

## Primary Energy Demand Insulation

	Lambda (W/mK)	Thickness (mm)	R-Value (m2K / W)	U-Value W/(m2K)	Primary Energy Demand (kWh/m2)	Heat Reflection Effect
Extruded polystyrene, XPS	0,032	200	6,25	0,16	140-200	no
Extruded polystyrene, XPS	0,035	200	5,71	0,175	140-200	no
EPS	0,040	200	5,00	0,200	40-150	no
Rock wool	0,035	200	5,71	0,175	30-80	no
Glas wool	0,035	200	5,71	0,175	50-100	no
Perlite	0,045	200	4,44	0,225	20-30	no
Foam glass	0,045	200	4,44	0,225	150-350	no
Cellulose	0,035	200	5,71	0,175	15-20	no
Softwood fibre	0,050	200	4,00	0,250	120-300	no
Hemp fibre	0,045	200	4,44	0,225	10-15	no
Flax fibre	0,037	200	5,40	0,185	10-15	no
THERMOLINE ISOFOLIE T1	0,0198	18	0,909	1,100	1	yes
THERMOLINE ISOFOLIE T2,5	0,0198	36	1,818	0,550	1	yes
THERMOLINE ISOFOLIE T3	0,0198	54	2,727	0,366	2	yes
THERMOLINE ISOFOLIE T3,5	0,0198	63	3,411	0,293	2	yes
THERMOLINE ISOFOLIE T4	0,0198	81	4,090	0,244	3	yes
THERMOLINE ISOFOLIE T4,5	0,0198	99	5,000	0,200	4	yes
THERMOLINE ISOFOLIE T5	0,0198	117	5,909	0,169	5	yes

Source IWU - ISOFOLIE-THERMOLINE

Calculation of demand for insulation Primary energy 450 m2

Single-family house 15 x 15 m = approx. 200 m2 living area

External wall area/insulation area/storey height 3 m = approx. 200 m2

Roof area 15° pitch = approx. 250 m2



The most commonly used insulation material is extruded polystyrene, or XPS for short.

XPS requires 101 MJ/kg of energy to produce. It has a density of 25 kg/m<sup>3</sup>. Assuming an insulation thickness of 20 cm, the weight per square metre is 5 kg.

5 kg/m<sup>2</sup> x 101 MJ/kg gives 505 MJ per square metre.

3.6 MJ is equal to 1 kWh. 505 MJ / 3.6 = 140 kWh/m<sup>2</sup>.

The production of one square metre of XPS requires 140 kWh of energy.

To insulate a single-family house with a floor area of 15 x 15 m (façade and roof) requires about 450 square metres of insulation. 450 m<sup>2</sup> x 140 kWh/m<sup>2</sup> = 63,000 kWh of energy. This does not include the energy expenditures for transport to the construction site. Up to 100,000 kWh of energy are consumed to carry out the complete insulation measure.

Primary Energy Demand with XPS 450 m2 Without Transport	Primary Energy Demand with THERMOLINE ISOFOLIE T5 450 m2 Without Transport
63.000 kWh	2.227,5 kWh
Insulation thickness 20 cm	Insulation thickness 11,7 cm
Without Heat Reflection Effect	With Heat Reflection Effect

For a single-family house with 200 m2 of floor space, it takes about 20,000 kWh to heat it for a year (standard of the 1995 Thermal Insulation Ordinance with 100 kWh / m2 and year).

This assumption is calculated much too high in the interest of the insulation lobby.

Approx. 20% of the total heat demand is lost through the façade, approx. 20% through the roof. That is approx. 8,000 kWh. Since roof and façade insulation does not prevent warm air loss, but delays heat flow, only 30% of these losses can be taken into account. That is then approx. 2,400 kWh. If one assumes an energy saving of 2,400 kWh per year caused by the roof and façade insulation, it will take about 50 years for the roof and façade insulation to save the invested energy.

### **And that is not all**

2,400 kWh energy savings per year correspond to approx. 240 litres of heating oil. At an oil price of € 0.60 (as of 03/2018), this is a saving of € 144/year. The renovation of the roof and façade of a single-family house involves a total investment of up to € 100,000, so the heating cost savings of € 144 do not even cover the interest expenses. The half-life of a façade insulation is about 25 years. After 25 years, the façade insulation must be reworked or replaced. Cracks have to be repaired and a new coat of paint is often due because of increased soiling and algae formation on insulation facades. This again costs energy. The normal service life of insulation façades is not yet known exactly. The insulation façades produced in the 1980s do not bode well. There are still no reliable statements about the costs of recycling insulation materials. But it is to be expected that these costs will be higher than those of production.

A rough estimate of the pure energy balance shows that energy savings through roof and façade insulation are completely impossible, regardless of the price structure. The insulation industry and the profiteers of the energy turnaround from all parties will of course claim the opposite. So dear environmentalists, know-it-alls and experts from the building segment, keep your hands off toxic and energy-destroying insulation materials.

