C3 NATIONAL BUILDING CODE OF FINLAND

Thermal insulation in a building
Regulations 2003

Decree of Ministry of the Environment on thermal insulation in a building

Issued in Helsinki on 30 October 2002

In accordance with the Decision of Ministry of the Environment the following regulations on thermal insulation in a building are enacted by virtue of section 13 of the Land Use and Building Act (132/1999) of 5 February 1999.

The regulations have been notified in accordance with Directive 98/34/EC of the European Parliament and of the Council as amended by Directive 98/48/EC laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services.

This Decree enters into force on 1 October 2003 and it repeals the Decision of Ministry of the Interior issued on 27 March 1983 on thermal insulation. Previous regulations may be applied to permit applications initiated before the Decree entered into force.

In Helsinki, on 30 October 2002

Minister *Suvi-Anne Siimes*

Senior Technical Adviser *Raimo Ahokas*

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MINISTRY OF THE ENVIRONMENT, Housing and Building Department

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Content

KEY TO SYMBOLS
Regulations printed in the wide column are mandatory.

Explanations *in italics in the narrow column provide further information and contain references to provisions, regulations and guidelines.*

DEFINITIONS

Thermal transmittance U

Thermal transmittance U indicates in steady state conditions the density of heat flow which permeates a building component when the temperature difference between the air spaces on both sides of the building component is one unit of temperature. The unit is $W/(m^2 K)$.

Especially warm space

An especially warm space refers to a space where, due to the intended use, the indoor temperature is continuously or occasionally high compared to a normal heated space. This kind of space may be, for instance, the steam room in a sauna.

Heated space

A heated space refers to a space where the design room temperature during a heating season is for comfort or other reasons $+17^oC$ or higher.

Partly heated space

A partly heated space refers to a space which is not intended for continuous stay wearing only normal indoor clothing. The temperature of the space is, during the heating season, on average a minimum of $+5^oC$ but below $+17^oC$ or the temperature of the space would be within these limits without heat from the production process. In respect of the thermal insulation requirements, partly heated spaces would include, for instance, holiday homes occasionally heated during the winter.

Cooled cold space

A cooled cold space refers to a space where the temperature is maintained around the year below 17^oC according its intended use with the help of a cooling and a possible heating system. These spaces may include, for instance, cool cellar and storage spaces.

Unheated space

An unheated space refers to a space which is not intended for continuous occupation during the heating season and which is intentionally not heated. The temperature in an unheated space follows usually the outdoor air temperature during the heating season. The thermal insulation requirements do not concern an unheated space and these are not taken into account when calculating heat losses in a building envelope. Unheated spaces include, for instance, glazed balconies, projecting porches, unheated garages and unheated conservatories attached to buildings.

Building envelope

The building envelope includes those building components which separate warm, cool, particularly warm or cooled cold space from the outdoor air, the ground or an unheated space. The building envelope does not include internal building components in a building separating different spaces from each other.

Air barrier

An air barrier refers to a material layer with its main task of preventing harmful air flow through the building component from one side to the other.

Design temperature

The design temperature refers to those indoor and outdoor air temperatures on the basis of which the heating and cooling power demand in a building is determined.

Energy use for heating in a building

Energy use for heating in a building refers to the quantity of heating energy which the heating system should transfer to the various heated spaces in a building so that the required temperature conditions are maintained.

1
GENERAL

1.1 Scope of application

1.1.1
These regulations concern buildings where energy is used for heating and, in addition, possibly for cooling to achieve an appropriate indoor temperature.

1.1.2
However, these regulations do not concern the following buildings:

a) industrial buildings where the manufacturing process transfers so much thermal energy that to achieve the desired indoor temperature there is no need or only a small need for other thermal energy, or production spaces where heavy thermal insulation outside the heating season would harmfully increase the internal temperature or would essentially increase the consumption for cooling energy,

b) holiday home, excluding a building intended for all-year or wintertime use,

c) greenhouse, air raid shelter or other equivalent building whose intended use would be unfairly difficult if these regulations were complied with.

2
BUILDING COMPONENTS AND AIR TIGHTNESS OF BUILDING ENVELOPE

2.1 Heated and partly heated space

2.1.1
The thermal and moisture physical properties of building components separating a heated and a partly heated space from the outdoor air, from an unheated space or from each others should make possible to achieve indoor climate conditions required by the intended use of the space in accordance with the requirements of good energy efficiency.

2.2 Especially warm space and cooled cold space

2.2.1
In addition, the heat and moisture physical properties of building components abutting to a especially warm or cooled cold space must be such that no damage is caused to the use of the adjacent rooms and their structures.

2.3 Air tightness of the building envelope

2.3.1
The air-tightness of the building envelope should be good enough that the ventilation system in the building is able to function as designed. If necessary, the structures must have a separate air barrier. Particular attention should be paid to the design of junctions and leads-in in structures and to the thorough construction work.

Explanation

In respect of functioning of the ventilation system, air-tightness of a building should be preferably close to the value of n_{50}= 1 1/h (one volume of air in the building is flowing through the building envelope in an hour when the pressure difference between the inside and outside air is 50 Pa).

2.3.2
The joints between windows and doors to the surrounding structures should be air-tight. The materials used for sealing the frame and the sash should endure the stresses of use without getting essentially damaged.

3
THERMAL INSULATION OF BUILDING ENVELOPE

3.1 Methods of fulfilling the requirements for thermal insulation

3.1.1
The requirements for thermal insulation may be fulfilled either by directly using the maximum U-values for building components in accordance with 3.2 or by indicating with calculations in accordance with 3.3 that the heat losses of the building envelope do not exceed the reference level according to the values in 3.2.

If the building envelope does not fulfil the requirements subject to 3.2 or 3.3, it shall be indicated, using calculations in accordance with 3.4, that the energy use for heating in a building does not exceed the calculated reference level provided with a building with the envelope in accordance with 3.2 and with the heat recovery of exhaust air in accordance with Part D2 of the National Building Code.

3.2 Requirements for thermal transmittance of building components and for window area in a building

3.2.1
When a heated or especially warm space abuts to the outdoor air, to an unheated space or to the ground, the thermal transmittances U for building components must not exceed the following values:

wall	0.25 W/m^{2}K
roof, base floor abutting to outside	0.16 W/m^{2}K
base floor abutting to a crawl space (total area of ventilation openings a maximum of 8 per mil of the base floor area)	0.20 W/m^{2}K
building component against the ground	0.25 W/m^{2}K
window, door	1.4 W/m^{2}K
skylight	1.5 W/m^{2}K

3.2.2
When a partly heated space abuts to the outdoor air, to an unheated space, to a crawl space or to the ground, the thermal transmittances U for building components must not exceed the following values:

wall	0.40 W/m^{2}K
roof, base floor	0.30 W/m^{2}K
building component against the ground	0.36 W/m^{2}K
window, door	1.8 W/m^{2}K

3.2.3
When a heated space abuts to a partly heated space, the thermal transmittances U for building components must not exceed the following values:

wall	0.45 W/m^{2}K
intermediate floor	0.45 W/m^{2}K
window, door	2.8 W/m^{2}K

3.2.4
Thermal transmittances for building components between a cooled cold space and a heated space must not exceed the values in accordance with 3.2.1.

3.2.5
When using the values in accordance with 3.2.1 and 3.2.2, the total window area in the building may be a maximum of 15 % of the gross floor area of the building. However, the proportion of the window area must not exceed 50 % of the total area of outside walls.

The window area is calculated in accordance with the external frame dimensions. Thermal insulation requirements for windows and doors concern the entire window structure with frame and sash.

Explanation

Part G1 of the National Building Code includes provisions on access to natural light in a dwelling room and on a minimum size of a window glazing area.

3.2.6
U-values for small parts of building components may be greater than indicated in 3.2.1 and 3.2.2 if this is necessary for reasons of strength or for any other special reasons. Small parts of building components deviating from the requirements (thermal bridge) must not cause moisture condensation or too high relative humidity on the surface of a structure or in a structure when the building is used normally.

3.2.7
Thermal insulation of the base floor must be designed together with frost insulation and implemented in such a way that frost damages are avoided.

3.3 Requirements for heat losses in a building envelope

3.3.1
Thermal transmittance for an individual building component and the window area can be increased if the heat losses of the building envelope are not higher than the heat losses calculated when the building components have the values indicated in 3.2.1, 3.2.2 and 3.2.5.

3.3.2
However, the thermal transmittance for wall, roof and base floor which are parts of the building envelope, may be a maximum of 0.6 W/m^{2}K. The thermal transmittance for a window abutting to a heated space may be a maximum of 1.8 W/m^{2}K and the thermal transmittance for a window abutting to a partly heated space may be a maximum of 2.8 W/m^{2}K.

3.3.3
When calculating heat losses of a building envelope, the thermal transmittance for a base floor against the ground with low foundations may not be less than 0.15 W/m^{2}K in heated spaces and in partly heated spaces less than 0.25 W/m^{2}K. When thermal transmittance for a base floor against the ground is less than the values in 3.2.1 and 3.2.2, special attention must be paid to the design and implementation of appropriate frost insulation.

3.4 Requirements for energy use for heating in a building

3.4.1
If the thermal transmittances for building components do not fulfil the requirements in accordance with 3.2 or the heat losses of the building envelope do not fulfil the requirements in accordance with 3.3, the thermal insulation requirements in a building may be fulfilled by improving heat recovery from exhaust air in respect of the required level in Part D2 of the National Building Code in such a way that the energy use for heating in the actual building is not more than the energy use for heating in a reference building thermally insulated in accordance with 3.2 and provided with heat recovery from exhaust air in accordance with the requirements in Part D2 of the National Building Code.

3.4.2
The reference level of energy use for heating in a building is calculated using thermally insulated building components in accordance with 3.2.1, 3.2.2 and 3.2.5, and a ventilation design in accordance with the requirements provided in Part D2 of the National Building Code.

The calculations use, as an annual efficiency of heat recovery equipment, the supply air temperature efficiency of a heat exchanger multiplied by 0.6 unless otherwise indicated by explanations. However, the heat losses of a building envelope must not be over 10 per cent greater than the heat losses of a building envelope in accordance with 3.2.

3.4.3
The calculations are made by applying the methods described in Parts C4 and D5 of the National Building Code or by using any other generally acceptable, corresponding calculation methods for thermal transmittance and energy use for heating. As the design indoor temperature is used 21^{o}C unless it is justifiable to use any other value due to the intended use of the building or for any other corresponding reason.

When determining the reference level and calculating the actual design, the same calculation method and the same calculation data, such as weather data and internal heat sources, and the same geometric data, such as the dimensions concerning the extent of the building and area data of building components, must be used.