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European Technical Assessment ETA 22/0306 of 13/07/2022

GENERAL PART

Trade name of the construction product	**LAMINAM + in the variants LAMINAM 3+, LAMINAM 5+, LAMINAM 12+ and LAMINAM 20+**
Product family to which the construction product belongs	**PAC 9: CURTAIN WALLING/ CLADDING/STRUCTURAL SEALANT GLAZING.** **Ceramic multilayer slab for wall claddings and floorings**
Manufacturer	**Laminam S.p.A.** **Via Ghiarola Nuova, 258** **41042 Fiorano Modenese (MO) - Italy**
Manufacturing plant	**1) Via Ghiarola Nuova, 258** **41042 Fiorano Modenese (MO) – Italy** **2) Via Primo Brindani SN** **43043 Borgo Val Di Taro (PR) - Italy**
This European Technical Assessment contains:	**10 pages, including 4 annexes which form an integral part of this assessment**
This European Technical Assessment is issued in accordance with Regulation (EU) n° 305/2011, on the basis of	**EAD 090078-00-0504 – Ceramic multilayer slab for wall claddings and floorings**

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SPECIFIC PARTS

1. TECHNICAL DESCRIPTION OF THE PRODUCT

The LAMINAM +, in the variants LAMINAM 3+, LAMINAM 5+, LAMINAM 12+, LAMINAM 20+, is a ceramic multilayer slab which consists of:

- one layer of dry-pressed ceramic slab (according to EN 14411:2016) with low water absorption, i.e., ≤ 0,5% (as percentage by mass), with nominal thickness from 3 mm up to 20 mm, reinforced with
- one layer of glass fibre mat on the back, which is applied on the ceramic slab under a controlled industrial process by means of
- a polyurethane adhesive.

The ceramic multilayer slab LAMINAM + is of type A according to the description in clause 1.1 of EAD 090078-00-0504 and is available in different variants according to different thicknesses of the ceramic slab (see Annex A).

LAMINAM + is unglazed and the surface finish may vary for what concerns texture and roughness (besides colours). The ceramic surface of the slab may also be processed with a mechanical process after firing (e.g., polishing).

LAMINAM + is manufactured in large dimensions, from 1000 mm x 3000 mm up to 1620 mm x 3240 mm (length x width), however, the manufactured slab may be supplied either in its original dimensions or reduced (= cut) in smaller sizes.

The product description, with reference to the different layers it is composed of, is shown in Annex A.

2. SPECIFICATION OF THE INTENDED USE IN ACCORDANCE WITH EUROPEAN ASSESSMENT DOCUMENT N° 090078-00-0504 (hereinafter EAD)

The ceramic multilayer slab LAMINAM + is intended both for external and internal uses and may be used as:

- a coating for internal and external walls: for this end use, the product can be installed by means of common adhesives for ceramic tiles (Use 1 with reference to EAD 090078-00-0504);
- a cladding element for external wall cladding systems in ventilated and non-ventilated facades: for this end use, the product can be mechanically fixed or bonded to a sub-frame (Use 2 with reference to EAD 090078-00-0504);
- internal and external floorings, including stairs (Use 3 with reference to EAD 090078-00-0504).

LAMINAM + may be installed on suitable substrates - both new and existing substrates.

Concerning product packaging, transport and storage it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport and storage, as he considers necessary in order to reach the declared performances.
The information about installation is provided with the technical documentation from the manufacturer and it is assumed that the product will be installed according to it or (in absence of such instructions) according to the usual practice of the building professionals.

The specifications and conditions given by the manufacturer are summarized in Annex B.

The performances assessed in this European Technical Assessment, according to the applicable EAD, are based on an assumed intended working life of at least 25 years, provided that the conditions for packaging, transport, storage, installation as well as appropriate use, maintenance and repair are met. The indications given on the working life cannot be interpreted as a guarantee given by the manufacturer, but are to be regarded only as a means for choosing the right products 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

The tests for performance assessment of LAMINAM + were carried out in compliance with EAD 090078-00-0504 according to the test methods reported herein, as well for what concerns sampling, conditioning and testing provisions.
The numbering (#) in the following tables corresponds to the numbering of Tables 2.1.1 (Use 1), 2.1.2 (Use 2) and 2.1.3 (Use 3) of EAD 090078-00-0504.

3.1 SAFETY IN CASE OF FIRE (BWR 2)

Table 3.1.1: Essential Characteristics for Use 1 (EAD, Table 2.1.1), Use 2 (EAD, Table 2.1.2) and Use 3 (EAD, Table 2.1.3)

#	**Essential characteristic**		**Performance**
1	Reaction to fire	LAMINAM 3+ LAMINAM 5+ LAMINAM 12+ LAMINAM 20+	• Use 1: Class: **A2 - s1, d0***
			• Use 2: **No performance assessed.**
			• Use 3: Class: **$A2_{fl}$ – s1***
2	Façade fire performance		**No performance assessed.**

***** classification valid for a PCS value (according to EN ISO 1716) of the ceramic slab of 2 MJ/kg or lower and of the polyurethane adhesive of 13,5 MJ/kg or lower

3.2 HYGIENE, HEALTH AND THE ENVIRONMENT (BWR 3)

Table 3.2.1: Essential Characteristics for Use 1 (EAD, Table 2.1.1), Use 2 (EAD, Table 2.1.2) and Use 3 (EAD, Table 2.1.3)

#	**Essential characteristic**	**Performance**
3	Water absorption	**No performance assessed.**
4	Moisture expansion	**No performance assessed.**

3.3 SAFETY AND ACCESSIBILITY IN USE (BWR 4)

Table 3.3.1: Essential Characteristics for Use 1 (EAD, Table 2.1.1)

#	Essential characteristic	Performance
5	Breaking strength	See Annex C1, Table C1
6	Flexural tensile strength or modulus of rupture	**No performance assessed.**
7	Bond strength between layers – strength perpendicular to the faces	See Annex C1, Table C3
8	Bond strength between layers – shear strength	See Annex C1, Table C4
9	Bond strength between layers after freeze and thaw conditioning *(only for external uses)*	See Annex C2, Table C5
10	Bond strength between layers after alkaline ageing *(only for type A)*	See Annex C2, Table C6
11	Bond strength/adhesion: - cementitious adhesives - dispersion adhesives - reaction resin adhesives	**No performance assessed.**
12	Coefficient of linear thermal expansion	**No performance assessed.**
13	Freeze and thaw resistance	See Annex C2, Table C7
14	Thermal shock resistance	**No performance assessed.**
15	Resistance to chemicals	**No performance assessed.**

Table 3.3.2: Essential Characteristics for Use 2 (EAD, Table 2.1.2)

#	Essential characteristic	Performance
5	Breaking strength	See Annex C1, Table C1
6	Flexural tensile strength or modulus of rupture	**No performance assessed.**
7	Bond strength between layers – strength perpendicular to the faces	See Annex C1, Table C3
8	Bond strength between layers – shear strength	See Annex C1, Table C4
9	Bond strength between layers after freeze and thaw conditioning	See Annex C2, Table C5
10	Coefficient of linear thermal expansion	**No performance assessed.**
11	Freeze and thaw resistance	See Annex C2, Table C7
12	Thermal shock resistance	**No performance assessed.**
13	Resistance to chemicals	**No performance assessed.**

Table 3.3.3: Essential Characteristics for Use 3 (EAD, Table 2.1.3)

#	**Essential characteristic**	**Performance**
5	Breaking strength	See Annex C1, Table C1
6	Flexural tensile strength or modulus of rupture	**No performance assessed.**
7	Abrasion resistance	See Annex C1, Table C2
8	Slipperiness	**No performance assessed.**
9	Impact resistance	**No performance assessed.**
10	Bond strength between layers – strength perpendicular to the faces	See Annex C1, Table C3
11	Bond strength between layers – shear strength	See Annex C1, Table C4
12	Bond strength between layers after freeze and thaw conditioning *(only for external uses)*	See Annex C2, Table C5
13	Bond strength between layers after alkaline ageing *(only for type A)*	See Annex C2, table C6
14	Coefficient of linear thermal expansion	**No performance assessed.**
15	Freeze and thaw resistance	See Annex C2, Table C7
16	Thermal shock resistance	**No performance assessed.**
17	Resistance to chemicals	**No performance assessed.**
18	Tactility	**No performance assessed.**

4. ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE (AVCP) SYSTEM APPLIED, WITH REFERENCE TO ITS LEGAL BASE

In accordance with the European Assessment Document EAD No. 090078-00-0504 the applicable European legal acts are:

- Use 1: **Decision 98/437/EC**, as amended by **Decision 2001/596/EC.**
  The system of assessment and verification of constancy of performance (AVCP) is: **4**.

  In addition, with regard to reaction to fire for products, the applicable European legal act is **Decision 98/437/EC**, as amended by **Decision 2001/596/EC.**
  The system of assessment and verification of constancy of performance (AVCP) is: **3**.

- Use 2: **Decision 2003/640/EC.**
  The system of assessment and verification of constancy of performance (AVCP) is: **2+**.

- Use 3: **Decision 97/808/EC,** as amended by **Decision 99/453/EC** and **Decision 2001/596/EC** and **Decision 2006/190/EC.**
  The system of assessment and verification of constancy of performance (AVCP) is: **4**.

  In addition, with regard to reaction to fire for products, the applicable European legal act is **Decision 97/808/EC,** as amended by **Decision 99/453/EC** and **Decision 2001/596/EC** and **Decision 2006/190/EC.**
  The system of assessment and verification of constancy of performance (AVCP) is: **3**.

5. TECHNICAL DETAILS NECESSARY FOR THE IMPLEMENTATION OF THE AVCP SYSTEM, AS PROVIDED FOR IN EAD 090078-00-0504

Technical details necessary for the implementation of the AVCP system are laid down in the Control Plan deposited at ITC-CNR.

Issued in San Giuliano Milanese, Italy on 13/07/2022
by ITC – CNR

Professor Antonio Occhiuzzi
Director of ITC-CNR

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GMT+00:00

PRODUCT DESCRIPTION: LAMINAM +, VARIANTS, TRADE NAMES AND DIMENSIONS

- LAMINAM 3+: ceramic slab 3 mm thick (nominal thickness) and glass fibre mat 0,4 mm thick, bonded by polyurethane adhesive (total thickness mm: 3,3 up to 4,1)
- LAMINAM 5+: ceramic slab 5,6 mm thick (nominal thickness) and glass fibre mat 0,4 mm thick, bonded by polyurethane adhesive (total thickness mm: 5,9 up to 6,8)
- LAMINAM 12+: ceramic slab 12 mm thick (nominal thickness) and glass fibre mat 0,4 mm thick, bonded by polyurethane adhesive (total thickness mm: 11,8 up to 12,6)
- LAMINAM 20+: ceramic slab 20 mm thick (nominal thickness) and glass fibre mat 0,4 mm thick, bonded by polyurethane adhesive (total thickness mm: 19,6 up to 20,5)

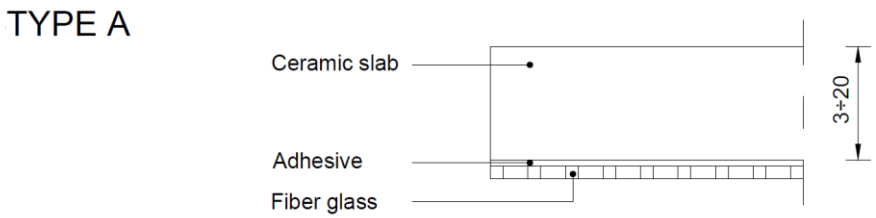

Figure A1: The different material layers and nominal thickness range of LAMINAM +

Table A1: Nominal thickness of the LAMINAM + layers

	Nominal thickness [mm]		
	ceramic slab	glass fibre mat	total
LAMINAM 3+	3,0	0,4	3,3 up to 4,1
LAMINAM 5+	5,6	0,4	5,9 up to 6,8
LAMINAM 12+	12,0	0,4	11,8 up to 12,6
LAMINAM 20+	20,0	0,4	19,6 up to 20,5

LAMINAM +	**Annex A** **of ETA N° 22/0306**
Product Description – The variants of LAMINAM +	

SPECIFICATION OF INTENDED USE

➢ INSTALLATION CONDITIONS

For the installation of LAMINAM + slabs, a class C2S1 or C2S2 cementitious adhesive for ceramic tiles (in accordance with EN 12004:2017) is recommended. The application shall be done in full bed using the double spreading technique, with particular attention to the edges and corners. Apply an adequate thickness of adhesive and tap vigorously to avoid the formation of gaps between the surface and the substrate.
For the installation of LAMINAM + slabs, a minimum joint of 2 mm is recommended for internal applications and of 5 mm for external applications, to be evaluated in any case according to the size of the slab and the surface to be covered. Make expansion joints every 25 m^2 indoors and 9/12 m^2 outdoors, to be modulated according to the expansion of the substrate and any local requirements. Before filling the joints, wait for the adhesive to dry according to the manufacturer's instructions. Cementitious or epoxy resin based products may be used.
For outdoor applications for floorings, consider reducing the slab size or placing membranes between the substrate and the slabs to facilitate the expansion of the substrate to which the material may be subjected.
External application on plaster or insulating substrates can be made in accordance with the requirements of the suppliers of the substrate. In particular, the use of a reduced slab size or, only for insulating substrates, medium-light colours may be required. The possible application with mechanical fastening shall be evaluated by the direction of works, in compliance with any local regulations.
LAMINAM + slabs can be installed in ventilated cladding systems and in curtain wall systems. When the façade system is a ventilated cladding (that is, fastened to a subframe and with a ventilated air gap between the cladding elements and the external wall or thermal insulation) different alternatives are possible:

A. bonded system: installation of the slabs by means of an adhesive applied directly on the profiles of the subframe;
B. mechanical system: the slabs are installed through mechanical fixings that can be visible or concealed, without adhesive;
C. cellular system: the cellular system foresees the application of the slabs on a factory-made system made of aluminium profiles and applied on site on profiles prepared for the hooking of these cells. The system is realized by gluing the slab on profiles with or without mechanical fastening.

For the façade systems A and C listed above, suitable adhesives must be used to ensure adhesion to the substructure and to the fibre mat applied to the back of the slab. The span of the substructure and the amount of adhesive or mechanical retainers must be verified to comply with national regulations.

For further information, refer to the current “LAMINAM Technical Guide" in effect on the time of installation and downloadable from the site www.Laminam.com

LAMINAM +	**Annex B** **of ETA N° 22/0306**
Intended Use – Specifications	

Table C1: Breaking strength

		Breaking strength S [N]
LAMINAM 3+	average value:	386,7
LAMINAM 5+ LAMINAM 12+	average value:	1619,0
LAMINAM 20+	average value:	14251,0

Table C2: Abrasion resistance

		Deep abrasion V [mm^3]
LAMINAM 3+		NPA
LAMINAM 5+	average value:	153
LAMINAM 12+	average value:	155
LAMINAM 20+	average value:	159

NPA= No Performance Assessed.

Table C3: Bond strength between layers – strength perpendicular to the faces

	23 °C		-20 °C		80 °C	
	σ^T_m [MPa]	σ^T_c [MPa]	σ^T_m [MPa]	σ^T_c [MPa]	σ^T_m [MPa]	σ^T_c [MPa]
LAMINAM 3+	8,5	7,8	>3,2*	>2,5*	3,1	2,8
LAMINAM 5+	8,4	7,6	>3,2*	>2,5*	3,0	2,8
LAMINAM 12+	8,4	7,6	>10,6*	>9,4*	3,0	2,8
LAMINAM 20+	NPA	NPA	NPA	NPA	NPA	NPA

*average maximum stress reached by the specimens during the test
NPA= No Performance Assessed.

Table C4: Bond strength between layers – shear strength

	23 °C		-20 °C		80 °C	
	τ^T_m [MPa]	τ^T_c [MPa]	τ^T_m [MPa]	τ^T_c [MPa]	τ^T_m [MPa]	τ^T_c [MPa]
LAMINAM 3+	> 9,0*	> 7,4*	> 5,0*	> 2,9*	2,2	1,8
LAMINAM 5+	> 6,2*	> 5,6*	> 2,6*	> 1,2*	2,2	1,8
LAMINAM 12+	> 6,2*	> 5,6*	> 2,6*	> 1,2*	2,2	1,9
LAMINAM 20+	NPA	NPA	NPA	NPA	NPA	NPA

*average maximum stress reached by the specimens during the test
NPA= No Performance Assessed.

LAMINAM +	**Annex C1 of ETA N° 22/0306**
Performances – Breaking strength, abrasion resistance and bond strength between layers – strength perpendicular to the faces and shear strength	

Table C5: Bond strength between layers after freeze and thaw conditioning

		Residual strength R_{σ}^{ft} [%]		Residual strength R_{τ}^{ft} [%]
LAMINAM 3+ LAMINAM 5+	Percentage of the as-delivered state:	54,1	Percentage of the as-delivered state:	91,1
LAMINAM 12+		100,0		98,4
LAMINAM 20+		NPA		NPA

NPA= No Performance Assessed.

Table C6: Bond strength between layers after alkaline ageing

		Residual strength R_{σ}^{a} [%]		Residual strength R_{τ}^{a} [%]
LAMINAM 3+	Percentage of the as-delivered state:	97,6	Percentage of the as-delivered state:	112,2
LAMINAM 5+		97,6		108,1
LAMINAM 12+		106,0		108,1
LAMINAM 20+		NPA		NPA

NPA= No Performance Assessed.

Table C7: Freeze and thaw resistance

	Number of damaged tiles after 100 freeze-thaw cycles n_{FT}	Water absorption after 100 freeze-thaw cycles E_2 [% by mass]
LAMINAM 5+	0	0,4

LAMINAM +	**Annex C2** **of ETA N° 22/0306**
Performances – Bond strength between layers after freeze and thaw conditioning, bond strength between layers after alkaline ageing and freeze and thaw resistance	