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Ministry of the Environment Decree

on the energy efficiency of new buildings

By decision of the Ministry of the Environment, the following is hereby laid down pursuant to § 117 g(4), § 131(2) and § 150 f(4) of the Land Use and Building Act (132/1999), as § 117 g(4) appears in Act 1151/2016, § 131(2) in Act 41/2014, and § 150 f(4) in Act 41/2014:

Chapter 1

General

§ 1

Scope

This decree applies to the design and construction of new buildings which are made of wall and roof structures and in which energy is used in order to maintain appropriate indoor climate conditions. It also concerns the expansion of a building and the increase of gross floor area. It applies to the expansion of a building with an area of less than 50 m2 only if the area of the expanded building exceeds 50 m2.

§ 2

Definitions

For the purposes of this Decree:

1) *the quantity of heat needed for the thermal ventilation*: the quantity of heat that is necessary for heating the ventilation air flow from outside temperature to room temperature;

2) *net heating energy need for ventilation*: the heating energy need that is created from heating the air after heat recovery to the temperature of the supply air and possibly from heating prior to heat recovery;

3) *annual efficiency ratio of the heat recovery of the extract air of the ventilation*: the relation between the annual quantity of heat recovered with the heat recovery equipment and the quantity of heat required for heating the ventilation per year, when there is no heat recovery;

4) *specific fan power of ventilation system* (kW/(m3/s): the total electrical power taken from the power supply by all the fans (and their connected frequency converters and other power regulation devices) of the building’s entire ventilation system, divided by the exit exhaust air flow or the outdoor air flow of the designed operating time of the ventilation system (whichever of these is greater);

5) *electric energy consumption of the ventilation system*: the fan electricity and the electricity consumption of possible accessory units;

6) *air leakage value* q50 (m3/(h m2)): the mean air leakage flow per hour of the building envelope by a 50 Pa difference in pressure, calculated in accordance with the total internal dimensions, per area of the building envelope;

7) *climate-controlled cool space*: a space where an appropriate all-year round temperature of under 17 °C is kept with a cooling and possible heating system;

8) *energy consumption of the cooling system*: the energy consumption for producing the cooling energy and the electricity consumption of the accessory units;

9) *district heating*: heat that is produced with central heat production and distributed in a public network to the buildings that are customers;

10) *cold bridge*: a decrease in the thermal transmittance coefficient in a small part of a building resulting from a structure’s strength or joints;

11) *heated net area* Anet (m2): the total area of the heated floor plates, including the internal surfaces of the outer walls surrounding the floor plates;

12) *unheated space*: a space that is not intended for continuous occupancy during the heating period, and does not plan to be heated;

13) *net heating energy need*: the total net energy need required for heating spaces, heating the ventilation and producing domestic hot water;

14) *heating energy need*: the amount of energy needed for maintaining indoor climate conditions, ventilation and heating domestic hot water;

15) *thermal transmittance coefficient*: the density of the air flow that, in a continuous state, penetrates the building component when the difference in temperature between the air spaces in the various building components is as big as the unit. Its symbol is U and W/(m2K) is the unit used;

16) *warm space*: a space in the building with a temperature of +17 °C or higher;

17) *net heating energy need of domestic hot water*: the heating energy need that includes the heating of the consumed domestic hot water from the temperature of cold water to the temperature of hot water;

18) *solid wood building*: a building where the outer walls are built primarily from solid wood with a mean structural thickness of at least 180 mm;

19) *semi-warm space*: a space that is not designed for constant occupancy by occupants dressed only in normal indoor clothes, and has a temperature that is maintained at a minimum of +5 °C but below +17 °C during the heating season;

20) *calculated purchased energy of the building*: energy that is calculated to be acquired to the building from the power grid, the district heating network, the district cooling network or from renewable energy or fossil fuels;

21) *building envelope*: the building components that separate the warm, semi-warm, very warm and climate-controlled cool spaces from the outdoor air, ground or unheated spaces;

22) *reference thermal loss of the building*: the sum of the thermal loss of the envelope, leakage air and the ventilation calculated in accordance with the formulae and reference values;

23) *mobile building*: a movable building intended for temporary use;

24) *design solution*: the design to be implemented in the building in question;

25) *renewable fuel*: wood, wood-based and other biofuels, with the exception of peat;

26) *adaptive ventilation*: a system that can be used for guiding air flows according to loads or air quality based on the usage situation;

27) *energy obtained from energy in the environment*: thermal or electric energy obtained from sun, wind, soil, air or water by means of equipment that is part of the building or near the building.

§ 3

Minimum requirements of the energy efficiency of buildings

The principal designer, specialist designer and building designer must, in accordance with the respective duties, ensure that the newly designed building meets the following requirements, depending on its use:

1) it is in compliance with the calculated energy efficiency reference value (*E-value*) or the structural energy efficiency;

2) it creates conditions for little energy consumption with regard to thermal loss in the building;

3) it is energy efficient with regard to its calculated room temperature in the summer, energy measurement, thermal and electrical efficiency needs as well as the specific fan power efficiency of a mechanical ventilation system.

Chapter 2

Energy efficiency

§ 4

Requirement levels for the calculated energy efficiency reference value according to use categories

The calculated energy efficiency reference value (*E-value*), for which unit kWhE/(m2 a) is used, is the calculated annual net purchased energy consumption of the building weighted by the coefficients of the energy forms per heated net area. An E-value calculated on the basis of a building’s use class must not exceed the following limits:

|  |  |
| --- | --- |
| Use category | E-value limit  kWhE/(m2 a) |
| Category 1) Small residential buildings:  a) Detached small house or part of a linked house, with a heated net area (Anet) of 50–150 m2  b) Detached small house or part of a linked house, with a heated net area (Anet) of more than 150 m2 but not exceeding 600 m2  c) Detached small house or part of a linked house, with a heated net area (Anet) of more than 600 m2  d) Terraced house and a block of flats with no more than two residential floors | 200–0.6 Anet  116–0.04 Anet  92  105 |
| Category 2) Block of flats with at least three residential floors | 90 |
| Category 3) Office building, healthcare facility | 100 |
| Category 4) Commercial building, department store, shopping centre except convenience stores of less than 2 000 m2 per unit, commercial centre, theatre, opera, concert and conference centres, cinema, library, archives, museum, art gallery, exhibition hall buildings | 135 |
| Category 5) Commercial accommodation building, hotel, hall of residence, residential home, retirement home, institution | 160 |
| Category 6) School buildings and day-care centres | 100 |
| Category 7) Large gyms, excluding indoor swimming pools and ice rinks | 100 |
| Category 8) Hospital | 320 |
| Category 9) Other building, storage building, traffic building, swimming pools and ice rinks, convenience stores of less than 2 000 m2 per unit, mobile building | no limit values |

In buildings of use category 6, where the heated net area does not exceed 1 000 m2, the E-value limit stated in subsection 1 above may be exceeded by 5 kWhE/(m2 a).

For solid wood buildings, the E-value limits stated in subsections 1 and 2 above may be exceeded by 20 % in use category 1a buildings, by 15 % in category 1b–c buildings, and by 10 % in other buildings in use categories 1d–8.

For buildings in use category 1d, the E-value limits stated in subsections 1 and 3 may be exceeded by 5 kWhE/(m2 a) if a building is connected to a heating system where heat is distributed through pipes outside of the building from a joint heat conveyance or heat generating system to three or more buildings.

The E-value for a category 9 building shall be calculated. Design values shall be used in the calculation.

The limit for the E-value is not applied to:

1) dwellings built in the attic of an block of flats;

2) a building expansion pursuant to category 1 or an addition to the floor area;

3) a building expansion pursuant to another category or an addition to the floor area where existing ventilation or heating systems can be used for ventilation or heating;

4) a small house designed as a holiday home.

§ 5

Building components included in different use categories

The E-value limits for the respective part shall apply to building components included in different use categories. If the heated net area of part of a building is less than 10 % of the total heated net area or the heated net area of such part is less than 50 m2, the building may be included in a use category with the greatest surface area.

§ 6

Calculated net purchased energy consumption of buildings

The calculated net purchased energy consumption of the building based on the standard use of the building type includes the energy consumption of heating, ventilation and cooling systems, their accessory units, consumer devices and lighting per energy form, reduced by energy obtained from energy in the environment that is used by equipment that is part of the building, to the extent that it is used to cover the energy consumption in the building based on standard use.

The use of energy obtained from the environment by equipment that is part of the building shall be calculated on a monthly basis or at shorter intervals.

§ 7

Calculation of the E-value

The E-value shall be calculated on the basis of the calculated purchased energy consumption by energy form, using the coefficients for each energy form:

|  |  |
| --- | --- |
| *E =* | *fdistrict heatingQdistrict heating + fdistrict coolingQdistrict cooling + ffuel,iQfuel,i + felectricityWelectricity* |
| *Anet* |

where:

E is the energy efficiency reference value, kWhE/(m2 a);

Qdistrict heating is the district heating consumption per year, kWh/a;

Qdistrict cooling is the district cooling consumption per year, kWh/a;

Qfuel,i is the energy consumption contained in fuel i per year, kWh/a;

Welectricity is the annual electricity consumption, taking into account the energy obtained freely from the environment using building equipment, to the extent that it is used to cover the energy consumption in the building based on standard use, kWh/a;

fdistrict heating is the coefficient for the energy form district heating;

fdistrict cooling is the coefficient for the energy form district cooling;

ffuel,i is the coefficient for the energy form i;

felectricity is the coefficient for the energy form electricity;

Anet is a building’s heated net area in m².

Values laid down in the Land Use and Building Act shall be used as values for energy type factors.

§ 8

Calculation method requirements

Calculations shall be performed using calculation methods that take into consideration at least the following factors:

1. building components and the thermal properties of their joints, building airtightness, ventilation air flow;
2. indoor air temperature;
3. need for hot domestic water;
4. ventilation heat recovery;
5. thermal loads from persons, lighting, electrical devices, domestic hot water and the sun;
6. heat and electric energy need of the space and ventilation heating system;
7. thermal and electric energy need of the domestic water heating system;
8. electric energy need of the ventilation system;
9. electric energy need of consumer devices and lighting.

When a solar collector, solar panel or wastewater heat recovery system is planned for the building:

1. heat generation of a solar collector and its use in the building;
2. electric energy generation of a solar panel and its use in the building;
3. wastewater heat recovery system and its use in the building.

The net purchased energy consumption of buildings, where there is no cooling required or cooling is only required for spaces with a heated net area that is less than 10 % of the building’s total heated net area or the heated net area is less than 50 m2, may be calculated using a monthly calculation method.

If the maintenance of a building’s indoor temperature requires cooling, the calculated net purchased energy consumption shall be calculated using a calculation method which, in addition to the factors mentioned in subsection 1, takes into consideration the thermal and electric energy need of the cooling system; the calculation of the heat conveyance shall take into account the structures’ specific thermal reserve that is dependent on the time, at intervals no greater than an hour (*dynamic calculation*).

§ 9

Weather data

The E-value shall be calculated using the weather data for climate zone I set out in Annex 1.

§ 10

Outdoor air flows and room temperatures

The E-value shall be calculated using the following outdoor air flows and cooling and heating limits for room temperatures:

|  |  |  |  |
| --- | --- | --- | --- |
| Use category | Outdoor air flow | Heating limit | Cooling limit |
|  | dm3/(s m2) | °C | °C |
| Category 1) | 0.4 | 21 | 27 |
| Category 2) | 0.5 | 21 | 27 |
| Category 3) | 2 | 21 | 25 |
| Category 4) | 2 | 18 | 25 |
| Category 5) | 2 | 21 | 25 |
| Category 6) | 3 | 21 | 25 |
| Category 7) | 2 | 18 | 25 |
| Category 8) | 4 | 22 | 25 |

Exhaust air flows shall be calculated using values equivalent to those of outdoor air flows.

For buildings other than those in use categories 1 and 2, the outdoor air flow during periods outside the period of use to be used in the calculation is at least 0.15 dm3/s per square metre.

In ventilation systems of blocks of flats in use category 2, in which residents can control the air flows in their flats so that they can be increased by at least 30 % and reduced by at least 40 % of the air flows of the designed period of use, a value of 0.4 dm3/s per square metre may be used as the buildings’ outdoor air flow.

For buildings equipped with an adaptive ventilation system that is controlled by the building’s automatic system on the basis of presence or environmental measurements, the outdoors air flow value may be 20 % less or, based on the ventilation design, the relative effect of the adaptive ventilation may be defined according to the outdoor air flow value referred to in subsection 1. During an inspection based on the ventilation design, the value for the space ventilation calculation may not be less than 0.35 dm3/s per square metre during the building’s period of use. The calculation of the outdoor air flow for the entire building can be reduced in proportion to the adaptive ventilation effect, taking into account the ratio of the building area equipped with adaptive ventilation to the surface area of the entire building.

§ 11

Standard use of a building

When calculating the E-value, the daily and weekly periods of use, average lighting, devices and degree of use due to the presence of people in the building during the periods of use, as well as the internal thermal loads per heated net area are as follows:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Use category | Hours | Period of use | | Degree of use | Internal thermal loads per heated net area | | |
|  |  | Daily  h/24h | Weekly  d/7d | - | Lighting  W/m2 | Consumer devices  W/m2 | Persons  W/m2 |
| Category 1) | 00:00–24:00 | 24 | 7 | lighting 0.1  other 0.6 | 6 | 3 | 2 |
| Category 2 | 00:00–24:00 | 24 | 7 | lighting 0.1  other 0.6 | 9 | 4 | 3 |
| Category 3) | 07:00-18:00 | 11 | 5 | 0.65 | 10 | 12 | 5 |
| Category 4) | 08:00-21:00 | 13 | 6 | 1 | 19 | 1 | 2 |
| Category 5) | 00:00–24:00 | 24 | 7 | 0.3 | 11 | 4 | 4 |
| Category 6) | 08:00-16:00 | 8 | 5 | 0.6 | 14 | 8 | 14 |
| Category 7) | 08:00-22:00 | 14 | 7 | 0.5 | 10 | 0 | 5 |
| Category 8) | 00:00–24:00 | 24 | 7 | 0.6 | 7 | 9 | 8 |

The annual thermal load Q (kWh/m2) caused by lighting, consumer devices and people shall be calculated using the following equation:



where:

k is the average degree of use of lighting and consumer devices, as well as the presence of people in the building during the period of use;

P is the heat load W/m2;

d is the number of hours of use of the building per 24 hours h;

W is the number of days of use of the building per week d.

The monthly thermal load caused by lighting, consumer devices and people shall be calculated on the basis of the number of days in the month.

In lieu of the thermal load of lighting value in subsection 1 above, a value according to the lighting design may be used, provided that the thermal load can be determined per space type on the basis of lighting power density and lighting control. A building’s thermal load of lighting is calculated as a weighted average of space type-specific surface areas.

The operating time of a ventilation system shall be calculated by adding an hour each to the beginning and end of the operating times referred to in subsection 1. This addition is not made for buildings in continuous use.

§ 12

Standard use of domestic hot water

The net heating energy need for the standard use of domestic hot water is calculated using the following use class-specific net heating energy needs per heated net area:

|  |  |
| --- | --- |
| Use category | Net energy need for heating domestic hot water per year  kWh/(m2 a) |
|  |
| Category 1) | 35 |
| Category 2) | 35 |
| Category 3) | 6 |
| Category 4) | 4 |
| Category 5) | 40 |
| Category 6) | 11 |
| Category 7) | 20 |
| Category 8) | 30 |

In category 1, the net heating energy need of domestic hot water does not exceed 4 200 kWh/year per flat.

Values that are 15 % lower than the ones above may be used when calculating the net heating energy need of domestic hot water if the building domestic water system is equipped with a standard pressure valve or other pressure control technology.

§ 13

Calculation zones

When calculating the E-value for a building in one use category, the entire building can be considered as one calculation zone. When calculating the E-value for a building with several use categories, the building must be divided into different calculation zones according to purpose and periods of use.

§ 14

Special spaces and certain technical systems

Restaurants, catering establishments, cafés, laboratories and other specialised spaces are not included in the calculations, and the E-value calculation is performed with the initial data corresponding to the use of the building or part thereof.

Other technical systems not listed in this calculation method are not taken into account in the E-value calculation.

§ 15

Net requirement of heating energy

The net heating energy need of spaces shall be calculated using conduction losses, leakage air thermal losses, heating of extract and supply air to room temperature, minus the effect of sun radiation and internal thermal loads. Sun shading solutions in the building shall be taken into account when calculating the sun energy entering the building.

The net heating energy need for ventilation shall be calculated from heating air after heat recovery to the temperature of the supply air and possibly from heating prior to heat recovery.

The net energy need for heating domestic hot water shall be calculated according to § 12.

§ 16

Taking thermal loss into account during the E-value calculation

When calculating the E-value, the thermal loss of the building envelope must be calculated using the envelope’s inner dimensions. The cold bridges of structures and their joints shall be taken into account in the calculation. Individual cold bridges of the building envelope shall not be taken into account in the calculation.

The effect of ground and crawl spaces shall be taken into account during the thermal loss calculation.

§ 17

Consideration of leakage air exchange in the E-value calculation

The building envelope’s design air leakage value shall be used to calculate the E-value, if airtightness is demonstrated by means of an industrial quality assurance method or by measurements. Otherwise, the building envelope’s design air leakage value is 4 m3/(h m2). Leakage air exchange qv,air leakage is calculated according to the following equation:

|  |  |  |
| --- | --- | --- |
| *qv,air leakage =* | *q50* | *Aenvelope* |
| *3600· x* |

where:

qv,air leakage is the air leakage exchange, m³/s;

q50 is the air leakage value of the building envelope, m3/(h·m2);

Aenvelope is the surface area of the building envelope, m2;

x is a coefficient, which is 35 for buildings with one floor, 24 for buildings with two floors, 20 for buildings with three and four floors, and 15 for buildings with more floors;

3 600 is the coefficient to convert air flow from a m3/h unit to a m3/s unit.

§ 18

Energy use of the heating system

The energy consumption of a building’s heating system includes the energy used for heating spaces, heating the ventilation and producing domestic hot water.

Calculation of the heating system's energy consumption takes into account the heat distribution losses inside and outside of the building, heat transfer losses, heating energy production losses and conversions, losses in the transfer and circulation of domestic hot water inside and outside of the building, storage losses as well as the electricity consumption of auxiliary devices.

If a building is connected to a heating system where heat is routed through pipes outside of the building from a joint heat conveyance or heat generating system to several buildings, the thermal loss of the respective heat pipes shall be divided between buildings according to the surface area ratio.

If a category 2 building has water circulation heating in the living rooms and electric floor heating in the wet rooms, the net heating energy need proportion can be assumed to be 35 % for heating wet spaces and 65 % for the living space heating system, unless the net electric energy need of the wet rooms is calculated by a more accurate dynamic calculation tool, taking into account the design air flows and transfer air flows between spaces. For wet rooms, 22 °C shall be used as the inside temperature. The proportion of electric floor heating in wet rooms as a share of heating energy of the living areas shall not exceed the installation power of electric floor heating calculated on the basis of the design plan and 8 760 hours of use.

If the circulation duct of domestic hot water is located outside of the building envelope insulation, the calculated thermal loss from domestic hot water does not create a thermal load in the building spaces. If the circulation duct of domestic hot water is located inside the building envelope insulation, 25 % of the calculated thermal loss of the domestic hot water circulation shall be added to the thermal load. If the circulation duct of domestic hot water is located inside the building envelope, 50 % of the calculated thermal loss of the domestic hot water circulation shall be added to the thermal load. If the domestic hot water tank is located inside the building envelope, 50 % of the calculated thermal loss of the domestic hot water circulation shall be added to the thermal load.

Additional heating energy resulting from potential temperature restrictions and partial effect dimensioning of the heating system shall be included in the heating system’s energy consumption.

§ 19

Fireplaces and air source heat pumps

If there is a heat-retaining fireplace, a maximum of 3 000 kWh per year can be calculated as the heating energy produced by the heat-retaining fire place.

If there is an air-air source heat pump, a maximum of 3 000 kWh per year can be calculated as the heating energy produced by the device, unless the device’s operation in the building is calculated by a more accurate dynamic calculation tool, taking into account the air flows between spaces and temperature differences.

§ 20

Ventilation system

The air flows and operating times of ventilation systems shall be calculated according to §§ 10 and 11. The electric energy consumption of the ventilation system is calculated using the air flows, the specific efficiency ratio and the operational times of all the ventilation devices and extractors in the building.

§ 21

Cooling system

Calculating the energy use of the cooling system shall take into account the energy consumption of the cooling energy generation and the electricity consumption of auxiliary devices to the extent that indoor temperature maintenance requires such systems.

§ 22

Electricity use of lighting and devices

The annual electricity use of the lighting and devices is calculated as shown in § 11 on the basis of their thermal loads. The electricity use of the lighting and devices is equal to their thermal load.

Chapter 3

Thermal loss of a building

§ 23

Determining the thermal loss of a building

The thermal loss of a building is the sum of the thermal loss of the envelope, leakage air and the ventilation. The maximum thermal loss of a building cannot exceed the reference thermal loss specified for a building using reference values. Conformity with thermal loss requirements is shown with a calculation that is made separately for warm and semi-warm spaces.

For a building expansion or addition to the floor area where existing ventilation or heating systems can be used for ventilation or heating, the thermal loss requirements only apply to the envelope. For small houses intended as holiday homes to be occupied for at least four months a year, the thermal loss requirements only apply to the envelope. The thermal loss requirement does not apply to mobile buildings made from prefabricated components prior to 1 July 2012 and which are still used for the same purpose.

§ 24

Thermal loss of a building envelope

The thermal loss of a building envelope shall be calculated on the basis of the surface areas and thermal transmittance coefficients of various building components, using the following equation:

*∑Hcond = ∑(Uouter wallAouter wall) + ∑(UceilingAceiling) + ∑(UfloorAfloor) + ∑(UwindowAwindow) + ∑(UdoorAdoor)*

where:

∑Hcond is the thermal loss of a building envelope, W/K;

Uis the coefficient of thermal transmittance of a building part, W/(m²K);

Ais the surface area of a part of a building, m².

The reference value of a building envelope’s thermal loss of a warm or climate-controlled cool space shall be calculated using the following reference values as the thermal transmittance coefficients for building components:

|  |  |
| --- | --- |
| a) wall | 0.17 W/(m2 K); |
| b) solid wood wall with a mean thickness of at least 180 mm | 0.40 W/(m2 K); |
| c) ceiling and floor butting against outdoor air | 0.09 W/(m2 K); |
| d) floor butting against crawl space | 0.17 W/(m2 K); |
| e) building component butting against the ground | 0.16 W/(m2 K); |
| f) window, roof window, door, skylight, smoke exhaust and exit door | 1.0 W/(m2 K). |

The reference value of a building envelope’s thermal loss of a mobile building or a semi-warm space shall be calculated using the following reference values as the thermal transmittance coefficients for building components:

|  |  |
| --- | --- |
| a) wall | 0.26 W/(m2 K); |
| b) solid wood wall with a structural mean thickness of at least 180 mm | 0.60 W/(m2 K); |
| c) ceiling and floor butting against outdoor air | 0.14 W/(m2 K); |
| d) floor butting against crawl space | 0.26 W/(m2 K); |
| e) building component butting against the ground | 0.24 W/(m2 K); |
| f) window, roof window, door, skylight, smoke exhaust and exit door | 1,4 W/(m2 K). |

For small houses intended as holiday homes to be occupied for at least four months a year, the reference value of a building envelope’s thermal loss shall be calculated using the following reference values as the thermal transmittance coefficients for building components:

|  |  |
| --- | --- |
| a) wall | 0.24 W/(m2 K); |
| b) solid wood wall with a structural mean thickness of at least 130 mm | 0.80 W/(m2 K); |
| c) ceiling and floor butting against outdoor air | 0.15 W/(m2 K); |
| d) floor butting against crawl space | 0.19 W/(m2 K); |
| e) building component butting against the ground | 0.24 W/(m2 K); |
| f) window, roof window, door, skylight, smoke exhaust and exit door | 1,4 W/(m2 K). |

The reference value of the total window area in the building is 15 % of the floor area of the floors that are wholly or partly on the ground, but may not exceed 50 % of the total area of outside walls. The window area shall be calculated in accordance with the external frame dimensions.

The dimensional and geometry data of the design building shall be used in the calculation. The areas of the different building components of the building envelope shall be determined according to the overall internal dimensions of the building.

When calculating the thermal loss of the design solution of the building, the designed building component-specific thermal transmittance coefficients and window areas shall be used.

§ 25

Calculation of a building’s thermal loss due to air leakage

The thermal loss due to air leakage shall be calculated using the following equation:

*Hair leakage = ρicpiqv, air leakage*

where:

Hair leakage is the thermal loss due to air leakage, W/K;

ρi is air density, 1.2 kg/m³;

cpi is the specific heat capacity of air, 1000 Ws/(kg K);

qv,air leakage is the air leakage exchange, m³/s.

Air leakage exchange qv,air leakage shall be determined according to § 17. When calculating the reference thermal loss of a building, the value to be used as the reference value for the envelope air leakage is 2.0 m3/(h m2).

When calculating the design solution thermal loss of a building, the design value shall be used to calculate the envelope air leakage value. If the airtightness design value cannot be demonstrated by measuring or industrial construction quality control methods, the value to be used for building envelope leakage air is 4.0 m3/(h m2).

§ 26

Calculation of a building’s ventilation thermal loss

A building’s ventilation thermal loss is calculated using the following equation:

*Hiv = ρicpiqv,extract td tv (1 – ηa)*

where:

Hiv is the specific thermal loss of the ventilation, W/K;

ρi is air density, 1.2 kg/m³;

cpi is the specific heat capacity of air, 1000 Ws/(kg K);

qv, extract is the calculated extract air flow for standardised use, m³/s;

td is the mean operating time ratio per 24h of the ventilation system, h/24h;

tv is the weekly operating time ratio of the ventilation system, day/7 days;

ηa is the annual efficiency ratio of the heat recovery of the extract air.

When calculating the reference value of the thermal loss of ventilation and the thermal loss of the design solution, the same air flow values and operating times shall be used.

The ventilation air flow shall be calculated in accordance with § 10. Adaptive ventilation is not included in the calculation of thermal loss of ventilation and the thermal loss of the design solution. The operating time of a ventilation system shall be calculated by adding an hour each to the beginning and end of the operating times referred to in § 11. This addition is not made for buildings in continuous use. For buildings in use category 9, the building design values are the air flows and ventilation operating times.

When calculating the reference thermal loss, a value of 55 % is used as the annual efficiency ratio of the heat recovery of the ventilation extract air. When calculating the reference thermal loss of an individual space, the annual efficiency ratio is 0 %, e.g. when the exceptional uncleanness of the extract air prevents heat recovery or if the temperature of the space during the heating season is below +10 °C and the heat of the extract air cannot be recovered in a cost-effective manner, or if the system operates on the basis of differences in pressure caused by differences in height and temperature, and by wind.

If mechanical ventilation is used, the annual efficiency ratio of heat recovery of the extract air shall be determined using the properties of the heat recovery devices and the designed air flows of the ventilation machine as well as the weather data for climate zone I set out in Annex 1.

The annual efficiency ratio of heat recovery of the extract air of two or more ventilation machines shall be determined as an annual efficiency ratio of weighted design air flows and operating times. The thermal loss of a building’s design ventilation solution shall be calculated using the specified annual efficiency ratio of the extract air of the heat recovery and air flow values and operating times set out in subsection 3.

Chapter 4

Special provisions

§ 27

Airtightness of the building

The air leakage value of the building envelope (q50) must not exceed 4.0 m3/(h m2). The air leakage value may exceed 4.0 m3/(h m2) if the structural solutions of the building’s purpose of use so require.

§ 28

Frost insulation, base wall heat insulation and insulation of certain spaces

The thermal insulation of the base floor must be designed together with the frost insulation and the thermal insulation of a possible base wall that does not form part of the building envelope, and be installed so as to avoid frost damage.

The thermal transmittance coefficient of the wall and intermediate floor between the cold space and the other spaces to be cooled may not exceed 0.27 W/(m2 K) and that of the door 1.4 W/(m2 K).

The thermal transmittance coefficient of the wall and intermediate floor between the warm space and the semi-warm spaces may not exceed 0.60 W/(m2 K) and that of the door and window 2.8 W/(m2 K), with the exception of small houses intended as holiday homes.

§ 29

Calculated summer season room temperature

The calculated summer season room temperature must not exceed the cooling limit of 27 °C in use category 2, and 25 °C in use categories 3–8 for more than 150 degree hours between 1 June and 31 August, using air flow according to the design solution. Compliance with the indoor temperature in the summer shall be demonstrated using a temperature calculation for different space types. With the exception of air flow, source data shall be used when calculating the E-value. The requirement regarding the summer season room temperature does not apply to buildings in use categories 1 and 9. A dynamic calculation tool shall be used when calculating the summer season room temperature.

§ 30

Specific power of a building’s mechanical ventilation system

In a building with a mechanical ventilation system, the specific power of a mechanical supply and extract air system must not exceed 1.8 kW/(m3/s) and the specific power of a mechanical extract air system must not exceed 0.9 kW/(m3/s).

The specific power of a ventilation system may exceed the aforementioned values if the indoor air pursuant to the building’s purpose of use so requires.

§ 31

Measuring energy consumption in a building

A building shall have the facilities to measure the energy consumption so that the building’s energy consumption can be monitored with regard to the most important consumption points and building size; such a monitoring option must be easy to implement.

§ 32

Need for heat and electricity in a building

The power of the building’s heating system shall be designed to maintain the planned temperature conditions for the building spaces according to the local climate zones as designed according to the outdoor temperatures stated in Annex 1.

The plans shall take into account possibilities to reduce the peak power needs for electricity and improve electric power management.

§ 33

Structural energy efficiency

By way of derogation from § 4, compliance requirements regarding a building’s energy efficiency set out in § 4 may be demonstrated using structural energy efficiency.

A building in use categories 1 and 2 meets the energy efficiency requirements if:

1) The maximum thermal loss of a building does not exceed the reference thermal loss specified for a building if calculated using the energy efficiency reference values stated in §§ 24, 25 and 26. The reference values for the thermal transmittance coefficient, air leakage value and annual ratio of heat recovery of the extract air are:

|  |  |
| --- | --- |
| a) wall, use category 1 | 0.12 W/(m2 K); |
| b) wall, use category 2 | 0.14 W/(m2 K); |
| c) ceiling and floor butting against outdoor air | 0.07 W/(m2 K); |
| d) ventilated floor butting against a crawl space and building component butting against the ground | 0.10 W/(m2 K); |
| e) window, roof window, door, skylight, smoke exhaust and exit door | 0.70 W/(m2 K); |
| f) building air leakage value (q50) | 0.60 m3/(h m2); |
| g) annual ratio of heat recovery of the extract air | 65 per cent; |

2) The building is equipped with a mechanical supply and extract air exchange system with a specific electric power not exceeding 1.5 kW/(m3/s);

3) The building’s heating system is district heating, a geothermal pump or air-water source heat pump.

§ 34

Energy declaration

An energy declaration shall be drawn up when planning a building. The energy declaration generally includes the following inspections:

1. the E-value according to § 4 and central source data and results of the E-value calculation, compliance with thermal loss regulations in accordance with § 23 and specific power of a mechanical ventilation system in accordance with § 30; or
2. compliance with structural energy efficiency rules under § 33.

The energy declaration also includes the following inspections:

1. calculated summer season temperature as per § 29;
2. energy certificate of the building, where required by law.

The energy declaration must be dated prior to commissioning of the building if design plans that were based on the energy declaration were modified during the permit phase. During the construction phase, the person responsible shall record in the construction inspection log that the construction work corresponds to the one presented in the energy declaration.

Chapter 5

Entry into force and transitional provisions

§ 35

Entry into force

This decree shall enter into force on 1 January 2018.

This decree repeals Ministry of the Environment Decree 2/11 on the energy efficiency of buildings.

The provisions in effect at the time of the entry into force of this Decree shall be applied to any pending projects.

Helsinki, 20 December 2017

Minister for the Environment, Energy and Housing Kimmo Tiilikainen

Counsellor for Construction Pekka Kalliomäki

Annex 1

Weather data to be used when calculating the E-value and heating power

Weather data to be used when calculating the E-value and heating power. Hourly weather data is available from the Ministry of the Environment’s website.

The heating power need is calculated using the outdoor temperature of the climate zone corresponding to the building's geographical location (Figure L1.1 and Table L1.1). .

|  |  |
| --- | --- |
| kuva_UUDET_RAJAT_keskilampokartalla_B&W | East  (E)  North-west  (NW)  South-west  (SW)  South-east  (SE)  North-east  (NE)  West  (W)  South  (S)  North  (N) |

Figure L1.1. Climate zones and compass point abbreviations.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| *Table L1.1.* | *Design outdoor air temperatures in the different climate zones.* | | | | | | | | | |
| Climate zone | Design outdoor air temperature, °C | | | | | | | | | |
| I | -26  -29  -32  -38 | | | | | | | | | |
| II |
| III |
| IV |
|  |  | | | |  | | | | | |
| *Table L1.2.* | *Monthly weather data for climate zone I Helsinki-Vantaa.* | | | | | | | | | |
| Month | Average outdoor temperature, Tu , °C | | | Total solar radiation energy to the horizontal plane,  Gradiation, horizontal surface, kWh/m² | | | |  | | |
| January | -3.97 | | | 6.2 | | | |  | | |
| February | -4.50 | | | 22.4 | | | |  | | |
| March | -2.58 | | | 64.3 | | | |  | | |
| April | 4.50 | | | 119.9 | | | |  | | |
| May | 10.76 | | | 165.5 | | | |  | | |
| June | 14.23 | | | 168.6 | | | |  | | |
| July | 17.30 | | | 180.9 | | | |  | | |
| August | 16.05 | | | 126.7 | | | |  | | |
| September | 10.53 | | | 82.0 | | | |  | | |
| October | 6.20 | | | 26.2 | | | |  | | |
| November | 0.50 | | | 8.1 | | | |  | | |
| December | -2.19 | | | 4.4 | | | |  | | |
| Entire year | 5.57 | | | 975 | | | |  | | |
|  |  | | | | | | | | | |
|  | Total solar radiation energy to vertical surfaces to different compass points,  Gradiation, vertical surface, kWh/m² | | | | | | | | | |
| Month | N | NE | E | | SE | S | SW | | W | NW |
| January | 6.2 | 4.7 | 3.8 | | 9.5 | 12.9 | 9.5 | | 3.8 | 4.7 |
| February | 17.3 | 13.8 | 15.6 | | 31.0 | 41.4 | 30.9 | | 15.6 | 14.0 |
| March | 40.3 | 38.1 | 48.5 | | 75.1 | 89.5 | 69.4 | | 43.7 | 36.9 |
| April | 43.9 | 56.3 | 79.9 | | 101.1 | 107.3 | 101.6 | | 80.6 | 56.8 |
| May | 57.8 | 82.1 | 112.8 | | 123.3 | 116.0 | 117.5 | | 104.5 | 76.3 |
| June | 70.6 | 87.9 | 109.6 | | 109.9 | 101.6 | 110.9 | | 111.2 | 89.1 |
| July | 66.3 | 91.1 | 118.8 | | 123.1 | 115.5 | 128.6 | | 122.7 | 91.2 |
| August | 50.0 | 66.4 | 91.8 | | 106.0 | 100.4 | 92.8 | | 78.8 | 61.1 |
| September | 32.9 | 37.5 | 56.5 | | 83.9 | 100.5 | 87.3 | | 59.3 | 38.1 |
| October | 17.9 | 15.6 | 17.5 | | 28.3 | 37.0 | 30.0 | | 18.8 | 15.7 |
| November | 7.2 | 5.5 | 5.1 | | 12.3 | 16.8 | 12.3 | | 5.1 | 5.6 |
| December | 4.2 | 3.2 | 2.6 | | 8.4 | 11.8 | 8.8 | | 2.9 | 3.2 |
| Entire year | 414.6 | 502.2 | 662.5 | | 811.9 | 850.7 | 799.6 | | 647.0 | 492.7 |
|  | Conversion factor Fdirection, by which total solar radiation energy to the horizontal plane is converted to total solar radiation energy to the vertical surface at different points of the compass | | | | | | | | | |
| Month | N | NE | E | | SE | S | SW | | W | NW |
| January | 0.995 | 0.757 | 0.609 | | 1.531 | 2.080 | 1.519 | | 0.605 | 0.759 |
| February | 0.774 | 0.618 | 0.700 | | 1.387 | 1.854 | 1.381 | | 0.700 | 0.624 |
| March | 0.627 | 0.592 | 0.754 | | 1.169 | 1.392 | 1.079 | | 0.679 | 0.574 |
| April | 0.366 | 0.470 | 0.666 | | 0.843 | 0.895 | 0.847 | | 0.672 | 0.474 |
| May | 0.349 | 0.496 | 0.681 | | 0.745 | 0.701 | 0.710 | | 0.632 | 0.461 |
| June | 0.419 | 0.521 | 0.650 | | 0.652 | 0.602 | 0.658 | | 0.659 | 0.528 |
| July | 0.367 | 0.503 | 0.657 | | 0.681 | 0.639 | 0.711 | | 0.679 | 0.504 |
| August | 0.395 | 0.524 | 0.725 | | 0.837 | 0.793 | 0.732 | | 0.622 | 0.482 |
| September | 0.401 | 0.457 | 0.689 | | 1.023 | 1.225 | 1.064 | | 0.723 | 0.465 |
| October | 0.683 | 0.595 | 0.670 | | 1.081 | 1.412 | 1.144 | | 0.718 | 0.598 |
| November | 0.888 | 0.683 | 0.632 | | 1.519 | 2.068 | 1.519 | | 0.633 | 0.686 |
| December | 0.920 | 0.697 | 0.571 | | 1.850 | 2.615 | 1.942 | | 0.637 | 0.697 |
| Entire year | 0.425 | 0.515 | 0.679 | | 0.833 | 0.872 | 0.820 | | 0.663 | 0.505 |