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European Assessment Document for

Inorganic fibre grids for reinforcement of cement-, anhydrite- or resin-based screeds

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) 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

This EAD covers inorganic fibre grids determined for reinforcement of cement-, anhydrite-, or resin-based floor screeds (hereinafter referred to as fibre grid(s)) in building works. Fibre grids are composed of an open rectangular grid fabric, made of glass, basalt or carbon fibre threads, positioned in warp and weft direction and manufactured by any textile processing using straight threads in warp and weft direction. To provide resistance to alkali- or to acid- conditions, fibre grids can be treated by an organic treatment, eventually with added flame retardant to improve performance of reaction to fire of the product.

This EAD covers fibre grids with the nominal grid size at least 3 mm, to allow the fresh screed to sufficiently penetrate the fibre grid during application, up to 150 mm to allow the fibre grid to work correctly as a screed reinforcement against cracking.

The fibre grid shall be specified in the ETA at least regarding the following characteristics, given in manufacturer's specification of product(s):

- Type of fibres in warp / weft direction, in case of glass fibres by type of glass in accordance with EN ISO 2078 [1] (E-glass, C-glass, AR-glass etc.);
- Type of textile processing;
- Type of resin used for manufacturing and treatment;
- Grid size and grid opening in warp and in weft direction;
- Determination of application (alkali-resistant; acid-resistant; alkali- and acid-resistant).

The EAD does not cover fibre grids made in warp direction from separate bars or rods of annular, elliptic or similar cross section, connected in knots with weft by glue or by any type of clips.

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

The product is not covered by EAD 040016-01-0404 due to different intended use, range of essential characteristics and test methods of fibre grids in warp/weft direction in relation to their application.

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, e.g., with regard to the intended end use conditions, 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 as long as the details of the assessment methods as laid down in this EAD are respected.

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

1.2.1 Intended use(s)

The fibre grid is intended to be used as reinforcement of cement-, anhydrite- or resin-based floor screeds, situated in dry, wet and/or especially aggressive and/or corrosive conditions (e.g., sewage plants, silage troughs, chemical, food processing, agricultural conditions) to prevent a formation of shrinkage cracks.

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

The fibre grid shall be embedded into a fresh screed and sufficiently covered by screed from both sides. The maximum particle size grading of aggregate used in applied screed in relation to the fibre grid openings shall be taken into account to prevent the damage of the fibre grid during application. The fibre grid size and tensile strength shall be taken into account in application in relation to screed thickness that fresh screed sufficiently penetrates through the fibre grid and will work as correct reinforcement. Ratio of covering shall be taken into account the fibre grid not to create an unsolicited separation layer in a screed.

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 fibre grid for the intended use of 25 years when installed in the works (provided that the fibre grid is subject to appropriate installation (see clause 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.

1.3.2 Yarn

Bundle of twisted or untwisted continuous fibres.

1.3.3 Thread

Basic part of composition of fibre grid in warp or weft direction, consisting of straight yarns, positioned as single or in small groups, 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 clause B.1 of Annex B), and for testing of tensile strength in accordance with clause 2.2.9 and Annex B. The picture with the geometry shall be stated in the ETA in such case to clarify the composition of the fibre grid, example of such fibre grid see in Figure 1.3.5.1.

1.3.4 Grid size

The grid size is difference between axes of separate adjacent threads in specified direction (warp or weft), defined as the average value of dimension between axes of threads, details see in Figure 1.3.5.1.

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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.

1.3.5 Grid opening

The grid opening is the largest width between threads in the middle part of opening between separate adjacent threads in specified direction warp or weft), defined as the average value of measured dimension.

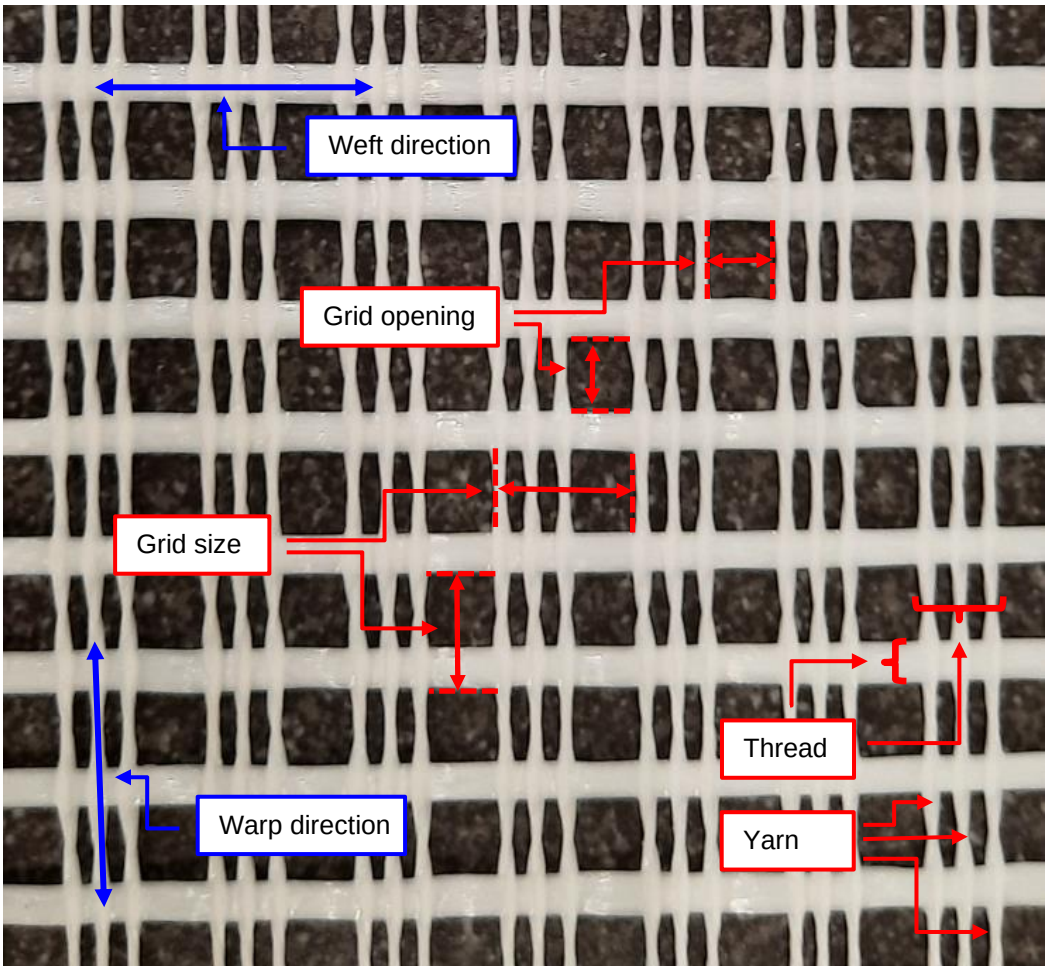

Figure 1.3.5.1 Relation between grid size (GS) and grid opening (GO) in specific case of threads consisting of more yarns

1.3.6 Coverage ratio

Threads cover significant part of area specified by grid size in warp and weft directions. Moreover they are usually coated by organic layer often lowly coherent with screed, therefore they can create pronounced separating layer in reinforced screed, they are installed in.

The coverage ratio *C* is defined as the portion of area of a fibre grid not covered by threads, specified by grid opening (*GO*) in warp and in weft direction, on total area specified by grid size (*GS*) in warp and in weft direction.

1.3.7 Symbols

F_{max}	Recorded tensile load at failure of test specimen
GS	Grid size
GO	Grid opening
H_{ash}	Content of ash
H_{org}	Content of organic compound
L	Length

$Q_{PCS,mass}$	Gross heat of combustion per mass unit
$Q_{PCS,A}$	Gross heat of combustion per area unit
R_{50}	Tensile strength within the width of 50 mm
T_{max}	Tensile strength within the width of 1 m
d	Width of thread
m_A	Weight of unit of area
m_0	Weight of specimen holder
m_1	Weight of dried test specimen plus holder
m_2	Weight of calcinated test specimen plus holder
m_{Cd}	Content of cadmium
n	Number of threads
ε	Elongation at tensile failure

1.3.8 Indices

A	reference to unit of area
acid	conditioning in acid solution
alk	conditioning in alkali solution
ash	reference to content of ash
cond	common marking of the state of testing, in final replaced by specific marking of the state
dir	direction of testing (warp or weft)
i	individual value
in	initial state
m	average value
mass	reference to unit of mass
max	maximal determined value or value referred to width of 1 m
org	reference to organic content
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 2.1.1 shows how the performance of fibre grids for reinforcement of cement-, anhydrite- or resin-based screeds is assessed in relation to the essential characteristics.

Table 2.1.1 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_{PSC} per unit of mass - Q_{PSC} per unit of area	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	 Description, Level Description, Level
Basic Works Requirement 4: Safety and accessibility in use			
5	Grid size	2.2.5	Level
6	Grid opening	2.2.6	Level
7	Coverage ratio	2.2.7	Level
8	Fabric accuracy	2.2.8	Description
9	Tensile strength and elongation Tensile strength in warp / weft direction: - In initial state - After conditioning in alkali conditions - After conditioning in acid conditions - Residual portion of tensile strength after alkali conditioning - Residual portion of tensile strength after acid conditioning Elongation ε in warp / weft direction: - In initial state - After conditioning in alkali conditions - After conditioning in acid conditions	2.2.9	 Level Level Level Level Level Level Level Level
10	Mass per unit of area	2.2.10	Level
11	Thickness	2.2.11	Level

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.

If for any components covered by harmonised standards or European Technical Assessments 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.

2.2.1 Reaction to fire

Purpose of the assessment

Reaction to fire describes the response of a fiber mesh, caused by its decomposition by fire under specified conditions.

Assessment method

The fibre grids shall be tested, using the method(s) relevant for the corresponding reaction to fire class in accordance with EN 13501-1, at least for critical case. Specific conditions for the tests of the fibre grids are given in the Annex C.

The critical case is specified as the fibre grid with the minimum grid size determined in accordance with clause 2.2.5, minimum grid opening determined in accordance with clause 2.2.6 and maximum coverage ratio determined in accordance with clause 2.2.7, made from threads with maximum organic content determined in accordance with clause 2.2.2, covered by treatment with maximum gross heat of combustion $Q_{PCS,A}$ determined in accordance with clause 2.2.3, and with minimum content of flame retardant or without according to manufacturer’s specification of product (see clause 1.1).

At least variant of fibre grid with minimum and with maximum mass per area unit determined in accordance with clause 2.2.10 shall be tested.

Expression of results

The fibre grids shall be classified in accordance with the Commission Delegated Regulation (EU) No 2016/364 in connection with EN 13501-1.

The reaction to fire class of the fibre grid shall be given in the ETA together with specification of the grid in accordance with manufacturer’s specification of product (see clause 1.1).

In extended application, the classification of the fibre grid is valid for products:

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

2.2.2 Organic content and ash content

Purpose of the assessment

Organic content and ash content describe variability of portion of flammable and inflammable components in composition of fiber grid in relation to characteristics “Reaction to fire” and “Tensile strength and elongation”.

Assessment method

Organic content and ash content shall be determined by test in accordance with ISO 1887 at (625 ± 20) °C or, with types of fibres unstable at this temperature, at a temperature lower, until constant mass is reached. Three test specimens, each of mass at least 5 g, cut off parallel to the threads at least 100 mm apart from the side of grid, shall be used for test. Test specimens shall be cut from grid so to keep the proportion of length of warp and weft threads in tested grid.

At preparation of the test, the test specimens can be cut to minor parts of length about 10 mm up to 20 mm to be able to put them into holder.

The test specimens shall be conditioned in accordance with 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 consecutive measured value.

After drying, the test specimens are burned in holder at temperature specified to the Table 2.2.2.1 for one hour. After burning, holders with test specimens shall be cooled in desiccator. Finally, conditioned remaining material shall be weighted. Accuracy of measurement in accordance with clause 6.3 of ISO 1887 shall be held.

If type of used fibres is unstable at the temperature (625 ± 20) °C, test temperature in such case shall be determined on basis of preliminary tests. The fibre grid shall be preliminary tested by burning of specimens prepared by the same procedure in holders for maximum temperature, not causing any visible deterioration (especially sintering or burning) of tested fibres.

Test temperature determined by preliminary tests shall be rounded to ten °C downwards. This test temperature also shall be kept constant within ± 20 °C interval during the test.

Table 2.2.2.1 Test temperature in accordance with type of fibers

Type of fibres	**Test temperature**
Glass or basalt stabile at the temperature 625 °C	(625 ± 20) °C
Glass or basalt unstable at the temperature 625 °C	Temperature between 500 °C and 600 °C, set by preliminary tests, not causing any deterioration of fibres
Carbon graphitised or carbonised, stabile at the temperature 625 °C	(625 ± 20) °C
Carbon unstable at the temperature 625 °C	Maximum temperature, set by preliminary tests, not causing any deterioration of fibres

Weight of specimen holder m_0, dried test specimen plus holder m_1 and weight of calcinated test specimen plus holder m_2 shall be determined in accordance with clause 6 of ISO 1887.

Expression of results

Organic content $H_{org,i}$ of individual test specimens shall be determined from individual values of m_0, m_1 and m_2 in [%] in accordance with equation (2.2.2.1):

$$H_{org,i} = \frac{m_{1,i} - m_{2,i}}{m_{1,i} - m_{0,i}} \quad [\%] \quad (2.2.2.1)$$

Then average value of organic content $H_{org,m}$ from individual test results of all tested specimens shall be calculated and rounded to the nearest integer.

Finally, average value of ash content $H_{ash,m}$ shall be determined in [%] in accordance with equation (2.2.2.2):

$$H_{ash,m} = 100 - H_{org,m} \quad [\%] \quad (2.2.2.2)$$

Following information shall be given in the ETA together with manufacturer's specification of product (see clause 1.1), preferably in form of table:

- The average value of the organic content $H_{org,m}$ in [%] of mass;
- The average value of the ash content $H_{ash,m}$ in [%] of mass;
- The test temperature in [°C] used for the tests.

2.2.3 Gross heat of combustion Q_{PCS} per unit of mass and per unit of area

Purpose of the assessment

Gross heat of combustion Q_{PCS} gives basic information for assessment of reaction to fire of complete assembly of screed reinforced by fibre grid concerning its reaction to fire, if fibre grid creates substantial or non-substantial component of complete flooring in accordance with clauses 3.1.5, 3.1.6, 3.1.7 and 3.1.8 of EN 13501-1.

Assessment method

The test shall be performed in accordance with EN ISO 1716 for each type of treatment, specified in the manufacturer's specification of product(s) by type of used resin and its applied mass per area unit. The test shall be conducted by using the crucible method in accordance with clause 7.9 of EN ISO 1716 utilizing a combustion aid, e.g., benzoic acid or paraffin oil. For preparation of the test specimens, the fibre grid shall be cut into small pieces.

Gross heat of combustion per unit of mass $Q_{PCS,m}$ in [MJ/kg] of individual tested specimens shall be calculated in accordance with clause 9.3 of EN ISO 1716.

Expression of results

Gross heat of combustion per unit of mass $Q_{PCS,m}$ of the product shall be calculated in accordance with clause 9.4.2 of EN ISO 1716 as average value of gross heat of combustion per unit of mass of individual tested specimens and rounded to the nearest three valid places.

Gross heat of combustion per unit of area $Q_{PCS,A}$ of the product shall be calculated from average value of gross heat of combustion per unit of mass $Q_{PCS,mass}$ of the product and from mass per unit of area m_A of the product, determined in accordance with clause 2.2.10, in accordance with equation (2.2.3.1):

$$Q_{PCS,A} = \frac{Q_{PCS,mass} \times m_A}{1000} \quad [\%] \quad (2.2.3.1)$$

Following information shall be given in the ETA together with manufacturer's specification of product (see clause 1.1), preferably in form of table:

- Gross heat of combustion $Q_{PCS,mass}$ per unit of mass in [MJ/kg];
- Gross heat of combustion $Q_{PCS,A}$ per unit of area in [MJ/m^2].

2.2.4 Content, emission and/or release of dangerous substances

Purpose of the assessment

The performance of the fibre grid regarding 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 taking into account the intended use(s) 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:

IA3: Product with no contact to indoor air

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

2.2.4.1 Leachable substances

Assessment method

For the intended use covered by the release scenario S/W2 the performance of the fibre grid concerning leachable substances shall be assessed. A leaching test with subsequent eluate analysis shall take place, each in duplicate. Leaching tests of the test specimens shall be conducted in accordance with EN 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 roll of fibre grid, cut off parallel to the thread at least 100 mm apart from the side. Before testing, the sample shall be stored for at least 2 days at (23 ± 2) °C and (50 ± 5) % RH, than 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 in accordance with EN ISO 6341;
- Toxicity test with algae in accordance with ISO 15799;
- Luminescent bacteria test in accordance with EN ISO 11348-1, EN ISO 11348-2 or EN ISO 11348-3.

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":

- Biological degradation in accordance with OECD Test Guideline 301 part A, B or E.

Expression of results

Determined toxicity in biological tests shall be expressed as EC20-values for each dilution ratio and given in the ETA together with manufacturer's specification of product (see clause 1.1). Maximum determined

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[3] The manufacturer may be asked to provide to the TAB the REACH related information which shall accompany the DoP (cf. Article 6(5) of Regulation (EU) No 305/2011).

The manufacturer may **not** be asked to:
- provide the chemical constitution and composition of the product (or of constituents of the product) to the TAB, or
- 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, taking into account the installation conditions of the construction product and the release scenarios resulting from there.

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

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

Assessment method

In accordance with Regulation (EC) No. 1907/2006 (REACH) [4], the content of cadmium or cadmium compound shall be determined in fibre grid due to its possible content in coating of threads. The test shall be performed in accordance with method A of EN 1122. At least one test specimen from sample taken from the fibre grid shall be tested.

Expression of results

In accordance with Annex XVII to the Regulation (EC) No. 1907/2006 (REACH), the maximum value of content of cadmium shall be equal or less than 0.01 % per weight. If the content of cadmium c_{Cd} exceeds this level, an ETA cannot be issued.

The content of cadmium m_{Cd} of the fibre grids, expressed in milligrams per kilogram [mg/kg], shall be given in the ETA together with manufacturer's specification of product (see clause 1.1).

2.2.5 Grid size

Purpose of the assessment

Grid size in warp / weft direction relates to ability of threads of fibre grid to transfer internal tensile strains in screed, fibre grid is installed in, caused by external load or by internal screed thermal expansion / contraction or by shrinkage due to desiccation or hardening of screed binder.

Assessment method

The grid size in warp / weft direction shall be tested in accordance with clause A.2 of Annex A on one test specimen selected in accordance with clause A.1 from the fibre grid in roll of length at least 10 m.

After measurement, the average values of the grid size in warp GS_{warp} and in weft GS_{weft} direction, expressed in [mm], shall be calculated and rounded in accordance with clause A.2 of Annex A.

Expression of results

The average values of the grid size in [mm] in warp (GS_{warp}) and in weft (GS_{weft}) direction shall be given in the ETA together with manufacturer's specification of product (see clause 1.1).

2.2.6 Grid opening

Purpose of the assessment

Grid opening in warp / weft direction covers applicability of fibre grid in screeds of different particle size grading due to possibility of its penetration, and ability of fibre grid to transfer correctly internal strains caused by tensile splitting of screed, induced by static or movable local loads on flooring.

Assessment method

The grid opening in warp / weft direction shall be tested in accordance with clause A.3 of Annex A on one test specimen selected in accordance with clause A.1 from the fibre grid in roll of length at least 10 m.

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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.

After measurement, the average values of the grid opening in warp GO_{warp} and in weft GO_{weft} direction, expressed in [mm], shall be calculated and rounded in accordance with clause A.3 of Annex A.

Expression of results

The average values of the grid opening in [mm] in warp (GO_{warp}) and in weft (GO_{weft}) direction shall be given in the ETA together with manufacturer's specification of product (see clause 1.1).

2.2.7 Coverage ratio

Purpose of the assessment

Coverage ratio covers applicability of fibre grid in screeds of low thickness and ability of screed to resist to internal strains caused by tensile splitting or by transversal peeling caused by static or movable local point loads on flooring.

Assessment method

Before the test, average value of grid size in warp and in weft direction according to clause 2.2.5 and average value of grid opening in warp and in weft direction according to clause 2.2.6 shall be tested and calculated, even in case the manufacturer does not wish to declare the performance for the essential characteristic "Grid size" according to clause 2.2.5 and "Grid opening" according to clause 2.2.6.

Coverage ratio (*C*) shall be calculated from measured values of grid size and grid opening, both determined in warp and weft direction, by calculation in accordance with clause A.4 of Annex A.

Expression of results

Coverage ratio *C* in [*%*] shall be given in the ETA together with manufacturer's specification of product (see clause 1.1).

2.2.8 Fabric accuracy

Purpose of the assessment

Fabric accuracy covers presence of possible imperfections in continuous textile weave of fibre grid, which adversely affect its tensile resistance and elongation.

Assessment method

One specimen of length of at least 2 m of the fibre grid in form of roll of length of at least 10 m, and of full width, random selected from a roll, shall be inspected visually in accordance with clause A.1 of Annex A. All singularities and defects of the fibre grid, e.g. as:

- untrimmed edge in any length;
- deflected (uneven) fronts of roll over ± 5 mm;
- gap over treble distance of wefts or warps in any length;
- weft skewing or weft waving over 4 % of width of the fabric (measured by a rectangular ruler);
- cracked thread

shall be recorded, included their frequency, and their typical appearance documented by photo.

Expression of results

Following information shall be given in the ETA together with manufacturer's specification of product (see clause 1.1), preferably in form of table:

- Type of the fibre grid;

- Description of the fabric accuracy after visual inspection, expressed as presence or absence of singularities or defects mentioned above, and their frequency, based on the observation;
- Photo(s) of appearance of typical (repeated) fabric inaccuracy(ies), if observed.

2.2.9 Tensile strength and elongation

Purpose of the assessment

Tensile strength and elongation in warp / weft direction cover ability of threads of fibre grid to transfer internal tensile strains in screed a fibre grid is installed in, caused by external loads, by screed thermal expansion / contraction or by shrinkage of screed, induced by desiccation or hardening of screed binder.

Assessment method

The tensile strength and elongation of the threads of the fibre grid shall be determined on at least 10 test specimens in accordance with Annex B for warp and for weft direction of threads separately.

Before the test, average value of grid size in warp and in weft direction according to clause 2.2.5 shall be tested and calculated, even in case the manufacturer does not wish to declare the performance for the essential characteristic “Grid size” according to clause 2.2.5.

Tests shall be performed in warp / weft direction in initial state and after alkali conditioning for 28 days in accordance with clause B.4.2 of Annex B and/or after acid conditioning in accordance with clause B.4.3 of Annex B, depending on final way of application of the fibre grid (see clause 1.1), specified by manufacturer in his MPII. If manufacturer’s instructions do not specify the environment of application of the fibre grid, both types of conditioning shall be tested.

Type of the test specimens and their preparation shall be selected according to number of threads, placed in the width of 50 mm of the fibre grid in tested direction, as given in clause B.1 of Annex B. Further rules for preparation of test specimens in accordance with clause 6.3.3 of EN ISO 10319 shall be held.

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 the nearest two valid places.

The test result shall be assessed according to the type of the test specimen used for tests in relation to number of threads within the width of 50 mm, as follows:

- If five and more threads are placed within the width of 50 mm in specified direction, the average tensile strength of the fibre grid within the width of 1 m $T_{max,m}$ [kN/m] shall be calculated from $R_{50,m}$ in accordance with clause B.3.1 of Annex B;
- If less than five threads are placed within the width of 50 mm in specified direction, the average tensile strength of the fibre grid within the width of 1 m $T_{max,m}$ in [kN/m] shall be calculated for tested number of threads from average value of tensile force F_{max} [kN] and from grid size (see clause 2.2.5) in accordance with clause B.3.2 of Annex B.

Expression of results

Following characteristics of the fibre grid shall be given in the ETA separately for warp and for weft direction for each tested type of the fibre grid according to manufacturer’s specification of product (see clause 1.1), preferably in form of table:

- Description of the type of the fibre grid (grid size, grid opening, dimension of the threads and type of textile processing) according to manufacturer´s specification (see clause 1.1);
- Tensile strength within the width of 50 mm and tensile strength within the width of 1 m if five and more threads are placed in warp / weft direction of the fibre grid:
  - In the initial state $R_{50,m,in}$ [kN/50 mm] and $T_{max,m,in}$ [kN/m] in specified direction;
  - After alkali conditioning $R_{50,m,alk}$ [kN/50 mm] and $T_{max,m,alk}$ [kN/m] in specified direction;

- After acid conditioning $R_{50,m,acid}$ [kN/50 mm] and $T_{max,m,acid}$ [kN/m] in specified direction;

- Tensile strength within the width of 1 m, if less than five threads are placed in warp / weft direction of the fibre grid:
  - In the initial state $T_{max,m,in}$ [kN/m] in specified direction;
  - After alkali conditioning $T_{max,m,alk}$ [kN/m] in specified direction;
  - After acid conditioning $T_{max,m,acid}$ [kN/m] in specified direction;

- The value of the residual portion of tensile strength within the width of 1 m after alkali conditioning $\Delta T_{max,alk}$ in [%] in warp / weft direction, calculated in accordance with clause B.3.1.1 or B.3.2.1 of Annex B according to number of threads in specified direction;

- The value of the residual portion of tensile strength within the width of 1 m after acid conditioning $\Delta T_{max,acid}$ in [%] in warp / weft direction, calculated in accordance with clause B.3.2.1 or B.3.2.2 of Annex B according to number of threads in specified direction;

- Average value of the elongation at rupture in warp / weft direction of the fibre grid:
  - In the initial state $\varepsilon_{m,in}$ in [%] in specified direction;
  - After alkali conditioning $\varepsilon_{m,alk}$ in [%] in specified direction;
  - After acid conditioning $\varepsilon_{m,acid}$ in [%] in specified direction.

2.2.10 Mass per unit of area

Purpose of the assessment

Mass per unit of area covers characteristic of fibre grid in relation to reaction to fire of complete screed with installed fibre grid in accordance with clauses 3.1.5, 3.1.6, 3.1.7 and 3.1.8 of EN 13501-1.

Assessment method

The mass per unit of area of the fibre grid shall be determined by measuring and weighing of three test specimens of length at least 1 m, cut from fibre grid in different, random selected parts of roll. The width of the specimen shall be the same as the width of the roll of the fibre grid.

Expression of results

The mass per unit of area m_A of tested fibre grid shall be calculated in [g/m^2] as the average value from three measured values, and rounded to the nearest integer.

The three measured values and the average value of mass per unit of area m_A shall be given in [g/m^2] in the ETA together with manufacturer's specification of product (see clause 1.1).

2.2.11 Thickness

Purpose of the assessment

Thickness of fibre grid covers characteristic of fibre grid in relation to complete screed with installed fibre grid in accordance with clauses 3.1.5, 3.1.6, 3.1.7 and 3.1.8 of EN 13501-1 and its ability to be used in screeds of low thickness (screeds on basis of resin binder).

Assessment method

The thickness of the fibre grid (perpendicular distance between surfaces of the fabric) shall be determined by measuring in accordance with ISO 4603, Table 1, for the set of conditions 2, i.e., standard pressure 2.0 kPa and measuring-foot area 25 cm^2. The test specimens before test shall be conditioned in standard conditions in accordance with clause 5 of ISO 187.

Expression of results

The average value of the thickness in [mm] and minimum and maximum measured thicknesses, rounded to the nearest three valid places, shall be given in the ETA together with manufacturer's specification of product (see clause 1.1).

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 Commission Delegated Decision (EU) 2015/1958.

The system is 2+.

For uses subject to regulations on reaction to fire the applicable AVCP systems regarding reaction to fire are 1, or 3, or 4 depending on the conditions defined in the said Decision.

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 are laid down in Table 3.2.1.

Table 3.2.1 Control plan for the manufacturer; cornerstones

No	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples	Minimum frequency of control
Factory production control (FPC) [including testing of samples taken at the factory according to a prescribed test plan]					
1	Reaction to fire	2.2.1	According to Control plan	According to the relevant EN specified by EN 13501-1	When starting the production or in change of manufacturing process
2	Ash content Organic content	2.2.2	According to Control plan	3	When starting the production or every 100 000 m
3	Gross heat of combustion	2.2.3	According to Control plan	In accordance with EN ISO 1716	When starting the production or in change of manufacturing process
4	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
5	Grid size	2.2.5	According to Control plan	Measurement at least three times on the specimen of length at least 10 m	When starting the production or every 10 000 m
6	Grid opening	2.2.6	According to Control plan	Measurement at least three times on the specimen of length at least 10 m	When starting the production or every 10 000 m
7	Coverage ratio	2.2.7	According to Control plan	Measurement at least 3 times on the specimen of length at least 10 m	When starting the production
8	Fabric accuracy	2.2.8	According to Control plan	1 (specimen of length at least 10 m)	When starting the production or every 100 000 m
9	Tensile strength and elongation in warp / weft direction: - in the initial state - after alkali conditioning - after acid conditioning	2.2.9	According to Control plan	At least 10 specimens in weft direction and at least 10 specimens in warp direction	When starting the production or four times per year
10	Mass per unit of area	2.2.10	According to Control plan	1	When starting the production or every 10 000 m
11	Thickness	2.2.11	According to Control plan	3	When starting the production or every 10 000 m

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 fibre grids for reinforcement of cement-, anhydrite- or resin-based screeds are laid down in Table 3.3.1.

Table 3.3.1 Control plan for the notified body; cornerstones

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 *(for system 2+ only)*					
1	Notified Body will ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing of the fibre grids for reinforcement of cement-, anhydrite- or resin-based screeds	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	According to Control plan	According to Control plan	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control *(for system 2+ only)*					
2	The Notified Body will ascertain that the system of factory production control and the specified manufacturing process are maintained taking account of the control plan.	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Table 3.2.1	According to Control plan	According to 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 (e.g., an addition of flame retardants or a limiting of organic material).

In this case the cornerstones of the actions to be undertaken by the notified body under AVCP system 1 are laid down in Table 3.3.2.

Table 3.3.2 Control plan for the notified body; cornerstones

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 carried out by the manufacturer regarding the constancy of performance related to reaction to fire *(for system 1 only)*					
1	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 are fulfilled for reaction to fire, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material).	Verification of the complete FPC as described in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	When starting the production or a new line
Continuous surveillance, assessment and evaluation of factory production control carried out by the manufacturer regarding the constancy of performance related to reaction to fire *(for system 1 only)*					
2	Where the intervention of the Notified Body is necessary only because the conditions for the applicability of system 1 in the Decisions regarding reaction to fire are fulfilled, the notified body will consider especially the clearly identifiable stage in the production process which results in an improvement of the reaction to fire classification (e.g., an addition of fire retardants or a limiting of organic material)	Verification of the controls carried out by the manufacturer as described in the control plan agreed between the TAB and the manufacturer with reference to the raw materials, to the process and to the product as indicated in Table 3.2.1	As defined in the control plan agreed between the TAB and the manufacturer	As defined in the control plan agreed between the TAB and the manufacturer	One per year

4 REFERENCE DOCUMENTS

EN 1122:2001	Plastics – Determination of cadmium – Wet decomposition method
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 13501-1:2018	Fire classification of construction products and building elements - Part 1: Classification using test data from reaction to fire tests
EN 13823:2020+A1:2022	Reaction to fire tests for building products - Building products excluding floorings exposed to the thermal attack by a single burning item
EN 16637-2:2023	Construction products - Assessment of release of dangerous substances - Part 2: Horizontal dynamic surface leaching test
EN ISO 1182:2020	Reaction to fire tests for products - Non-combustibility test
EN ISO 1716:2018	Reaction to fire tests for products - Determination of the gross heat of combustion (calorific value)
EN ISO 2078:2022	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 11925-2:2020	Reaction to fire tests - Ignitability of building products subjected to direct impingement of flame - Part 2: Single-flame source test
EN ISO 12960:2020	Geotextiles and geotextile-related products - Screening test methods for determining the resistance to acid and alkaline liquids
EN ISO 80000-1:2022	Quantities and units - Part 1: General
ISO 187:2022	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/Amd 1:2010	Textile glass - Woven fabrics - Determination of thickness
ISO 15799:2019	Soil quality - Guidance on the ecotoxicological characterization of soils and soil materials
EAD 040016-01-0404	Glass fibre mesh for reinforcement of cementitious or cement-based renderings
OECD Test No. 301	Ready Biodegradability, OECD Guidelines for the Testing of Chemicals, Section 3, OECD Publishing, Paris

ANNEX A: GRID SIZE, GRID OPENING, COVERAGE RATIO

A.1 General

Following characteristics are determined in accordance with this Annex for the fibre grids for reinforcement of cement-, anhydrite- or resin-based screeds:

- grid size *GS* separately for warp / weft direction;
- grid opening *GO* separately for warp / weft direction;
- fabric accuracy;
- coverage ratio *C*.

Before testing, a specimen of the fibre grid, consisting of one roll of length of at least 10 m, shall be conditioned at (23 ± 2) °C and (50 ± 5) % RH for at least 24 hours.

After conditioning, the specimen shall be unfolded on flat underlay of width larger or at least equal to width of specimen and of length at least 2.5 m. Tested area for measurement shall be positioned from onset of roll at least in distance 2 m. Tested area shall be straightened and weighted on opposite vacant ends in direction of roll by appropriate weight.

If any visible inaccuracy in unfold tested area of specimen of width equal to width of a roll and of length 2 m is present, such place of specimen shall be moved to get this inaccuracy outside the area of unfolded part of roll. Type and dimensions of visible inaccuracy shall be recorded and documented by photo.

A.2 Grid size

The grid size shall be determined by measurement of distance of specified number of threads. Length at least of 500 mm or of five openings, the longer length is decisive, shall be measured separately for warp and for weft direction. The principle of measurement of grid size is shown in Figure A.2.1.

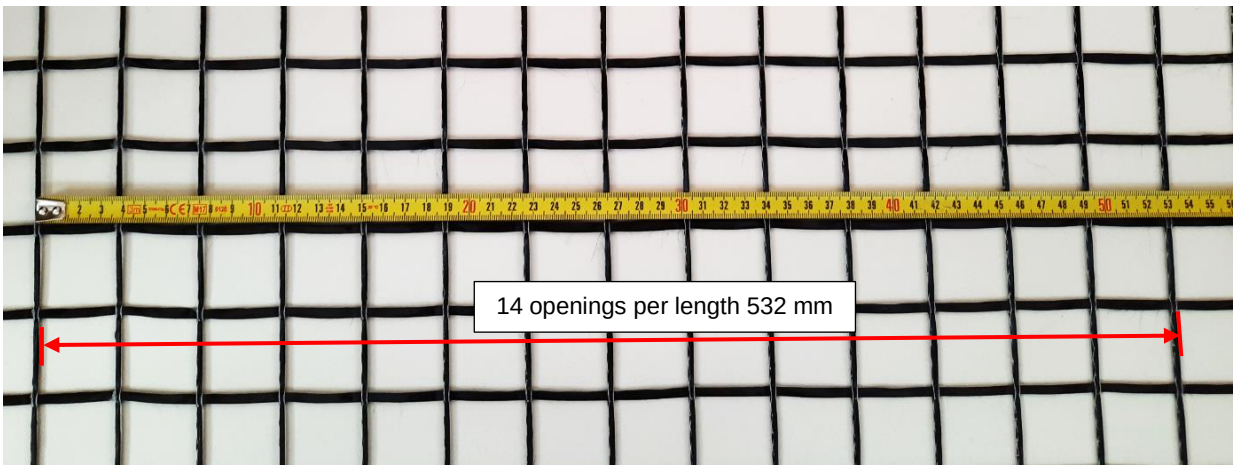

Figure A.2.1 Example of determination of number of threads per unit of length

One measurement of grid size shall be taken in warp direction and one measurement shall be taken in weft direction. Measured places shall be selected approximately in the middle of unfold area. The beginning and final points of measurement shall be positioned on the same edge (right or left) of peripheral threads of measured length and marked on the specimen by marker. Number of openings between markings shall be counted.

A metal scale of length at least 600 mm, providing a precision of 1 mm, shall be used for measurement of grid size. Measured length and counted number of openings shall be recorded separately for warp and for weft direction.

The grid size shall be calculated as portion of measured length and of counted number of threads in measured length separately for warp and for weft direction of fibre grid in accordance with equation (A.2.1):

$$GS_{dir} = \frac{l_{dir}}{n_{dir}} \quad [\%] \quad (A.2.1)$$

where index *dir* means direction of measurement, i.e. warp or weft.

The calculated value of grid size *GS* shall be rounded upwards as follows:

- for grid size up to 40 mm included: to 0.1 mm;
- for grid size exceeding 40 mm, but equal or lower to 100 mm: to 0.5 mm;
- for grid size exceeding 100 mm: to 1 mm.

A.3 Grid opening

The grid opening shall be determined on unfolded sample, as specified in A.1, by measurement of width of at least ten threads separately for warp and for weft direction. If there are less than ten threads on the width of the roll (i.e. in weft direction), each of them shall be measured only one times, no further measurement is performed.

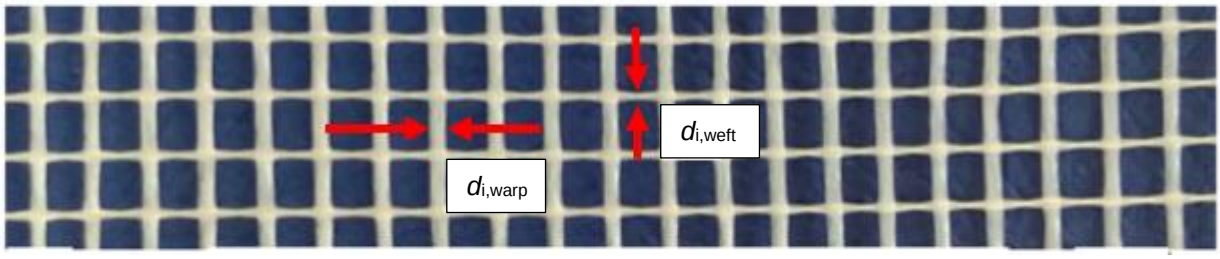

Figure A.3.1 Determination of width of thread

Tested points shall be positioned in the middle between separate adjacent threads. The principle of measurement of width of thread *d* is shown in Figure A.3.1.

Width of thread shall be measured by calliper with accuracy at least 0.05 mm. During measurement, jaws of calliper shall touch edges of the thread lightly, without any deformation of the thread.

The grid opening *GO* in warp and in weft direction shall be calculated by subtracting the average value of the width of the measured threads from the grid size *GS* in this direction.

The calculated value of grid opening shall be rounded downwards as follows:

- for grid opening up to 40 mm included: to 0.1 mm;
- for grid opening exceeding 40 mm, but equal or lower to 100 mm: to 0.5 mm;
- for grid opening exceeding 100 mm: to 1 mm.

A.4 Coverage ratio

To determine the area, that the fibre grid threads cover, to the area not covered by them, the coverage ratio shall be calculated in accordance with equation (A.4.1):

$$C = (1 - \left(\frac{GO_{warp} \times GO_{weft}}{GS_{warp} \times GS_{weft}}\right)) \times 100 \quad [\%] \quad (A.4.1)$$

The calculated value of coverage ratio *C* shall be expressed in [%] and rounded to the nearest integer.

A.5 Test results

Test results shall include at least the following information:

- registered data of the type of fibre grid and of its mass per unit of area, determined in accordance with clause 2.2.10;
- measured data about test specimen in test of grid size (tested width, tested number of threads, tested direction);
- individual measured values of width of threads for each direction separately;
- calculated average value of the grid size for each direction separately;
- calculated average value of the grid opening for each direction separately;
- calculated value of the coverage ratio;
- type and dimensions of visible inaccuracies, if observed, completed by (typical) photo(s) of inaccuracy.

ANNEX B: TENSILE STRENGTH AND ELONGATION

B.1 General

The tensile strength and elongation of the fibre grids for reinforcement of cement-, anhydrite- or resin-based screeds shall be measured in the weft and warp directions respectively on 10 specimens at least at initial state and after conditioning by immersion in alkali- and/or in acid- solution. For tests at least ten + ten specimens in initial state and ten + ten specimens after conditioning in one solution in warp / weft direction are necessary, or at least twenty + twenty specimens in case of conditioning in both solutions.

Test specimens shall be prepared in accordance with clause 6.3.3 of EN ISO 10319 with difference in their width according to number of threads, placed in the width of 50 mm of the fibre grid in tested direction, as follows:

- If five and more threads are placed in tested direction within the fibre grid width of 50 mm, the test specimens shall be prepared and tested as a strips of nominal width 50 mm in minimum, with one thread exceeding width 50 mm;
- If less than five threads are placed in tested direction within the width of 50 mm, the test specimens shall be prepared and tested as strips containing only 2 threads of fibre grid;
- For fibre grids of grid size (see clauses 1.3.4 and 2.2.5) equal or greater than 100 mm in direction perpendicular to the tested, only one thread shall be tested;
- If one thread consists of specific group of more yarns as specified in clause 1.3.3 and shown in Figure 1.3.5.1, it shall 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 fibre grid. 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 fibre grids 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 at least 1.0 mm, of at least the whole width of the test specimen and of the length of at least 60 mm. Tabs shall be glued to tested end of fibre grid in parallel position. Test can be performed after regular maturing of used resin. This possibility is recommended for fibre grids with less than 5 threads per 50 mm.

Test machine of class 1 or better in accordance with EN ISO 7500-1, equipped with rigid jaws capable to resist deformation during the test, shall be used. Jaws equipped with soft inserts shall be preferred.

The specimen shall be located perpendicular to the jaws of the tensile testing machine in axis of acting load. The free length of test specimen between jaws shall be 200 mm.

For measurement of extension, contactless extensometer with accuracy 0.001 mm or better shall be used. After its installation, all measurement devices shall be reset and the test can start.

Tensile load shall be increased with a constant crosshead speed of (10 $\pm$ 5) mm/min until failure occurs. Acting load and measured deformation shall be scanned permanently and recorded during test with frequency at least 10 Hz. The maximum load in kN and type of failure shall be recorded after the test.

If the test specimen is displaced within the jaws or where the failure occurs at the jaws, the test shall be discarded and replaced by another one.

The assessment of the tensile strength depends on the grid size, as specified in clause 2.2.5; i.e. how many threads are in the width of 50 mm of the test specimen.

For determination of number of threads per 50 mm width of the test specimen, approach in accordance with clause B.1 shall be applied.

Test strips shall be cut with small overlap in transversal direction not to harm tested threads. Nominal tested width of test specimen, determined from tested number of threads and nominal grid size in tested direction in accordance with clause 2.2.5, shall be taken into calculation of tensile strength of tested specimen.

B.3 Specific conditions for test and its assessment

B.3.1 Fibre grids with five and more threads within the width of 50 mm

The test specimens shall be prepared as the strips of nominal width 50 mm in minimum, with length at least 350 mm. They shall contain at least five threads in minimum within the width of the test specimen. If necessary due to distances between threads, one can exceed nominal width 50 mm.

Calculations based on clause 8 of EN 13496 shall be undertaken to determine the following quantities for warp and for weft direction of fibre grid in initial state and after specified type of conditioning separately.

B.3.1.1 Alkali conditioning of the fibre grid

Quantities for alkali conditioning:

- the individual values of the tensile strength per 50 mm after alkali conditioning $R_{50,l,alk}$ in warp / weft direction in [kN/50 mm];
- the average value of tensile strength per width of 50 mm after alkali conditioning $R_{50,m,alk}$ in warp / weft direction in [kN/50 mm];
- the average value of tensile strength per width of one metre after alkali conditioning $T_{max,m,alk}$ in warp / weft direction in [kN/m];
- the individual values of elongation at failure after alkali conditioning $\varepsilon_{l,alk}$ in warp / weft direction in [%];
- the average value of elongation at failure after alkali conditioning $\varepsilon_{m,alk}$ in warp / weft direction in [%].

Average tensile strength per width of one meter in warp / weft direction after alkali conditioning $T_{max,m,alk}$ shall be calculated from $R_{50,m,alk}$ for specified direction in accordance with equation (B.3.1.1.1):

$$T_{max,m,alk} = R_{50,m,alk} \times 20 \qquad \text{[kN/m]} \qquad \text{(B.3.1.1.1)}$$

and rounded to the nearest integer.

The residual portion of tensile strength $\Delta T_{max,alk}$ in [%] in warp / weft direction after 28 days of conditioning in alkali conditions shall be calculated as portion of the average tensile strength in specified direction after alkali conditioning $T_{max,m,alk}$ divided by the average tensile strength in specified direction in initial state $T_{max,m,in}$ in accordance with equation (B.3.1.1.2):

$$\Delta T_{max,alk} = \frac{T_{max,m,alk}}{T_{max,m,in}} \times 100 \qquad \text{[%]} \qquad \text{(B.3.1.1.2)}$$

The residual portion of the tensile strength in warp / weft direction after alkali conditioning shall be rounded to the nearest integer.

B.3.1.2 Acid conditioning of the fibre grid

Quantities for acid conditioning:

- the individual values of the tensile strength per 50 mm after acid conditioning $R_{50,l,acid}$ in warp / weft direction in [kN/50 mm];
- the average value of tensile strength per width of 50 mm after acid conditioning $R_{50,m,acid}$ in warp / weft direction in [kN/50 mm];
- the average value of tensile strength per width of one metre after acid conditioning $T_{max,m,acid}$ in warp / weft direction in [kN/m];
- the individual values of elongation at failure after acid conditioning $\varepsilon_{l,acid}$ in warp / weft direction in [%];
- the average value of elongation at failure after acid conditioning $\varepsilon_{m,acid}$ in warp / weft direction in [%].

Average tensile strength per width of one meter $T_{max,m,acid}$ in warp / weft direction shall be calculated from $R_{50,m,acid}$ in specified direction in accordance with equation (B.3.1.2.1):

$$T_{max,m,acid} = R_{50,m,acid} \times 20 \qquad \text{[kN/m]} \qquad \text{(B.3.1.2.1)}$$

and rounded to the nearest integer. The residual portion of tensile strength $\Delta T_{max,acid}$ in [%] in warp / weft direction after 3 days of conditioning in acid conditions shall be calculated as portion of the average tensile strength after acid conditioning $T_{max,m,acid}$ in specified direction divided by the average tensile strength in initial state $T_{max,m,in}$ in specified direction in accordance with equation (B.3.1.2.2):

$$\Delta T_{max,acid} = \frac{T_{max,m,acid}}{T_{max,m,in}} \times 100 \qquad \text{[%]} \qquad \text{(B.3.1.2.2)}$$

The residual portion of the tensile strength in warp / weft direction after acid conditioning shall be rounded to the nearest integer.

B.3.2 Fibre grids with less than five threads within the width of 50 mm

If the fibre grids contain less than 5 threads within the width of 50 mm, just two treads shall be tested, or if grid size of fibre grid is equal or greater than 100 mm, only single thread shall be tested.

The length of test specimens shall be at least 350 mm. The free length of the test specimen between clamps shall be 200 mm.

The preparation of test specimen except its width and its testing shall be identical with testing of the fibre grids with 5 and more treads within the width of 50 mm, but only width with 2 treads (or 1 thread) shall be tested.

Calculation based on Equation (1) and (3) of clause 9.1 of EN ISO 10319 shall be undertaken for width of one meter to determine for each direction of fibre grid in initial state and after specified type of conditioning separately.

B.3.2.1 Alkali conditioning of the fibre grid

Quantities for alkali conditioning:

- the individual values of the tensile strength after alkali conditioning $T_{max,l,alk}$ in warp / weft direction in [kN/m];
- the individual values of elongation at failure after alkali conditioning $\varepsilon_{l,alk}$ in warp / weft direction in [%];
- the average value of tensile strength after alkali conditioning $T_{max,m,alk}$ in warp / weft direction in [kN/m]
- the average value of elongation at failure after alkali conditioning $\varepsilon_{m,alk}$ in warp / weft direction in [%].

The residual portion of tensile strength in warp / weft direction after 28 days of conditioning in alkali conditions $\Delta T_{max,alk}$ in [%] shall be calculated for specified direction in accordance with clause B.3.1.1 and equation (B.3.1.1.2) and rounded to the nearest integer.

B.3.2.2 Acid conditioning of the fibre grid

Quantities for acid conditioning:

- the individual values of the tensile strength after acid conditioning $T_{max,l,acid}$ in warp / weft direction in [kN/m];
- the individual values of elongation at failure after acid conditioning $\varepsilon_{l,acid}$ in warp / weft direction in [%];
- the average value of tensile strength after acid conditioning $T_{max,m,acid}$ in warp / weft direction in [kN/m]
- the average value of elongation at failure after acid conditioning $\varepsilon_{m,acid}$ in warp / weft direction in [%].

The residual portion of tensile strength in warp / weft direction after 3 days of conditioning in acid conditions $\Delta T_{max,acid}$ in [%] shall be calculated in accordance with clause B.3.1.2 and equation (B.3.1.2.2) and rounded to the nearest integer.

B.4 Conditioning and conditioning of test specimens

B.4.1 Conditioning in the initial state

Before the test in accordance with clause B.2 or before conditioning of test specimens in accordance with clause B.4.2 or clause B.4.3, all test specimens shall be conditioned at (23 ± 2) °C and (50 ± 5) % RH for at least 24 hours.

B.4.2 Conditioning in the alkali solution

At least ten test specimens in the weft and 10 test specimens in the warp direction shall be immersed for 28 days in 4 litres of specified alkaline solution at (23 ± 2) °C. The composition of 1 litre of the alkaline solution shall be as follows:

- 1 g NaOH,
- 4 g KOH,
- 0.5 g $Ca(OH)_2$,
- to one litre of distilled water.

After conditioning, the test specimens shall be rinsed by immersion for 5 minutes in acid solution 5 ml HCl (35 % diluted) to 4 litres water. Then they shall be placed successively in 3 baths of water, 4 litres each. The specimens shall be left for 5 minutes in each bath.

Subsequently they shall be taken out and dried at (23 ± 2) °C and (50 ± 5) % RH for 48 hours. After this, the test in accordance with clause B.2 shall be performed.

B.4.3 Conditioning in the acid solution

At least ten test specimens in the weft and ten test specimens in the warp direction shall be immersed for three days in 4 litres of specified acid solution at (60 ± 1) °C. The composition of 1 litre of the acid solution in accordance with clause 5.2.1 of EN ISO 12960 shall be as follows:

- 0.025 M H_2SO_4
- Amount of solution shall be more than 30 times as weight of test specimens, test specimens shall be fully immersed.

After conditioning, the test specimens shall be rinsed by immersion in distilled water, after that in solution 0.01 M Na_2CO_3 and again in distilled water, each rinsing at least for 1 minute. Amount of liquid shall be enough for thorough cleanness.

Subsequently they shall be taken out and dried at (23 ± 2) °C and (50 ± 5) % RH for 48 hours. During drying specimens shall not be subjected to bending or other undue stress. After this, the test of tensile strength in accordance with clause B.2 shall be performed.

B.5 Test results

Test results shall include at least the following information:

- registered data of the type and mass per unit area determined in accordance with clause 2.2.10 of the tested fibre grid;
- 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 [kN/50 mm] for each test specimen with 5 or more threads per 50 mm width in accordance with clause B.3.1 separately for each state (see clause B.4: initial state, after alkali- or acid- conditioning) and direction (warp or weft);
- calculated individual tensile strength per 1 m $T_{max,i}$ in [kN/m] and elongation at failure ε_i in [%] for each test specimen according to its type (see clause B.3.1 or clause B.3.2) separately for each state (see clause B.4: initial state, after alkali- or acid- conditioning) 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 portion of tensile strength $\Delta T_{max,alk}$ in [%] after alkali conditioning separately for each direction;
- calculated value of the residual portion of tensile strength $\Delta T_{max,acid}$ in [%] after acid conditioning separately for each direction.

ANNEX C: REACTION TO FIRE

C.1 General

This Annex covers fibre grids in accordance with clause 1.1 for testing of reaction to fire in accordance with EN 13501-1 and classification in accordance with Regulation (EU) No. 2016/364.

The determination of reaction to fire of the fibre grid is based on testing of the worst case, specified as configuration with the biggest Q_{PCS} value in accordance with clause 2.2.3 and the biggest mass per unit of area in accordance with clause 2.2.10. This test is valid for:

- any combination of fibres and treatment with Q_{PCS} value, determined in accordance with clause 2.2.3, equal or lower than tested;
- any combination of fibres and treatment with mass per unit of area, determined in accordance with clause 2.2.10, equal or lower than tested.

C.2 Testing in accordance with EN ISO 1182

This test method is relevant only for the classes A1 and A2.

This test method shall be performed for each type of the treatment used according to manufacturer's specification of product(s) for manufacturing of the fibre grids.

Using this test method, for fibre grids based on glass or basalt fibres only the treatment as substantial component of the fibre grid (see clause 3.1.5 of EN 13501-1) shall be tested. Concerning fibre grids, based on carbon fibres, complete composition of material (i.e. carbon fibres covered by treatment) shall be tested.

C.3 Testing in accordance with EN ISO 1716

This method is relevant to determine classes A1 and A2. Test shall be performed separately for each type of the treatment used according to manufacturer's specification of product(s) for manufacturing of the fibre grids, as specified in 2.2.3.

Relevant parameters for this test method, when performing calculation, are the determined Q_{PCS} value in accordance with clause 2.2.3 and organic content H_{org} in accordance with clause 2.2.2.

C.4 Testing in accordance with EN ISO 11925-2

This method is relevant to determine the reaction to fire classes B, C, D and E.

At least six test specimens shall be tested for the fibre grid of the biggest mass per unit of area, determined in accordance with clause 2.2.10, made of threads with one treatment and the same organic content, determined in accordance with clause 2.2.2.

Test specimens of dimensions given in clause 5.2 of EN ISO 11925-2 shall be prepared by cutting from the sample of the fibre grid of dimensions at least 1 m x 1 m.

The test specimens shall be dried at laboratory conditions (23 $\pm$ 3) °C and (50 $\pm$ 5) % RH for at least seven days before testing. Then the specimens shall be tested using the test method given in EN ISO 11925-2 on at least six test specimens. For more details see clause 5.4 of EN ISO 11925-2.

Due to application of fibre grids in practice, the low energy level of the ignition source and the short time of flame exposure, the influence of the end use condition can be considered as negligible when testing the specimens.

The product shall be tested with steel substrate behind. Testing of all test specimens shall be conducted with edge exposure in accordance with clause 7.3.3.2 of EN ISO 11925-2.

The following parameters for fibre grids made of threads of the same mass per unit of area, determined in accordance with clause 2.2.10, shall be taken into account when preparing the specimens:

- each different basic chemical composition of treatment;
- the biggest and lowest grid size determined in accordance with clause 2.2.5 and grid opening, determined in accordance with clause 2.2.6;
- the lowest and the highest volume of ash content, determined in accordance with clause 2.2.2 and
- the lowest volume of flame retardant.

The test result in accordance with EN ISO 11925-2 is valid for the variation tested and any variant of the product:

- For any combination of fibres and treatment with Q_{PCS} value, determined in accordance with clause 2.2.3, lower than tested and with the same mass per unit of area, determined in accordance with clause 2.2.10, as tested;
- For any combination of fibres and treatment with the same Q_{PCS} value, determined in accordance with clause 2.2.3, as tested and with mass per unit of area, determined in accordance with clause 2.2.10, lower than tested;
- For any combination of fibres and treatment with Q_{PCS} value, determined in accordance with clause 2.2.3, and mass per unit of area, determined in accordance with clause 2.2.10, lower than tested.

C.5 Testing in accordance with EN 13823 (SBI-test)

This method is relevant to determine the classes A2, B, C and D as well as for the additional classifications s1, s2, s3, d0, d1 and/or d2 regarding smoke production and flaming droplets. At least three test specimens shall be tested.

In principle, it is desirable to find the test specimen configuration that gives the critical case concerning the reaction to fire test results.

In this test procedure, the complete fibre grid shall be tested. The tested fibre grid shall be applied on a standard substrate made from fibre cement board in accordance with clause 5.3.1 and table 1 of EN 13238. The test specimen shall be mechanically hold in position by steel clamps in maximum vertical distance 500 mm, screwed into cement fibre board. Clamps and screws shall be without any coating.

After preparation of the test specimens they shall be conditioned in accordance with clause 4.3, bullet c) of EN 13238.

During the test procedure in accordance with EN 13823, values for the rate of heat release, total heat release, lateral flame spread, rate of smoke release, total smoke release and burning droplets shall be determined.

The test result in accordance with EN 13823 is valid for the variation tested and any variant of the product:

- For any combination of fibres and treatment with $Q_{PCS,A}$ value, determined in accordance with clause 2.2.3, lower than tested and with the same mass per unit of area, determined in accordance with clause 2.2.10, as tested;
- For any combination of fibres and treatment with the same $Q_{PCS,A}$ value, determined in accordance with clause 2.2.3, as tested and with mass per unit of area, determined in accordance with clause 2.2.10, lower than tested;
- For any combination of fibres and treatment with $Q_{PCS,A}$ value, determined in accordance with clause 2.2.3, and mass per unit of area, determined in accordance with clause 2.2.10, lower than tested.
- For any combination of fibres and treatment of $Q_{PCS,A}$ value, determined in accordance with clause 2.2.3, and mass per unit of area, determined in accordance with clause 2.2.10, equal or lower than tested with amount of flame retardant bigger then tested.