

Analysis of changes in the thickness of insulating materials in recent years

It is estimated that approximately 75% of occupied buildings in Poland are not energy efficient to various degrees. They have to be renovated and require solutions that reduce energy losses. This article discusses these changes.

TOWARDS ENERGY EFFICIENCY

In Poland and other European countries, there are initiatives aimed at reducing the consumption of energy required to heat buildings as well as reducing carbon dioxide emissions. As of 1 January 2021, there are new requirements defining the heat transfer coefficient for exterior walls of heated premises in residential buildings, i.e., $U = 0.20$ [W/(m²K)]. When compared with the requirements from the 1990s, this represents an increase of the coefficient by 63%.

PERIOD	LEGAL REQUIREMENT	EXTERIOR SPACE DIVIDER		
		WALL	ROOF	FLOOR
1993-2001	applicable construction standards	0.55	0.40	0.60
2002-2008	regulations on the technical requirements for buildings and their location	0.30	0.30	0.60
2009-2013	regulations on the technical requirements for buildings and their location	0.30	0.25	0.45
2014-2016	regulations on the technical requirements for buildings and their location	0.25	0.20	0.30
2017-2020	regulations on the technical requirements for buildings and their location	0.23	0.18	0.30
FROM 1/1/2021	regulations on the technical requirements for buildings and their location	0.20	0.15	0.30

floor above an unheated room or confined underfloor space (e.g., floor above a garage, basement, etc.)

INCREASINGLY THICKER INSULATION?

The aforementioned changes have a direct impact on insulation thickness. Let's take a look at how the regulatory changes in recent years would increase the thickness of polystyrene board if the lambda parameter stayed the same, i.e., if we used boards with the same lambda parameters. The calculations are based on structural materials available both in 1993 and in 2021, i.e., an exterior wall made of hollow clay blocks with a thickness of 24 or 25 cm, insulated with polystyrene with heat transfer coefficient $\lambda = 0.045$ W/(mK).

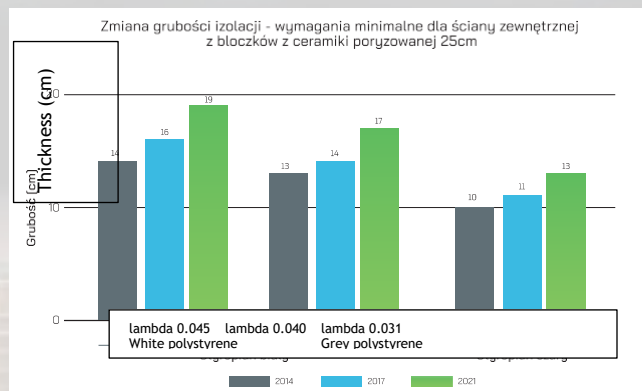
PERIOD	EXTERIOR SPACE DIVIDER - COMPOSITE WALL	
	REQUIRED U COEFFICIENT (W/m ² K)	REQUIRED POLYSTYRENE THICKNESS (cm)
1993-2001	0.55	5
2002-2008	0.30	12
2009-2013	0.30	12
2014-2016	0.25	15
2017-2020	0.23	16
FROM 1/1/2021	0.20	20

This resulted in intense efforts of the manufacturers of thermal insulation materials to improve the heat transfer coefficient.

EXAMPLE OF INSULATION USE

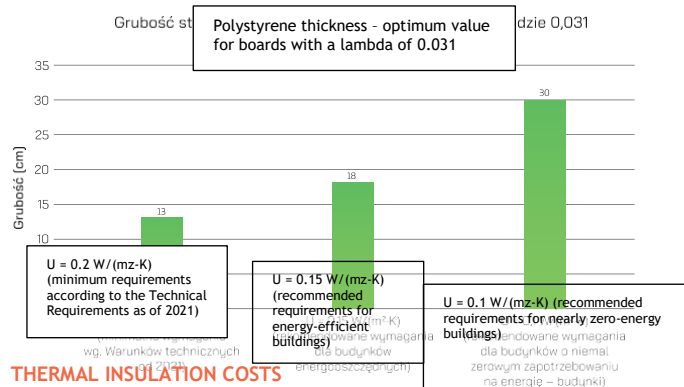
Let's consider an exterior wall made of hollow clay blocks with a thickness of 25 cm. To meet the minimum technical requirements effective as of 2021, it is sufficient to use white polystyrene boards with a thickness of 19 cm or grey polystyrene boards with a thickness of 13 cm. This shows that modern insulating materials can achieve good performance with smaller thickness.

Change in insulation thickness - minimum requirements for exterior walls from 25-cm lightweight clay blocks



THE PATH TO ENERGY SAVINGS

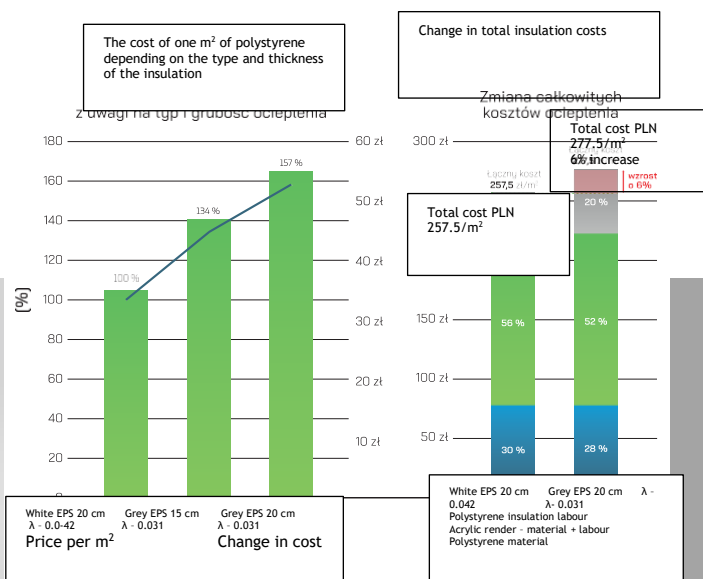
Considering the current changes in the requirements and the work on regulations covering the European programmes, the insulation requirements for exterior walls are expected to increase in the next few years.



THERMAL INSULATION COSTS

In the face of rising costs, builders carefully consider their choices. It is important to understand two perspectives of costs - the cost of the material itself and the cost of the project.

The chart below shows a comparison of different polystyrene boards that meet the applicable minimum technical requirements ($U=0.20$ [W/(m²K)]).



CONCLUSIONS:

- 1) The increasing requirements for the thermal insulation of buildings require thicker insulation layers.
- 2) Using grey polystyrene boards enables better performance without increasing thickness.
- 3) Selecting the right polystyrene can help achieve better performance without generating excessive costs.

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