EUROPEAN ASSESSMENT DOCUMENT

EAD 040016-01-0404

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GLASS FIBRE MESH FOR REINFORCEMENT OF CEMENTITIOUS OR CEMENT BASED RENDERINGS

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This European Assessment Document (EAD) has been developed taking into account up-to-date technical and scientific knowledge at the time of issue and is published in accordance with the relevant provisions of Regulation (EU) No 305/2011 as a basis for the preparation and issuing of European Technical Assessments (ETA).

Contents

1 SCOPE OF THE EAD

1.1 Description of the construction product

Glass fibre mesh for reinforcement of cementitious or cement-based renderings (mesh used hereinafter) is determined for reinforcement of base coat or rendering against crack creation. It is composed of an open mesh fabric, made of glass fibre threads, positioned in warp and weft direction, manufactured by any textile processing. To provide resistance to alkali conditions, mesh is treated by organic layer coating. The type of the glass according to EN ISO 2078 [1], used for manufacturing of mesh, is to be specified by manufacturer (E-glass, C-glass, AR-glass etc.).

This EAD covers meshes with the mesh opening (see 1.3.5) at least 3 mm so that the reinforced rendering or mortar sufficiently penetrates the meshes and 40 mm in maximum, so that the mesh works regularly against crack development in rendering.

This EAD covers two different types of glass fibre meshes:

- rectangular mesh, that´s mesh made of threads in perpendicular directions (weft and warp);
- triaxial mesh, that´s mesh made of threads laid in three directions mutually formed habitually in angle 120° (one in warp direction and two in weft directions).

Note: Currently, it is assumed that all the meshes assessed for cementitious or cement-based renderings are also suitable for use in polymeric renderings.

The product is not covered by a harmonised European standard (hEN).

This version of the EAD 040016-01-0404 amends the version 040016-00-0404 as follows:

- EAD is extended generally for all types of textile manufacturing of glass fibre meshes;
- Reinforced meshes for additional reinforcement of rendering are added into the scope of the EAD;
  Note: Types of meshes (standard / reinforced) come out from Clause 2.2.21 of EAD 040083-00-0404.
- New construction type of mesh - triaxial mesh - is introduced;
- Assessment methods are precised.

Concerning product packaging, transport, storage, maintenance, replacement and repair it is the responsibility of the manufacturer to undertake the appropriate measures and to advise his clients on the transport, storage, maintenance, replacement and repair of the product as he considers necessary.

It is assumed that the product will be installed according to the manufacturer's instructions or (in absence of such instructions) according to the usual practice of the building professionals.

Relevant manufacturer's stipulations having influence on the performance of the product covered by this European Assessment Document shall be considered for the determination of the performance and detailed in the ETA.

1.2 Information on the intended use(s) of the construction product

1.2.1 Intended use(s)

The mesh is used as reinforcement of cementitious base coats, for example in ETICS, or cement-based and/or lime-cement-based core part of wall rendering/plastering. Nominal thickness of reinforced layer is usually of 2 mm up to 15 mm. The mesh shall be embedded into a fresh mortar and sufficiently covered. The maximum particle size of aggregate used in rendering in relation to the mesh opening has to be taken

[1] All undated references to standards in this EAD are to be understood as references to dated versions listed in Chapter 4.

into account to prevent the damage of the mesh during application and its action as a separation layer in renderings (especially base coats of ETICS).

The mesh can be used in the following types of renderings:

- cementitious (or polymeric) base coat on external thermal insulation systems with rendering and/or tilling on different substrates;

- cement or cement-lime based rendering on masonry or concrete walls or ceilings.

The mesh is produced according to its construction in two variants:

- The rectangular mesh with warp and weft threads in perpendicular directions. This mesh prevents the surface of hardened rendering from cracking, caused by linear shrinkage.

- The triaxial mesh, with one warp and two declined wefts positioned in angle, specified by manufacturer. This mesh prevents the hardened rendering from cracking, caused by multiaxial shrinkage in the all area, corners of openings in walls (especially windows, doors) included.

The meshes are used in two possible variants according to their specified characteristics and purpose:

- Standard mesh, used in primary layer as essential reinforcement of rendering. Standard mesh is embedded into rendering layer and always tied positively at joints by overlapping;

- Reinforced mesh, used in one or more additional layer(s) as supplementary reinforcement to standard mesh to achieve higher resistance of rendering. Reinforced mesh is habitually embedded into additional layer(s) of rendering and usually applied without overlapping in joints.

For correct function, both types of meshes should be positioned approximately in the middle of thickness of a rendering layer they are to reinforce. Standard meshes can be used in ETICS as reinforced meshes too, the reverse approach is not possible.

1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD have been written based on the manufacturer's request to take into account a working life of the glass fibre mesh for reinforcement of cementitious or cement-based renderings for the intended use of 25 years when installed in the works (provided that the glass fibre mesh for reinforcement of renderings is subject to appropriate installation, see 1.1). These provisions are based upon the current state of the art and the available knowledge and experience.

When assessing the product the intended use as foreseen by the manufacturer shall be taken into account. The real working life may be, in normal use conditions, considerably longer without major degradation affecting the basic requirements for works [2].

The indications given as to the working life of the construction product cannot be interpreted as a guarantee neither given by the product manufacturer or his representative nor by EOTA when drafting this EAD nor by the Technical Assessment Body issuing an ETA based on this EAD, but are regarded only as a means for expressing the expected economically reasonable working life of the product.

1.3 Specific terms used in this EAD

1.3.1 Fibre

Single filament with a diameter of a few microns.

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[2] The real working life of a product incorporated in a specific works depends on the environmental conditions to which that works is subject, as well as on the particular conditions of the design, execution, use and maintenance of that works. Therefore, it cannot be excluded that in certain cases the real working life of the product may also be shorter than referred to above.

1.3.2 Yarn

Bundle of twisted or untwisted continuous fibres.

1.3.3 Thread

Basic part of composition of mesh in warp and weft direction, consisting of single, or of short group of yarns, periodically repeated in specified distance.

In specific case, one thread can consist from more separate yarns, positioned in tight neighbourhood. Such group of yarns is considered to be one thread for purpose of determination of the number of threads per 50 mm, see B.1 of Annex B, and for testing of tensile strength according to 2.2.7 and Annex B too. The picture with the geometry shall be stated in ETA in such case to clarify the composition of the mesh, example of such mesh, see on Figure 1.

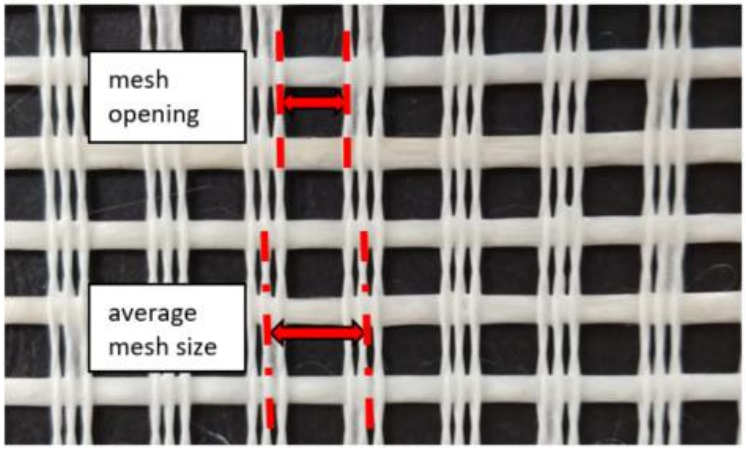

Figure 1 Relation between mesh size and mesh opening in specific case of threads consisting of more yarns

1.3.4 Mesh size

The mesh size in specified direction is defined as the average value of difference between axes of separate adjacent threads.

1.3.5 Mesh opening

The mesh opening in specified direction is defined as the average value of the largest width between threads in middle part of opening between separate adjacent threads.

1.3.6 Coverage ratio

The coverage ratio is defined as the portion of area covered by threads of a fibre mesh in both directions and area of cassette specified by mesh size,

1.3.7 Symbols

F_{max}	Recorded tensile load at failure of test specimen
Q_{PCS}	Gross heat of combustion
T_{max}	Tensile strength within the width of 1 meter
m_{Cd}	Content of cadmium

n	Number of yarns or threads
R_{50}	Tensile strength within the width of 50 mm
ε	Elongation at tensile failure

1.3.8 Indices

alk	ageing in alkalis solution
i	individual value
m	average value
max	maximal determined value or value referred to width of 1 meter
50	value referred to width of 50 mm

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of glass fibre mesh for reinforcement of cementitious or cement-based renderings is assessed in relation to the essential characteristics.

The essential characteristics for the standard mesh and for the reinforced mesh are identical, only level of tensile strength after alkalis ageing is different (see 2.2.7).

The essential characteristic No. 10 of Table 1 *Improvement to limitation of crack development* is relevant only for triaxial mesh.

Table 1 Essential characteristics of the product and methods and criteria for assessing the performance of the product in relation to those essential characteristics

No	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 2: Safety in case of fire			
1	Reaction to fire	2.2.1	Class
2	Organic content and ash content - Organic content [%] - Ash content [%]	2.2.2	 Level Level
3	Gross heat of combustion - Q_{PCS} per mass unit [MJ/kg] - Q_{PCS} per area unit [MJ/m^2]	2.2.3	 Level Level
Basic Works Requirement 3: Hygiene, health and the environment			
4	Content, emission and/ or release of dangerous substances - Leachable substances - Content of cadmium	 2.2.4.1 2.2.4.2	 Level Level
Basic Works Requirement 4: Safety and accessibility in use			
5	Mesh size - Mesh size in warp/weft - Mesh opening in warp/weft - Coverage ratio	2.2.5.1 for rectangular mesh 2.2.5.2 for triaxial mesh	 Level Level Level
6	Weaving accuracy	2.2.6	Description

No	Essential characteristic	Assessment method	Type of expression of product performance
7	Tensile strength and elongation	2.2.7	
	In initial state (standard and/or reinforced mesh) in warp / weft: - tensile strength: $R_{50,m,in}$ [N/50 mm] and/or $T_{max,in}$ [kN/m] - elongation $\varepsilon_{m,in}$ [%]		Level Level
	After ageing in alkali conditions in warp / weft: standard mesh: - tensile strength: $R_{50,m,alk}$ [N/50 mm] and/or $T_{max,m,alk}$ [kN/m] - elongation $\varepsilon_{m,alk}$ [%] - relative value of residual tensile strength within the width of 1 meter after alkalis ageing $\Delta T_{max,m,alk}$ [%] reinforced mesh: - tensile strength: $R_{50,m,alk}$ [N/50 mm] and/or $T_{max,m,alk}$ [kN/m] - elongation $\varepsilon_{m,alk}$ [%] - relative value of residual tensile strength within the width of 1 meter after alkalis ageing $\Delta T_{max,m,alk}$ [%]		Level Level Level Level Level Level
8	Mass per unit area	2.2.8	Level
9	Thickness	2.2.9	Level
10	Improvement to limitation of crack development (only for triaxial mesh)	2.2.10	Description

2.2 Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product

This chapter is intended to provide instructions for TABs. Therefore, the use of wordings such as “shall be stated in the ETA” or “it has to be given in the ETA” shall be understood only as such instructions for TABs on how results of assessments shall be presented in the ETA. Such wordings do not impose any obligations for the manufacturer and the TAB shall not carry out the assessment of the performance in relation to a given essential characteristic when the manufacturer does not wish to declare this performance in the Declaration of Performance.

Testing will be limited only to the essential characteristics, which the manufacturer intends to declare. If for any components covered by harmonized standards or European Technical Assessment the manufacturer of the component has included the performance regarding the relevant characteristic in the Declaration of Performance, retesting of that component for issuing the ETA under the current EAD is not required.

All tests are to be performed at normal laboratory environment (+23 ± 5) °C and (50 ± 10) % RH, if relevant test procedure does not specify otherwise. Test specimens are to be conditioned in relevant environment for at least 24 hours before the test if test procedure does not specify otherwise.

2.2.1 Reaction to fire

The product shall be tested using the test method(s) for the corresponding reaction to fire class according to EN 13501-1 in order to be classified according to the Commission Delegated Regulation (EU) No 2016/364.

The reaction to fire class is stated in the ETA.

For the tests according to EN ISO 11925-2 and EN 13823 (if relevant), the product is tested in a frame as defined in CEN/TS 15447. The mesh is tested without substrate, only mechanically fixed (clamped) on steel frame. Steel frame shall be without any coating.

For test according to EN ISO 11925-2 substrate of steel sheet of thickness 1 mm, without any coating, can be used as substrate to hold position of test specimen in test chamber. Tested specimen shall be fixed to steel substrate mechanically by clamps. For test according to EN 13823 test specimen shall be tested without substrate, mechanically hold by steel clamps in position in vertical distance max. 500 mm on horizontal steel rails. Clamps and rails shall be without any coating.

If there are more products with the same type of coating to be classified, the testing of the product with the highest mass per unit of the coating covers all the products. The classification of glass fibre mesh is valid for product:

- with the same mass per unit area,
- with equal or less organic content and equal or greater ash content,
- with equal or greater content of the same type of flame retardants,
- with equal or lower Q_{PCS}-value per unit area.

2.2.2 Organic content and ash content

Organic content and ash content are determined by test according to ISO 1887 at (625 ± 20) °C or, with types of glass unstable at this temperature, at a temperature between 500 and 600 °C, until constant mass is reached. Three test specimens of mass at least 5 g (approximately 220×220 mm), cut off parallel to the thread at least 100 mm apart from the side, are used for test. Test specimens could be cut to minor parts, tested together.

Test specimens are conditioned according to Clause 6 of ISO 1887 by drying at (105 ± 5) °C and weighting of initial mass, repeating the drying, cooling and weighing operations until constant mass is reached. The mass is considered constant when the difference between two last measurements, carried out at intervals of about 24 hours, is within 1 % of the last measured value.

After drying, test specimens are burned in holder at (625 ± 20) °C for 1 hour. After burning, holders with test specimens are cooled in desiccator. Finally, conditioned remaining material is weighted. Accuracy of measurement according to ISO 1887 is to be held.

If type of glass is unstable at temperature (625 ± 20) °C, it should be tested at a test temperature between 500 °C and 600 °C, causing no deterioration of tested glass. Tests temperature in such case should be determined by preliminary tests and rounded to ten °C downwards (for example 550 °C). This test temperature also shall be kept constant to within ± 20 °C interval.

The test result of each test specimen is evaluated according to Clause 7 of ISO 1887 and expressed as a percentage relative to its initial mass. Finally, average values of organic and ash content from test results of all separate tested specimens are determined.

The average values of ash content [%] and of organic content [%] of mesh, rounded for three valid places, are stated in the ETA together with that temperature used for the tests.

2.2.3 Gross heat of combustion

The test shall be performed according to EN ISO 1716. The test shall be conducted by using either the crucible method according to Clause 7.9 of EN ISO 1716 or cigarette method according to Clause 7.10 of EN ISO 1716 utilizing a combustion aid, for example benzoic acid or paraffin oil. The mesh is to be cut into the small pieces.

For calculating the area-related Q_{PCS}-value [MJ/m^2], the average mass per unit area, as determined in accordance with 2.2.8, is to be used.

Gross heat combustion Q_{PCS} in both variants per mass unit [MJ/kg] and per area unit [MJ/m^2], both rounded for three valid places, according to EN ISO 1716 is stated in the ETA.

2.2.4 Content, emission and/or release of dangerous substances

The performance of the glass fibre mesh, related to the emissions and/or release and, where appropriate, the content of dangerous substances, will be assessed on the basis of the information provided by the manufacturer [3] after identifying the release scenarios (in accordance with EOTA GD 014), taking into account the intended use of the product and the Member States, where the manufacturer intends his product to be made available on the market.

The identified intended release scenarios for this product and intended use with respect to dangerous substances are:

S/W2: Product with indirect contact to soil, ground- and surface water.

2.2.4.1 Leachable substances

For the intended use covered by the release scenario S/W2 the performance of the glass fibre mesh for reinforcement of renderings concerning leachable substances is to be assessed. A leaching test with subsequent eluate analysis must take place, each in duplicate. Leaching tests of the test specimens are conducted according to CEN/TS 16637-2. The leachant shall be pH-neutral demineralised water and the ratio of liquid volume to surface area shall be (80 ± 10) l/m².

The sample to be tested shall be taken from the mesh, cut off parallel to the thread at least 100 mm apart from the side. Before testing, the sample is stored for at least 2 days at (23 ± 2) °C and (50 ± 5) % RH, then eluates of "6 hours" and "64 days" can be prepared.

In eluates of "6 hours" and "64 days", the following biological tests shall be conducted:

- Acute toxicity test with Daphnia magna Straus according to EN ISO 6341
- Toxicity test with algae according to ISO 15799
- Luminescent bacteria test according to EN ISO 11348-1+A1, EN ISO 11348-2+A1 or EN ISO 11348-3+A1.

For each biological test, EC20-values shall be determined for dilution ratios 1:2, 1:4, 1:6, 1:8 and 1:16.

If the parameter TOC is higher than 10 mg/l, the following biological tests shall be conducted with the eluates of "6 hours" and "64 days":

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3 The manufacturer may be asked to provide to the TAB the REACH related information which he must accompany the DoP with (cf. Article 6(5) of Regulation (EU) No 305/2011). The manufacturer is **not** obliged:

- to provide the chemical constitution and composition of the product (or of constituents of the product) to the TAB, or
- to provide a written declaration to the TAB stating whether the product (or constituents of the product) contain(s) substances which are classified as dangerous according to Directive 67/548/EEC and Regulation (EC) No 1272/2008 and listed in the "Indicative list on dangerous substances" of the SGDS.

Any information provided by the manufacturer regarding the chemical composition of the products may not be distributed to EOTA or to TABs.

- Biological degradation according to OECD Test Guideline 301 part A, B or E.

Determined toxicity in biological tests shall be expressed as EC20-values for each dilution ratio and given in the ETA. Maximum determined biological degradability shall be expressed as "… % within … hours/days". The respective test methods for analysis shall be specified.

2.2.4.2 Content of Cadmium

According to Regulation (EC) No. 1907/2006 (REACH)[4], the content of cadmium or cadmium compound shall be determined in glass fibre mesh for reinforcement of renderings due to its possible content in coating of yarns or threads. The test is performed according to method A of EN 1122. At least one test specimen from sample taken from the mesh is tested.

According to Annex XVII to the Regulation (EC) No. 1907/2006 (REACH), the maximum value of content of cadmium is to be equal or less than 0.01 % per weight.

The content of cadmium m_{Cd} of glass fibre mesh for reinforcement of renderings, expressed in milligrams per kilogram [$mg \cdot kg^{-1}$] and rounded for two decimal places, is given in the ETA.

2.2.5 Mesh size

2.2.5.1 Rectangular mesh

The mesh size is to be tested according to Annex A.1.

The mesh size [mm] and the mesh opening [mm] both in warp and in weft direction, rounded for one decimal place, and coverage ratio [%], rounded in integer, are stated in the ETA.

If the mesh with a specific geometry (especially with threads created by group of yarns, see 1.3.3) is to be included in the ETA, the picture with the geometry of the mesh shall be given in the ETA to clarify the mesh size and mesh opening.

Note: The assessment method stated in Annex A.1 of this EAD is equal to the method of EAD 040016-00-0404, the modification consists on experiences in better and more detailed description of the test and calculation method to avoid different interpretation.

2.2.5.2 Triaxial mesh

The mesh size is to be tested according to Annex A.2.

The mesh size [mm] and the mesh opening [mm] in warp and in both weft (that´s cross) directions, rounded for one decimal place, and coverage ratio [%], rounded in integer, are stated in the ETA.

2.2.6 Weaving accuracy

At least 10 metres of the length of the mesh shall be visually inspected. All singularities and/or defects of the mesh shall be recorded.

Description of weaving accuracy after visual inspection based on the following observation is stated in the ETA:

- an untrimmed edge in any length;
- deflected (uneven) fronts of rolls over ± 5 mm (measured from the edge of the inner tube);
- a gap over treble distance of wefts or warps (in case of rectangular mesh) in any length;

[4] Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals establishing a European Chemicals Agency as amended.

- weft skewing or weft waving (in case of rectangular mesh) over 4 % of width of the fabric (measured by a rectangular rule) the angle between cross direction thread (at least 3 measurements within 10 m) and warp of triaxial mesh is identical or within the tolerance of ± 5° to the angle specified by the manufacturer;

- a cracked yarn or thread.

2.2.7 Tensile strength and elongation

The test is performed on 10 test specimens at least for each direction of threads in mesh (rectangular or triaxial) in initial state and after alkalis ageing according to Annex B.

Preparation of the test specimen for the specified direction of the mesh depends on the mesh nominal size in specified direction, that´s how many threads are placed in a nominal width of 50 mm of the test specimen, as follows:

- if 5 and more threads are placed within the width of 50 mm, the test specimen is prepared as a strip of nominal width of 50 mm, number of threads *n* in test specimen is calculated and recorded for posterior evaluation;

- if less than 5 threads are placed within the width of 50 mm, the test specimen is prepared as a strip containing only 2 threads of mesh.

Both types of test specimen can be combined according to mesh size as specified in 2.2.4, if nominal mesh size differs from in separate directions.

Tensile strength and elongation are to be determined by the tests, test conditions and by evaluation described in Annex B.

Test result is expressed according to type of test specimen used for tests, as follows:

- if 5 and more threads are placed within the width of 50 mm, the average tensile strength of mesh within the width of 1 meter $T_{max,m}$ in [kN/m] is calculated from average tensile strength within the width of 50 mm $R_{50,m}$ according to B.3.1 of Annex B;

- if less than 5 threads are placed within the width of 50 mm, the average tensile strength of mesh within the width of 1 meter $T_{max,m}$ in [kN/m] is calculated from separate values of tensile strength $T_{max,i}$ [kN] according to B.3.2 of Annex B.

Calculated average values of tensile strength with respect to provision of Clause B.5, Annex B of EN ISO 80000-1 shall be rounded downwards for three valid places. Calculated average values of elongation shall be rounded upwards for two valid places.

The average value of the tensile strength within the width of 50 mm $R_{50,m}$ in [N/50 mm] and/or within the width of 1 meter $T_{max,m}$ in [kN/m] for the rectangular or the triaxial mesh after alkalis ageing for each direction shall be:

- 1000 N/50 mm (that´s 20 N/mm) or 20 kN/m at least for both types of mesh (standard and reinforced) and for each direction of threads;

- relative value of residual strength after alkalis ageing:
    - at least 50 % of the strength in the initial state for the standard mesh;
    - at least 40 % of the strength in the initial state for the reinforced mesh.

Following characteristics for each specified direction of mesh are stated separately in the ETA:

- number of threads per meter, determined on the principle of Clause 6.3 of EN 13496;

- average value of characteristic in the initial state:

  - tensile strength within the width of 50 mm $R_{50,m,in}$ [N/50 mm], if 5 and more threads are placed within the width of 50 mm in specified direction of mesh;

  and, in all cases,

  - tensile strength within the width of 1 meter $T_{max,m,in}$ [kN/m];

- average value of characteristic after alkalis ageing:

  - tensile strength within the width of 50 mm $R_{50,m,alk}$ [N/50 mm], if 5 and more threads are placed within the width of 50 mm in specified direction of mesh;

  and, in all cases,

  - tensile strength within the width of 1 meter $T_{max,m,alk}$ [kN/m];

- the relative value of residual tensile strength within the width of 1 meter after alkalis ageing $\Delta T_{max,m,alk}$ in [%], calculated according to B.3.2 of Annex B;

- average value of the elongation $\varepsilon_{m,in}$ [%] in the initial state;

- average value of the elongation $\varepsilon_{m,alk}$ [%] after alkalis ageing.

Historical data according to Clause 5.6.7.1 of ETAG 004 used as EAD and/or Clause 2.2.7 of EAD 040016-00-0404 may be taken into account and used in the ETA under the responsibility of the TAB issuing the ETA. The testing described in this version of EAD is identical to Clause 5.6.7.1 of ETAG 004 used as EAD and/or Clause 2.2.7 of EAD 040016-00-0404, but the calculation is modified. If historical data and values of tensile strength are stated in the ETA, it shall be mentioned in the ETA. Tensile strength within the width of 1 meter $T_{max,m}$ can be expressed in [N/mm] too.

2.2.8 Mass per unit area

The mass per unit area is determined by measuring and weighing of part of the mesh of length one metre. For mesh in form of a roll, the width of the sample should be the same as the roll width. The result is expressed in g/m² as the average value from 3 measurements.

The average value of the mass per unit area [g/m²], rounded in integer, is stated in the ETA.

2.2.9 Thickness

The thickness of the product (perpendicular distance between surfaces of the fabric) is determined by measuring according to Table 1 of ISO 4603/Amd.1, for the set of conditions 2 - standard pressure 2.0 kPa and measuring-foot area 25 cm². The samples before test shall be conditioned in standard conditions according to Clause 5 of ISO 187. Applied conditions shall be stated in the ETA.

The average value of the thickness of mesh in [mm], rounded for two valid places, is stated in the ETA.

2.2.10 Improvement to limitation of crack development

Improvement to limitation of crack development of the triaxial mesh is tested on one test specimen prepared according to Annex C. The test of hygrothermal behaviour is performed according to Clause 7 of EN 16383 for cycles as follows:

a) 80 cycles of heating to (70 ± 5) °C and spraying by water (15 ± 5) °C

b) 5 cycles of heating to (50 ± 5) °C and cooling to (-20 ± 5) °C

c) 30 cycles of wetting by water (15 ± 5) °C, freezing to (-20 ± 5) °C and thawing by spraying water (15 ± 5) °C.

Description of the cracks development after finish of test according to Annex C expressed either as “No cracks passing through all thickness of base coat layer create.” or “Cracks passing through all thickness of base coat layer create.” is stated in the ETA.

Average values and estimation of standard deviation of static modulus of elasticity, tensile strength at failure and elongation at failure after curing and/or ageing of material used for base coat applied on test specimen, are given in the ETA separately as complementary information of test of improvement to limitation of crack development.

3 ASSESSMENT AND VERIFICATION OF CONSTANCY OF PERFORMANCE

3.1 System(s) of assessment and verification of constancy of performance to be applied

For the products covered by this EAD the applicable European legal act is: Decision 97/556/EC [5] as amended [6].

The system(s) to be applied is (are): 2+

In addition, with regard to reaction to fire the system(s) to be applied is (are): 1, 2+

3.2 Tasks of the manufacturer

The cornerstones of the actions to be undertaken by the manufacturer of the product in the procedure of assessment and verification of constancy of performance for all types of meshes are laid down in Table 2.

Table 2 Control plan for the manufacturer; corner stones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC)					
1	Mesh size - average mesh size - mesh opening - coverage ratio	2.2.5	specified value within the specified tolerance	measure-ment at least 3 times on a sample	when starting the production or every 100 000 metres coverage ratio at start of production or at change of product
2	Weaving accuracy	2.2.6	without defects specified in 2.2.6	1 (at least 10 metres)	when starting the production or every 100 000 metres
3	Organic content and ash content	2.2.2	specified value within the tolerance of 4 %	3	when starting the production or every 100 000 metres
4	Gross heat of combustion	2.2.3	specified value or lower	according to EN ISO 1716	when starting the production of the particular type of glass fibre mesh and following changes

5 Official Journal of the European Communities/Union L 229 of 20.08.1997, p. 14.

6 Official Journal of the European Communities/Union L 209 of 2.8.2001, p. 33.

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
5	Tensile strength and elongation	2.2.7		at least 10 samples in weft direction and at least 10 samples in warp direction	when starting the production or 4x per year
	- in the initial state, in warp / weft direction		<u>standard and/or reinforced mesh:</u> - tensile strength $R_{50,m,in}$ [N/50 mm] or $T_{max,m,in}$ [kN/m] - elongation $\varepsilon_{m,in}$ [%]		
	- after alkalis ageing, in warp / weft direction		<u>standard mesh:</u> - tensile strength $R_{50,m,alk}$ at least 1000 N/50 mm, or $T_{max,m,alk}$ at least 20 kN/m and residual strength after alkalis ageing $\Delta T_{max,m,alk}$ at least 50 % of initial state <u>reinforced mesh:</u> - tensile strength $R_{50,m,alk}$ at least 1000 N/50 mm or $T_{max,m,alk}$ at least 20 kN/m and residual strength after alkalis ageing $\Delta T_{max,m,alk}$ at least 40 % of initial state <u>standard and/or reinforced mesh:</u> - elongation after alkalis ageing $\varepsilon_{m,alk}$ [%]		
6	Mass per unit area	2.2.8	specified value within the tolerance of 5%	1	when starting the production or every 100 000 metres
7	Thickness	2.2.9	specified value within the specified tolerance	3	when starting the production or every 100 000 metres
8	Reaction to fire • direct tests: - relevant test methods to the reaction to fire class according to EN 13501-1 and • indirect tests: - confront lines 2 (organic content) and 8 (mass per	2.2.1	specified reaction to fire class	according to the relevant EN specified by EN 13501-1	direct tests when starting the production or once per year except EN 13823, testing based on EN 13823 when starting the production of the particular type of glass fibre mesh and following

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
	unit are) of Table 1				changes and indirect tests when starting the production or every 100 000 metres
9	Content, emission and/or release of dangerous substances	2.2.4	according to control plan	1	when starting the production or in change of manufacturing process
10	Improvement to limitation of crack development (only for triaxial mesh)	2.2.10	according to control plan	1	when starting the production or in change in composition of product or in change of manufacturing process

3.3 Tasks of the notified body

The cornerstones of the actions to be undertaken by the notified body in the procedure of assessment and verification of constancy of performance for glass fibre mesh for reinforcement of cementitious or cement-based renderings are laid down in Table 3 for AVCP system 1 and Table 4 for AVCP system 2+.

The involvement of a notified product certification body is required only under the conditions in Decision 97/556/EC as amended, in case of reaction to fire class A1, A2, B and C of the product for which clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (for example an addition of fire retardants or a limiting of organic material).

Table 3 Control plan for the notified body; corner stones for AVCP system 1

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Initial inspection of the manufacturing plant and of factory production control carried out by the manufacturer considering the constancy of performances of reaction to fire and taking into account the limit of organic material and/or the addition of fire retardants.	As defined in control plan	As defined in control plan	As defined in control plan	When starting the production, after starting a new production line or after modification of production processes

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Continuous surveillance, assessment and evaluation of factory production control					
2	Continuous surveillance, assessment and evaluation of the factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire and taking into account a limiting of organic material and/or the addition of fire retardants.	As defined in control plan	As defined in control plan	As defined in control plan	Once per year

The intervention of the notified body under AVCP system 1 is only necessary for reaction to fire for products/materials for which a clearly identifiable stage in the production process results in an improvement of the reaction to fire classification (for example an addition of fire retardants or a limiting of organic material).

Table 4 Control plan for the notified body; corner stones for AVCP system 2+

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Initial inspection of the manufacturing plant and of factory production control					
1	Initial inspection of the manufacturing plant and of factory production control carried out by the manufacturer considering the constancy of performances of essential characteristics under the Basic Works Requirements 2, 3 and 4.	As defined in control plan	As defined in control plan	As defined in control plan	When starting the production, after starting a new production line or after modification of production processes
Continuous surveillance, assessment and evaluation of factory production control					
2	Continuous surveillance, assessment and evaluation of the factory production control carried out by the manufacturer regarding the constancy of performance related to essential characteristics under the Basic Works Requirements 2, 3 and 4.	As defined in control plan	As defined in control plan	As defined in control plan	Once per year

4 REFERENCE DOCUMENTS

EN 1122:2001	Plastics – Determination of cadmium – Wet decomposition method
EN 13162:2012+A1:2015	Thermal insulation products for buildings - Factory made mineral wool (MW) products - Specification
EN 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests
EN 13496:2013	Thermal insulation products for building applications – Determination of the mechanical properties of glass fibre meshes as reinforcement for External Thermal Insulation Composite Systems with renders (ETICS)
EN 13823:2010+A1:2014	Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item
EN 16383:2016	Thermal insulation products for building applications - Determination of the hygrothermal behaviour of external thermal insulation composite systems with renders (ETICS)
EN 60855-1:2017	Live working - Insulating foam-filled tubes and solid rods - Part 1: Tubes and rods of a circular cross-section
EN ISO 1716:2018	Reaction to fire tests for products - Determination of the cross heat of combustion (calorific value)
EN ISO 2078:1998+A1:2015	Textile glass - Yarns - Designation
EN ISO 6341:2012	Water quality - Determination of the inhibition of the mobility of Daphnia magna Straus (Cladocera, Crustacea) - Acute toxicity test
EN ISO 7500-1:2018	Metallic materials - Calibration and verification of static uniaxial testing machines - Part 1: Tension/compression testing machines - Calibration and verification of the force-measuring system
EN ISO 10319:2015	Geosynthetics - Wide-width tensile test
EN ISO 11348-1:2008+A1:2018	Water quality - Determination of the inhibitory effect of water samples on the light emission of Vibrio fischeri (Luminescent bacteria test) - Part 1: Method using freshly prepared bacteria
EN ISO 11348-2:2008+A1:2018	Water quality - Determination of the inhibitory effect of water samples on the light emission of Vibrio fischeri (Luminescent bacteria test) - Part 2: Method using liquid-dried bacteria
EN ISO 11348-3:2008+A1:2018	Water quality – Determination of the inhibitory effect of water samples on the light emission of *Vibrio fischeri* (Luminescent bacteria test) – Part 3: Method using freeze-dried bacteria
EN ISO 11925-2:2011	Reaction to fire tests - Ignitability of building products subjected to direct impingement of flame - Part 2: Single-flame source test
ISO 80000-1:2009/Corr.1:2011-10	Quantities and units - Part 1: General
ISO 187:1990	Paper, board and pulps. Standard atmosphere for conditioning and testing and procedure for monitoring the atmosphere and conditioning of samples

ISO 1887:2014	Textile glass - Determination of combustible-matter content
ISO 4603:1993+A1:2010	Textile glass - Woven fabrics - Determination of thickness
ISO 15799:2019	Soil quality - Guidance on the ecotoxicological characterization of soils and soil materials
CEN/TS 15447:2006	Mounting and fixing in reaction to fire tests under the Construction Products Directive
CEN/TS 16637-2:2014	Construction products - Assessment of release of dangerous substances - Part 2: Horizontal dynamic surface leaching test
EAD 040083-00-0404	External thermal insulation composite systems (ETICS) with renderings (superseding “ETAG 004”)
ETAG 004:2000+Amendment 2011 and 2013	External Thermal Insulation Composite Systems (ETICS) with Rendering, used as EAD (superseded by EAD 040083-00-0404)

ANNEX A – MESH SIZE

A.1 Rectangular mesh

The mesh size shall be determined by measuring of the distance between 21 threads – axial distance (that´s 20 threads, see Figure A.1). One measurement is taken in warp direction and one measurement is taken in weft direction. Calliper providing precision 0.02 mm or better shall be used. The test is performed after conditioning of the specimens at (23 ± 2) °C and (50 ± 5) % RH for at least 24 hours.

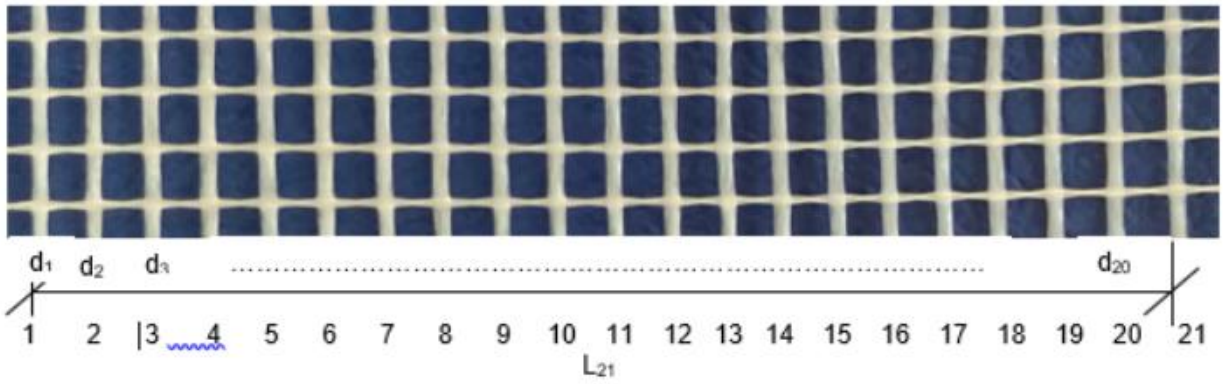

Fig. A.1 Scheme of measurement of mesh size on rectangular mesh

The average value of mesh size is determined by dividing the measured distance by the number of meshes (20). The mesh opening is calculated by subtracting the thicknesses of the threads ($d_1 \ldots d_{20}$) from the mesh size and dividing by number of meshes (20).

Average value of mesh size = $L_{21}/20$ shall be counted in both warp and weft directions.

Mesh opening = $(L_{21} – d_1 – d_2 \ldots\ldots – d_{20})/20$

L_{21}	distance between 21 threads see Fig. 1 [*mm*]
$d_1 \ldots d_{20}$	width of the thread 1, 2, 3,……(weft or warp) [*mm*]

If mesh with a specific geometry (threads created by group of yarns, see 1.3.3) is to be included in ETA, the picture with the geometry of the mesh shall be taken to clarify the mesh size and mesh opening.

To emphasize the area that the mesh threads cover to the area not covered by them, the coverage ratio in [%] is counted according to equation:

$$\text{coverage ratio} = \left(1 - \left(\frac{\text{average mesh opening warp} * \text{average mesh opening weft}}{\text{average mesh size warp} * \text{average mesh size weft}}\right)\right) * 100$$

Note: The assessment method is the same as in the EAD 040016-00-0404, the modification of this assessment method relates to the more detailed description to of the method to avoid the different interpretation (based on experiences).

A.2 Triaxial mesh

The mesh size shall be determined by measuring the distance between 21 threads – axial distance (that´s 20 threads) in warp direction and in both cross directions. The assessment method is the same as described in 2.2.4.1, the only difference is that there are three directions, see Figure A.2.

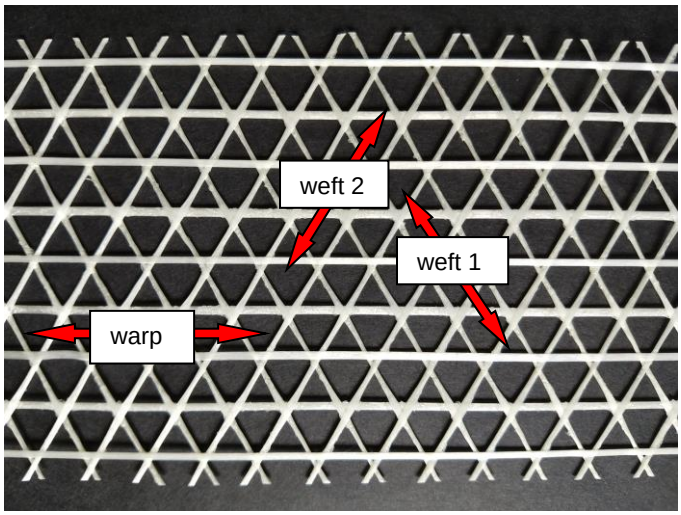

Figure A.2 Scheme of measurement of mesh size on triaxial mesh

To emphasize the area that the mesh threads cover to the area not covered by the threads, the coverage ratio in [%] is counted according to equation:

$$\text{coverage ratio } = (1 - \left(\frac{\text{area of triangle counted from average mesh opening values}}{\text{area of triangle counted from average mesh size values}}\right)) * 100.$$

A.3 Test results

Test results shall include the following information at least:

- registered data of the type, geometry and mass per area unit of the tested mesh;
- type and measured data about tested specimens (tested width, tested number of threads, tested direction);
- measured individual values of width of threads for each direction separately;
- calculated average value of mesh size for each direction separately;
- calculated average value of mesh opening for each direction separately;
- calculated value of coverage ratio;
- type and dimensions of visible inaccuracies, if detected, photo(s) of inaccuracy(ies), if necessary.

ANNEX B – TENSILE STRENGTH AND ELONGATION

B.1 General

The characteristics are to be measured in the weft and warp directions on 10 specimens respectively and at each state - in the initial state and after immersion in alkaline solution - ageing (it means 10 + 10 /+ 10 for triaxial mesh/ specimens in initial state and 10 + 10 /+ 10 for triaxial mesh/ specimens after ageing).

Test specimens are to be prepared according to Clauses 6.3.1 of EN 13496 with difference in their width according to number of threads, placed within the width of 50 mm of the mesh in tested direction, as follows:

- if 5 and more threads are placed within the mesh width of 50 mm, the test specimens are prepared in dimensions and manner of Clause 6.3.1 and 6.3.3 of EN 13496. Number of threads per 50 mm n_{50} is calculated according to Clause 6.3.2 and rounded according to Clause 6.3.3 of EN 13496;

- if less than 5 threads are placed within the width of 50 mm, the test specimens are prepared as strips containing only 2 threads of mesh;

- if one thread consists of group of more yarns as specified in 1.3.3, it is to be considered as one thread for purpose of determination of number of threads per 50 mm.

B.2 Test procedure

Installation of test specimens into jaws of test machine shall not harm tested mesh. It can be achieved by one of following ways:

- Using the jaws of the test machine covered with a rubber surface of suitable hardness. This possibility is recommended for meshes with 5 threads or more per 50 mm;

- Using the metal tabs glued by suitable type of resin on both sides of both ends of test specimen before test. Metal tabs can be made of aluminium or steel sheet of thickness 1.0 mm at least, of the whole width of the test specimen at least and of the length of 60 mm at least. Tabs shall be glued to tested end of mesh in parallel position. Test can be performed after regular maturing of used resin. This possibility is recommended for meshes with less than 5 threads per 50 mm.

Test machine of class 1 or better according to EN ISO 7500-1, equipped with rigid jaws capable to resist deformation during the test, shall be used.

The test specimen shall be located perpendicular to the clamp of the tensile testing machine. The free length of the test specimen between jaws should be 200 mm. The tensile load is increased with a constant crosshead speed of (10 $\pm$ 5) mm/min until failure occurs. The test load at failure in N and the measured deformation in mm are recorded. Samples, where the specimen is displaced within the jaws or where the failure occurs at the jaws, shall be discarded.

The evaluation of the tensile strength depends on the mesh size; that´s how many threads are within the width of 50 mm of the test specimen.

If one thread consists of specific group of more yarns as specified in A.1, it is to be considered as one thread for purpose of determination of number of threads per 50 mm.

B.3 Specific conditions for test and its evaluation

B.3.1 Meshes with 5 and more threads within the width of 50 mm [7]

The test specimens are prepared as strips of nominal width of 50 mm and of length 300 mm at least. They shall contain at minimum 5 threads within the width. Number of threads in a strip n is calculated and recorded.

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7 Testing according to Clause 5.6.7.1 of ETAG 004 used as EAD, calculation based on EN 13496. The difference from EAD 040016-00-0404 consists in calculation based on EN 13496, technically more correct than in ETAG 004 used as EAD and in EAD 040016-00-0404.

Calculation based on Clause 8 of EN 13496 is undertaken to determine:

- the individual values of the tensile strength $R_{50,i}$ [N/50 mm];
- the individual values of elongation at failure ε_i [%];
- the average value of tensile strength $R_{50,m}$ [N/50 mm];
- the average value of tensile strength per one metre $T_{max,m}$ [kN/m];
- the average value of elongation at failure ε_m [%];
- the relative value of residual tensile strength $\Delta T_{max,m,alk}$ in [%] after 28 days of alkalis ageing.

Average tensile strength within the width of one meter $T_{max,m}$ is calculated from $R_{50,m}$ according to equation:

$$T_{max,m} = R_{50,m} / 50 \quad [kN/m].$$

and rounded in integer.

The relative value of residual tensile strength $\Delta T_{max,m,alk}$ in [%] after 28 days of alkalis ageing is calculated as the average tensile strength after alkalis ageing $T_{max,m,alk}$ divided by the average tensile strength in initial state $T_{max,m,in}$ according to equation:

$$\Delta T_{max,m,alk} = 100 \times T_{max,m,alk} / T_{max,m,in}.$$

B.3.2 Meshes with less than 5 threads within the width of 50 mm

If the meshes contain less than 5 threads within the width of 50 mm, just two threads are tested.

The length of the test specimens is at least 300 mm. The free length of the specimen between jaws should be 200 mm at least. The testing is identical with testing of the meshes with 5 and more threads within the width of 50 mm, but instead of the width of 50 mm, only width with 2 threads is tested.

Calculation based on Equation (1) and (3) of Clause 9.1 of EN ISO 10319 is undertaken for width of one meter to determine for each direction of mesh in initial state or after alkalis ageing separately:

- the individual values of the tensile strength $T_{max,i}$ [kN/m];
- the individual values of elongation at failure ε_i [%];
- the average value of tensile strength $T_{max,m}$ [kN/m];
- the average value of elongation at failure ε_m [%;
- the relative value of residual tensile strength $\Delta T_{max,m,alk}$ in [%] after 28 days of alkalis ageing.

The relative value of residual tensile strength $\Delta T_{max,m,alk}$ in [%] after 28 days of alkalis ageing is calculated according to B.3.1.

B.4 Conditioning and ageing of test specimens

B.4.1 Tensile strength and elongation of the glass fibre mesh in the initial state

The test according B.2 or before alkalis ageing of test specimens according to B.4.2, all test specimens are conditioned at (23 ± 2) °C and (50 ± 5) % RH for at least 24 hours.

B.4.2 Tensile strength and elongation of the glass fibre mesh after alkalis ageing

The specimens are immersed for 28 days in 4 litres alkaline solution at (23 ± 2)°C: 20 specimens, 10 in the weft and 10 in the warp direction.

The composition of 1 litre of the solution is as follows:

- 1 g NaOH,
- 4 g KOH,

- 0,5 g Ca $(OH)_2$,
- to one litre of distilled water.

The samples are rinsed by immersion for 5 minutes in acid solution 5 ml HCl (35 % diluted) to 4 litres water. Then placed successively in 3 baths of water, 4 litres each. The samples are left for 5 minutes in each bath.

Subsequently they are taken out and dried at (23 ± 2) °C and (50 ± 5) % RH for 48 hours. After this conditioning, the testing according to B.2 is performed.

B.5 Test results

Test results shall include the following information at least:

- registered data of the type and mass per area unit of the tested mesh;
- type and measured data about tested specimens (tested width, tested number of threads, tested direction);
- measured maximal load at failure F_{max} in [N], basic measured length and length at failure in [mm] for each tested specimen separately for each state and direction;
- calculated individual tensile strength per 50 mm $R_{50,i}$ in [N/50 mm] for each test specimen with 5 or more threads within the width of 50 mm according to B.3.1 separately for each state (see B.4, initial state and after alkalis ageing) and direction (warp or weft);
- calculated individual tensile strength within the width of 1 meter $T_{max,i}$ in [kN/m] and elongation at failure ε_i in [%] for each test specimen according to its type (see B.3.1 or B.3.2) separately for each state (see B.4, initial state and alkalis ageing) and direction (warp or weft);
- calculated average values of tensile strength $T_{max,m}$ in [kN/m] and of elongation at failure ε_m in [%] separately for each state and direction;
- calculated value of the residual value of tensile strength after alkalis ageing $\Delta T_{max,m,alk}$ in [%].

ANNEX C – IMPROVEMENT TO LIMITATION OF CRACK DEVELOPMENT

C.1 The configuration of the test specimen:

- test wall width ≥ 2,5 m, height ≥ 2,0 m, area 6 m2 at least;
- thermal insulation product MW CS(10/Y)30-TR10, thickness of 100 mm, with mechanical characteristics not exceeding the closest higher class of the characteristics according to EN 13162+A1;
- cementitious reinforced base coat of max. thickness of 4 mm;
- cementitious base coat of average tensile strength max. 0.80 MPa and of average tensile modulus of elasticity in maximum 400 MPa, without any additional reinforcement as fibres, for example any base coat tested according to Clause A.6.8.3, Annex A of EAD 040083-00-0404, with specification of characteristics given in valid ETA of ETICS, complying with specified level of given characteristics; or base coat verified by preliminary tests of specified characteristics;
- the perimeter edges of the test wall and perimeter edges of the opening shall be wrapped/covered with the reinforced base coat;
- in the middle of the test wall, one opening of dimensions of 1.6 m width and 1 m height shall be included;
- strips (No. 1 and 2 on Figure C.1) of reinforcement, situated in linings of opening, shall have its longitudinal axis equal to the line of lining;
- remaining area of test specimen shall be reinforced by strips of tested reinforcement with nominal overlapping 100 mm. If necessary, wider strips shall be cut for requisite width;
- no other reinforcement (especially diagonal) shall be positioned in corners of opening;
- no additional profiles for creating of opening (corners etc.) are used, except windowsill profile on bottom side;
- contact line of opening edges with test substrate wall shall be sealed by appropriate mastic.

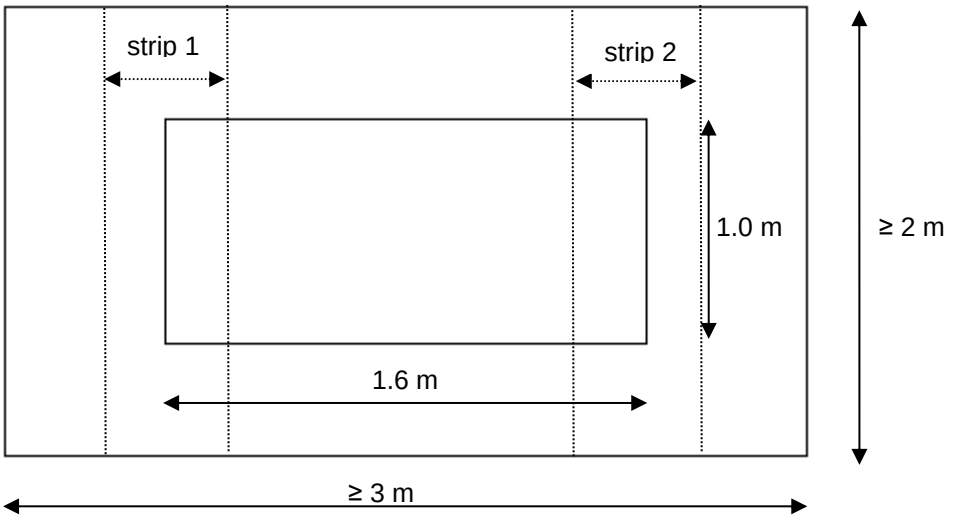

Figure C.1 - Test wall – dimensions

C.2 Examination of test wall after hygrothermal cycles

After finish of hygrothermal cycles, test wall is to be dried for at least 7 days at (23 ± 10) °C and (50 ± 10) % RH. After drying, external surface of base coat is visually examined for presence of any cracks.

If any cracks are detected, their position on test wall is documented by sketches and pictures. After documentation, at least the critical cracks are examined for their depth by following procedure. Critical cracks are specified as follows:

- Any crack in front area of corner of opening
- Any crack of width 0.2 mm or higher anywhere in front area of base coat
- Any crack anywhere in front area of base coat, if no cracks of width 0.2 are detected.

At least one crack of each type is to be examined as follows, if relevant type is registered on front side of test wall after hygrothermal cycles.

Surface of base coat in position of tested cracks is sprayed by 1.5 % water solution of eosin ($C_6OH_6Br_4Na_2O_5$, see EN 60855-1) until surface of base coat is visibly wet and coloured solution drains over crack down. Then the test wall is left until sprayed colour solution dries. After drying, probes of approximate width 100 mm and length 250 mm are cut in base coat perpendicularly and symmetrically to tested cracks by angle grinder.

Then cut probes are taken off carefully from surface of test wall and their rear side is visually inspected for presence of colouring by used pigment solution. If any presence of colour is detected, crack is evaluated as penetrating through the complete base coat.

If no presence of colour is registered, test sample is broken in crack carefully and surface of fracture is examined by magnifying glass (5× at least) for depth of penetration of colour pigment. Depth of colour penetration is registered as follows:

- less or equal to plane of reinforcing triaxial mesh;
- penetrating through plane of reinforcing triaxial mesh up to rear side of base coat.

Test is evaluated in test report by one of following manner:

- “No cracks create” if no cracks create or “Only cracks of depth not penetrating through plane of reinforcing mesh create” if all tested cracks penetrate only up to plane of reinforcing mesh;

or

- in all other cases, “Cracks penetrating through the complete thickness of base coat create”.

Details of visual inspection of test wall after hygrothermal cycles, and, if cracks are presented, sketches and photos of cracks and findings and photos of samples tested by colour penetrating method are given in test report too.

C.3 Tensile strength, elongation at break and static modulus of elasticity of base coat used for the test

The test is performed on sample of base coat material, used for preparation of test rig for improvement to limitation of crack development. Nominal dimensions of test specimen are 3 mm x 50 mm x 300 mm. Used type of base coat shall be without any additional reinforcement, for example by fibres.

The test is carried out on test sample, consisting of five tests specimens cured for at least 28 days at (23 ± 2) °C and (50 ± 5) % RH, and of five test specimens, after this curing subjected to conditioning by the hygrothermal test on the rig according to 2.2.10 and Annex C.1.

Test specimens are prepared using strips of extruded polystyrene of thickness 3 mm, appropriately positioned as moulding on and adhered to expanded polystyrene board. Material of base coat, mixed according to relevant instruction manual, is to be applied into prepared moulding and uniformly smoothed. Than the sample, consisting of 10 test specimens at least, is cured for at least 28 days at (23 ± 2) °C and (50 ± 5) % RH. After curing, the test specimens are carefully cut from the polystyrene board by appropriate

method, for example with hot wire. The test specimens, conditioned by hygrothermal test, are to be equally placed in the opening on the rig during conditioning.

After curing and/or conditioning, test specimens are subjected to a tensile test until failure, with initial distance 200 mm between the test jaws and with tensioning speed 2 mm/min. If necessary, test specimens are held between jaws with the interposition pads. Dimensions of cross section in position of specimen failure are to be controlled and registered after each test with accuracy 0,1 mm.

Loading at failure and elongation at failure are registered for each test specimen separately. Working diagram loading / elongation shall be recorded during each test.

Static modulus of elasticity E_s [*MPa*] for span 5 % as bottom level and 30 % as upper level of loading at failure for each test specimen is to be calculated according to equation:

$$E_s = \frac{\Delta\sigma}{\Delta\varepsilon}$$

E_s static modulus of elasticity [*MPa*]

$\Delta\sigma$ difference of tensile strength at level of 5 % and 30 % of force at failure $F_{max,}$ expressed in [*MPa*]

$\Delta\varepsilon$ difference of elongation at level of 5 % and 30 % of force at failure $F_{max,}$ expressed as [-]

Appropriate values of loading and elongation for calculation of modulus of elasticity are taken from working diagram.

Difference of tensile strength $\Delta\sigma$ [*MPa*] is to be calculated according to equation:

$$\Delta\sigma = \frac{F_{30\%} - F_{5\%}}{A}$$

$F_{5\%}$ force at level of 5 % of force at failure, expressed in [*N*]

$F_{30\%}$ force at level of 30 % of force at failure, expressed in [*N*]

A area of test specimen, expressed in [mm^2] as actual area at the point of failure

Difference of elongation $\Delta\varepsilon$ [-] is to be calculated according to equation:

$$\Delta\varepsilon = \frac{l_{30\%} - l_{5\%}}{l}$$

$l_{5\%}$ length at level of 5 % of force at failure, expressed in [*mm*]

$l_{30\%}$ length at level of 30 % of force at failure, expressed in [*mm*]

l the basic tested length of the sample, expressed in [*mm*]

Average values and estimation of standard deviation of static modulus of elasticity, tensile strength at failure and elongation at failure after curing and/or conditioning are to be calculated. Evaluation for each quantity is to be calculated separately for cured and/or for conditioned part of sample.