



EUROPEAN ASSESSMENT DOCUMENT

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**BED JOINT REINFORCEMENT  
FOR STRUCTURAL USE**

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## **1 SCOPE OF THE EAD**

### **1.1 Description of the construction product**

The bed joint reinforcement is a wire mesh – ladder type, provided on rolls - and consists of multiple longitudinal 3-wire cords (3 x a diameter between 0,40 and 0,80 mm) and transverse interwoven glass roving. Around the longitudinal cords, a (pure) polypropylene yarn is woven to connect the strands with the cross glass roving. The longitudinal cords are of low carbon steel protected against corrosion or of corrosion resistant steel. A coating on the mesh generates the stiffness. The number of longitudinal cords is related to the product width.

Steel materials for the manufacture of bed joint reinforcement and their protective coatings shall correspond with those specified in EN 845-3:2013+A1:2016, clause 4.1. The glass roving is a single end roving and has a silane based sizing. The product is made using glass fibre, combining the electrical and mechanical properties of traditional E glasses with the acid corrosion resistance of E-CR glass and meets the requirements of both E and E-CR glass in EN ISO 2078. The single end roving is manufactured in conformity with ISO 2797.

The product is not fully covered by EN 845-3:2013+A1:2016. EN 845-3 covers only 100% steel reinforcement that is prefabricated for building into a bed joint. Moreover bed joint reinforcement for structural use is limited in EN 845-3 to welded wire meshwork, i.e. cross wires that are welded to longitudinal wires, with longitudinal wires that have a minimum size of 3 mm.

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 construction 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)**

Bed joint reinforcement for structural use. The bed joints may be of normal purpose mortar or thin layer mortar.

#### **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 50 years when installed in the works, provided that the product 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<sup>1</sup>.

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<sup>1</sup> 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.

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 Bed joint**

Mortar layer between the bed faces of masonry units

#### **1.3.2 Bed joint reinforcement**

Reinforcement of longitudinal steel cords that is prefabricated for building into a bed joint

#### **1.3.3 Bond strength**

Tensile load that may be resisted by a specific length of reinforcement in a masonry bed joint

#### **1.3.4 Characteristic yield strength**

Value of the yield strength above which 95% of all the individual test results occur

#### **1.3.5 Cross wires**

Wires which connect longitudinal cords

#### **1.3.6 Assessed value**

Value for a product property determined in accordance with this EAD, that the manufacturer is confident of achieving, bearing in mind the variability of the manufacturing process

#### **1.3.7 Element**

Complete length of a bed joint reinforcement in a roll

#### **1.3.8 Anchorage length**

Minimum embedment of a length of bed joint reinforcement in mortar in order to achieve the full effectiveness of the reinforcement

#### **1.3.9 Longitudinal wire or cord**

Wire or cord placed parallel to the length of the masonry

#### **1.3.10 Meshwork**

Network created with longitudinal strands and interwoven glass roving cross wire

#### **1.3.11 Profile height**

Maximum overall height (distance between the upper and the lower surfaces at right angles to the length and width of the joint) of the embedded portion of the bed joint reinforcement

### **1.3.12 Width**

Overall dimension in the plane of the bed joint reinforcement measured perpendicular to the longitudinal axis

## 2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

### 2.1 Essential characteristics of the product

Table 1 shows how the performance of the product is assessed in relation to the essential characteristics.

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

N°	Essential characteristic	Assessment method	Type of expression of product performance
Basic Works Requirement 1: Mechanical resistance and stability			
1	Tensile strength		
	Dimensions (length, width, profile height, wire sizes, pitch of cords)	2.2.1	Level
	Characteristic yield strength of the longitudinal cords	2.2.2	Level
	Ductility of longitudinal cords	2.2.3	Level
	Strength of the cross-cords (Mean breaking force of the glass roving)	2.2.4	Level
2	Bond strength		
	Bond strength and anchorage length	2.2.5	Level
3	Flexural strength	2.2.6	Level
4	Durability of performance characteristics (against corrosion)	<b>Error! Reference source not found. Error! Reference source not found.</b>	Material/coating reference; steel grade <sup>a</sup>
<sup>a</sup> Durability of performance characteristics against corrosion is dependent on both the conditions of exposure of the masonry and the material/coating specification. This European Assessment Document follows the state of the art by giving material/coating specifications to suit.			

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

#### 2.2.1 Dimensions

The dimensions and limit deviations on dimensions of the bed joint reinforcement as listed in Table 2, sampled at random and with a minimum of specimen per test as given in Table 4 and measured in accordance with clause 3.3, shall be specified in the ETA.

**Table 2 - Dimensions and limit deviations**

Dimensions	Symbol	Verification method and number of samples (clause in this EAD)
Wire sizes	c	3.3.3
Cord cross sectional area	Ac	3.3.4
Length of the roll	L	
Width of the total mesh	W	
Pitch of the outer longitudinal steel cords	e	3.3.5
Pitch of the inner longitudinal steel cords	f	
Profile height	t	
Pitch of the interwoven glass roving	b	

### 2.2.2 Characteristic yield strength, tensile strength and total elongation at maximum force of the longitudinal cords

The value of the characteristic yield strength of the longitudinal cords, when sampled in accordance with clause 3.3.6 without removing any organic coating and polypropylene yarn and tested by the method of EN ISO 15630-3 using test specimens each containing at least two interwoven glass roving wire connections within the gauche length, shall be specified in the ETA.

If a yield phenomenon is not present, the 0,2% proof strength ( $R_{p0,2}$ ) shall be assessed and specified. The values of the percentage total elongation at maximum force, ( $A_{gt}$ ) and the ratio of tensile strength to the yield strength ( $R_m/R_{p0,2}$ ) shall also be specified in the ETA.

### 2.2.3 Ductility of longitudinal strands

The ductility of the longitudinal strands shall be specified in the ETA, based on the assessment of the total elongation at maximum force ( $A_{gt}$ ) in accordance with EN 845:2013+A1:2016, Table 4.

### 2.2.4 Breaking force and elongation at break of transverse roving wires.

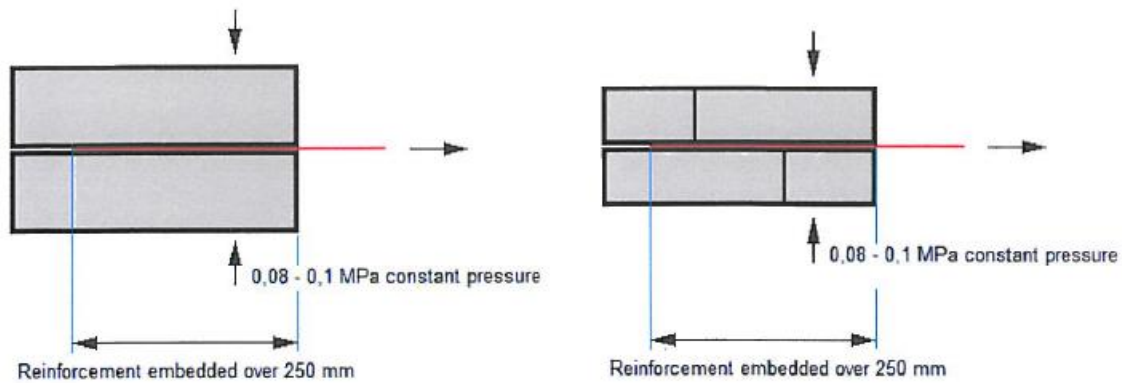
The value of the arithmetic mean of the breaking force, when sampled in accordance to clause 3.3.6 and tested by the method of ISO 3341, shall be specified in the ETA. The elongation at break and the breaking force shall also be specified in the ETA.

### 2.2.5 Bond strength and anchorage length

The bond strength, when sampled in accordance with clause 3.3.6 and tested in accordance with EN 846-2, shall be specified in the ETA for specified combinations of mortar and masonry units, together with the bond length,  $b$ .

For this type of reinforcement, the embed length  $b$  is 250mm. The specimen formats related to the dimensions of the masonry elements are given in figure 1. There are no other deviations from the test method of EN 846-2.



**Figure 1:** Specimen format related to the dimensions of the masonry elements

## 2.2.6 Flexural strength

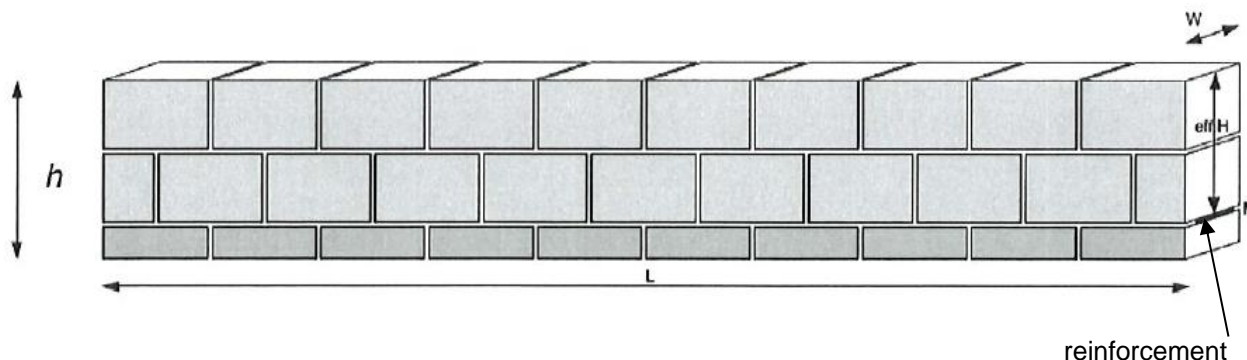
### 2.2.6.1 General

The application of the bed joint reinforcement for structural use shall be proven by tests on walls and lintels, made by specified combinations of mortar and masonry units and the bed joint reinforcement. The test results shall at least correspond with those that may be obtained by calculating in accordance with EN 1996-1-1.

### 2.2.6.2 In plane flexural strength

The flexural strength in plane for specified combinations of mortar and masonry units and the bed joint reinforcement, when sampled in accordance to clause 3.3.6 and tested by the method of EN 846-9:2016, method 8.5.1 and fig (1,a), shall be specified in the ETA.

The lintels shall be built according to EN 846-6, clause 8.3. The dimensions of the lintel shall be chosen in that way that failure mode is to expect by failure of the cords. An example is given in figure 2.

**Figure 2:** Example of an onsite built lintel

### 2.2.6.3 Shear resistance

The shear resistance of wall beams for specified combinations of mortar, masonry units and the bed joint reinforcement, when sampled in accordance to clause 3.3.6 and tested in accordance with EN 846-9, shall be specified in the ETA.

### 2.2.6.4 Out of plane flexural strength

The flexural strength out of plane perpendicular to the bed joint for specified combinations of mortar, masonry units and the bed joint reinforcement, when sampled in accordance to clause 3.3.6 and tested by the method of EN 1052-2, shall be specified in the ETA. The test specimens shall meet the requirements of EN 1052-2:2016, Table 2, for a plane of failure perpendicular to the bed joints.

### 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<sup>2</sup> 1997/740/EC of the European Commission for masonry and related products, as amended by Decision<sup>3</sup> 2001/596/EC of 8 January 2001. The systems are specified in Table 3.

**Table 3 - System of assessment and verification of constancy of performance applicable to bed joint reinforcement**

Product(s)	Intended use(s)	Level(s) or class(es)	AVCP system(s) <sup>a</sup>
Bed joint reinforcement	Walls and partitions	-	3

<sup>a</sup> See Annex V to Regulation (EU) N° 305/2011

#### 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 4.

**Table 4 - Control plan for the manufacturer; cornerstones**

N°	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples and frequency of control
<b>Factory production control (FPC)</b> [including testing of samples taken at the factory in accordance with a prescribed test plan]*				
1	Material properties	EN 845-3:2013+A1:2016, Table 1 This EAD, Table 5 This EAD, Table 6	Conformity with the specified material / coating specification	<ul style="list-style-type: none"> <li>- For each change of raw material; or</li> <li>- As given in the FPC documentation</li> </ul>
2	Organic coating-Type 2	EN 846-13	Conformity with the requirements given in Table 5 <b>Error! Reference source not found.</b>	<ul style="list-style-type: none"> <li>- For each change of raw material; or</li> <li>- As given in the FPC documentation</li> </ul>
3	Dimensions	3.3	Conformity with assessment result	<ul style="list-style-type: none"> <li>- 1 Product specimen per 1000m of reinforcement production; or</li> <li>- As given in the FPC documentation</li> </ul>
4	Tensile strength	EN ISO 15630-3	Conformity with assessment result	<ul style="list-style-type: none"> <li>- As given in the FPC documentation</li> </ul>

<sup>2</sup> Official Journal L 299 of 4 November 1997

<sup>3</sup> Official Journal L 209 of 2 August 2001

N°	Subject/type of control	Test or control method	Criteria, if any	Minimum number of samples and frequency of control
5	Bond strength	EN 846-3	Conformity with assessment result	– As given in the FPC documentation

### 3.3 Special methods of control and testing used for the verification of constancy of performance

#### 3.3.1 Glass roving

The properties of the single end roving as listed in Table 5 shall be assessed.

**Table 5 - Properties of single end roving**

Property	Expression [Unit]	Test method
Average Filament Diameter	μ	ISO 1888
Solids content	%	ISO 1887
Moisture	%	EN ISO 3344
Linear density	tex	EN ISO 1889
Linear Density (yield)	USL	
	NOM	
	LSL	
Mechanical properties		ISO 3341

#### 3.3.2 Polypropylene (PP) yarn

The properties of the PP yarn as listed in Table 6 shall be specified in the ETA. The limit deviations on the total linear density shall be as given in Table 6.

**Table 6 - Properties of the polypropylene yarn woven around each cord**

Properties	Expression [Unit]
Pure polypropylene density	kg/m <sup>3</sup>
Linear density of the yarns	dtex
Tenacity	cN/dtex
Elongation at break	
Nominal tensile strength	N/mm <sup>2</sup>

#### 3.3.3 Determination of the wire size

After removal from de organic coating and the polypropylene yarn, measure the diameter of each wire in a sample with a micrometer, in two directions, approximately at right angles, to the nearest 0,01 mm. The wire size shall be the mean of the two diameters.

### 3.3.4 Determination of the strand cross sectional area

The nominal diameter, corresponding to the cross sectional area of the 3-wire cord is given by the following formula:  $2,1547 \times \text{wire diameter}$

### 3.3.5 Determination of other dimensions

Dimensions shall be measured using a calibrated device capable of achieving an error limit of  $\pm 1\%$ .

### 3.3.6 Test samples, testing and compliance criteria

The minimum sample size of bed joint reinforcement for a single test shall be as given in Table 7 and shall be drawn at random. The batch from which the sample is drawn shall be of a size of at least 100 times the number of specimens taken. Pre-production samples may be used where it is possible to demonstrate that the characteristics of the performance are representative of products from the full production process.

**Table 7 - Sampling – number of specimens**

Characteristic	Clause(s)	Minimum number per tests
Dimensions	Table 5, Table 6 and 2.2.1	10
Characteristic yield strength and ductility of longitudinal cords, EN ISO 15630-3	2.2.2, 2.2.3 and 2.2.4	10
Bond strength, EN 846-2	2.2.5	5
Flexural strength in plane, EN 846-9	2.2.6.2	3
Shear strength, EN 846-9	2.2.6.3	3
Flexural strength out of plane, EN 1052-2	2.2.6.4	5

## 4 REFERENCE DOCUMENTS

As far as no edition date is given in the list of standards thereafter, the standard in its current version at the time of issuing the European Technical Assessment, is of relevance.

EN 845-3:2013+A1:2016	Specification for ancillary components for masonry - Part 3: Bed joint reinforcement of steel meshwork
EN 846-2	Methods of test for ancillary components for masonry - Part 2: Determination of bond strength of prefabricated bed joint reinforcement in mortar joints
EN 846-9:2016	Methods of test for ancillary components for masonry - Part 9: Determination of flexural resistance and shear resistance of lintels
EN 846-13	Methods of test for ancillary components for masonry - Part 13: Determination of resistance to impact, abrasion and corrosion of organic coatings
EN 1052-2:2016	Methods of test for masonry - Part 2: Determination of flexural strength
EN 1996-1-1	Eurocode 6 - Design of masonry structures - Part 1-1: General rules for reinforced and unreinforced masonry structures
EN ISO 1889	Reinforcement yarns - Determination of linear density
EN ISO 2078	Textile glass - Yarns - Designation
EN ISO 3344	Reinforcement products - Determination of moisture content
EN ISO 15630-3	Steel for the reinforcement and prestressing of concrete - Test methods - Part 3: Prestressing steel
ISO 1887	Textile glass - Determination of combustible-matter content
ISO 1888	Textile glass - Staple fibres or filaments - Determination of average diameter
ISO 2797	Textile glass - Rovings - Basis for a specification
ISO 3341	Textile glass - Yarns - Determination of breaking force and breaking elongation