Republic of Latvia

Cabinet
Regulation No. 280
Adopted 25 June 2019

Regulations Regarding the Latvian Construction Standard LBN 002-19, Thermotechnics of Building Envelopes

Issued pursuant to
Section 5, Paragraph one, Clause 3 of the Construction Law

1. The Regulation approves the Latvian Construction Standard LBN 002-19, Thermotechnics of Building Envelopes (hereinafter – the Construction Standard).

2. Cabinet Regulation No. 339 of 30 June 2015, Regulations Regarding the Latvian Construction Standard LBN 002-15, Thermotechnics of Building Envelopes (*Latvijas Vēstnesis*, 2015, No. 125), is repealed.

3. Building designs which have been drawn up according to specific procedures and coordinated until the day of coming into force of this Regulation need not be remade according to the requirements laid down in the Construction Standard.

4. The Regulation shall come into force on 1 January 2020.

Informative Reference to the European Union Directive

This Regulation contains legal norms arising from Directive 2010/31/EU of the European Parliament and of the Council of 19 May 2010 on energy performance of buildings.

Prime Minister A. K. Kariņš

Minister for Economics R. Nemiro

Approved by
Cabinet Regulation No. 280
25 June 2019

Latvian Construction Standard LBN 002-19, Thermotechnics of Building Envelopes

I. General Provisions

1. The Construction Standard prescribes:

1.1. the procedures for the energy efficiency design of the structure elements of external building envelopes and their connections for heated buildings to be newly erected, rebuilt, and renewed, and also for new heated premises to be installed in already built buildings the temperature in which during the heating season is maintained at 8 °C and higher;

1.2. the thermotechnical parameters to be used in the calculations during the designing of heating, ventilation, and systems.

2. The purpose of the Construction Standard is to reduce energy consumption in buildings by increasing the efficiency of energy use and to prevent the formation of structural-physical defects in buildings and their structure elements. Energy efficient structure elements limiting carbon dioxide emissions shall be provided for in the construction of buildings.

3. Envelopes or elements of buildings (hereinafter – the structure element) are the external walls, roofs, garret floors, coverings which are in contact with the outdoor air (also over passages), floors on unheated cellars, cold cellars and floor on the ground, external walls of a cellar which are in contact with the outdoor air or ground, windows in the external walls, doors and gates, and also internal walls and other surfaces, if they delimit premises the temperature margin between which is 5 °C and more. Such structure elements and their solutions are energy efficient which provide sufficiently efficient protection of the room from cooling during the winter and from overheating during the summer, ensuring a better thermal comfort indoors. Thermal inertia shall be assessed for the structure elements and the most appropriate combination of load bearing and thermal insulating layers shall be selected.

4. In projects which are co-financed by the European Union, the State, or the local government, the solutions for the designs of rendered façades of external walls and the solutions for the designs of ventilated façades shall be drawn up in accordance with European Technical Approvals issued on the basis on the European Technical Approval Guidelines for External Thermal Insulation Composite Systems ETAG 004.

5. The Construction Standard shall not be applied to the buildings referred to in Section 3, Paragraph two, Clause 2 of the Energy Efficiency Law.

6. A specific micro-climate of high energy intensity shall be ensured for buildings and premises (for example, for freezing rooms, climate chambers), providing for energy efficient structure elements, and the technically and economically most appropriate solution shall be ensured in the application of this Construction Standard, in addition also ensuring high efficiency of energy use for it.

7. Upon performing the thermotechnical calculation and designing of the structure elements, the standards referred to in this Construction Standard shall be applied. Application of an

alternative methodology for calculation shall be permitted if the result of the technical execution thereof is not worse than that laid down in the standard and it ensures conformity with the essential requirements to be brought forward for the structure laid down in the Construction Law.

II. Energy Efficiency Requirements

8. Energy efficiency of the buildings to be newly erected shall conform to the threshold values indicated in Table 1 of Annex to this Construction Standard. Calculation of energy consumption shall be performed in accordance with Cabinet regulations regarding the methodology for calculating the energy efficiency of buildings.

9. Energy efficiency of the buildings to be renewed or rebuilt shall conform to the threshold values indicated in Table 2 of Annex to this Construction Standard. Calculation of energy consumption shall be performed in accordance with Cabinet regulations regarding the methodology for calculating the energy efficiency of buildings.

10. If the average height of the building for premises to be heated is more than 3.5 metres, the minimum permissible level of energy efficiency of the buildings may exceed the indicators referred to in Paragraphs 8 and 9 of this Construction Standard. Taking into account the average height of the building for premises to be heated, the minimum permissible level of energy efficiency of the buildings shall be calculated, using the following formula:

$$E_{min.apr.} = E_{min} \times \frac{h}{3.5} \text{ where (1)}$$

$E_{min.apr.}$ – minimum permissible level of energy efficiency of the buildings, if the average height of the building for premises to be heated exceeds 3.5 metres (kWh/m^2 per year). If the re-calculated minimum permissible level of energy efficiency of the buildings for a building to be newly erected exceeds 90 kWh/m^2 per year, the minimum permissible level of energy efficiency of the buildings for a building to be newly erected shall be 90 kWh/m^2 per year. If the re-calculated minimum permissible level of energy efficiency of the buildings for renewal or rebuilding exceeds 120 kWh/m^2 per year, the minimum permissible level of energy efficiency of the buildings for renewal or rebuilding shall be 120 kWh/m^2 per year;
h – actual average height of the building for premises to be heated (m);
E_{min} – the minimum permissible level of energy efficiency of the buildings in accordance with Paragraph 9 or 10 of this Construction Standard (kWh/m^2 per year).

11. The values U_i and ψ_j of the calculated heat transmittance coefficients of individual structure elements and linear thermal bridges shall not exceed the maximum values U_{RM} and ψ_{RM} specified in Table 3 of Annex to this Construction Standard, U_{RM} shall be the maximum heat transmittance coefficient W/($m^2 \times$ K) of the relevant structure element, whereas ψ_{RM} – the maximum heat transmittance coefficient of the relevant linear thermal bridge W/(m × K). The maximum values U_{RM} for floors which are in contact with the outdoor air shall be the same as for roofs.

12. If renewal or rebuilding affects less than 25 % of the total surface area of the structure elements of the building, the requirements referred to in Paragraph 9 of this Construction Standard need not be applied.

13. The temperature in unheated adjacent premises shall be determined in accordance with the standard LVS EN ISO 13789:2017, Thermal performance of buildings – Transmission and ventilation heat transfer coefficients – Calculation method (ISO 13789:2017).

III. Calculated Values of Construction Products and Structure Elements

14. The values of the calculated heat transmittance coefficients U_i, ψ_j, and χ_k shall be determined for:

14.1. walls, roofs, and floors which are in contact with the outdoor air – in accordance with the standard LVS EN ISO 6946:2017, Building components and building elements – Thermal resistance and thermal transmittance – Calculation methods (ISO 6946:2017);

14.2. floors lacking contact with the outdoor air – in accordance with the standard LVS EN ISO 13370:2017, Thermal performance of buildings – Heat transfer via the ground – Calculation methods (ISO 13370:2017);

14.3. windows and doors – in accordance with the standard LVS EN ISO 10077-1:2017, Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 1: General (ISO 10077-1:2017), and LVS EN ISO 10077-2:2017, Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 2: Numerical method for frames (ISO 10077-2:2017);

14.4. thermal bridges ψ_j and χ_k – in accordance with the standard LVS EN ISO 10211:2017, Thermal bridges in building construction – Heat flows and surface temperatures – Detailed calculations, or LVS ISO 14683:2017, Thermal bridges in building construction – Linear thermal transmittance – Simplified methods and default values (ISO 14683:2017). For the determination of the heat transmittance coefficients of thermal bridges ψ_j and χ_k such catalogues of thermal bridges may be used in which the values of thermal bridges have been determined, using the calculation conditions of the standard LVS EN ISO 10211:2017, Thermal bridges in building construction – Heat flows and surface temperatures – Detailed calculations (ISO 10211:2017), and the calculation conditions of which correspond to the situation to be designed;

14.5. point thermal bridges χ_k if they present a risk of condensate – by assessing as an additional attenuation in structures. The necessary calculations and threshold values shall be determined in accordance with LVS EN ISO 13788:2013, Hygrothermal performance of building components and building elements – Internal surface temperature to avoid critical surface humidity and interstitial condensation – Calculation methods (ISO 13788:2012).

15. Thermal bridge ψ_j (W/mK) is any formation in the construction of a building where the heat transmission of homogeneous envelopes is changed by the following factors:

15.1. the envelope or a part thereof is crossed by materials with different thermal conductivity;

15.2. the thickness of materials changes;

15.3. there is a difference between the external and internal dimensions of the structure element;

15.4. other factors affecting heat losses in local areas.

16. The conformity of the heat transmittance coefficient of a thermal bridge with the values defined in this Construction Standard shall be assessed according to the external dimensions of the structure element. The relative critical surface humidity at sites of the thermal bridge shall be inspected in accordance with the methodology for calculation defined in the standard LVS EN ISO 13788:2013, Hygrothermal performance of building components and building elements – Internal surface temperature to avoid critical surface humidity and interstitial condensation – Calculation methods (ISO 13788:2012), and the permissible threshold values.

Upon determining the relative critical surface humidity, the calculation shall be performed provided that the temperature of external air is Θ_e (–5°C).

17. The calculated heat transmittance coefficient U_i for industrially manufactured structure elements in the regulated field shall be certified in a conformity assessment process in accordance with Regulation (EU) No 305/2011 of the European Parliament and of the Council of 9 March 2011 laying down harmonised conditions for the marketing of construction products and repealing Council Directive 89/106/EEC (hereinafter – Regulation No 305/2011).

18. For the construction products the main function of which in the structure element is not thermal insulation and the thermotechnical properties thereof are not certified during the conformity assessment process, the values of the calculated heat transmittance and other thermotechnical characteristics shall be determined in accordance with Table 10 of Annex to this Construction Standard.

19. The measurements of the actual values of the calculated heat transmittance coefficient U_i of the structure elements shall be taken in conformity with the standard LVS EN ISO 8990:2007 L, Thermal insulation – Determination of steady-state thermal transmission properties – Calibrated and guarded hot box.

IV. Air Permeability and Energy Efficiency Indicators of Buildings

20. Air permeability of a structure is a structural and physical value characterising the construction quality of the building and ensures a possibility for efficient control of micro-climate in the building and for ensuring of the energy efficiency requirements.

21. Air permeability of the entire building, expressed as an air leak $m^3/(m^2 \times h)$ and measured with the pressure margin 50 Pa (q_{50}), may not exceed the threshold values determined in Paragraph 22 of this Construction Standard.

22. Depending on the method of ventilation of the relevant building, the following threshold values shall be determined for residential houses, homes for the elderly, hospitals, kindergartens, and public buildings:

22.1. for buildings with natural ventilation (airing) – $q_{50} \leq 3\ m^3/(m^2 \times h)$;

22.2. for buildings with a mechanical ventilation system – $q_{50} \leq 2\ m^3/(m^2 \times h)$;

22.3. for buildings with a mechanical ventilation system which is equipped with heat recovery (air recuperation) devices – $q_{50} \leq 1.5\ m^3/(m^2 \times h)$;

22.4. for production buildings – $q_{50} \leq 4\ m^3/(m^2 \times h)$.

23. The requirements referred to in Paragraph 22 of this Construction Standard shall also be taken into account in relation to the connections and assembly seams of the structure element.

24. Air permeability of buildings shall be determined in accordance with the standard LVS EN 9972:2016, Thermal performance of buildings – Determination of air permeability of buildings – Fan pressurization method (ISO 9972:2016). For the performance of the test, the building shall be prepared according to the Method 2 of the abovementioned standard – by closing all the windows, doors, hatches in the building.

V. Water Vapour Permeability of Structure Elements

25. If the structure element, its connections and assembly seams consist of different layers, the total equivalent of air diffusion of water vapour resistance s_d of the layers on the warm side

thereof shall be at least five times greater than the total equivalent of air diffusion of water vapour resistance s_d of the layers adjacent to the cold side. The s_d values for most commonly utilised membrane materials are determined in Table 4 of Annex to this Construction Standard.

26. The water vapour resistance of construction products shall be determined, using the following formula:

$$S_d = \sum_n^1 \mu_1 \times d_1 + \mu_2 \times d_2 + \cdots + \mu_n \times d_n \text{ where (2)}$$

s_d – the equivalent of air diffusion of water vapour resistance of construction products (m);
µ – the water vapour resistance factor;
d – the thickness (m) of the layer of the homogeneous construction product.

27. The structure element shall be designed and constructed in a way that:

27.1. the balance of accumulation of humidity in the structure element within a year is not positive;

27.2. the drying reserve of humidity for the structure elements of the external wall within a year is at least 100 g/m^2, for the structure elements of the roof – at least 200 g/m^2;

27.3. the maximum possible quantity of absorbed water of layer materials of the structure element is not exceeded;

27.4. the quantity of the water vapour condensate does not exceed 400 g/m^2 on surfaces not absorbing humidity in order to preclude trickling of water drops;

27.5. the total quantity of condensate during the annual heating season does not exceed 1 kg/m^2;

27.6. the quantity of humidity for timber in overall increases by not more than 5 % of their mass, for materials containing wood the quantity of humidity increases by not more than 3 % of their mass;

27.7. upon assessing the long-term safety of humidity damages of the structure element, the assessment includes the quantity of layer humidity of the structure elements, and also the transfer of humidity caused by air permeability of the building in the structure element.

28. The technical solution for the fulfilment of the requirements referred to in Paragraph 25 or 27 of this Construction Standard for the structure element, its connections and assembly seams shall be indicated to the same extent and in the same content as to be able to assess conformity with the requirements laid down.

29. Derogations from the requirements referred to in Paragraph 25 of this Construction Standard shall be permissible if conformity with the requirements referred to in Paragraph 27 of this Construction Standard is ensured.

30. If an air gap between the thermal insulation or wind barrier next to it and the external finish is required to fulfil the requirements referred to in Paragraph 25 or 27 of this Construction Standard, it must be possible to ventilate the thermal insulation. Such thermal insulation is considered ventilated the air separating layer of which is in contact with the outdoor air and the air flow conditions conform to the criteria specified in the standard LVS EN ISO 6946:2017, Building components and building elements – Thermal resistance and thermal transmittance – Calculation methods (ISO 6946:2017). The air separating layer is ventilated, if the following conditions are met:

30.1. the cross-sectional area of ventilation apertures is not smaller than 15 cm^2 per each metre of the length of a vertical air separating layer (along the perimeter of the building);

30.2. the cross-sectional area of ventilation apertures is not smaller than 15 cm^2 per each square metre of the surface of the envelope for a horizontal air separating layer.

31. The value s_d for glass, ceramic tiles, metals, and metal sheets shall be unlimited. The value 10^6 m shall be used in the calculations.

32. In respect of hermetic multilayer panels covered on both sides by metal sheets with a thermal insulation layer between them, the requirement referred to in Paragraph 25 of this Construction Standard shall apply to the junctures of the panels which are on the warm and cold sides of the thermal insulation.

VI. Thermotechnical Characteristics of Construction Products

33. Upon performing engineering calculations, the information provided by the manufacturer shall be primarily selected as the output data. If such information is not available, it shall be permitted to use studies, the literature of the field, or Annex to this Construction Standard. Upon selecting the data provided by the manufacturer regarding thermal conductivity of materials, it shall be ascertained that it has been checked in accordance with the methodology referred to in Paragraph 36 of this Construction Standard. The declared thermal conductivity λ_D shall be used for the performance of calculations.

34. The manufacturer shall indicate in the declaration of conformity the declared thermal conductivity λ_D W/(m × K) for each type of thermal insulation product according to the technical provisions.

35. A class of thermal conductivity shall be determined for all thermal insulating products. The class of thermal insulating product shall be the guaranteed declared thermal conductivity thereof which is expressed in W/(m × K) (Watts per meter and degree) and rounded up to the highest closest class indicator. The manufacturer shall indicate the class of the thermal insulating material according to the technical provisions of the construction product.

36. The declared coefficient of thermal conductivity λ_D or the declared thermal resistance R_D of the thermal insulating material shall be determined in accordance with the standard LVS EN ISO 10456+AC:2013 L, Building materials and products – Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values.

37. Conversion of thermal values shall be performed in accordance with the standard LVS EN ISO 10456+AC:2013 L, Building materials and products – Hygrothermal properties – Tabulated design values and procedures for determining declared and design thermal values.

38. Upon determining the calculated heat transmittance value U_i and the thickness of the thermal insulation layer for the structure element, the shrinkage of the bulk thermal insulating material during the lifetime thereof shall be taken into consideration. The extent of shrinkage for glass wool and rock wool shall not be less than 5 %, but for cellulose-based fibres – not less than 20 %.

39. If the measurements of the thermal conductivity are taken according to the harmonised technical provisions for construction products or using matured (aged) materials, the correction factor Dl_a may be zero.

40. The declared thermal conductivity λ_D W/(m × K) shall be determined according to the harmonised technical provisions for construction products or using the following formula (if there are no harmonised technical provisions for the relevant thermal insulating material or the

way of determination of the declared thermal conductivity is not referred to in the harmonised technical provisions):

$$\lambda_D > \lambda_{10m} + \Delta\lambda_s + \Delta\lambda_a \text{ where (3)}$$

λ_{10m} – the thermal conductivity value of the thermal insulating material at the average temperature of 10 °C in accordance with Paragraph 28 or 38 of this Construction Standard;
$\Delta_{\lambda s}$ – the correction factor for the evaluated standard deviation in accordance with Paragraph 27 of this Construction Standard;
$\Delta_{\lambda a}$ – the correction factor for ageing.

41. If thermal insulating materials which are manufactured in accordance with the harmonised European standards and which have been labelled with the CE mark, and have a declared product thermal resistance of R_D (m^2K/W), the thermal conductivity class of such products shall be determined in accordance with formula (4) and the acquired value shall be rounded up to the closest value with accuracy up to 0.001 W/(m × K):

$$\lambda_{cl} = \frac{d_N}{R_d} \text{ where (4)}$$

d_N – the nominal thickness of the thermal insulating material in accordance with the relevant harmonised European standard. In such case the manufacturer shall indicate the declared thermal conductivity λ_D or the declared thermal resistance of the construction product R_D on the packaging, without indicating the thermal conductivity class with a separate mark.

42. The calculated thermal conductivity λ_D W/(m × K) of a thermal insulating material, taking into consideration the envelopes in actual working conditions, shall be determined in accordance with the standard LVS EN ISO 6946:2017, Building components and building elements – Thermal resistance and thermal transmittance – Calculation methods (ISO 6946:2017), or by using formula (5), adding the adjustment-for-working-conditions coefficient $\Delta\lambda_w$ to the result obtained in accordance with Table 4 of Annex to this Construction Standard unless specified otherwise in the harmonised standard for a construction product:

$$\lambda_d = \lambda_{cl} + \Delta\lambda_W \quad (5)$$

43. The calculated thermal conductivity of the thermal insulating material for the structure element to be indicated in the documentation of the construction intention shall be determined in accordance with Paragraph 42 of this Construction Standard.

44. The values $\Delta\lambda_w$ of the adjustment coefficient for the thermal insulating materials most frequently used in the structure elements are specified in Table 5 of Annex to this Construction Standard.

45. The values of the correction coefficient $\Delta\lambda_w$specified in Table 6 of Annex to this Construction Standard shall apply to thermal insulating materials which are used on the ground, in the external walls of a cellar, under the floor on the ground or outside horizontally as a protection measure against frost heave of the soil. If the density of the thermal insulating material conforms to the range indicated in the abovementioned table, the values of the correction coefficient $\Delta\lambda_w$ shall be determined by means of a linear interpolation. If the density of the thermal insulating material does not conform to the range referred to in the table, the use thereof in such manner is not permitted.

46. The values of the correction coefficient $\Delta\lambda_w$ for inverted roof constructions for the thermal insulation of which extruded expanded polystyrene (XPS) or grooved sheets thereof covered with a straining cloth have been applied shall be specified in Table 7 of Annex to this Construction Standard. An inverted roof shall be such a roof in which the thermal insulation layer is laid over the waterproofing layer.

47. The calculated thermal conductivity shall be used upon determining the value of the calculated thermal conductivity coefficient U_i of the structure element.

48. The calculated thermal conductivity λ_d for construction products to be used in a regulated field the conformity of which has not been certified as for thermal insulating materials in accordance with Regulation No 305/2011 shall be determined in accordance with Table 10 of Annex to this Construction Standard.

VII. Thermal Inertia of Structure Elements

49. Thermal inertia shall depend on thermal mass of the structures of a building. Thermal mass is a function from the density of the material (ρ, kg/m^3) and the specific heat capacity c_p (kJ/(kgK)) and is the indicator of heat resistance.

50. The thermal inertia of the structure element shall be calculated in accordance with the standard LVS EN ISO 52016-1:2017, Energy performance of buildings – Energy needs for heating and cooling, internal temperatures and sensible and latent heat loads – Part 1: Calculation procedures (ISO 52016-1:2017).

51. The dimensions λ, ρ, and c for some construction products are indicated in accordance with Paragraph 39 of this Construction Standard and also are indicated in Tables 9 and 10 of Annex to this Construction Standard. The humidity of some construction products for the calculations of thermal inertia in percentage is specified in Table 7 of Annex to this Construction Standard. For thermal insulating materials the calculated thermal conductivity λ_d of which is determined in accordance with this Construction Standard, in calculations of inertia = $\lambda_{.\ d}$.

Minister for Economics R. Nemiro

Annex
to Latvian Construction Standard LBN 002-19,
Thermotechnics of Building Envelopes
(approved by Cabinet Regulation No. 280
of 25 June 2019)

Indicators of Thermotechnics of Building Envelopes and Their Values

Table 1

Minimum Permissible Level of Energy Efficiency of Buildings for Newly Erected Buildings[1]

No.	Acceptance period of the documentation of the construction intention of the building	Minimum permissible level of energy efficiency of buildings, energy efficiency assessment for heating of newly erected buildings			
		for residential buildings		for non-residential buildings (the types of buildings referred to in Sub-paragraphs 6.1.3, 6.1.4, 6.1.5, 6.1.6, 6.1.7, 6.1.8, and 6.1.9 of the Regulation[2])	
		multi-apartment buildings	one-apartment or two-apartment buildings	buildings which are in the ownership of the State or local government and in the possession of the authorities and where the State or local government authorities are located	other non-residential buildings
1.	Until 31 December 2016	≤ 70 kWh/m^2 per year	≤ 80 kWh/m^2 per year	≤ 100 kWh/m^2 per year	≤ 100 kWh/m^2 per year
2.	From 1 January 2017 to 31 December 2017	≤ 60 kWh/m^2 per year	≤ 70 kWh/m^2 per year	≤ 90 kWh/m^2 per year	≤ 90 kWh/m^2 per year
3.	From 1 January 2018 to 31 December 2018	≤ 60 kWh/m^2 per year	≤ 70 kWh/m^2 per year	≤ 65 kWh/m^2 per year	≤ 90 kWh/m^2 per year
4.	From 1 January 2019 to 31 December 2020	≤ 50 kWh/m^2 per year	≤ 60 kWh/m^2 per year	nearly zero-energy building	≤ 65 kWh/m^2 per year
5.	From 1 January 2021	nearly zero-energy building	nearly zero-energy building	nearly zero-energy building	nearly zero-energy building

Notes.
[1] The minimum permissible level (class) of energy efficiency of buildings for the buildings to be newly erected need not be applied if application of the relevant requirements is either technically or functionally impossible and benefit analysis on the useful lifetime of the relevant building indicates to losses.
[2] Cabinet Regulation No. 383 of 9 July 2013, Regulations Regarding Energy Certification of Buildings.

Table 2

Minimum Permissible Level of Energy Efficiency of Buildings for Renewal and Rebuilding of Buildings

<table>
<tr><th rowspan="3">No.</th><th rowspan="3">Acceptance period of the documentation of the construction intention of the building</th><th colspan="4">The minimum permissible level of energy efficiency of buildings, assessment of energy efficiency for heating for the buildings to be renewed and rebuilt</th></tr>
<tr><th colspan="2">for residential buildings</th><th colspan="2">for non-residential buildings (the types of buildings referred to in Sub-paragraphs 6.1.3, 6.1.4, 6.1.5, 6.1.6, 6.1.7, 6.1.8, and 6.1.9 of the Regulation[1])</th></tr>
<tr><th>multi-apartment buildings</th><th>one-apartment or two-apartment buildings</th><th>buildings which are in the ownership of the State or local government and in the possession of the authorities and where the State or local government authorities are located</th><th>other non-residential buildings</th></tr>
<tr><td>1.</td><td>From 21 November 2015 to 31 December 2020</td><td>≤ 90 kWh/m² per year</td><td>≤ 100 kWh/m² per year</td><td>≤ 110 kWh/m² per year</td><td>≤ 110 kWh/m² per year</td></tr>
<tr><td>2.</td><td>From 1 January 2021</td><td>≤ 80 kWh/m² per year</td><td>≤ 90 kWh/m² per year</td><td>≤ 90 kWh/m² per year</td><td>≤ 100 kWh/m² per year</td></tr>
</table>

Note. [1] Cabinet Regulation No. 383 of 9 July 2013, Regulations Regarding Energy Certification of Buildings.

Table 3

Maximum Permissible Levels of the Heat Transmittance Coefficients U_{RM} W/(m^2 × K) and ψ_{RM} W/(m × K) of the Structure Element and the Linear Thermal Bridge

No.	Structure	Residential houses, homes for the elderly, hospitals, and kindergartens	Non-residential buildings	Production buildings
		Value of U_{RM}, W/(m^{2}K)	Value of U_{RM}, W/(m^{2}K)	Value of U_{RM}, W/(m^{2}K)
1.	Floor[1]:			
1.1.	floors and walls in contact with the ground	0.2	0.25	0.35
1.2.	floor to a non-heated basement or floor with a ventilated cellar	0.3	0.35	0.40
2.	External walls:			
2.1.	external walls	0.23	0.25	0.30
2.2.	walls in traditional log buildings without building of a thermal insulation layer into the wall	0.65	0.65	0.65
3.	Roofs and coverings which are in contact with outdoor air	0.20	0.23	0.25
4.	External doors and gates	1.80	2.00	2.20
5.	Windows and balcony doors[2]	1.10	1.10	1.30
6.	Thermal bridges, ψ_{RM}	0.20	0.20	0.35

Notes.
[1] In all cases the calculation in accordance with the standard LVS EN ISO 13370:2017, Thermal performance of buildings – Heat transfer via the ground – Calculation methods (ISO 13370:2017).
[2] The indicated value of U is the value of calculation in accordance with Table F3 of Annex F to the standard LVS EN ISO 10077-1:2017, Thermal performance of windows, doors and shutters – Calculation of thermal transmittance – Part 1: General (ISO 10077-1:2017). A standard window with the part of the frame in the amount of 30 % from the total area shall be viewed.

Table 4

Equivalent of Air Diffusion of Water Vapour Resistance s_d for Membrane Materials

No.	Product or material	Equivalent of air diffusion of water vapour resistance s_d (m)
1.	Polyethylene film 0.15 mm	50
2.	Polyethylene film 0.2 mm	75
3.	Polyethylene film 0.25 mm	100

4.	Polyester film 0.2 mm	50
5.	Polyvinyl chloride (PVC) film	30
6.	Aluminium foil 0.05 mm	1500
7.	Polyethylene film (squeeze-clamped) 0.15 mm	8
8.	Polyethylene film (squeeze-clamped) 0.20 mm	12
9.	Glassine 1 mm	2
10.	Prepared roofing paper	15
11.	Aluminium-based paper 0.4 mm	10
12.	Air pervious (breathing) windproof membrane	0.2
13.	Acrylic paint (0.1-0.2 mm layer)	1
14.	Latex paint (0.1 mm layer)	0.3
15.	Alkyd paint (0.1 mm layer)	4
16.	Polyurethane paint (0.03 mm layer)	4
17.	Silicate paint (0.1 mm layer)	0.2
18.	Vinyl wallpaper	2

Notes.
1. The warm side s_d of the structure element is the value of such layers which are located before the layer of thermal insulation up to the first air layer to be ventilated (internal layer).
2. The cold side s_d of the structure element is the value of such layers which are located after the layer of thermal insulation (inclusive) up to the first air layer to be ventilated (external layer).
3. For masonry and massive structure elements the total equivalent of air diffusion of water vapour resistance $s_{d,i}$ of the layers on the warm side thereof shall be not less than 2 m.
4. For structure elements of light-weight framework structures the total equivalent of air diffusion of water vapour resistance $s_{d,i}$ of the layers on the warm side thereof shall be not less than 5 m.
5. For structure elements of non-ventilated roofs with a non-ventilated structure of the roof covering the equivalent of air diffusion of water vapour resistance $s_{d,i}$ of the layers on the warm side thereof shall be not less than 50 m.

Table 5

Adjustment Coefficient $\Delta\lambda_w$ W/(m × K) for Thermal Insulating Materials and Products to be Used in the Structure Elements Depending on the Working Conditions of Thermal Insulation

No.	Name of the thermal insulating material or product, specific resistance or density of air permeability	Working conditions of thermal insulation	
		Ventilated structure element $\Delta\lambda_w$ (W/mK)	Non-ventilated structure element $\Delta\lambda_w$ (W/mK)
1.	Mineral wool (rock wool, glass wool) products with $R_a \leq 6$ kPa × s × m^{-2}	0.006	0.008

2.	Mineral wool (rock wool, glass wool) products with $R_a > 6$ kPa × s × m^{-2}	0.001	0.002
3.	Loose-fill mineral wool with $R_a \leq 6$ kPa × s × m^{-2}	0.008	may not be used
4.	Loose-fill pulp fibre (ecowool) r > 25 kg/m^3 ($R_a > 6$ kPa × s × m^{-2})	0.008	may not be used
5.	Hydraulically entangled pulp fibre ρ = 35–75 kg/m^3 ($R_a > 6$ kPa × s × m^{-2})	0.008	0.02
6.	Extruded polystyrene (XPS) plates	0.001	0.002
7.	Phenol and carbamide-formaldehyde plastic foam plates	0.02	0.03
8.	Aerated concrete $\rho \leq 400$ kg/m^3	0.015	0.02
9.	Aerated concrete $400 < \rho \leq 600$ kg/m^3	0.03	0.04
10.	Aerated concrete $\rho > 600$ kg/m^3	0.07	0.08
11.	Reed plates $\rho = 200$ kg/m^3	0.035	may not be used
12.	Perchlor vinyl plastic foam sheets	0.012	0.015
13.	Expanded polystyrene (EPS) plates	0.003	0.004
14.	Foam gypsum $\rho = 500$ kg/m^3	0.07	0.08
15.	Foam polyurethane and foam polyurethane plates	0.012	0.015
16.	Straw plates (with liquid glass binder) $\rho = 350$ kg/m^3	0.045	may not be used
17.	Fibrolite plates	0.002	0.003
18.	Arbolite plates	0.015	0.017
19.	Keramzite concrete $400 < \rho \leq 600$ kg/m^3	0.01	0.02
20.	Keramzite concrete $600 < \rho \leq 800$ kg/m^3	0.025	0.045
21.	Keramzite concrete $800 < \rho \leq 1000$ kg/m^3	0.05	0.07
22.	Peat plates $200 < \rho \leq 300$ kg/m^3	0.015	0.02
23.	Crude fibre and particle plates $\rho = 200$ kg/m^3	0.015	may not be used
24.	Crude fibre and particle plates $\rho = 1000$ kg/m^3	0.11	may not be used
25.	Foam glass $\rho = 200$ kg/m^3	0.02	0.025
26.	Foam glass $\rho = 400$ kg/m^3	0.035	0.04

Note. In ventilated air separating layers the thermal insulating products shall be protected from outside by a wind barrier or the surface thereof shall be provided with a thermal insulating product against enforced convection effects upon the thermal conductivity of the thermal insulating material. This condition does not apply to cold attics in which the speed of the airflow above the thermal insulating materials does not exceed 0.5 m/s.

Table 6

Adjustment Coefficient $\Delta\lambda_w$ W/(m × K) under Increased Humidity Conditions for Various Density r (kg/m^3) Thermal Insulating Materials which are in Direct Contact with the Soil

No.	Insulating product	For unilateral contact with the ground $\Delta\lambda_w$	For bilateral (mutual) contact with the ground $\Delta\lambda_w$
1.	Aerated concrete ρ = 300–600 kg/m^3	0.02-0.04	may not be used
2.	Keramzite concrete ρ = 400–600 kg/m^3	0.01-0.02	may not be used
3.	Keramzite fill ρ = 200–400 kg/m^3	0.05-0.06	0.06-0.07
4.	Mineral wool $\rho \geq 100$ kg/m^3	0.005	0.01
5.	Expanded polystyrene (EPS) $\rho \geq 30$ kg/m^3	0.01	0.02
6.	Extruded polystyrene (XPS) $\rho \geq 25$ kg/m^3	0.002	0.004

Table 7

Adjustment Coefficient $\Delta\lambda_w$ W/(m × K) under Increased Humidity Conditions for Extruded Polystyrene (XPS) Plates the Density of which ρ = 25–40 kg/m^{3}and which are in an Inverted Roof

No.	Type of a construction	$\Delta\lambda_w$ (W/mK)
1.	Open ventilated surface:	
1.1.	one extruded polystyrene (XPS) layer and gravel dike	0.001
1.2.	two extruded polystyrene (XPS) layers and gravel dike	0.003
2.	Closed unventilated surface:	
2.1.	roof terraces with extruded polystyrene (XPS) thermal insulation and covered with humus	0.008
2.2.	extruded polystyrene insulation (XPS) under pavement	0.008
2.3.	extruded polystyrene (XPS) insulation under concrete surface in car parks	0.008

Table 8

Weight Humidity w of Construction Products in Percentage for the Calculation of Thermal Inertia

No.	Material	Weight humidity w (%)
1.	Expanded polystyrene (EPS)	10
2.	Foam polyurethane	5
3.	Reinforced concrete	3
4.	Keramzite concrete	10
5.	Slag concrete	8
6.	Aerated concrete	12
7.	Mortar	4

8.	Brick wall	4
9.	Conifers	20
10.	Oak	15
11.	Particle boards	12
12.	Sand	2
13.	Keramzite	3
14.	Slag	4

Table 9

Thermotechnical Characteristics of Construction Products and Calculation Values

No.	Material	Density ρ_o (kg/m^3)	Humidity at a relative air humidity of 50 % and at a temperature of 23 °C $u_{23,50}$ (kg/kg)	Humidity at a relative air humidity of 80 % and at a temperature of 23 °C $u_{23,80}$ (kg/kg)	Humidity conversion coefficient f_u	Water vapour resistance factor μ	Specific heat capacity c J/(kg × K)
1.	Expanded polystyrene (EPS)	10-50	0.01	0.01	0.1	60	1450
2.	Extruded polystyrene (XPS)	20-65	0.001	0.0015	0.1	150	1450
3.	Foam polyurethane boards	28-55	0.02	0.03	0.3	60	1400
4.	Phenol plastic foam	20-50	0.02	0.03	0.2	50	1400
5.	Glass wool	10-120	0.004	0.005	2.5	1	1030
6.	Rock wool	15-200	0.004	0.005	2.5	1	1030
7.	Foam glass	100-150	0	0	0	10^6	1000
8.	Perlite boards	140-240	0.02	0.03	0.8	5	900
9.	Cork plates	90-160	0.05	0.07	1.0	10	1560
10.	Phenol and carbamide-formaldehyde plastic foam	10-30	0.1	0.15	0.7	2	1400
11.	Sprayed polyurethane foam	10-30	0.02	0.03	0.3	60	1400
12.	Wood wool with liquid glass	30-150	0.12	0.2	1.0	5	1600
13.	Wood wool with cement	250-450	0.06	0.1	1.0	5	1470

14.	Fibre board (soft)	150-250	0.1	0.16	1.5	10	1400
15.	Loose-fill glass wool	15-60	0.004	0.005	2.5	1	1030
16.	Loose-fill rock wool	20-60	0.004	0.005	2.5	1	1030
17.	Loose-fill cellulose-based fibre (Eco Wool)	20-60	0.11	0.18	0.5	2	1600
18.	Loose-fill foam perlite	30-150	0.01	0.02	3	2	900
19.	Loose-fill keramzite	200-400	0	0.001	4	2	1080
20.	Loose-fill expanded polystyrene (particulate matters)	10-30	0.01	0.02	0.2	2	1400
21.	Clay bricks	1000-2400	0.006	0.01	10	16	1000
22.	Calcium silicate	1000-2000	0.006	0.012	4	20	1000
23.	Pumice concrete	500-1300	0.025	0.045	2.6	50	1000
24.	Concrete with airtight filling	1600-2400	0.011	0.018	6.4	150	1000
25.	Industrially produced stone	1600-2400	0.011	0.018	6.4	150	1000
26.	Concrete filled with expanded polystyrene	600-1200	0.06	0.10	3	120	1000
27.	Keramzite concrete	400-700	0.02	0.03	2.6	6	1000

Table 10

Calculation Values of Thermotechnical Characteristics of Construction Products

No.	Group of materials	Material	Density ρ_o (kg/m^3)	Thermal conductivity λ_d W/(m × K)	Specific heat capacity c J/(kg × K)	Water vapour resistance factor μ
1.	Metals	aluminium	2700	220	890	∞ (10^6)
		duralumin	2800	160	880	∞ (10^6)
		brass	8400	120	380	∞ (10^6)
		bronze	8700	65	380	∞ (10^6)
		copper	8900	370	380	∞ (10^6)

		low-carbon steel	7900	75	450	∞ (10^6)
		pig iron	7500	50	450	∞ (10^6)
		alloy steel	7800	50	450	∞ (10^6)
		reinforcing steel	7850	58	480	∞ (10^6)
		stainless steel	7900	17	460	∞ (10^6)
		lead	11300	35	130	∞ (10^6)
		zinc	7100	110	380	∞ (10^6)
2.	Wood and materials on the basis thereof	homogeneous wood	150	0.07	1610	40
			300	0.10	1610	40
			500	0.13	1610	40
			1000	0.24	1610	40
		plywood	150	0.07	1610	400
			300	0.10	1610	400
			500	0.13	1610	400
			1000	0.24	1610	400
		particle board	300	0.10	1700	50
			500	0.14	1700	50
			700	0.18	1700	50
		particle board with concrete binder	1200	0.23	1500	50
		hardboard	400	0.09	1700	10
			600	0.15	1700	10
			800	0.18	1700	10
		pressed paperboard	1000	0.23	2300	10
		paper	1000	0.27	2300	–
		corrugated cardboard	650	0.18	2300	7
3.	Gypsum	gypsum	600	0.18	1000	10
			1500	0.54	1000	10
		gypsum paperboard	900	0.25	1050	10
4.	Mortar	normal masonry mortar, mixed on the building site	1800	0.9	1100	10
5.	Concrete	cast concrete with fragments or shingles	1600	0.7	1080	100
			2400	2.0	1060	130
		reinforced concrete	2500	2.0	840	100
		clay with straw	800	0.4	1260	–
		sawdust concrete	800	0.3	1460	2
			1000	0.4	1520	2.5
		slag concrete	1400	0.93	840	30

6.	Stones	basalt	2700-3000	3.5	860	10000
		granite	2500-3000	2.8	800	10000
		sandstone	2000-2500	2.0	860	40
		limestone	2000-2500	2.5	870	200
		dolomite	2400	2.2	880	10
7.	Soils	clay	1200-1800	1.5	1670-2500	–
		gravel and sand	1700-2200	2.0	910-1180	–
8.	Water, ice, snow	water (10 °C)	1000	0.6	4187	–
		ice (0 °C)	900	2.2	2000	–
		snow (new) < 30 mm	100	0.06	2000	–
		snow (new) 30–70 mm	200	0.12	2000	–
		snow (slightly sunk) 70-100 mm	300	0.23	2000	–
		snow (significantly sunk) > 200 mm	500	0.70	2000	–
9.	Plastering	cement-perlite	1000	0.3	840	4
		cement-slag polystyrene (XPS)	1400	0.7	840	6
		gypsum-perlite	600	0.25	840	4
		gypsum	1300	0.65	840	6
		limestone-sand-cement	1700	0.9	840	6
		limestone-sand	1600	0.8	840	5
		polymer cement	1800	1.0	840	10
10.	Glass	quartz glass	–	1.4	700	∞ (10^6)
		glass mosaic	2000	1.2	1000	∞ (10^6)
		simple window glass	2500	1.0	720	∞ (10^6)
11.	Gas	air	1.23	0.025	1008	1
		argon	1.7	0.017	519	1
		krypton	3.56	0.009	245	1
		xenon	5.90	0.0055	160	1
		carbon dioxide (CO_2)	1.95	0.014	820	1
12.		acrylic	1050	0.20	–	10000
		polycarbonate	1200	0.21	1200	5000

	Plastic, hard (without pores)	PTFE	2200	0.23	1000	10000
		hard polyvinyl chloride (PVC)	1390	0.18	900	50000
		polyvinyl chloride (PVC) with 40 % softener	1200	0.14	1000	50000
		polyethylene, high density (HD)	980	0.40	1800	100000
		polyethylene, low density (LD)	920	0.32	2100	100000
		polystyrene	1050	0.18	1300	100000
		polyacetal	1410	0.30	1400	100000
		phenol-formaldehyde	1400-1800	0.3-0.7	1200	–
		polypropylene	910	0.22	1700	10000
		EPDM	1150	0.20	1000	6000
		PMMA (acrylate)	1180	0.18	1500	–
		polyurethane	1200	0.25	1800	6000
		polyamide	1130	0.25	1700	–
		epoxy resins	1200	0.23	800-1400	10000
13.	Silicones	pure silicone	1000-1050	0.25-0.35	1000	5000
		filled silicone	1300-1450	0.35-0.5	1000	5000
14.	Rubber	polysobutylen	920	0.13	1130	–
		butyl (hot smelted)	1200	0.24	–	200000
		neoprene	1240	0.23	2140	
		porous rubber	60-80	0.04	1500	7000
15.	Glazing distance pieces	solid butyl rubber	–	0.24	–	200000
		polyester resins	1.4	0.19	1200	200000
		Kiesel gel	–	0.13	–	–
		silicone foam	–	0.12	–	–
16.	Materials for tamping	nylon	1140	0.23	1700	–
		urethane (liquid)	–	0.3	–	–
		silicone foam	–	0.12	–	–
		elastic vinyl	–	0.12	–	–
		flexible porous rubber	70	0.05	–	–
		polyethylene foam	36	0.06	2300	100
17.	Roofings	asphalt	2100-2300	0.7	1500	50000
		bitumen	1000	0.13	1000	50000

		prepared roofing paper	1100	0.23	1000	50000
		clay roof tiles	1900	0.9	900	10
		concrete roof tiles	2100	1.4	1000	50
18.	Floor coverage	linoleum	1300	0.17	1400	5000
		cork linoleum	500-700	0.10	1300	1500
		carpet floors	–	0.07	–	5
		plastics and rubber	1200-1700	0.17-0.27	1400	10000
19.	Solid brick wall	ceramic bricks sand-cement grout	1800	0.81	880	10
		silicate bricks sand-cement grout	1800	0.87	880	10
20.	Hollow brick wall	ceramic bricks 1400 kg/m^3gross sand-cement grout	1600	0.64	880	155
		ceramic bricks 1300 kg/m^3gross sand-cement grout	1400	0.58	880	15
		ceramic bricks 1000 kg/m^3gross sand-cement grout	1200	0.52	880	15
		silicate bricks sand-cement grout	1500	0.81	880	15
		silicate bricks sand-cement grout	1400	0.76	880	15

Minister for Economics R. Nemiro