

## EUROPEAN ASSESSMENT DOCUMENT

EAD 200050-00-0102

December 2016

**GABION BOXES, MATTRESSES  
AND SACK GABIONS  
MADE OF HEXAGONAL REGULAR  
TWISTED MESH  
WITH PRE COATED ZINC AND/OR  
ZINC+ORGANIC COATING**

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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).

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# 1 SCOPE OF THE EAD

## 1.1 Description of the construction product

A gabion is a kit consisting from closed gabion box (mattress and/or sack gabion) of specified dimensions and fittings and filled with specified stacked stone and/or stone or aggregate ballast, for use in loadbearing geotechnical construction works and/or other loadbearing or non-loadbearing construction works.

A gabion box (see EN 10223-3, Cl. 3.6 and Fig. 3) is a double-twisted wire mesh container of variable sizes, uniformly partitioned into internal cells, interconnected with other similar units. In construction works it is filled at the project site to form flexible and permeable structures such as retaining walls, sea walls, channel linings, revetments, and weirs for erosion control projects.

A mattress (see EN 10223-3, Cl. 3.7 and Fig. 4) is a double-twisted wire mesh container uniformly partitioned into internal cells with relatively small height in relation to other dimensions, having generally smaller mesh openings than the mesh used for gabions. Mattresses are generally used for riverbank protection and channel linings.

A sack gabions, covered by this EAD too, are described in EN 10223-3, Cl. 3.8 and Fig. 5.

This EAD covers gabion boxes, mattresses and sack gabions manufactured from:

- steel wire with mechanical performances according to EN 10223-3, Cl. 5.2,
- double-twisted non-ferrous metallic (zinc) coated mesh of steel wire of diameter 2,2 mm for meshes 60/80 mm and 80/100 mm,
- double-twisted non-ferrous metallic (zinc) coated mesh of steel wire of diameter 2,7 mm for mesh 80/100 mm,
- diaphragms, selvedge and edge wires made from steel wire of diameter 2,7 mm and 3,4 mm,
- lacing wire made from steel wire of diameter min. 2,2 mm,
- products made of non-ferrous metallic (zinc) coated steel wire with mass of zinc coating of classes A, AB, B, C, D and/or A×3 according to EN 10244-2, Cl. 3.3 and Tab 1,
- products made of non-ferrous metallic (zinc) coated wire additionally coated by poly(vinyl chloride) (PVC) according to EN 10245-2, poly(ethylene) (PE) according to EN 10245-3 or poly(amid) (PA6) according to EN 10245-5.

Non-ferrous metallic coated zinc steel wires for lacing wire, stiffeners, and connection components are used for manufacturing, assembling and installation of the product in construction works.

For connection of lid, bottom and intermediate diaphragms of the gabion (or mattresses) during the installation, the following options can be used:

- 1) By hand employing lacing wire. The diameter of lacing wire shall be the same or thinner than the wire from which the mesh is woven (see EN 10223-3, Cl. 3.10 and Fig. 6).
- 2) By spirals. Once the gabion walls are placed tightly together so that edge wires would be contact and then around them the spiral is screwed. Ends of spiral should be bent to prevent its removal.
- 3) With gabion C-rings (or clips or similar connection components) employing hand or pneumatic stapler. The units to be connected are put tightly together so that the edge wires are in contact and the gabion C-rings (clips etc.) are placed by such a way they encircle the edge wires of both adjacent walls. The maximum distance between the gabion C-rings (clips etc.) should be 200 mm, see EN 10223-3, Cl. 3.11 and Fig. 7.

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

This EAD applies only to products their manufacturer completely has designed, manufactured and markets under his name or trademark.

The product is not fully covered by EAD 200039-00-0102, which does not cover gabion boxes and mattresses with mass of zinc coating of classes AB, B, C, D and/or A×3 according to EN 10244-2, Cl. 3.3 and Tab 1.

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 good 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)

Hexagonal woven mesh gabion boxes, mattresses and sack gabions with zinc coating and/or additional organic coating are intended to be used in loadbearing geotechnical construction works according to EN 1997-1 as e.g.:

- earth retention,
- soil reinforcement,
- river training,
- erosion control,
- fascia systems and others.

They can be used too in other loadbearing and/or non-loadbearing construction works as e.g.:

- architectural claddings,
- free-standing walls,
- sound barriers,
- noise mitigation works,
- and others.

Gabion boxes, mattresses and sack gabions take over and re-distribute all the transversal tension and deformation of gabion filling (stacked stone and/or stone or aggregate ballast) and retained earthwork in the final use in geotechnical structures. The mechanical resistance of gabion construction to embedded loads is in final ensured by tension resistance of gabion wall filling and tension resistance of gabion wall connection components.

### 1.2.2 Working life/Durability

The assessment methods included or referred to in this EAD take into account a working life of the hexagonal woven mesh, gabion boxes and mattresses, based on the combination of European standards EN ISO 9223, Tab. 2, for presumed corrosion rate, EN 1990, Tab. 2.1, for design working life category and informative design working life and EN 10244-2, Tab. 1, for specification of classes of zinc coating thickness in relation to used diameter of wire. Products of declared diameter of zinc coated wire according to EN 10244-2, Tab. 1, may be used when installed in the works according to its class generally as follows:

**Table 1: Working life / Durability**

Class of zinc coating thickness acc. to EN 10244-2, Tab. 1	Diameter of wire	Category of corrosivity of atmosphere acc. to EN ISO 9223, Tab. 2	Design working life category acc. to EN 1990, Tab. 2.1	Informative design working life acc. to EN 1990, Tab. 2.1
class A	2,2 mm	category C3 or lower	3	15 to 30
	2,7 mm	category C3 or lower	3	15 to 30
	3,4 mm	category C3 or lower	3	15 to 30
class AB	2,2 mm	category C2 or lower	3	15 to 30
	2,7 mm	category C2 or lower	3	15 to 30
	3,4 mm	category C2 or lower	3	15 to 30
class B	2,2 mm	category C2 or lower	3	15 to 30
	2,7 mm	category C2 or lower	3	15 to 30
	3,4 mm	category C2 or lower	3	15 to 30
class C	2,2 mm	category C2 or lower	3	15 to 30
	2,7 mm	category C2 or lower	3	15 to 30
	3,4 mm	category C2 or lower	3	15 to 30
class D	2,2 mm	category C2 or lower	1	10
	2,7 mm	category C2 or lower	1	10
	3,4 mm	category C2 or lower	1	10
class A×3	2,2 mm	category C4 or lower	4	50
	2,7 mm	category C4 or lower	4	50

Class of zinc coating thickness acc. to EN 10244-2, Tab. 1	Diameter of wire	Category of corrosivity of atmosphere acc. to EN ISO 9223, Tab. 2	Design working life category acc. to EN 1990, Tab. 2.1	Informative design working life acc. to EN 1990, Tab. 2,1
	3,4 mm	category C4 or lower	4	50

The additional organic coating does not contribute to the working life of the product assessed and, therefore, no further assessment on its durability is considered

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>.

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

Primary terms are given in EN 10223-2 and EN 10223-3.

#### 1.3.1 Diaphragm

Hexagonal double twisted wire mesh panel made of similar mesh as a gabion/mattress itself (with Zn and /or Zn+organic coating), connected to the back, front, lid and base panels to stabilize and ensure the position and the shape of gabion/mattress.

#### 1.3.2 Selvedge wire

A terminal wire (Zn and/or Zn+organic coated) used to edge the wire mesh perpendicular to the double twist by mechanically wrapping the mesh wires around it at least 2,5 times or by inserting it throughout the twists and folding one mesh length.

#### 1.3.3 Edge wire

A terminal wire (Zn and/or Zn+organic coated) used to edge the wire mesh parallel to the double twist direction by continuously weaving it into the wire mesh.

#### 1.3.4 Clips

A clips made from high strength steel wire with Zn coating or stainless steel wire, used to assembled and interconnect the empty gabions and to close and secure the units filled with stone.

#### 1.3.5 Connection components

A connection components used to assembled and interconnect the empty gabions and to close and secure the units filled with stone (lacing wire, C-rings, clips and spirals).

<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.

## 2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

### 2.1 Essential characteristics of the product

Table 2 shows how the performance of hexagonal woven mesh gabion boxes, mattresses and/or sack gabions with zinc and/or zinc+organic coating is assessed in relation to the essential characteristics.

**Table 2: 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
<b>Basic Works Requirement 1: Mechanical resistance and stability</b>			
1	Mechanical resistance to embedded load	2.2.1	--
	<ul style="list-style-type: none"> <li>• tensile resistance of gabion wall filling</li> </ul>	2.2.1.1	Level
	<ul style="list-style-type: none"> <li>• resistance to opening of gabion connection components</li> </ul>	2.2.1.2	Level
	<ul style="list-style-type: none"> <li>• tensile strength, elongation and diameter of wire</li> </ul>	2.2.1.3	Level
<b>Basic Works Requirement 4: Safety and accessibility in use</b>			
2	Dimensions	2.2.2	--
	<ul style="list-style-type: none"> <li>• dimensions of gabion boxes, mattresses and sack gabions</li> </ul>	2.2.2.1	Level
	<ul style="list-style-type: none"> <li>• mesh size</li> </ul>	2.2.2.2	Level
	<ul style="list-style-type: none"> <li>• connection components, selvedge and edge wires</li> </ul>	2.2.2.3	Description / Level
<b>Basic Works Requirement 7: Sustainable use of natural resources</b>			
3	Protection to corrosion	2.2.3	--
	<ul style="list-style-type: none"> <li>• non-ferrous metallic coating               <ul style="list-style-type: none"> <li>- type</li> <li>- mass of zinc coating</li> <li>- thickness of zinc coating</li> <li>- resistance to neutral salt spray</li> </ul> </li> </ul>	2.2.3.1	Description Level Level Level
	<ul style="list-style-type: none"> <li>• organic coating               <ul style="list-style-type: none"> <li>- type</li> <li>- wire diameter with organic coating</li> <li>- thickness of organic coating</li> <li>- coating concentricity</li> <li>- coating integrity in double twist region of mesh</li> <li>- resistance of organic coating to ageing</li> </ul> </li> </ul>	2.2.3.2	Description Level Level Level Level Level

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

### 2.2.1 Mechanical resistance to embedded load

#### 2.2.1.1 Tensile resistance of gabion wall filling $\rho_k$ [kN/m]

The mechanical resistance of gabion wall filling made from double twisted wire in the direction parallel with the axis of twist is to be determined on three test specimens at least. The test procedure shall be in accordance with EN 10223-3, Cl. 6.6 and 9.3.

To take into account provision of EN 10223-3, Cl. 6.6 on characteristic of organic coating in double twist area, TAB should inform manufacturer on test results.

If the performance is given in the ETA, following characteristics are to be specified separately:

- the individual tested values of tensile strength of mesh  $\rho_k$  [kN/m],
- the individual tested values of diameter of wire  $D_w$  [mm] of mesh tested,
- the individual tested values of tensile strength of wire  $f_{t,c}$  [N/mm<sup>2</sup>] and of elongation of wire  $\varepsilon$  [%] of mesh tested.

#### 2.2.1.2 Resistance to opening of gabion connection components $F_m$ [kN]

The resistance to opening of gabion C-ring  $F_m$  [kN] or similar type of connection components is to be measured on 5 test specimens at least in accordance with Annex B.

The individual tested values of resistance to opening of gabion C-ring or similar type of connection components  $F_m$  [kN] are given in the ETA.

#### 2.2.1.3 Tensile strength, elongation and diameter of wire

The diameter  $D_w$  [mm], tensile strength  $f_{t,c}$  [N/mm<sup>2</sup>] and the elongation  $\varepsilon$  [%] of gabion wall connection components and meshes made from wire is to be determined according to EN 10218-1, Cl. 3 and EN ISO 6892-1, Cl. 3.10.1 and Cl. 19 on five test specimens at least.

To take into account provision of EN 10223-3, Cl. 6.8 and 6.9, TAB should inform manufacturer on test results.

If the performance for diameter of wire, specified by manufacturer, is given in the ETA, individual tested values of following characteristics are to be given separately:

- the wire diameter  $D_w$  [mm],
- the wire tensile strength  $f_{t,c}$  [N/mm<sup>2</sup>] and the elongation  $\varepsilon$  [%].

### 2.2.2 Dimensions

The dimensions are intended the following partial characteristics of the components:

#### 2.2.2.1 Dimensions of gabion boxes, mattresses and sack gabions

The dimensions of gabion boxes, mattresses and sack gabions shall be measured on three test specimens at least for each type of product in accordance with Annex C.

To take into account provision of EN 10223-3, Cl. 6.3, TAB should inform manufacturer on test results.

The individual tested values of the product dimensions (length, width, height and/or diameter) are given in the ETA.



### 2.2.2.2 Mesh size

The mesh size  $M$  [mm] shall be measured according to EN 10223-3, Cl. 3.1 in millimetres as integer on three test specimens at least. The mesh designation in relation to the mesh wire and selvedge and end wire (if relevant) diameter shall be checked.

To take into account provision of EN 10223-3, Cl. 6.1 and Tab. 2, TAB should inform manufacturer on test results.

The individual tested values and two-sided confidence interval at the confidence level 95 % according to ISO 2602, Cl. 6.2 for each mesh dimension separately are given in the ETA.

### 2.2.2.3 Connection components, selvedge and edge wires

The diameter of wire of connection components, selvedge and edge wires of diaphragm shall be measured according to EN 10218-2, Cl. 4.1 on 5 test specimens at least for each type of connection components, selvedge and edge wires.

To take into account provision of EN 10223-3, Cl. 6.2, 6.8 and 6.9, TAB should inform manufacturer on test results.

The individual tested values of the diameter of wire for connection components, selvedge and edge wires of diaphragm are given in the ETA.

## 2.2.3 Protection to corrosion

### 2.2.3.1 Non-ferrous metallic coating

The type of Zn coating shall be expressed in the ETA if relevant.

Manufacturer can be asked by different users to express corrosion protection in different way according to user's convention.

The corrosion protection is to be determined by method(s) mentioned below according to manufacturers' specification by testing one or more of following characteristics:

- Zn coating mass on wires [g/m<sup>2</sup>] (mesh wire or other connection components) shall be measured in accordance with EN 10244-2, Cl. 5.2.2. Number of test samples is three test specimens at least.
- Thickness of Zn coating on wires [µm] (mesh wire or other connection components) shall be measured in accordance with EN ISO 1463. Number of test samples is three test specimens at least.
- Neutral salt spray (NSS) test on mesh samples (at least one sample) carried out according to EN ISO 9227, method NSS.

If the performance is given in the ETA, one or more following characteristics according to method(s) specified by manufacturer are to be given:

- Mass of zinc coating in [g/m<sup>2</sup>],
- Thickness of zinc coating in [µm],
- For zinc coating as the number of hours of exposure in neutral salt spray after which each mesh sample does not show more than 5 % of DBR (Dark Brown Rust).

When stainless steel wire according to EN 10223-3, Cl. 5.2 is used for gabion C-ring, it shall be given in the ETA.

### 2.2.3.2 Organic coating

The type of organic coating shall be expressed in ETA if relevant. Possible coatings are: PVC in accordance with EN 10245-2, PE in accordance with EN 10245-3, PA6 in accordance with EN 10245-5.

Manufacturer can be asked by different users to express corrosion protection in different way according to user's convention.

The corrosion protection is to be determined by method(s) mentioned below according to manufacturers' specification by testing one or more of relevant characteristics on 3 test specimens at least according to following table:

Performance	Material of organic coating		
	PVC	PE	PA6
Wire diameter with organic coating $D_c$ [mm]	EN 10245-1, Cl. 5.3.4.2		
Thickness of organic coating in [mm]	EN 10245-1, Cl. 5.3.4.2		
Coating concentricity in [%]	EN 10245-1, Cl. 5.3.4.2		
Coating integrity in double twist region of mesh	Annex A, Cl. A5		
Resistance of organic coating to ageing	EN 10223-3, Cl. 6.7.3 (ageing according to EN ISO 4892-2, 4000 hours of xenon arc lamp, test of tensile strength according to EN 10245-1, Cl. 4.3.5, and EN ISO 527-1,-2)		

Coating integrity in double twist region of mesh is to be verified by test at 50 % of the nominal value of tensile strength of the mesh as defined in EN 10223-3, Cl. 6.6.

To take into account provision of EN 10223-3, Cl. 6.6, TAB should inform manufacturer on test results.

If the performance is given in the ETA, one or more of following characteristics according to method(s) specified by manufacturer are to be given:

- Wire diameter with organic coating  $D_c$  [mm] and thickness of organic coating in [mm],
- Coating concentricity in [%],
- Coating integrity in [kN/m],
- Resistance of organic coating as relationship of retained and initial tensile strength and elongation of polymer coating itself expressed in % of change of initial tensile strength.

### 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 1998/214/EC

The system is: **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 are laid down in Table 3.

**Table 3: 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
<b>Factory production control (FPC)</b> <b>including testing of samples taken at the factory in accordance with a prescribed test plan</b>					
1	<b>Wire:</b> Tensile strength, elongation, diameter	EN 10218-1	EN 10223-3	3 / each diameter	1 / production day
2	<b>Metallic coating of wire:</b> Outer diameter Visual Coating thickness or mass	EN 10218-2 MTF EN 10244-2	EN 10218-2 MTF EN 10223-3 EN 10244-2	3 / each diameter 1 1	1 / production day 1 / production day 1 / production day
3	<b>Organic coating of wire:</b> Type of coating Outer diameter Visual Thickness/concentricity	EN 10245 EN 10218-2 EN 10245-1 EN 10245-1	MTF EN 10218-2 MTF EN 10218-2	batch of raw material 3 1 3	every batch 2 / production day 2 / production day 2 / production day
4	<b>Mesh:</b> Mesh dimensions, mesh size Tensile resistance of mesh	2.2.2.2	declared value  declared value		1 / production day  at modification of product or production process
5	<b>Gabion boxes, gabion mattresses, sack gabions:</b> Product dimensions Connection component dimensions Coating integrity Resistance to opening of gabion wall components	2.2.2.1 2.2.2.3 2.2.3.2 2.2.1.2	declared value value declared value value	1 sample/type 1 sample/type 1 sample/type 3 samples/type	1 / production day 1 / production day 1 / production day at modification of product
MTF – Manufacturer's Technical File					

### 3.2 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 hexagonal woven mesh gabion boxes, mattresses and sack gabions with zinc / zinc+organic coating are laid down in Table 4.

**Table 4: 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
<b>Initial inspection of the manufacturing plant and of factory production control</b>					
1	Ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing of the hexagonal woven mesh gabion boxes, mattresses and sack gabions with zinc / zinc+organic coating	-	Laid down in control plan	-	1
<b>Continuing surveillance, assessment and evaluation of factory production control</b>					
2	Verifying that the system of factory production control and the specified automated manufacturing process are maintained taking account of the control plan	-	Laid down in control plan	-	1/year

## 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 1990+A1/AC	Eurocode: Basis of Structural Design
EN 1997-1	Eurocode 7: Geotechnical design - Part 1: General rules
EN 10218-1	Steel wire and wire products. General. Part 1: Test methods
EN 10218-2	Steel wire and wire products. General. Part 2: Wire dimensions and tolerances
EN 10223-3	Steel wire and wire products for fencing and netting - Part 3: Hexagonal steel wire mesh products for civil engineering purposes
EN 10244-1	Steel wire and wire products. Non-ferrous metallic coatings on steel wire - Part 1: General principles
EN 10244-2	Steel wire and wire products. Non-ferrous metallic coatings on steel wire - Part 2: Zinc or zinc alloy coatings
EN 10245-1	Steel wire and wire products. Organic coatings on steel wire. Part 1: General rules
EN 10245-2	Steel wire and wire products. Organic coatings on steel wire. Part 2: PVC finished wire
EN 10245-3	Steel wire and wire products - Organic coatings on steel wire - Part 3: PE coated wire
EN 10245-5	Steel wire and wire products. Organic coatings on steel wire. Part 5: Polyamide coated wire
EN ISO 527-1	Plastics - Determination of tensile properties - Part 1: General principles
EN ISO 527-2	Plastics - Determination of tensile properties - Part 2: Test conditions for moulding and extrusion plastics
EN ISO 1463	Metallic and oxide coatings - Measurement of coating thickness - Microscopical method
EN ISO 4892-2	Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps
EN ISO 6892-1	Metallic materials - Tensile testing - Part 1: Method of test at room temperature
EN ISO 7500-1/AC	Metallic materials. Verification of static uniaxial testing machines. Part 1: Tension/compression testing machines. Verification and calibration of the force measuring system
EN ISO 9223	Corrosion of metals and alloys. Corrosivity of atmospheres. Classification, determination and estimation
EN ISO 9227	Corrosion tests in artificial atmospheres - Salt spray tests
ISO 2602	Statistical interpretation of test results. Estimation of the mean. Confidence interval
EAD 200039-00-0102	Hexagonal woven mesh and gabion boxes and mattresses with zinc coatings

## ANNEX A – INTEGRITY OF ORGANIC COATING ON WIRES OF DOUBLE TWISTED MESH

### A.1 Scope

The aim of this test is to show the integrity of organic coating on the wires when the net is loaded by tension.

### A.2 Terms and definitions

For the purposes mentioned above the following symbols and definitions are applied:

**Panel:** Element made of double twisted net prepared for the longitudinal tensile test with a minimum width equal to 8 times the size of the single mesh and a length allowing a distance between the equipment grip tools equal to a complete mesh length .

**Sample:** The sample for integrity evaluation of the polymer coating inside the double twists of the net is created by the twists in the middle part of the panel.

### A.3 Sampling

Panel of double twist wire mesh made of organic coated wire according to EN 10223-3, Cl. 9 and Fig. 11 to Fig. 14 in order to perform the longitudinal tensile test is to be prepared.

Each panel sample is subjected to tensile strength test according to EN 10223-3, Cl. 9.3.3, up to 50 % of the characteristic tensile strength values.

For each tensioned panel the double twist regions are to be verified (see EN 10223-3, Cl. 3.4).

From each sample, the wires in the double twist shall be cut around 10 cm long, corresponding to panel central twists as highlighted by marks in Fig. A.1.

### A.4 Test arrangement

The upper and lower ends of the net sample are used to hang it to the supports of the traction machine during the tensioning and therefore they cannot be used to evaluate for the outcome of the test.

Each sample's effective width is made of a fixed number of wires in relation to the mesh type:

- $n \times 16$  wire sections for 10 x 12 mesh type
- $n \times 16$  wire sections for 8 x 10 mesh type
- $n \times 20$  wire sections for 6 x 8 mesh type

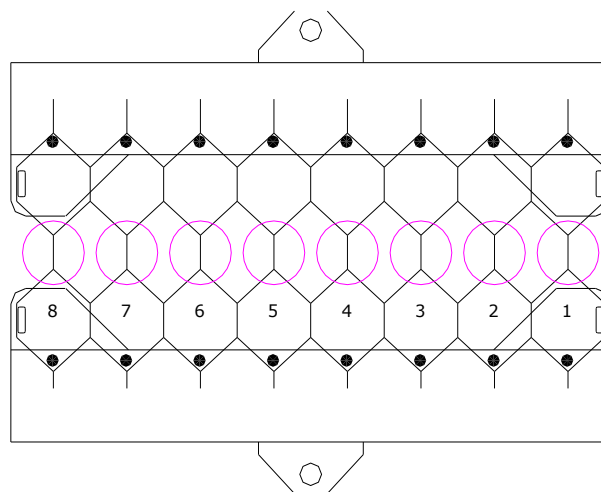


Figure A.1 – Example of sample for 10 x 12 mesh type

## A.5 Evaluation of test results

For each sample visual inspection of integrity of organic coating is carried out for each wire portion in correspondence with the double twists.

Damage is to be classified into 4 categories according to EAD 200039-00-0102:

### Category 1: General abrasion

Abrasion means the condition of the organic coating where the wire inside the twists has left an imprint that does not let the underlying steel wire visible.

### Category 2: Splits

Split means a region of wire in which the organic coating is locally cut and raised and so the underlying steel wire can be visible.

### Category 3: Cuts

Cut means a region of the wire clearly cut where organic strips are still in contact.

### Category 4: Bruises

Bruise means a wire region where organic coating is pressed and the underlying steel wire can visible.

If the mesh made from organic coated wire when tested in tensile test, shows cracks in the organic coating within the double twists region at 50 % of the characteristic values of tensile strength of mesh (whenever the underlying steel wire is clearly visible), the integrity of organic coating is considered to be broken.

To take into account provision of EN 10223-3, Cl. 6.6, in such situation laboratory should inform manufacturer on test result.

## A.6 Test Report

The test report shall include at least the following information:

- Name of laboratory and name of operator who performed the tests;
- Characteristics of the testing machine and its calibration certificate;
- Date of test;
- Identification of the tested panel and sample (supplier and material nature of the surface treatment, dimensions, etc.);
- Documentation of test by photographs;
- Results expressed by category and/or different categories in % to the tested overall length.

## **ANNEX B – RESISTANCE TO OPENING OF GABION C-RING (OR SIMILAR CONNECTION COMPONENTS)**

### **B.1 Scope**

The aim of this test is to show the pull-apart resistance of gabion C-ring (or similar connection components) used to assemble gabion units.

### **B.2 Test Specimen**

The test specimen is the closed gabion C-ring (or similar connection components) itself.

### **B.3 Test equipment**

The traction machine shall be in accordance with the requirements of EN ISO 7500-1 and shall be at least of Class 1. The testing apparatus shall be able to memorize or record the maximum force resulting opening staples.

### **B.4 Test Conditions**

#### **B.4.1 Method of sample fixing**

The specimen shall be maintained by suitable means such as yokes, shackles or other mounting for the tensile test. The equipment shall keep the test sample so that the load is applied along the longitudinal axis of the gabion C-ring (or similar connection components) through the closure.

#### **B.4.2 Test procedure**

Speed of application of the load is 5 mm/min with an uncertainty of less than 5 %, until the complete opening of the tested gabion ring.

#### **B.4.3 Number of samples per type connection components**

For determination of the average opening load at least 5 samples for each type of gabion C-ring (or similar connection components) shall be tested.

#### **B.4.4 Determination of the opening load**

The opening load is considered to be a maximum load achieved during the test i. e. the force corresponding to the maximum recorded and stored by the testing apparatus fitted to the testing machine value or the maximum value on force – opening diagram recorded.

### **B.5 Test report**

The test report shall include at least the following information:

- Name of the laboratory and the name of the operator who performed the tests;
- The characteristics of the testing machine and its calibration certificate;
- Identification of the tested gabion C-ring (or similar connection components) (supplier and material nature of the surface treatment, dimensions, etc.);
- The date of test and results (opening load, mean and standard deviation of the results by gabion C-ring type (or similar connection components), with appropriate, observations justify the results, force – opening diagram – if relevant).



## **ANNEX C – DIMENSIONS OF GABION BOXES, MATTRESSES AND SACK GABIONS**

### **C.1 Scope**

The aim of this test is to verify dimensions of gabion boxes, mattresses and sack gabions.

### **C.2 Test Specimen**

The test specimen is the closed gabion box, mattresses or sack gabion itself.

### **C.3 Test equipment**

The test is to be performed by using slide gauge with accuracy 1 mm.

### **C.4 Test Conditions**

#### **C.4.1 Test procedure**

Three measurements of each dimension of relevant part of gabion box and/or mattresses (i.e. walls, bottom, and diaphragm) expressed as height  $H$  [mm], length  $L$  [mm] and/or width  $W$  [mm] on each test specimen shall be performed in accordance with EN 10223-3 Fig. 3, 4 and 5.

Diameter  $D$  [mm] of sack gabion is to be determined by five measurements of cross-section width [mm] of external edges of tightly wrapped product, uniformly located on its length, and then by calculation from average value of these results according to basic mathematic equation for circle circumference.

#### **C.4.3 Number of samples**

For determination of dimensions at least 3 samples for each type of gabion box, mattress or sack gabion shall be tested.

### **C.5 Test report**

The test report shall include at least the following information:

- Name of the laboratory and the name of the operator who performed the tests;
- The characteristics of the testing machine and its calibration certificate;
- Identification of the tested gabion boxes, mattress or sack gabion (supplier and material nature of the surface treatment, dimensions, etc.);
- The date of test and results (individual tested values, mean)