Unofficial translation.

Legally binding only in Finnish and Swedish

Decree of the Ministry of the Environment

on the Energy Performance of New Buildings

By decision of the Ministry of the Environment, the following is enacted by virtue of section 117g, subsection 4; section 131, subsection 2 and section 150f, subsection 4 of the Land Use and Building Act (132/1999), as amended by section 117g, subsection 4 of Act 1151/2016; section 131, subsection 2 of Act 41/2014; and section 150f, subsection 4 of Act 41/2014:

Chapter 1

General

Section 1

Scope of application

This Decree applies to the design and construction of new buildings consisting of a roofed construction having walls, for which energy is used to condition the indoor climate. The Decree also applies to extensions of buildings and increases of gross floor area. The Decree applies to extensions of buildings the gross floor area of which is less than 50 m^2 only where the building, including the extension, exceeds 50 m^2.

Section 2

Definitions

For the purposes of this Decree:

1) *amount of heat required for ventilation heating* means the amount of heat that is required to heat ventilation air flow from outdoor temperature to room temperature;

2) *net heating energy demand for ventilation* means the demand for heating energy consisting of the heating of air after heat recovery to supply air temperature and any heating of air before heat recovery;

3) *annual efficiency of ventilation extract air heat recovery* means the ratio of the amount of heat recovered and utilised with heat recovery equipment to the amount of heat required for ventilation heating in a year when there is no heat recovery;

4) *specific fan power of ventilation system* (kW/(m3/s)) means the total combined amount of electrical power taken from the power supply by all of the fans and any connected frequency converters and other power control equipment in a building's entire ventilation system, divided by the exhaust air flow rate or outdoor air flow rate of the design operating time of the ventilation system, whichever of these is greater;

5) *electrical energy consumption* of ventilation system means the electricity consumption of fans and any auxiliary units;

6) *air leakage rate* q50 (m3/(h m2)) means the average hourly rate of leakage air flow of the building envelope at a pressure differential of 50 Pa per building envelope surface area calculated on the basis of the building's total internal dimensions;

7) *cooled cold space* means a space where a temperature below +17 °C in accordance with the intended use is maintained around the year with a cooling system and a possible heating system;

8) *cooling system energy consumption* means the energy consumption for cooling energy production and the electricity consumption of auxiliary units;

9) *district heat* means heat supplied to customer properties via a distribution network;

Directive 2015/1535/EU of the European Parliament and of the Council (32015L1535); OJ L 241, 17.9.2015, p. 1
Directive 2012/27/EU of the European Parliament and of the Council (32012L0027); OJ L 315, 14.11.2012, p. 1
Directive 2010/31/EU of the European Parliament and of the Council (32010L0031); OJ L 153, 18.6.2010, p. 13
Directive 2009/28/EU of the European Parliament and of the Council (32009L0028); OJ L 140, 5.6.2009, p. 16

10) thermal bridge means a deterioration in the thermal transmittance coefficient of a small part of a building element for solidity or connection reasons;

11) *net heated area* Anet (m2) means the sum total of the heated floor plate areas calculated on the basis of the internal surfaces of the exterior walls at the perimeter of the floor plates;

12) *unheated space* means a space that is not intended for continuous occupancy during the heating season and that is not designed to be heated;

13) *net heating energy demand* means the total combined net demand for heating energy for a building's spaces, ventilation and domestic hot water;

14) *heating system's energy consumption* means the energy consumption for the heating of spaces, ventilation and domestic hot water;

15) *thermal transmittance coefficient* means the density of heat flow that in the steady state penetrates a building element when the difference in temperature between the air spaces on the different sides of the building element is one unit of temperature, and the symbol of which is U and the unit of which is W/(m2K);

16) *warm space* means of space in a building the room temperature of which is +17 °C or higher;

17) *net heating energy demand for domestic hot water* means the demand for heating energy consumed for the heating of domestic hot water from the temperature of cold water to the temperature of hot water;

18) *mass timber building* means a building the main construction material of the exterior walls of which is a mass timber structure with a mean structural thickness of at least 180 mm;

19) *semi-warm space* means a space not intended for continuous occupancy while merely wearing normal indoor clothing and the temperature of which during the heating season is on average at least +5 °C but below +17 °C;

20) *building's calculated consumption of delivered energy* means energy consumption based on the building's standardised use that is calculated as being acquired for the building from an electricity distribution network, district heating network, district cooling network or as energy contained by a renewable or fossil fuel;

21) *building envelope* means the building elements that separate a warm, semi-warm, particularly warm or cooled cold space from the outdoor air, the ground or an unheated space;

22) b*uilding's reference heat loss* means the calculated heat loss of a building's envelope, leakage air and ventilation calculated using reference values;

23) *portable building* means a movable building intended for temporary use;

24) *design solution* means a design plan for a building intended to be implemented;

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

26) *demand-controlled ventilation* means a system where air flows can be controlled in accordance with load or air quality according to occupancy situation;

27) *energy sourced from environmental energy* means heat or electrical energy generated from sunlight, wind, ground, air or water on-site or near a building using equipment belonging to the building.

Section 3

Minimum requirements for building energy performance

A principal designer, special designer and building designer shall, in accordance with their respective duties, see to the design of a new building so that it, in accordance with its intended use:

1) is in compliance as regards its energy performance with either the calculated energy performance reference value (*E-value*) or structural energy efficiency;

2) creates conditions for energy demand with low energy loss;

3) is energy efficient as regards its calculated room temperature in the summer, its energy consumption measurement, its heat and electrical energy demand and, where using a mechanical ventilation system, also as regards the specific fan power of its ventilation system.

Chapter 2

Energy performance

Section 4

Requirement levels for the calculated energy performance reference value for each intended use category

The calculated energy performance reference value (*E-value*), the unit of which is $kWh_E/(m^2\ a)$, is a building's calculated annual consumption of delivered energy weighted by energy carrier factors per the building's net heated area. The E-value calculated in accordance with the building's intended use category shall not exceed the following limits:

Intended use category	Limit for E-value $kWh_E/(m^2\ a)$
Category 1) Small residential buildings: a) Detached houses and link-detached houses with a net heated area (A_{net}) of 50–150 m^2 b) Detached houses and link-detached houses with a net heated area (A_{net}) exceeding 150 m^2 but not exceeding 600 m^2 c) Detached houses and link-detached houses with a net heated area (A_{net}) exceeding 600 m^2 d) Terraced houses and blocks of flats with residential storeys on a maximum of two storeys	 200–0.6 A_{net} 116-0.04 A_{net} 92 105
Category 2) Blocks of flats with residential storeys on at least three storeys	90
Category 3) Office buildings, health centres	100
Category 4) Commercial buildings, department stores, shopping centres; wholesale and retail trade buildings, excluding grocery trade units under 2,000 m^2; shopping halls, theatres, opera, concert and congress halls, cinemas, libraries, archives, museums, art galleries, exhibition halls	135
Category 5) Accommodation establishment buildings, hotels, boarding houses, assisted living accommodation, retirement homes, residential care institutions	160
Category 6) Education and training buildings and daycare centres	100
Category 7) Buildings for sports and physical exercise, excluding indoor swimming pools and indoor ice rinks	100
Category 8) Hospitals	320
Category 9) Other buildings, warehouses, transport and communications buildings, indoor swimming pools, indoor ice rinks, grocery trade units under 2,000 m^2, portable buildings	no limit

In buildings of intended use category 6 the net heated area of which is a maximum of 1,000 m^2, the limit for the E-value provided above in subsection 1 may be exceeded by 5 $kWh_E/(m^2\ a)$.

In mass timber buildings, the limits for the E-value provided above in subsections 1 and 2 may be exceeded in buildings of intended use category 1a by 20%, in buildings of intended use categories 1b–c by 15% and in other buildings of intended use categories 1d–8 by 10%.

In buildings of intended use category 1d, the limit for the E-value provided in subsections 1 and 3 may be exceeded by 5 $kWh_E/(m^2\ a)$ when the building is connected to a heating system where heat is conveyed via heat pipes external to the building from a shared heat exchanger or heat generation unit to three or more buildings.

The E-value for buildings of intended use category 9 shall be calculated. Design values shall be used in the calculations.

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

1) the construction of a dwelling in the attic of a block of flats;

2) an extension or increase of gross floor area of a building falling under intended use category 1;
3) an extension or increase of gross floor area of a building falling under another intended use category where the existing ventilation or heating system can be used for the provision of ventilation or heating;
4) a detached or semi-detached house designed for use as a holiday dwelling.

Section 5

Building units falling under different intended use categories

The limits for the E-value in accordance with each unit shall be applied to building units falling under different intended use categories. If the net heated area of a building unit is less than 10% of the entire building's net heated area or the net heated area of a building unit is less than 50 m^2, the building unit may be classified as falling under the intended use category that is the largest in terms of its area.

Section 6

Calculated consumption of delivered energy of buildings

A building's calculated consumption of delivered energy based on standardised use consists of the energy consumption of the heating, ventilation and cooling systems as well as system auxiliary units, consumer equipment and lighting itemised by energy carrier, less any energy sourced from environmental energy using equipment belonging to the building to the extent where this has been used in the building to cover energy consumption based on standardised use taking place in the building.
The utilisation of energy sourced from environmental energy using equipment belonging to the building shall be calculated on a monthly basis or for shorter periods of time.

Section 7

Calculation of the E-value

The E-value shall be calculated on the basis of the building's calculated consumption of delivered energy itemised by energy carrier using the energy carrier factors with the following formula:

$$E = \frac{f_{kaukolämpö} Q_{kaukolämpö} + f_{kaukojäähdytys} Q_{kaukojäähdytys} + \sum_i f_{polttoaine,i} Q_{polttoaine,i} + f_{sähkö} W_{sähkö}}{A_{netto}}$$

where:
E is the energy performance reference value, $kWh_E/(m^2\ a)$;
$Q_{kaukolämpö}$ is the annual consumption of district heat, kWh/a;
$Q_{kaukojäähdytys}$ is the annual consumption of district cooling, kWh/a;
$Q_{polttoaina,i}$ is the annual consumption of energy contained in fuel i, kWh/a;
$W_{sähkö}$ is the annual consumption of electricity, taking into account any reductions of energy sourced from freely utilisable environmental energy using equipment belonging to the building to the extent where this has been used in the building to cover energy consumption based on standardised use taking place in the building, kWh/a;
$f_{kaukolämpö}$ is the energy carrier factor for district heat;
$f_{kaukojäähdytys}$ is the energy carrier factor for district cooling;
$f_{fuel,i}$ is the energy carrier factor for fuel i;
$f_{electricity}$ is the energy carrier factor for electricity;
A_{netto} is the net heated area of the building, m^2.
The figures to be used as the energy carrier factors are the figures provided under the Land Use and Building Act.

Section 8

Calculation method requirements

Calculations shall take place using a calculation method taking at least the following factors into account:

a) the thermal characteristics of building elements and their connections, the building's airtightness, ventilation air flow;

b) indoor air temperature;

c) the demand for domestic hot water;

d) ventilation heat recovery;

e) the thermal loads from humans, lighting, electrical appliances, domestic hot water and sunlight;

f) the heat and electrical energy demand of the space and ventilation heating system;

g) the heat and electrical energy demand of the domestic hot water preparation system;

h) the electrical energy demand of the ventilation system;

i) the electrical energy demand of consumer equipment and lighting.

And where the building is designed have a solar collector, solar panel or drainwater heat recovery:

j) the heat output of the solar collector and its utilisation in the building;

k) the electricity output of the solar panel and its utilisation in the building;

l) drainwater heat recovery and its utilisation in the building.

The building's calculated consumption of delivered energy may be calculated using the monthly calculation method for buildings the indoor air temperature control of which does not require cooling or where cooling is only required for spaces the net heated area of which is less than 10% of the building's net heated area or the net heated area of which is less than 50 m^2.

If the building's indoor air temperature control requires cooling, the building's calculated consumption of delivered energy shall be calculated using a calculation method that, in addition to the factors specified in subsection 1, also takes into account the cooling system's heat and electrical energy demand and the heat transfer calculations of which take into account the time-dependent heat storage capacity of structures at time steps of one hour at the maximum (*dynamic calculation method).*

Section 9

Weather data

The E-value shall be calculated in accordance with the weather data for climatic zone I of Annex 1.

Section 10

Outdoor air flows and room temperatures

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

Intended use category	Outdoor air flow $dm^3/(s\ m^2)$	Heating limit °C	Cooling limit °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

Extract air flows shall be calculated using values corresponding to outdoor air flows.

The outdoor air flow used in the calculations for buildings other than those in intended use categories 1 and 2 outside the occupancy period shall be at least 0.15 dm^3/s per m^2.

For buildings of intended use category 2 where residents have the opportunity to control supply and extract air flows in a manner whereby these can dwelling unit-specifically be increased by at least 30% and decreased by at least 40% from the air flow rates of the design occupancy period, the outdoor air flow rate used for the building may be 0.4 dm^3/s per m^2.

For a space of a building equipped with demand-controlled ventilation controlled with a building automation system based on presence detection or condition measurement, an outdoor air flow value that is 20% lower may be used or, on the basis of the ventilation design plan, the relative impact of demand-controlled ventilation on the outdoor air flow value presented in subsection 1 may be determined. In examinations based on a ventilation design plan, the ventilation of the space may, however, be reduced in the calculations no further than to 0.35 dm^3/s per m^2 during the building's occupancy period. The entire building's outdoor air flow value may be reduced in the calculations by a proportion corresponding to the impact of demand-controlled ventilation, taking into account the ratio of the building unit covered by demand-controlled ventilation to the entire building's area.

Section 11

Standardised use of buildings

The daily and weekly occupancy period of a building, the average usage rate of lighting and consumer equipment and the average human occupancy rate during the building's occupancy period as well as the internal thermal loads per net heated area to be used in the calculation of the E-value are as follows:

Intended use category	Time	Occupancy period		Usage/Occupancy rate	Internal thermal load per net heated area		
		Daily h/24h	Weekly d/7d	-	Lighting W/m^2	Consumer equipment W/m^2	Humans W/m^2
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 from lighting, consumer equipment and human occupancy Q (kWh/m2) shall be calculated using the formula:

$$Q = kP \frac{\tau_d}{24} \frac{\tau_w}{7} \frac{8760}{1000}$$

where:

k is the average usage rate of lighting and consumer equipment and the average human occupancy rate during the building's period of occupancy;

P is the thermal load W/m^2;

τ_d is the number of hours of building occupancy per day h;

τ_w is the number of days of building occupancy per week d.

The monthly thermal load from lighting, consumer equipment and humans shall be determined on the basis of the annual thermal load on the basis of the number of days in the month.

Instead of the provisions laid down above in subsection 1, the value used for the thermal load from lighting may be a value in accordance with the lighting design plan if the thermal load can be determined from the lighting design plan specifically for each space type on the basis of lighting power density and lighting control. The building's average thermal load from lighting is calculated as an average weighted by the areas of the space types.

The operating time of the ventilation system shall be calculated by adding to the occupancy period in accordance with subsection 1 one hour before the start of the occupancy period and one hour after the end of the occupancy period. This addition is not made for buildings that are in continuous occupancy.

Section 12

Standardised use of domestic hot water

The following net heating energy demand figures for each intended use category per a building's net heated area shall be used as the net heating energy demand for the standardised use of domestic hot water:

Intended use category	Annual net heating energy demand for domestic hot water kWh/(m^2 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 demand for domestic hot water is, however, at most 4,200 kWh per year per dwelling unit.

Values that are 15% lower than the above-mentioned values may be used in the calculation of the net heating energy demand for domestic hot water if the building's domestic water network is equipped with a constant pressure valve or other corresponding pressure control technology.

Section 13

Calculation zones

The entire building may be calculated as a single calculation zone in the calculation of the E-value for a building with a single intended use. When calculating the E-value for a building with multiple intended uses, the building shall be divided into calculation zones corresponding to the intended uses and occupancy periods.

Section 14

Special spaces and certain technical systems

The calculation of the E-value for a restaurant, professional kitchen, canteen, café, laboratory or other special space in a building shall, as regards such spaces, take place using initial data corresponding to the intended use of the building or building unit.

Technical systems not specified in this Decree are not taken into account in the calculation of the E-value.

Section 15

Net heating energy demand

The net heating energy demand for a building's spaces shall be calculated on the basis of conduction loss, leakage air heat loss and the heating of replacement air and supply air in the space to room temperature, less the impact of the sun and internal thermal loads. Any solar protection solutions in the building shall be taken into account in the calculation of solar energy gains for the building.

The net heating energy demand for ventilation shall be calculated on the basis of the heating of air after heat recovery to supply air temperature and any heating before heat recovery.

The net heating energy demand for domestic hot water shall be calculated in accordance with section 12.

Section 16

Taking heat loss into account in calculations of E-value

When calculating the E-value, the heat loss from the building envelope shall be calculated on the basis of the internal dimensions of the building envelope. Any thermal bridges of structures and their connections shall be taken into account in the calculations. Individual thermal bridges in the building envelope are not taken into account.

The impact of the ground and crawl space on heat loss shall be taken into account in heat loss calculations.

Section 17

Taking leakage air flow into account in calculations of E-value

When calculating the E-value, the design value shall be used as the air leakage rate figure for the building envelope if airtightness is proven by an industrial building construction quality assurance procedure or will be proven by measurements. In other cases, the value of 4 $m^3/(h\ m^2)$ shall be used as the air leakage rate figure for the building envelope.

Leakage air flow qv,leakage air shall be calculated using the formula:

$$q_{v,vuotoilma} = \frac{q_{50}}{3600 \cdot x} A_{vaippa}$$

where:

$q_{v,vuotoilma}$ is the leakage air flow, m³/s;

q_{50} is the air leakage rate figure for the building envelope, $m^3/(h \cdot m^2)$;

A_{vaippa} is the area of the building envelope, m^2;

x is a factor which for single-storey buildings is 35, for two-storey buildings is 24, for three- and four-storey buildings is 20 and for buildings taller than these is 15;

3600 is a factor converting the air flow from m^3/h to m^3/s.

Section 18

Energy use of heating systems

The energy use of a building's heating system comprises the energy use for space heating, ventilation heating and domestic hot water preparation.

Heat distribution losses inside and outside the building, heat emission losses, losses and conversions in heating energy production, losses in domestic hot water transmission and circulation piping inside and outside the building, storage losses and electricity consumption of the auxiliary units of the heating system are taken into account in the calculation of the energy consumption of a heating system.

If the building is connected to a heating system where heat is conveyed via heat pipes external to the building from a shared heat exchanger or heat generation unit to several buildings, the heat loss from those pipes shall be divided between the buildings in proportion to their areas.

If, in a building of intended use category 2, the habitable rooms have hydronic heating and the wet spaces have electric underfloor heating, 35% of the net heating energy demand for the spaces in a dwelling unit may be calculated to arise from the underfloor heating of the wet spaces and 65% from the heating system of the habitable rooms, unless the share of the electric underfloor heating of the wet spaces of the net demand of the spaces is calculated more specifically with a dynamic calculation tool taking into account the designed air flows and transfer air flows between spaces. The indoor temperature used for wet spaces shall be +22 °C. The share of the electric underfloor heating of the wet spaces of the net heating energy demand of the spaces of a dwelling unit is, however, at most a share calculated on the basis of the installed output of the electric underfloor heating presented in the design plan and using an operating time of 8,760 hours.

If the domestic hot water circulation piping is located outside the building envelope insulation, no thermal load is created for the building's spaces from the calculated heat loss of domestic hot water circulation. If the circulation piping is located inside the building envelope's insulation, 25% of the calculated domestic hot water circulation heat loss shall be added to the thermal load of the spaces of the building. If the circulation piping is located inside the building envelope, 50% of the calculated domestic hot water circulation heat loss shall be added to the thermal load of the spaces of the building. If the domestic hot water cylinder is located inside the building envelope, 50% of the calculated domestic hot water cylinder heat loss shall be added to the thermal load of the spaces of the building.

Supplementary heating energy resulting from any temperature restrictions and part-load sizing shall be included in the heating system's energy consumption in the calculations.

Section 19

Fuel-fired appliances and air-source heat pumps

A maximum of 3,000 kilowatt hours per appliance per year may be calculated as the heating energy produced by heat-storing fuel-fired appliances for a dwelling unit.

A maximum of 3,000 kilowatt hours per pump per year may be calculated as the heating energy produced by air-source heat pumps for a dwelling unit, unless the operation of the pump in the building is calculated more specifically with a dynamic calculation method taking into account the air flows and temperature differences between the spaces.

Section 20

Ventilation systems

The air flows and operating times of a building's ventilation system shall be calculated in accordance with sections 10 and 11. The electrical energy consumption of a mechanical ventilation system shall be calculated on the basis of air flows, specific fan powers and operating times for all air handling units and powered roof ventilators in the building.

Section 21

Cooling systems

When calculating the energy consumption of a building's cooling system, the energy consumption of cooling energy production and the electrical energy consumption of auxiliary units shall be taken into account where the use of the systems is required for indoor temperature control.

Section 22

Electricity use for lighting and consumer equipment

The annual consumption of electrical energy for lighting and consumer equipment used in the building shall be calculated in accordance with section 11 on the basis of the thermal load of these. The electrical energy consumption of lighting and consumer equipment equals the thermal load of these.

Chapter 3

Building heat loss

Section 23

Determination of building heat loss

The heat loss of a building is the total combined heat losses from the building envelope, leakage air and ventilation. A building's heat loss may at most equal the reference heat loss determined for the building on the basis of reference values. The requirement set for a building's heat loss applies separately to the building's warm and semi-warm spaces.

As regards building heat loss, only the requirements set for heat loss from the building envelope apply to an extension of a building or an increase of gross floor area where the existing ventilation or heating system can be used for the provision of ventilation or heating. As regards building heat loss, only the requirements set for heat loss from the building envelope apply to a detached or semi-detached house designed for use as a holiday dwelling for at least four months per year. The requirement set for building heat loss does not apply to a portable building composed of parts made before 1 July 2012 that is still used for the same intended purpose.

Section 24

Building envelope heat loss

Heat loss from the building envelope shall be calculated on the basis of the areas and thermal transmittance coefficients of the various building elements using the following formula:

$$\sum H_{joht} = \sum (U_{ulkoseinä}\ A_{ulkoseinä}) + \sum (U_{yläpohja}\ A_{yläpohja}) + \sum (U_{alapohja}\ A_{alapohja}) + \sum (U_{ikkuna}\ A_{ikkuna}) + \sum (U_{ovi}\ A_{ovi})$$

where:
$\sum H_{joht}$ is the heat loss from the building envelope, W/K;
U is the thermal transmittance coefficient for the building element, W/(m²K);
A is the area of the building element, m².

The reference value for the building envelope heat loss for a warm space or a cooled cold space shall be calculated using the following reference values as the thermal transmittance coefficients for the building elements:

a) wall 0.17 W/(m² K);
b) mass timber wall with an average thickness of at least 180 mm 0.40 W/(m² K);
c) roof and base floor bounded by outdoor air 0.09 W/(m² K);
d) base floor bounded by crawl space 0.17 W/(m² K);
e) building element against the ground 0.16 W/(m² K);
f) window, roof window, door, dome rooflight, smoke and exit hatch 1.0 W/(m² K);

The reference value for the building envelope heat loss for a portable building and a semi-warm space shall be calculated using the following reference values as the thermal transmittance coefficients for the building elements:

a) wall 0.26 W/(m² K);
b) mass timber wall with an average structural thickness of at least 180 mm 0.60 W/(m² K);
c) roof and base floor bounded by outdoor air 0.14 W/(m² K);
d) base floor bounded by crawl space 0.26 W/(m² K);
e) building element against the ground 0.24 W/(m² K);
f) window, roof window, door, dome rooflight, smoke and exit hatch 1.4 W/(m² K);

For a detached or semi-detached house designed for use as a holiday dwelling for at least four months per year, the reference value for building envelope heat loss shall be calculated by using the following reference values as the thermal transmittance coefficients of the building elements:

a) wall 0.24 W/(m² K);
b) mass timber wall with an average thickness of at least 130 mm 0.80 W/(m² K);
c) roof and base floor bounded by outdoor air 0.15 W/(m² K);
d) base floor bounded by crawl space 0.19 W/(m² K);
e) building element against the ground 0.24 W/(m² K);
f) window, roof window, door, dome rooflight, smoke and exit hatch 1.4 W/(m² K);

The reference value for a building's total combined window area is 15% of the sum total of the floor plate areas of the building's storeys that are fully or in part above the ground but, however, at most 50% of the building's facade area. The area of a window shall be calculated on the basis of the measurements of the external perimeter of the window.

The size or geometry data of the designed building shall be used for the calculations. The areas of the various building elements of the building envelope shall be determined on the basis of the building's total internal dimensions.

The designed building element-specific thermal transmittance coefficients and window areas shall be used in the calculation of heat loss from the envelope for the building design solution.

Section 25

Calculating heat loss from leakage air of buildings

The leakage air heat loss from a building shall be calculated using the following formula:

$$H_{vuotoilma} = \rho_i c_{pi} q_{v,\,vuotoilma}$$

where:
$H_{vuotoilma}$ is the leakage air heat loss, W/K;
ρ_i is the density of air, 1.2 kg/m³;
c_{pa} is the specific heat capacity of air, 1,000 Ws/(kg K);
$q_{v,vuotoilma}$ is the leakage air flow, m³/s.
The leakage air flow $q_{v,vuotoilma}$ shall be determined in accordance with section 17. When calculating the reference heat loss of a building, the value of 2.0 $m^3/(h\ m^2)$ shall be used as the reference value for the air leakage rate figure for the building envelope.
When calculating the heat loss for a building's design solution, the design value shall be used as the value of the air leakage rate figure for the building envelope. If the achievement of the design value for airtightness is not proven with measurements or by an industrial building construction quality assurance procedure, the value used as the air leakage rate figure shall be 4.0 $m^3/(h\ m^2)$.

Section 26

Calculating heat loss from building ventilation

The leakage air heat loss from the ventilation of a building shall be calculated using the following formula:

$$H_{iv} = \rho_i c_{pi} q_{v,poisto} t_d\ t_V\ (1 - \eta_a)$$

where:
H_{iv} is the specific heat loss from ventilation, W/K;
ρ_i is the density of air, 1.2 kg/m³;
c_{pi} is the specific heat capacity of air, 1,000 Ws/(kg K);
$q_{v,poisto}$ is the calculated extract air flow in accordance with standardised use, m³/s;
t_d is the ventilation system's mean daily operating time ratio, h/24 h;
t_w is the ventilation system's weekly operating time ratio, 24 h/7 days;
η_a is the annual efficiency of heat recovery from ventilation extract air.
The same air flow values and operating times shall be used for the calculations of the reference heat loss from ventilation and the design solution's heat loss from ventilation.
The ventilation air flow shall be calculated in accordance with section 10. Demand-controlled ventilation is not taken into account when calculating reference heat losses and design solution heat losses. The ventilation operating time shall be calculated by adding one hour before and one hour after the building's occupancy period in accordance with section 11. This addition is not made for buildings that are in continuous occupancy. For buildings of intended use category 9, the building's design values shall be used as air flows and ventilation operating time.
In reference heat loss calculations, the value used as the annual efficiency of heat recovery from ventilation extract air of the building's ventilation system shall be 55%. In a building's reference heat loss calculations, the value of the annual efficiency of heat recovery from ventilation extract air of an individual space is 0% if the impurity of extract air prevents the functioning of heat recovery, the temperature of the space during the heating season is below +10 °C and no heat is recoverable cost-effectively from extract air or if the functioning of the ventilation system is based on pressure differences caused mainly by differences in height and temperature and the action of the wind.
If mechanical ventilation is used, the annual efficiency of the extract air heat recovery of the air handling unit shall be determined by using the heat recovery equipment's properties and

the design air flows of the air handling unit as well as weather data for climatic zone I provided in Annex 1.

The annual efficiency of the extract air heat recovery of two or more air handling units shall be determined as the weighted annual efficiency of the design air flows and operating times. The heat loss from ventilation for the building's design solution shall be calculated by using the annual efficiency of the extract air heat recovery determined in this manner and the air flow values and operating times in accordance with subsection 3.

Chapter 4

Miscellaneous provisions

Section 27

Building airtightness

The air leakage rate (q_{50}) of a building envelope may be a maximum of 4.0 $m^3/(h\ m^2)$. The air leakage rate figure may exceed the value of 4.0 $m^3/(h\ m^2)$ if so required by structural solutions needed for the use of the building.

Section 28

Ground frost insulation, thermal insulation of foundation walls and insulation between certain spaces

To prevent ground frost damage, ground frost insulation and any thermal insulation of foundation walls not included in the building envelope shall be taken into account in the design of thermal insulation for a building's base floor.

Between a cooled cold space and other spaces, the thermal transmittance coefficient of a wall and an intermediate floor may be a maximum of 0.27 $W/(m^2\ K)$ and that of a door a maximum of 1.4 $W/(m^2\ K)$.

Between a warm space and a semi-warm space, the thermal transmittance coefficient of a wall and an intermediate floor may be a maximum of 0.60 $W/(m^2\ K)$ and that of a window and a door a maximum of 2.8 $W/(m^2\ K)$, excluding detached and semi-detached houses designed for use as a holiday dwelling.

Section 29

Calculated room temperature for the summer season

The calculated room temperature for the summer season may not exceed the cooling limit value of +27 °C for intended use category 2 and the cooling limit value of +25 °C for intended use categories 3–8 by more than 150 degree hours between 1 June and 31 August while using air flows in accordance with the design solution.

Conformity of the room temperature for the summer season shall be verified by temperature calculations for the various space types. With the exception of air flow, the initial data used in the calculations shall be in accordance with the calculation of the E-value. The requirement laid down for the room temperature for the summer season does not apply to buildings of intended use categories 1 and 9. A dynamic calculation tool shall be used for the calculation of the room temperature for the summer season.

Section 30

Specific fan power of mechanical ventilation systems of buildings

If a building has a mechanical ventilation system, the specific fan power of a mechanical supply and extract ventilation system may be at most 1.8 kW/(m^3/s) and the specific fan power of a mechanical extract ventilation system at most 0.9 kW/(m^3/s).

The specific fan power of a ventilation system may exceed the above values if so required by the indoor climate in accordance with the building's intended use.

Section 31

Energy consumption measurement in buildings

A building shall have measuring instruments and measurement readiness enabling the measurement of energy consumption so that the building's energy consumption can be monitored as regards the most important consumption points and as regards the building's total consumption or such a monitoring opportunity shall be easy to put in place.

Section 32

Heating capacity and electrical power demand of buildings

The heating capacity of a building's heating system shall be designed so that the designed temperature conditions and ventilation of the spaces can be maintained at the design outdoor temperatures of the climatic zone in accordance with the location of the building presented in Annex 1.

In design, opportunities to reduce the need for peak power and to improve the controllability of electric power consumption shall be taken into account.

Section 33

Structural energy efficiency

By way of derogation from section 4, the fulfilment of the requirements set for the energy performance of a building in section 4 may be verified on the basis of structural energy efficiency.

A building of intended use category 1 or 2 meets the requirements set for energy performance if:

1) the building's heat loss is at most equal to the reference heat loss determined for the building on the basis of the structural energy efficiency reference values calculated correspondingly to what is set out in sections 24, 25 and 26. The reference values for building element thermal transmittance coefficients, air leakage rate and annual efficiency of ventilation extract air heat recovery are:

a) wall, intended use category 1 — 0.12 W/(m^2 K);
b) wall, intended use category 2 — 0.14 W/(m^2 K);
c) roof and base floor bounded by outdoor air — 0.07 W/(m^2 K);
d) aired base floor bounded by crawl space and building element against the ground — 0.10 W/(m^2 K);
e) window, roof window, door, dome rooflight, smoke and exit hatch — 0.70 W/(m^2 K);
f) building air leakage rate figure (q_{50}) — 0.60 m^3/(h m^2)
g) annual efficiency of heat recovery from extract air — 65%;

2) The building is equipped with a mechanical supply and extract ventilation system the specific fan power of which is at most 1.5 kW/(m3/s);

3) The heating system used for the building shall be district heating, a geothermal heat pump or an air-to-water heat pump.

Section 34

Energy declarations

An energy declaration shall be drawn up when designing a building. An energy declaration contains surveys of the following:

a) the E-value in accordance with section 4 and the key initial data and results of the E-value calculations, conformity of the building's heat loss in accordance with section 23 and the specific fan power of a mechanical ventilation system in accordance with section 30; or

b) the conformity of structural energy efficiency in accordance with section 33.

In addition, an energy declaration contains surveys of the following:

a) the calculated room temperature for the summer season in accordance with section 29;

b) the building's energy performance certificate if so required by legislation on building energy performance certificates.

The energy declaration shall be updated before the commissioning of the building if changes have taken place in designs used as a basis for the permit-stage energy declaration. The person responsible for the construction stage shall make an entry in the building inspection documents concerning compliance of construction work with the information presented in the energy declaration.

Chapter 5

Transitional provisions and entry into force

Section 35

Entry into force

This Decree enters into force on 1 January 2018.

This Decree repeals the Decree of the Ministry of the Environment on the Energy Performance of Buildings (2/11).

Upon the entry into force of this Decree, pending projects shall be subject to the rules valid at the time of entry into force of this Decree.

Helsinki, 20 December 2017

Kimmo Tiilikainen, Minister for Housing, Energy and the Environment

Pekka Kalliomäki, Senior Construction Adviser

Annex 1

Weather data used for calculations of the E-value and heating capacity

The weather data presented in this Annex is used for calculations of the E-value and heating capacity. Hourly weather data is available from the Ministry of the Environment website.

Demand for heating capacity is calculated using the design outdoor air temperature for the climatic zone in accordance with the geographical location of the building site (Figure L1.1 and Table L1.1).

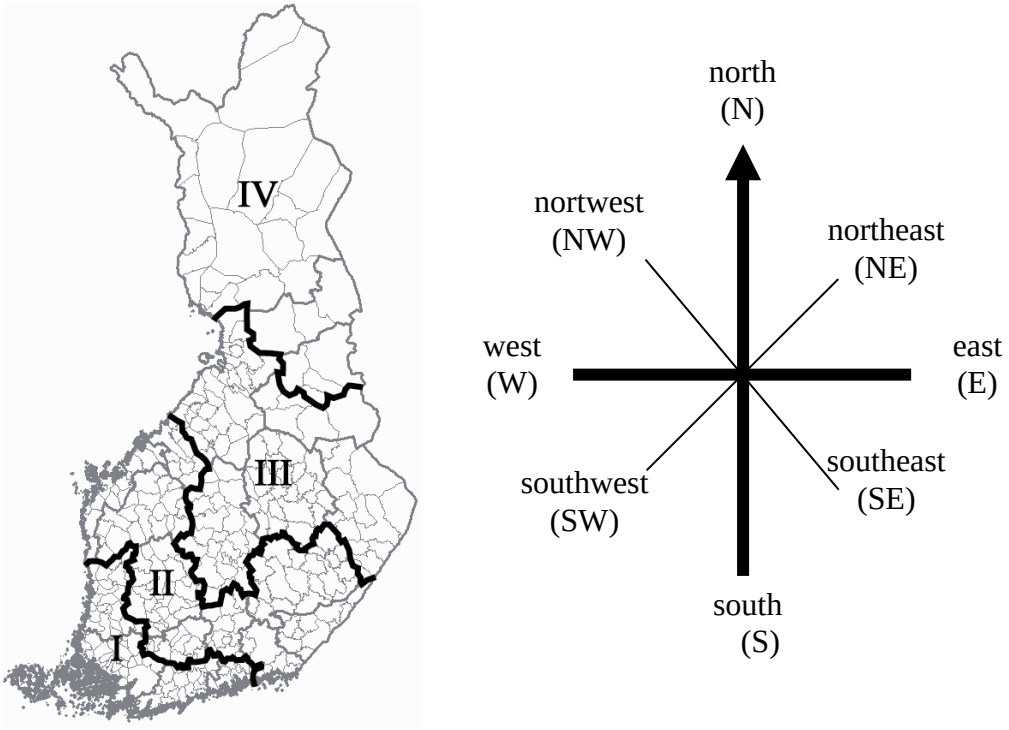

Figure L1.1. Climatic zones and compass point abbreviations.

Table L1.1.	*Design outdoor air temperatures for the various climatic zones.*
Climatic zone	Design outdoor air temperature, °C
E	-26
II	-29
III	-32
IV	-38

Table L1.2.	*Monthly weather data for climatic zone I Helsinki-Vantaa.*	
Month	Average outdoor air temperature, T_o, °C	Gross solar radiation energy on horizontal plane, $G_{radiation,\ horizontal\ plane}$, 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

	Gross solar radiation energy on vertical planes for each compass point, $G_{radiation,\ vertical\ plane}$, 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 $F_{direction}$ for converting gross solar radiation energy on horizontal plane to gross solar radiation energy on vertical plane for each compass direction							
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