embedded system.

3.5**calculation time step**

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

Note 1 to entry: This is typically assumed to equal 3 600 s.

3.6**circuit**

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

3.7**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 1 to entry: 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.

3.8**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 1 to entry: 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 $\text{m}^2\text{K}/\text{W}$; 1 clo = 0,155 $\text{m}^2\text{K}/\text{W}$.

3.9**conductive region of the slab**

region of the slab that includes the pipes with thermal conductivities of the layers higher than 0,8 $\text{W}/(\text{m}\cdot\text{K})$

Note 1 to entry: 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.

3.10**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

3.11**convective heating and cooling system**

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

3.12**convective peak load**

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

3.13**daily average temperature of the conductive region of the slab**

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

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3.14**design cooling capacity** $Q_{H,c}$

thermal output by a cooling surface at design conditions

3.15**design cooling load** $Q_{N,c}$

required thermal output necessary to achieve the specified design conditions in outside summer design conditions

3.16**design sensible cooling load**

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

3.17**design dew point** $\theta_{Dp,des}$

dew point determined for the design

3.18**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 1 to entry: The flow and the supply temperature are the same throughout the EN 1264 series.

3.19**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**3.20****design heating capacity** $Q_{H,h}$

thermal output from a heating surface at design conditions

3.21**design heating load** $Q_{N,h}$

required thermal output necessary to achieve the specified design conditions in outside winter design conditions

Note 1 to entry: When calculating the value of the design heat load, the heat flow from embedded heating systems into neighbouring rooms is not taken into account.

3.22**design heating/cooling medium differential temperature** $\Delta\theta_{H,des}/\Delta\theta_{C,des}$

temperature difference at design heat flux

3.23**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

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3.24**design heating/cooling medium flow rate** m_H

mass flow rate in a circuit which is needed to achieve the design heat flux

3.25**design indoor temperature** θ_i

operative temperature at the centre of the conditioned space used for calculation of the design load and capacity

Note 1 to entry: The operative temperature is considered relevant for thermal comfort assessment and heat loss calculations. This value of internal temperature is used for the calculation method.

3.26**distributor**

common connection point for several circuits

3.27**draught**

unwanted local cooling of a body caused by movement of air and related to temperature

3.28**electric floor (wall, ceiling) heating system**

several panel systems that convert electrical energy to heat, raising the temperature of conditioned indoor surfaces and the indoor air.

3.29**embedded surface heating and cooling system**

system consisting of circuits of pipes embedded in floor, wall or ceiling construction, distributors and control equipments

3.30**equivalent heat transmission coefficient** K_H

coefficient describing the relationship between the heat flux from the surface and the heating/cooling medium differential temperature

3.31**family of characteristic curves**curves denoting the system-specific relationship between the heat flux, q , and the required heating medium differential temperature $\Delta\theta_H$ for conduction resistance of various floor coverings**3.32****heat flux** q

heat flow between the space and surface divided by the heated/cooled surface

Note 1 to entry: For heating it is a positive value and for cooling it is a negative value.

3.33**heat transfer coefficient** h_t

combined convective and radiative heat transfer coefficient between the heated or cooled surface and the space operative temperature (design indoor temperature)

3.34**heating or cooling surface**

surface (floor, wall, ceiling) covered by the embedded surface heating/cooling system between the pipes at the outer edges of the system with the addition of a strip at each edge of width equal to half the pipe spacing, but not exceeding 0,15 m