

Technical Assessment Body issuing the European Technical Assessment:

Instituto de Ciencias de la Construcción Eduardo Torroja (IETcc)

Trade name of the construction product

BOLTHERM

Product family to which the construction product belongs

Thermal insulation products for buildings with radiant heat reflective components

Manufacturer

Ropre, S.A.
Parque industrial, Rua M, Lote 15
6200 - 027 Covilha, Portugal

Manufacturing plant(s)

Parque industrial, Rua M, Lote 15
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This European Technical Report contains

7 pages

This European Technical Report is issued in accordance with

European Assessment Document (EAD) N.º 040007-00-1201 for “Thermal insulation products for buildings with radiant heat reflective components”

1. GENERAL

The reflective product BOLTHERM is composed by two external aluminium films (min. 99% of purity) cover with an external coat of PET (Polyethylene Terephthalate) and other of PE (Polyethylene) of emissivity 0.4, linked by a thermo-welded to several internal layer of polyethylene. The total thickness of the product goes from 5.0 to 20 mm.

The tests were carried out at the laboratories of the Instituto Ciencias de la Construcción Eduardo Torroja. The assessment of the fitness for use of the BOLTHERM according to the Essential Requirements nº 2, 3 and 6 was carried out in compliance with to (EAD) N° 040007-00-1201 for “Thermal insulation products for buildings with radiant heat reflective components”

2. DESCRIPTION OF PRODUCT

The system “BOLTHERM” is constituted by:

Trade name	Composition
BOLTHERM 121P	Constituted by two external aluminium films (6.5 µm) protected with an external coat made of PET (12 µm) + PE (20 µm), and a core of recycled PE/PET bubbles (5mm). The total thickness is 5 mm.
BOLTHERM 121P IGN	Constituted by two external aluminium films (6.5 µm) protected with an external coat made of PET (12 µm) + PE (20 µm), and a core of recycled PE/PET bubbles (5mm) + Fire Resistant Component. The total thickness is 5 mm.
BOLTHERM 231P	Constituted by two external aluminium films (6.5 µm) protected with an external coat made of PET (12 µm) + PE (20 µm), and a core of two recycled PE/PET bubbles layers (4 mm + 4 mm). The total thickness is 8 mm.
BOLTHERM 235P	Constituted by two external aluminium films (6.5 µm) protected with an external coat made of PET (12 µm) + PE (20 µm), and a core of two recycled PE/PET bubbles layers (5 + 5 mm) separated with a PE foam (3mm). The total thickness is 13 mm.
BOLTHERM 235P IGN	Constituted by two external aluminium films (6.5 µm) protected with an external coat made of PET (12 µm) + PE (20 µm), and a core of two recycled PE/PET bubbles layers (5 + 5mm) separated with a PE foam (3 mm) + Fire Resistant Component. The total thickness is 13 mm.
BOLTHERM 820	Constituted by two external aluminium films (6.5 µm) protected with an external coat made of PET (12 µm) + PE (20 µm), and a core of 9 PE foam (2 mm) + 8 PET metalized (12 µm). The total thickness is 20 mm.
BOLTHERM 809	Constituted by two external aluminium films (6.5 µm) protected with an external coat made of PET (12 µm) + PE (20 µm), and a core of 4 PE foam (2 mm) + 3 PET metalized (12 µm). The total thickness is 13 mm.
BOLTHERM 61006	Constituted by two external aluminium films (6.5 µm) protected with an external coat made of PET (12 µm) + PE (20 µm), and a core of 1 PE foam (5 mm). The total thickness is 5 mm.
Adhesive band	Refª. – 903 2 (50 mm x 50 m) Refª. – 904 (75 mm x 50 m) Band constituted by aluminium layer of 30 µm without any external protection and an adhesive based on Styrene Butadiene Rubber (SBR).

3. PREPARATION OF SAMPLES

The preparation of the samples to perform the tests was carried out by the IETcc, in its laboratory. The product was conditioned at temperature of 23 °C (±2) and 50 % (±5) relative humidity.

4. RESULTS AND ASSESMENT OF PERFORMED TEST

4.1 ER.2 Safety in case of fire

Reaction to fire (2.2.1). No performance assessed (NPA).

4.2 ER.3 Hygiene, health and environment

Biological resistance (2.2.2). Not relevant for products made out of film or PE/PP foam or other plastic foams

4.3 ER.4 Safety and accessibility in use

Corrosion developing capacity (2.2.3). The test is carried out according to the EN ISO 9227:1991: “Corrosion tests in artificial atmospheres – Salt spray tests”. The purpose of the test is to check the product coating behaviour in regard to corrosion, when it is subject to the action of sodium chloride atmospheric solutions (for example salt fog, neutral type: NSS).


The dimensions of the test specimens are: 200 x 200 mm. The exposure times are: 24 h, 48 h, 96 h, 168 h. Number of test specimens test: 5. The test specimens are carried out as follows:

- test specimens are cut from the central area of the roll, away from the edges,
- test specimens are cleaning with distilled water,
- orientation: test specimens are exposed in the spray chamber so that they are plane and installed facing to the top, with an angle of 20° (15 - 25°) approximately compared to the vertical,
- test specimens are not in contact with the walls of the room nor with any metallic material and are installed suspended on the air through a support made of synthetic material (inert insulating).

Mode of cleaning of the test specimens after each period of exposure: Rising with distilled water gently without brushing it. After each exposure time, the specimens are checked to measure the weight and to carry out a visual control.

The temperature of test	35 °C
The temperature of liquid solution	45 °C
The pH of the solution of test and the solution collected	6.5 -7.2
Salt concentration	50 g/l

There weren't loss weights of each batch to the different exposure time. The visual checking does not detect any significant defect.

Aluminium without external PET									
	Weight (g)		Visual Aspect after the following hours					Pictures	Emissivity
	Initial	Ageing 168h	2	6	48	96	168		
P1	2.15	2.16	Without relevant changes						0,05
P2	2.13	2.12							0,05
P3	2.23	2.23							0,05
P4	2.16	2.17							0,05
P5	2.26	2.26							0,05

External Aluminium coat with PET									
	Weight (g)		Visual Aspect after the following hours					Pictures	Emissivity
	Initial	Ageing 168h	2	6	48	96	168		
P1	1.39	1.39	Without relevant changes						0.51
P2	1.46	1.46							0.53
P3	1.38	1.38							0.52
P4	1.43	1.42							0.52
P5	1.38	1.39							0.53

4.4 ER.5 Protection against noise. NPA

4.5 ER.6 Energy economy and heat retention

Core thermal resistance (2.2.9). The core thermal resistance is determined according to the EN 12667 “Thermal performance of building materials and products - Determination of thermal resistance by means of guarded hot plate and heat flow meter methods - Products of high and medium thermal resistance”. The core thermal resistance is measured with a pile of four test specimens in order to have a sufficient thickness according to EN 12667: NPA

Emissivity (2.2.11). The emissivity of the product is measured according to the EN 16012 and then given according to accelerated ageing described in this standard (The samples are kept for 28 days at 70 °C of temperature and 95% RH).

Samples	Aluminium with PET protection (TECNALIA, test report 090811)	
	Initial	28 d
1	0.41	0.40
2	0.41	0.39
3	0.42	0.43
Average	0.41	0.41

The emissivity was also determined with the emisometer in according with ASTM C 1371-97 “Standard Test Method for Determination of Emittance of Materials Near Room Temperature Using Portable Emisometer at initial and ageing at 28 and 90 days.

Samples	Aluminium layer without PET					
	Batch 1		Batch 2		Batch 3	
	Initial	28d / 90d	Initial	28d / 90d	Initial	28d / 90d
1	0.05	0.05	0.05	0.05	0.05	0.05
2	0.05	0.05	0.05	0.05	0.04	0.05
3	0.06	0.05	0.05	0.05	0.04	0.05
4	0.04	0.05	0.05	0.05	0.05	0.05
5	0.05	0.05	0.05	0.05	0.05	0.05
6	0.05	0.05	0.05	0.05	0.05	0.05
Average	0.05	0.05	0.05	0.05	0.05	0.05

Samples	Aluminium layer with PET					
	Batch 1		Batch 2		Batch 3	
	Initial	28d / 90d	Initial	28d / 90d	Initial	28d / 90d
1	0.41	0.41	0.41	0.42	0.41	0.41
2	0.42	0.41	0.42	0.41	0.41	0.41
3	0.43	0.41	0.42	0.43	0.41	0.41
4	0.49	0.41	0.43	0.44	0.44	0.44
5	0.49	0.43	0.43	0.45	0.43	0.44
6	0.44	0.43	0.43	0.46	0.42	0.44
Average	0.42	0.41	0.42	0.43	0.42	0.43

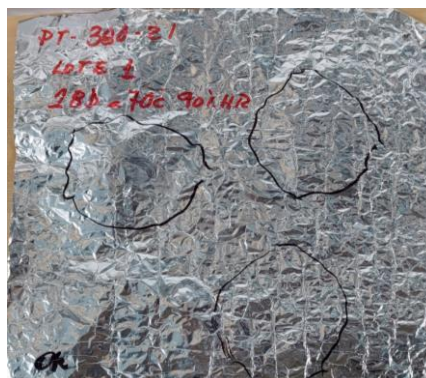


Photo 1. Samples of aluminum without PET after 28d ageing

The factors making it possible to determine ϵ_D are:

- factor of ageing, obtained by comparison of the test results before and after ageing of external surfaces of the product: $F_a = 1$,
- safety factor related to the mode of self-quality control of emissivity: $\Delta\epsilon = 0$,

The fractile value of emissivity is $\epsilon_S = \epsilon(10\text{ °C}, 90/90) = 0.43$ (aluminum with PET) / 0,05 (aluminum without PET), representing at least 90 % of the production with a confidence limit of 90%. The declared value of thermal resistance is $\epsilon_D = 0.4$ ((aluminum with PET) / 0.05 ((aluminum without PET).

The average initial and the ageing emissivity of the adhesive band were:

Adhesive band			
Samples	Initial	28d	90d
1	0.05	0.05	-----
2	0.05	0.05	-----
3	0.05	0.05	-----
4	0.05	0.05	-----
5	0.04	0.04	-----
Average	0.05	0.05	-----

Water vapour diffusion resistance (2.2.12). The test is performed according to EN 12086 “*Thermal insulating products for building applications. Determination of water vapour transmission properties*”. Since this product is watertight to the water vapor, the test was performed on a sample formed with two pieces of layer joined with the adhesive band. The test was performed on 5 samples at 23 °C, relative humidity 90-95%. The surface of the samples was of 50 cm² and Cl₂Ca was used as desiccant. The thickness to μ calculation was 0.004 m.

Samples	Membrane	Overlap membrane + adhesive tape
	g/(m ² d)	g/(m ² d)
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
Maximum value	0	0
μ	-	> 20 000

Water absorption (2.2.13). NPA

Watertightness (2.2.14). NPA

Geometry (2.2.15). The thickness of the product is determined according to EN 823 “*Thermal insulation products for building applications - Determination of thickness*”. The test is carried out with a load of 50 Pa.

The length and the width of the products is determined according to EN 822 “*Thermal insulation products for building applications - Determination of length and width*”. The deviation from nominal length does not exceed (-2 %, +5 %) and from width does not exceed ± 2 %.

Mass per square meter (g/m²) (2.2.16). It is determined according to EN 1602 “*Thermal insulating products for building applications - Determination of the apparent density*”

Product	Width (m)	Length (m)	Thickness (mm)	Surface roll (m ²)	g/m ²
BOLTHERM 121P	1,20	50	5	60	330
BOLTHERM 121P IGN	1,20	50	5	60	330
BOLTHERM 231P	1,20	25	8	30	600
BOLTHERM 235P	1,20	20,8	13	25	780
BOLTHERM 235P IGN	1,20	20,8	13	25	780
BOLTHERM 820	1,20	12,5	20	15	440
BOLTHERM 809	1,20	16,7	10	20	230
BOLTHERM 61006	1,20	33,33	5	40	250

Squareness (2.2.17). NPA.

Compressive strength for products exposed to compression loads (2.2.18). NPA

Dimensional stability (2.2.19). The measurement of Dimensional stability is carried out according to EN 1604 “*Thermal insulating products for building applications. Determination of dimensional stability under specified temperature and humidity conditions*”. Five square test specimens were taken, with a length of 200 ± 1mm. The specimens were kept at 70 ± 2 °C during 48 hours; after this period they were left to cool at 23 °C during a period exceeding 4 hours. The method use was the B (calibre method).

Dimensional Stability (Δ%)			
Samples	Width	Length	Thickness
BOLTHERM 121P / BOLTHERM 121P IGN	0	0	+ 10 %
BOLTHERM 231P	0	0	- 1 %
BOLTHERM 235P / BOLTHERM 235P IGN	0	0	- 4 %
BOLTHERM 820	0	0	NPA
BOLTHERM 809	0	0	NPA
BOLTHERM 61006	0	0	+ 10 %

Tensile strength parallel to face (2.2.20). NPA



Tensile strength perpendicular to face (2.2.21). EN 1607, “*Thermal insulating products for building applications. determination of tensile strength of tensile strength perpendicular to faces*” before and after accelerated ageing. The speed of the test was 10 mm/min. The dimensions of the samples are 100 x 100 mm. The dimensions of the samples with the adhesive band are 50 x 50 mm.

Tensile strength perpendicular to face (kPa)		
Samples	Initial	Ageing 28 d, 70 °C, 95 % HR
BOLTHERM 121P / BOLTHERM 121P IGN	0.3 (c)	0.3 (c)
BOLTHERM 231P	0.3 (c)	0.3 (c)
BOLTHERM 235P / BOLTHERM 235P IGN	0.3 (c)	0.3 (c)
BOLTHERM 820	-----	-----
BOLTHERM 809	-----	-----
BOLTHERM 61006	0.7 (c)	0.5 (c)

c), Type of rupture is for the core of the product

Resistance to rearing (nail) (2.2.22). The measurement of resistance to tearing is carried out according to EN 12310-1 “*Flexible sheets for waterproofing - part 1: bitumen sheets for roof waterproofing - determination of resistance to tearing (nail shank)*”, before and after accelerated ageing. The tests were performed at 23 ± 2 °C and a speed of 100 ± 1 mm/min.

The weakest product with the different external aluminum foil was chosen to make this test.

Resistance to tearing (N) (minimum /average)		
Samples: nail / staple	Initial	Ageing 28 d, 70 °C, 95 % HR
BOLTHERM 121P IGN (aluminum ALLOY 1235 / 8079) 	67 / 62	50 / 57
BOLTHERM 61006 (aluminum ALLOY 1235 / 8079) 	67 / 69	65 / 70

Peel Strength or mechanical resistance of adhesive tape (2.2.23). The test is carried out according to EN ISO 11339 “Adhesives - T-peel test for flexible-to-flexible bonded assemblies” on the samples before and after accelerated ageing.

Resistance to peeling is determined by the measurement of the strength of peeling of a adhesive tape joint bonded in form of a T, made of a flexible material (adhesive tape) on the surface of the reflective product. The adhesive tape used for test is the one specified for the relative assembly of the product when implemented (used to put together the product parts). 5 test specimens were tested with the following dimensions: 200 mm x 50 mm (width of the adhesive band). The speed of the machine was **100 mm/min**, the resistance of adhesion is taken equal to the average of the strength for a separated length of at least 100 mm. The results are express in N on five samples of 5 cm of width.

Peel strength. R. maximum (N/5cm) (minimum / average)		
Samples	Initial	Ageing 28 d, 70 °C, 95 % HR
Tape Adhesive	1.5 / 2	2 / 2.5

Compressive creep for products exposed to compression loads 2.2.24). NPA

Behaviour under point load for products exposed to compression loads (2.2.25). NPA