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Trade name of the construction product

Designação comercial do produto de construção

Product family to which the construction product belongs

Família de produtos a que o produto de construção pertence

Manufacturer

Fabricante

Manufacturing plant(s)

Instalações de fabrico

This European Technical Assessment contains

A presente Avaliação Técnica Europeia contém

This European Technical Assessment is issued in accordance with Regulation (EU) No. 305/2011, on the basis of

A presente Avaliação Técnica Europeia é emitida ao abrigo do Regulamento (UE) n.º 305/2011, com base no

This European Technical Assessment

A presente Avaliação Técnica Europeia

GRISOL NS, GRISOL BS, GRISOL NP2, GRISOL BP2

Inverted Roof Kits based on extruded polystyrene insulation (XPS) with cement mortar protective finishing

Kits para isolamento térmico de coberturas invertidas com isolamento de poliestireno expandido extrudado (XPS) e proteção superficial de argamassa de cimento

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8 pages, including 1 annex which forms an integral part of this assessment

8 páginas, incluindo 1 anexo que faz parte desta avaliação

European Assessment Document (EAD) No. 041827-00-0401: Kits made of insulation boards with protective finishing for inverted roofs

Documento de Avaliação Europeu (EAD) n.º 041827-00-0401: Kits para isolamento térmico de coberturas invertidas com placas de isolamento e proteção superficial

Replaces ETA 15/0700 issued on 19/11/2018

Substitui a ETA 15/0700 emitida em 19/11/2018

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1. Technical description of the product

This European Technical Assessment applies to the inverted roofs insulation kits with protective finishing comprising components which are factory-produced by the manufacturer or products and component suppliers. The ETA holder is ultimately responsible for all components of the Inverted Roof Insulation Kits specified in this ETA.

The Inverted Roof Kits use factory-made composite insulation components, hereafter referred to as composite insulation, which are constituted by extruded polystyrene (XPS) thermal insulation with integral protective finishing screed, combined with a separation layer.

Depending on the different alternatives of cement and screed finishing, four types of composite insulation boards are identified and designated by, respectively:

- GRISOL NS: modified cement mortar and smooth finishing;
- GRISOL NP2: modified cement mortar and porous finishing;
- GRISOL BS: modified white cement mortar and smooth finishing;
- GRISOL BP2: modified white cement mortar and porous finishing.

The thermal insulation boards are manufactured (either by Dow Chemical Company or by Iberfibran, Poliestireno Extrudido, S.A.) using XPS boards according to EN 13164:2012+A1:2015.

The extrusion skin of the surface of the XPS insulation in contact with the protective finishing is removed and the surface presents an orthogonal grooved grid pattern in order to complement the mutual adhesion provided by an adhesive layer.

The inverted roof composite insulation has a rebate (shiplap) joint type and has the following dimensions:

Nominal length: 600 mm

Nominal width: 600 mm

XPS nominal thicknesses: 40 mm to 120 mm

Finishing screed thickness: 25 mm or 35 mm

The European Technical Assessment is issued for the product on the basis of agreed data/information, deposited with Laboratório Nacional de Engenharia Civil, which identifies the product that has been assessed and judged. The European Technical Assessment applies only to products satisfying the requirements of this agreed data/information.

2. Specification of the intended use in accordance with the applicable European Assessment Document (EAD)

The loose-laid inverted roof insulation kits are intended for use in fully supported specifications above a waterproofing layer in flat roofs.

The kits may be used in new or existing construction works and in the following flat roof areas:

- untrafficked areas;
- pedestrian trafficked areas.

Where necessary the composite component is used in conjunction with a separation layer and additional ballast may be required due to wind uplift forces acting on the roof.

Apart from meeting specific insulation requirements also requirements and regulations concerning components and materials to be used in combination with the thermal insulation as well as the entire roof buildup are necessary for the successful use of the insulation in the inverted roof. Evaluation of the thermal insulation takes account of the end-use conditions.

Concerning the application of the insulation materials, the respective national regulations shall be observed.

The design value of the thermal conductivity or thermal resistance shall be laid down according to relevant national provisions.

For evaluating the Inverted Roof Kits GRISOL NS, NP2, BS and BP2, as illustrated in the Annex, it is assumed that:

- a. The existing waterproofing layer shall be watertight and in good condition;
- b. The building shall be sufficiently structurally sound to carry the additional imposed load exerted by the assembled system;

- c. Roofs shall be properly designed with adequate falls/drainage;
- d. Regular maintenance of the roof shall be conducted;
- e. The finishing screed ensures protection against the effects of ultra violet radiation;
- f. Separation layers and other components of the assembled system shall be rot-resistant.

This European Technical Assessment, based on the provisions, test and assessment methods in EAD 041827-00-0401, have been written based upon the assumed intended working life of the Inverted Roof Insulation Kit for the intended use of 25 years, provided that the kit is subject to appropriate use and maintenance.

The indications given on the working life cannot be interpreted as a guarantee given by the producer, but are to be regarded only as a means for choosing the right product in relation to the expected economically reasonable working life of the works.

3. Performance of the product and references to the methods used for its assessment

Sampling, conditioning, testing and assessment for the intended use of this Inverted Roof Kits according to the Essential Requirements were carried out in compliance with EAD 041827-00-0401 – *Kits made of insulation boards with protective finishing for inverted roofs* (designated in this ETA as EAD 041827).

Table 1 presents the relevant performance of the product and the corresponding methods used in its assessment.

TABLE 1

Performance of the product and methods used for its assessment

Basic requirement for construction work	Essential characteristic	Assessment method	Type of expression of product performance (level, class, description)
BWR 1 Mechanical resistance and stability	–	Not applicable	Not relevant
BWR 2 Safety in case of fire	Reaction to fire	EN 13501-1 CDR 2016/364	Class E XPS insulation: Class E Finishing screed: Class A1/A _{fl}
	External fire performance	EN 13501-5 (classification) CEN/TS 1187 (test methods) Decision 2000/553/EC	Performance not assessed No classification needed for the following inorganic coverings: <ul style="list-style-type: none"> • Loose laid gravel with a thickness of at least 50 mm or a mass $\geq 80 \text{ kg/m}^2$ (minimum aggregate size 4 mm, maximum 32 mm) • Sand/cement screed to a thickness of at least 30 mm • Cast stone or mineral slabs of at least 40 mm thickness
BWR 3 Hygiene, health and the environment	Water vapour transmission of insulation	EN 12086	$\mu = 70 - 100$
	Water vapour transmission of protective layer and adhesive	EN 1015-19	$S_{d(\text{GRISOL NS, GRISOL BS})} < 0.8 \text{ m}$ $S_{d(\text{GRISOL NP2, GRISOL BP2})} < 0.5 \text{ m}$
	Chemical resistance	Description	Declaration by the manufacturer (list of chemicals or chemical families with which the insulation shall not come into contact)
	Compatibility with other components of the assembled system	Description	Declaration by the manufacturer

TABLE 1

Performance of the product and methods used for its assessment (cont.)

Basic requirement for construction work	Essential characteristic	Assessment method	Type of expression of product performance (level, class, description)
BWR 4 Safety and accessibility in use	Resistance to wind load	EN 822	Mass per unit area
	Slip resistance	EN 13893	$\mu = 0.64$
	Hard body impact resistance (after ageing and freeze-thaw)	EAD 041827, Annex A	No cracking, indentation, flaking and/or delamination of the finishing screed from the thermal insulation
	Tensile bond strength (before and after ageing and freeze-thaw)	EN 1607	$\sigma_{mt} > 80 \text{ kPa}$
	Static loading (Point loading)	EAD 041827, Annex B	No degradation of the finishing screed (no cracking, indentation and/or flaking)
	Wear resistance	CEN/TS 12633	PTV = 72
	Freeze-thaw resistance of insulation with protective finishing	EN 12091 EAD 041827, 2.2.7.7	$d_N \leq 50 \text{ mm}$: $W_v < 2\%$ [FT2] acc. to EN 13164 $d_N > 50 \text{ mm}$: $W_v < 1\%$ [FT1] acc. to EN 13164 No damage/degradation (cracking, flaking and/or delamination) on the surface of the protective finishing
	Ageing of insulation with protective finishing	EAD 041827, 2.2.7.6 (water absorption by capillarity following rain/heat cycles)	$W_p < 1.0 \text{ kg/m}^2$
	Mass per unit area	EN 822 EN 823 Weighing balance $d = 5 \text{ g}$	Screed finishing nominal thickness (d_N) GRISOL NS and BS composite boards $d_N = 25 \text{ mm}$: $53.5 \text{ kg/m}^2 \pm 10\%$ $d_N = 35 \text{ mm}$: $73.0 \text{ kg/m}^2 \pm 10\%$ GRISOL NP2 and BP2 composite boards $d_N = 25 \text{ mm}$: $51.5 \text{ kg/m}^2 \pm 10\%$ $d_N = 35 \text{ mm}$: $69.0 \text{ kg/m}^2 \pm 10\%$
	Protective finishing characteristics	EN 823	$d_N = (25 \pm 5) \text{ mm}$ $d_N = (35 \pm 5) \text{ mm}$
	thickness (d_N)	EN 1015-10	$\rho_{\text{(GRISOL NS and BS)}} = 1975 \text{ kg/m}^3 \pm 10\%$ $\rho_{\text{(GRISOL NP2 and BP2)}} = 1875 \text{ kg/m}^3 \pm 10\%$
	density (ρ)	EN 1015-11	$f_{cm \text{ (GRISOL NS and BS)}} > 13.0 \text{ N/mm}^2$ $f_{cm \text{ (GRISOL NP2 and BP2)}} > 10.0 \text{ N/mm}^2$
BWR 5 Protection against noise	compressive strength	EN 1015-11	$f_m \text{ (GRISOL NS and BS)} > 3.2 \text{ N/mm}^2$ $f_m \text{ (GRISOL NP2 and BP2)} > 3.1 \text{ N/mm}^2$
	flexural strength (f_m)		
	Adhesive characteristics (type, coating weight)	Description	Declaration by the manufacturer Water based acrylic resin Coating weight: $100 \text{ g/m}^2 \pm 10\%$
	—	No requirements	Performance not assessed

TABLE 1

Performance of the product and methods used for its assessment (cont.)

Basic requirement for construction work	Essential characteristic	Assessment method	Type of expression of product performance (level, class, description)
BWR 6 Energy economy and heat retention	Thermal conductivity of insulation	EN 13164 EN 12667 EN 12939 EAD 041827, 2.2.8.2	$d_N \leq 50$ mm: $\lambda_D = 0.035$ W/(m.K) $d_N > 50$ mm: $\lambda_D = 0.036$ W/(m.K) $\lambda_{cor,level 1} (\leq 50 \text{ mm}) = 0.042$ W/(m.K) $\lambda_{cor,level 1} (> 50 \text{ mm}) = 0.040$ W/(m.K) $\lambda_{cor,level 2} (\leq 50 \text{ mm}) = 0.040$ W/(m.K) $\lambda_{cor,level 2} (> 50 \text{ mm}) = 0.039$ W/(m.K)
	Correction value for thermal conductivity ($\lambda_{cor} = \lambda_D \cdot F_m$)		
	Thermal resistance/transmittance	EN ISO 6946 EAD 041827, 2.2.8.1	XPS thickness correction (grooves on the surface) $d_{cor} = [0.287 \cdot (d_N - 0.008) + 0.713 \cdot d_N]$ $R_{cor} = d_{cor} / \lambda_{cor}$ Correction value due to water flow through the Inverted Roof Kit: $f = 0.90$ (drainage factor) $f \cdot x = 0.036$ (W.day)/(m ² .K.mm)
	Long-term water absorption by diffusion	EN 16536	$d_N \leq 50$ mm: $W_d \leq 5\%$ v/v [WD(V)5] acc. to EN 13164 $d_N > 50$ mm: $W_d \leq 3\%$ v/v [WD(V)3] acc. to EN 13164
	Long-term water absorption by immersion	EN 12087 (method 2A)	XPS insulation component: $W_{it} < 0.7\%$ v/v [WL(T)0.7] acc. to EN 13164 Finishing screed component: $W_{it(GRISOL \text{ NS and BS})} < 4\%$ w/w $W_{it(GRISOL \text{ NP2 and BP2})} < 6\%$ w/w
	Freeze-thaw of insulation	EN 12091	$d_N \leq 50$ mm: $W_v < 2\%$ v/v [FT2] acc. to EN 13164 $d_N > 50$ mm: $W_v < 1\%$ v/v [FT1] acc. to EN 13164 Reduction in compressive strength does not exceed 10% of the initial value
	Compressive strength/stress of insulation	EN 826	$\sigma_{10} > 300$ kPa [CS(10/Y)300] acc. to EN 13164
	Compressive creep of insulation	EN 1606 i_1 = total i_2 = creep 25 years $\sigma_c = 50$ kPa	$d_N \leq 50$ mm: ($i_1 = 4.0\%$; $i_2 = 3.0\%$) [CC(4/3.0/25)50] acc. to EN 13164 $d_N > 50$ mm: ($i_1 = 2.0\%$; $i_2 = 1.5\%$) [CC(2/1.5/25)50] acc. to EN 13164
	Deformation of insulation under specified compressive load and temperature (70 °C / 40 kPa)	EN 1605 (70 °C / 40 kPa)	Relative thickness reduction (compression): $\Delta \epsilon_d \leq 5.0\%$ [DLT(2)5] acc. to EN 13164
	Dimensional stability under heat (70 °C / 90% RH)	EN 1604	Relative changes in length, width and thickness: $\Delta \epsilon_{l,b,d} \leq 0.5\%$
BWR 7 Sustainable use of natural resources	—	—	Performance not assessed

4. Assessment and verification of constancy of performance (hereinafter AVCP) system applied, with reference to its legal base

According to decision 97/556/EC¹ of the European Commission as amended by 2001/596/EC², the system of assessment and verification of constancy of performance (see Annex V and Article 65, Paragraph 2, of Regulation (EU) No. 305/2011) given in Table 2 applies.

TABLE 2
System of assessment and verification of constancy of performance (AVCP)
applicable to Inverted Roof Insulation Kits

Product(s)	Intended use(s)	Level(s) or class(es)	AVCP system(s)
Inverted Roof Insulation Kits	Insulation of roofs	–	2+

In addition, according to decision 97/556/EC¹ of the European Commission as amended by 2001/596/EC², the system(s) of attestation of conformity given in Table 3 applies to Inverted Roof Insulation Kits with regard to reaction to fire.

TABLE 3
Systems of assessment and verification of constancy of performance (AVCP)
applicable to Inverted Roof Insulation Kits with regard to reaction to fire

Product(s)	Intended use(s)	Level(s) or class(es)	AVCP system(s)
Inverted Roof Insulation Kits	For uses subject to regulations on reaction to fire	A1*, A2*, B*, C*	1
		A1**, A2**, B**, C**, D, E	3
		(A1 to E)***, F	4

* Products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (e.g. an addition of fire retardants or a limiting of organic material)

** Products /materials not covered by note (*)

*** Products/materials that don't require to be tested for reaction to fire (e.g. products/materials of class A1 according to Commission Decision 96/603/EC, as amended)

5. Technical details necessary for the implementation of the AVCP system, as provided for in the applicable EAD

5.1 General

The ETA is issued on the basis of agreed data/information, deposited with LNEC, which identifies the product that has been assessed and judged. It is the manufacturer's responsibility to make sure that all those who use the kit are appropriately informed of the specific conditions laid down in this ETA, including its annex.

Changes to the Inverted Roof Kits or the components or their production process should be notified to LNEC before the changes are introduced. LNEC will decide whether or not such changes affect the ETA and if so whether further assessment or alterations to the ETA shall be necessary.

5.2 Tasks for the manufacturer

Factory production control

The manufacturer shall exercise permanent internal control of production. All the elements, requirements and provisions adopted by the manufacturer shall be documented in a systematic manner in the form of written policies and procedures, including records of results performed.

This production control system shall ensure that the product is in conformity with this ETA.

The manufacturer may only use components stated in the technical documentation of this ETA. The incoming raw materials are subjected to verifications by the manufacturer before acceptance.

For the components of the Inverted Roof Kit which the manufacturer does not manufacture by himself, he shall make sure that the factory production control carried out by the other manufacturers gives the guarantee of the components compliance with the ETA.

¹ Official Journal of the European Communities L229/14 of 20.08.1997

² Official Journal of the European Communities L229/33 of 02.08.2001

The factory production control shall be in accordance with the Control Plan³, which is part of the Technical Documentation of this ETA. The control plan has been agreed between the manufacturer and the LNEC and is laid down in the context of the factory production control system operated by the manufacturer and deposited within LNEC. The results of factory production control shall be recorded and evaluated in accordance with the provisions of the control plan.

Other tasks for the manufacturer

The manufacturer shall, on the basis of a contract, involve a body (bodies) which is (are) notified for the tasks referred to in section 4 in the field of Inverted Roof Kits in order to undertake the actions laid down in this clause. For this purpose, the control plan shall be handed over by the manufacturer to the notified body (bodies) involved.

For assessing the Inverted Roof Kits and the components the results of the tests performed as part of the assessment for the ETA shall be used unless there are changes in the production line or plant. In such cases the necessary testing has to be agreed with LNEC.

The declaration of performance of the Inverted Roof Kits to be drawn up by the manufacturer following the issuing of this ETA shall include its reference number and issuing date.

Changes to the Inverted Roof Kits or the components or their production process should be notified to LNEC before the changes are introduced. LNEC will decide whether or not such changes affect the ETA and if so whether further assessment or alterations to the ETA shall be necessary.

5.3 Tasks for the notified body (bodies)

Notified bodies undertaking tasks under system 1 shall consider the European Technical Assessment issued for the kit as the assessment of the performance of that kit. Notified bodies shall therefore not undertake the tasks referred to in point 1.2(b)(i) of Annex V of Regulation (EU) no 305/2011, unless there are changes in the manufacture or manufacturing plant. In such cases, the necessary assessment and verifications have to be agreed between LNEC and the notified product certification body.

Within the scope of the initial inspection of factory and of factory production control, the notified body (bodies) shall ascertain that, in accordance with the Control Plan, the factory (in particular the employees and the equipment) and the factory production control are suitable to ensure continuous and orderly manufacturing of the components according to the specifications mentioned in this ETA.

Within the scope of continuous surveillance, assessment and evaluation of factory production control, the notified body (bodies) shall visit the factory at least once a year for surveillance. It has to be verified that the factory production control is maintained in suitable conditions.

These tasks shall be performed in accordance with the provisions laid down in the Control Plan.

The notified body (bodies) shall retain the essential points of its (their) actions referred to above and state the results obtained and conclusions drawn in a written report.

Under systems 1 and 2+ the notified certification body(ies) involved by the manufacturer shall issue respectively a certificate of constancy of performance of the kit and a certificate of conformity of the factory production control on the basis of the assessments and verifications carried out by that (those) body(ies).

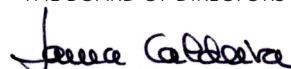
In cases where the provisions of the ETA and its control plan are no longer fulfilled, the notified certification body(ies) shall withdraw the certificate(s) issued and inform LNEC without delay.

Issued in Lisbon on 27/06/2022

By

Laboratório Nacional de Engenharia Civil (LNEC)

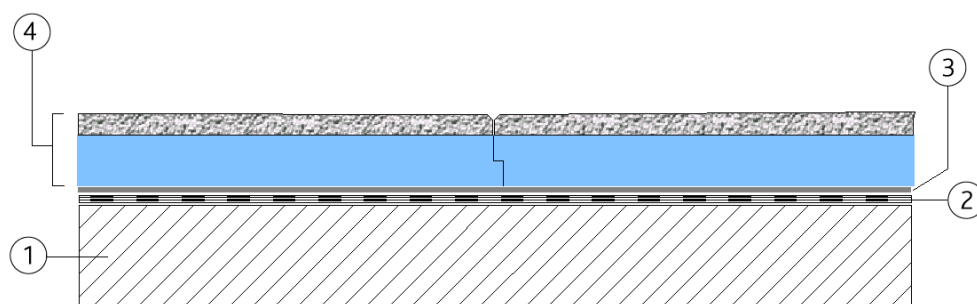
THE BOARD OF DIRECTORS



Laura Caldeira
President

³ The Control Plan is a confidential part of this European Technical Assessment and is only handed over to the notified body or bodies involved in the procedure of assessment and verification of constancy of performance. See section 5.3.

Annex



Schematic build-up of the insulated inverted flat roof

- 1 Supporting construction
- 2 Roof waterproofing system
- 3 Separation layer (optional)
- 4 GRISOL NS, NP2, BS or BP2 (XPS + protective finishing)

