

EUROPEAN ASSESSMENT DOCUMENT

EAD 230008-00-0106

April 2016

DOUBLE TWISTED STEEL WIRE MESH REINFORCED OR NOT WITH ROPES

The reference title and language for this EAD is English. The applicable rules of copyright refer to the document elaborated in and published by EOTA.

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

Contents

| | | |
|----------|---|-----------|
| 1 | Scope of the EAD | 4 |
| 1.1 | Description of the construction product | 4 |
| 1.2 | Information on the intended use(s) of the construction product | 7 |
| 1.2.1 | Intended use(s)..... | 7 |
| 1.2.2 | Working life/Durability..... | 7 |
| 1.3 | Specific terms used in this EAD | 8 |
| 1.3.1 | Double-twisted wire mesh | 8 |
| 1.3.2 | Mesh size of double twisted mesh | 8 |
| 1.3.3 | Mesh designation | 8 |
| 1.3.4 | Double twisted wire mesh reinforced with wire ropes | 8 |
| 1.3.5 | Lacing wire | 8 |
| 1.3.6 | Lacing lap-link, C-rings and clips..... | 8 |
| 1.3.7 | Polymer three dimensional matrix..... | 9 |
| 1.3.8 | Edge wire..... | 9 |
| 2 | Essential characteristics and relevant assessment methods and criteria | 10 |
| 2.1 | Essential characteristics of the product | 10 |
| 2.2 | Methods and criteria for assessing the performance of the product in relation to essential characteristics of the product | 11 |
| 2.2.1 | Mesh designation, mesh size M (in mm)..... | 11 |
| 2.2.2 | Wire diameter D_w (in mm)..... | 11 |
| 2.2.3 | Wire tensile strength f_t (in N/mm ²) and elongation ε (in %) | 11 |
| 2.2.4 | Rope characteristics | 11 |
| 2.2.5 | Dimensions of product and connection components W , L and a (in mm) | 11 |
| 2.2.6 | Corrosion protection: non-ferrous metallic coating- type and class of coating mass | 12 |
| 2.2.7 | Additional corrosion protection: organic coating | 13 |
| 2.2.8 | Tensile resistance of mesh p_m (in kN/m) | 13 |
| 2.2.9 | Punching resistance of mesh F_m (in kN) and deflection δ_m (in mm)..... | 13 |
| 2.2.10 | Durability..... | 13 |
| 3 | Assessment and verification of constancy of performance | 15 |
| 3.1 | System(s) of assessment and verification of constancy of performance to be applied | 15 |
| 3.2 | Tasks of the manufacturer | 15 |
| 3.2 | Tasks of the notified body | 17 |
| | Reference documents | 18 |
| | Annex A – Integrity of organic coating on wires of double twisted mesh | 19 |
| | Annex B – Tensile test on double twisted wire mesh reinforced with wire ropes | 22 |

1 SCOPE OF THE EAD

This EAD applies to double twisted steel wire mesh construction products and reinforced geomat with polymer made three dimensional matrix extruded onto the steel mesh, for retaining of unstable slopes controlling and preventing rockfall and loose debris flow along roads, highways and railways.

Only the characteristics of the double twisted steel wire mesh construction products are included in this document. Anchors and/or soil nails for fixing of double twisted steel wire mesh construction products to the unstable slope are not covered by this EAD.

1.1 Description of the construction product

This EAD covers:

- Double twisted wire meshes (see Figure 1);
- Double twisted wire meshes with additional geomat (polymer made three dimensional matrix) extruded onto the steel mesh (Figure 2);
- Double twisted wire meshes reinforced with wire ropes (see Figures 3 and 4);
- Double twisted wire meshes reinforced with wire ropes with additional geomat (polymer made three dimensional matrix) extruded onto the steel mesh (Figure 5).

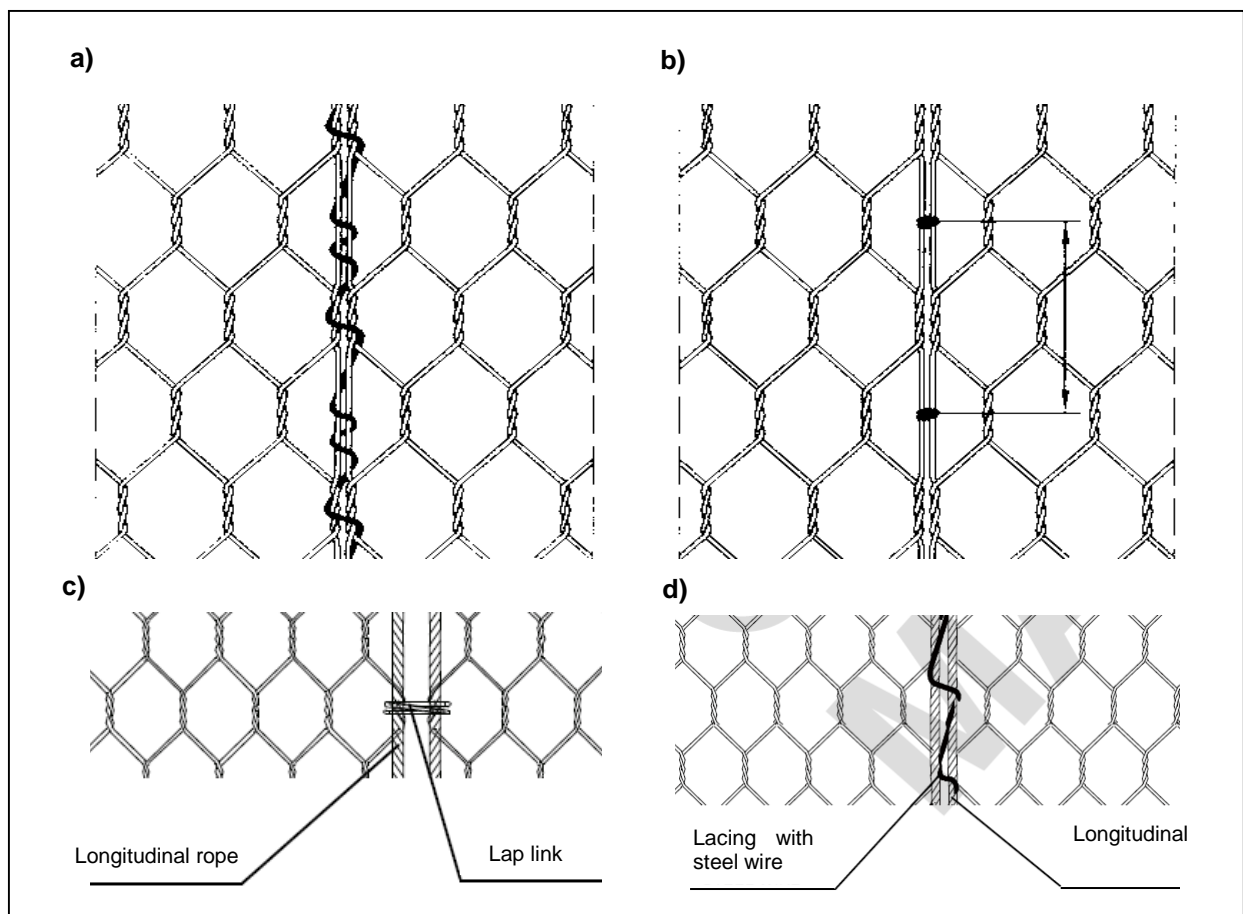


Figure 1 – Shape and connection of double twisted wire mesh and double twisted wire mesh reinforced with ropes connected: a) and d) by lacing wire, b) by lacing rings or clips, c) by lacing lap links

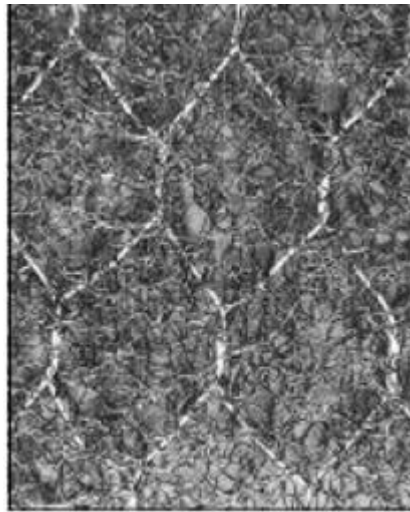


Figure 2 – Double twisted wire mesh with additional geomat

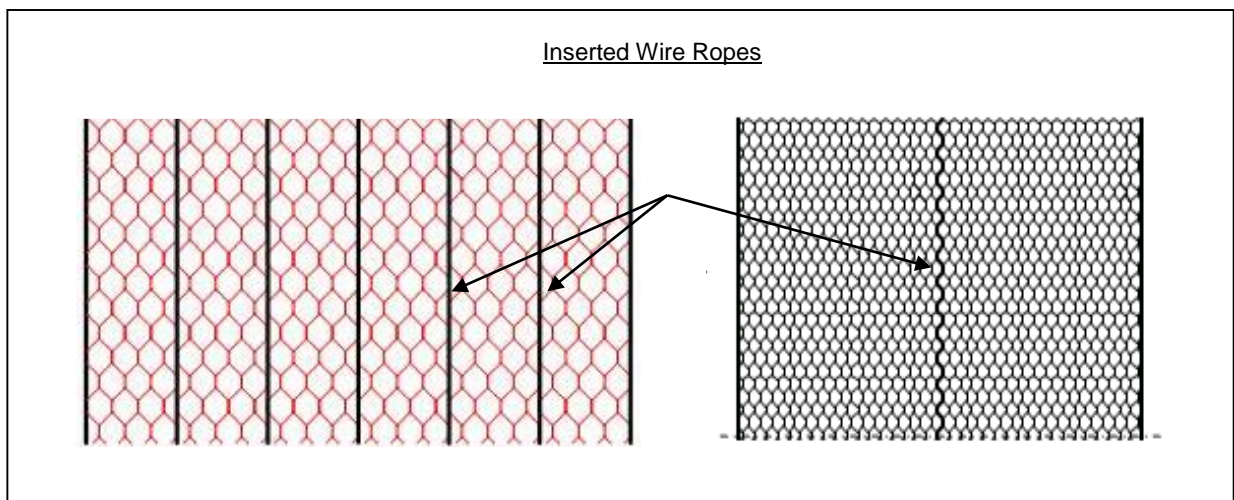


Figure 3 – Double twisted wire mesh reinforced with ropes mono oriented

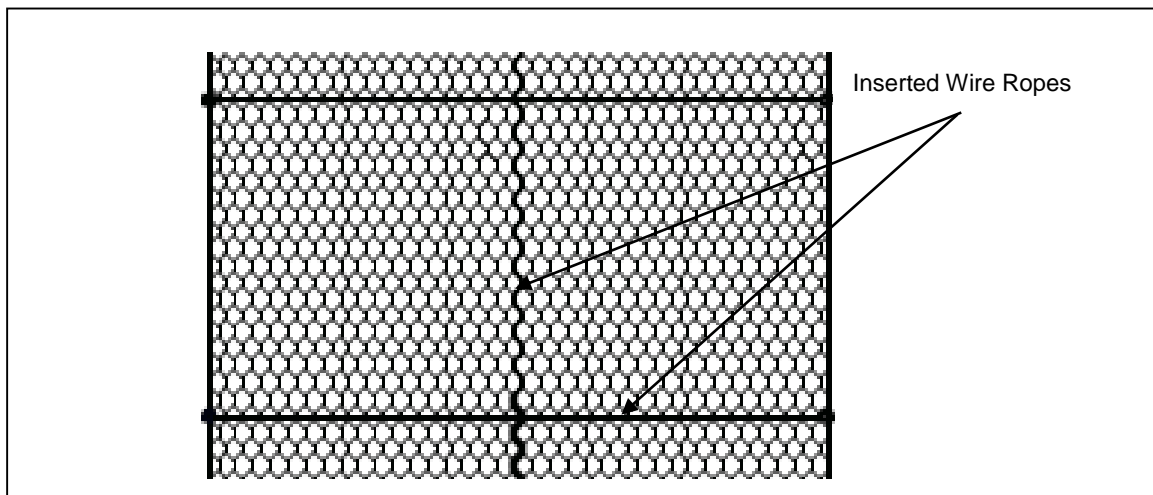


Figure 4 – Double twisted wire mesh panels reinforced with wire ropes: bi-oriented



Figure 5 - Double twisted wire mesh reinforced with ropes and with additional geomat

The products are produced from components:

- non-ferrous metallic coated wires,
- non-ferrous metallic coated wire with organic coating extruded onto the metallic coated wire,
- non-ferrous metallic coated steel wire ropes and non-ferrous metallic coated wire,
- non-ferrous metallic coated steel wire ropes and non-ferrous metallic coated wire with organic coating extruded onto the metallic coated rope and wire

and connection components of mesh:

- lacing wires, lacing rings, clips and lap-links to connect the mesh together.

Double twisted mesh reinforced or not with wire ropes during the production, is produced in rolls or panels and can be supplied in both options.

Double twisted mesh reinforced with wire ropes during the production is a composite mesh, formed from steel wires and wire ropes, assembled during production of double twisted mesh with hexagonal pattern.

Double twisted wire mesh reinforced with wire ropes can be produced in two options:

- Mono oriented composite mesh reinforced with wire ropes in longitudinal direction – direction of the axis of twist (see Figure 3) or in transversal direction;
- Bi-oriented composite mesh reinforced with wire ropes in both, longitudinal and transversal directions (see Figure 4).

The connection of double twisted wire meshes together is performed using lacing wires, lacing rings or lacing clips and lacing lap links (see Figure 1).

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

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

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

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

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

1.2.1 Intended use(s)

Double twisted steel wire mesh construction products made of hexagonal double twisted wire mesh (see Figure 1) and reinforced geomat with polymer made three dimensional matrix extruded onto the steel mesh and double twisted wire meshes reinforced with wire ropes (see Figures 2 and 3) and reinforced geomat with polymer made three dimensional matrix extruded onto the steel mesh reinforced with wire ropes, are intended to be used for:

- retaining of unstable slopes,
- controlling and preventing rockfall,
- loose debris flow,
- soil nailing system,
- erosion control system,

along roads, highways and railways.

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:

- a) Working life of the double twisted steel wire mesh reinforced or not with ropes for the intended use, in accordance with Annex A in EN 10223-3, in relation to different wire coating and corrosive categories (according to EN ISO 9223) of environment, when installed in the works when durability tests are performed according to cl. 2.2.10.1, 2.2.10.2 and 2.2.10.3 in this EAD, moreover

When tested according to 2.2.10.1:

- for non-ferrous metallic coating Zn the number of cycles is 14;
- for non-ferrous metallic coating Zn95/Al5 and Zn95/Al5+organic coating the number of cycles is 28;
- for non-ferrous metallic coating Zn90/Al10 and Zn90/Al10+organic coating the number of cycles is 56;
- for non-ferrous advanced metallic coating the number of cycles is 56;
- for non-ferrous advanced metallic coating + organic coating the number of cycles is 56;

When tested according to 2.2.10.2:

- for non-ferrous metallic coating Zn the number of hours in exposure is 500;
- for non-ferrous metallic coating Zn95/Al5 and Zn95/Al5+organic the number of hours in exposure is 1000;
- for non-ferrous metallic coating Zn90/Al10 and Zn90/Al10+organic coating the number of hours in exposure is 2000;
- for non-ferrous advanced metallic coating the number of hours in exposure is 2000;
- for non-ferrous advanced metallic coating + organic coating the number of hours in exposure is 2000;

When tested according to 2.2.10.3:

- the change of retained tensile strength and elongation of organic coating material is not more than 25%.

- b) Working life of 25 years for corrosivity category C1 and C2 and dry conditions and 10 years for corrosivity category C3 and dry conditions (for corrosivity category see EN ISO 9223) for less number of cycles, less number of hours of exposure or greater change in retained tensile strength and elongation of organic coating material than written in section a).

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 works¹.

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 Double-twisted wire mesh

A mesh made by twisting continuous pairs of wires through three one-half turns (commonly called double-twisted) to form hexagonal-shaped openings which are then interconnected to adjacent wires to form hexagonal openings.

1.3.2 Mesh size of double twisted mesh

A distance measured at right angles between two twisted sides M (see Figure 6).

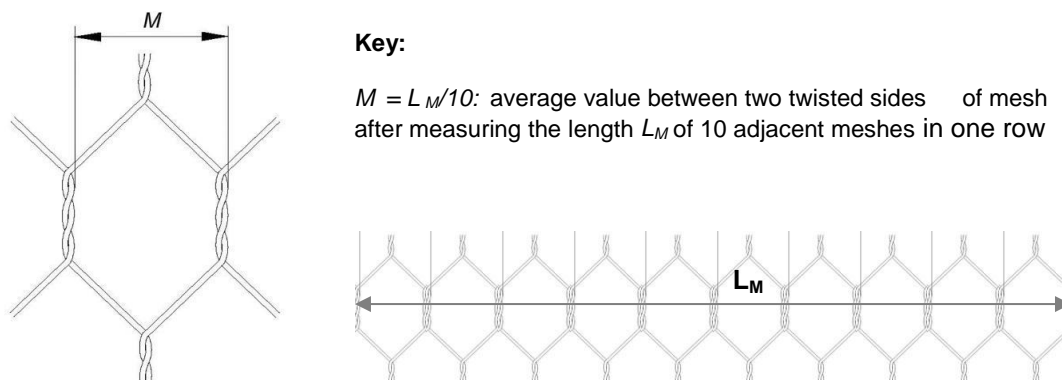


Figure 6 – Mesh size

1.3.3 Mesh designation

Definition of double twisted mesh type related to typical dimension of mesh, for example 6x8, 8x10.

1.3.4 Double twisted wire mesh reinforced with wire ropes

Mesh formed from steel wires and ropes, assembled during the production of double twisted wire mesh of variable sizes.

1.3.5 Lacing wire

Non-ferrous metallic-coated steel wire and/or with organic over-coating or stainless steel wire used to assemble and interconnect the units.

1.3.6 Lacing lap-link, C-rings and clips

Rings of C-shape and clips made from high strength steel wire with non-ferrous metallic coating or stainless steel wire, used to connect the double twisted wire meshes together.

¹ 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.

1.3.7 Polymer three dimensional matrix

Eventual polymer three dimensional matrix extruded directly onto the steel mesh, with no structural function, created to facilitate the re-establishment of vegetation on the slope.

1.3.8 Edge wire

A terminal wire used to edge the wire mesh parallel to the double twist direction by continuously weaving it into the wire mesh.

2 ESSENTIAL CHARACTERISTICS AND RELEVANT ASSESSMENT METHODS AND CRITERIA

2.1 Essential characteristics of the product

Table 1 shows how the performance of double twisted steel wire mesh reinforced or not with ropes 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

| No | Essential characteristic | Assessment method | Type of expression of product performance (level, class, description) |
|---|---|---|---|
| Basic Works Requirement 1: Mechanical resistance and stability | | | |
| 1 | Mesh designation Mesh size | 2.2.1 | M (mm) |
| 2 | Wire diameter | 2.2.2 | D_w (mm) |
| 3 | Wire tensile strength and elongation | 2.2.3 | f_t (N/mm ²) ε (%) |
| 4 | Rope characteristics: diameter designation wire tensile strength grade breaking force | 2.2.4 | D_r (mm) description (N/mm ²) (kN) |
| 5 | Dimensions of product and connection components | 2.2.5 | W, L, a, b (mm) Specific dimensions (mm) |
| 6 | Corrosion protection: non-ferrous metallic coating (wire and rope) type class of coating mass | 2.2.6 | description description |
| 7 | Additional corrosion protection: organic coating type coating thickness and wire/rope diameter coating concentricity on mesh wire coating integrity | 2.2.7 | description (mm) (%) description |
| 8 | Tensile resistance of mesh | 2.2.8 | ρ_m (kN/m) |
| 9 | Punching resistance and deflection of mesh | 2.2.9 | F_m (kN) δ_m (mm) |
| 10 | Durability in artificial atmospheres | | |
| | Sulphur dioxide test with general condensation of moisture of Zn/Al alloy coated mesh samples | 2.2.10.1 | Number of cycles with surface DBR \leq 5% surface (Number) |
| | Neutral salt spray test with general condensation of moisture of Zn/Al alloy coated mesh samples | 2.2.10.2 | Exposure time with surface DBR \leq 5% surface (hours) |
| UV resistance of organic coating material | 2.2.10.3 | % of retained tensile strength and elongation (%) | |

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

2.2.1 Mesh designation, mesh size M (in mm)

The mesh size M (in mm) shall be measured according to cl. 3.1 in EN 10223-3 (see also 1.3.2 in this EAD). The mesh size M shall be measured on at least three individual mesh samples. The mesh designation in relation to the mesh wire and edge wire (if relevant) diameter shall be checked.

The TAB shall inform the manufacturer of outcomes of the comparison of test results with Table 2 in EN 10223-3.

2.2.2 Wire diameter D_w (in mm)

The diameter D_w (in mm) of mesh wire, connection wires and edge wires as well, shall be verified according to cl. 4.1 in EN 10218-2. The verification shall be carried out by checking the inspection documents of incoming wire products and by additional checking according to the manufacturer's control plan.

The TAB shall inform the manufacturer of outcomes of the comparison of test results with Table 1 (tolerance class T1) in EN 10218-2.

2.2.3 Wire tensile strength f_t (in N/mm²) and elongation ε (in %)

The tensile strength and elongation of mesh and connection components' wires and edge wires shall be verified according to cl. 3 in EN 10218-1. The verification shall be carried out by checking the inspection documents of incoming wire products and by additional checking according to the manufacturer's control plan.

The TAB shall inform the manufacturer of outcomes of the comparison of test results with cl. 5.2 in EN 10223-3 for mesh, edge and lacing wire and with cl. 6.9 in EN 10223-3 for connection component (C-ring) wire.

2.2.4 Rope characteristics

The rope diameter D_r (in mm) designation of rope according to EN 12385-2+A1, rope wire tensile strength grade (in N/mm²) according to EN 12385-4+A1, breaking force (in kN) according to Table 5, EN 12385+A1 shall be verified by checking the inspection documents of incoming rope products and by additional checking according to the manufacturer's control plan.

2.2.5 Dimensions of product and connection components W , L and a (in mm)

The product dimensions (W – width of mesh roll, L – length of mesh roll, a , b – rope spacing (centre to centre distance) in orthogonal directions) and connection components' dimensions (see Figure 7) *specific dimensions* (in mm) shall be measured at least on three samples for each type of product.

The TAB shall inform the manufacturer of outcomes of the comparison of test results with cl. 6.3 in EN 10223-3 for W and L .

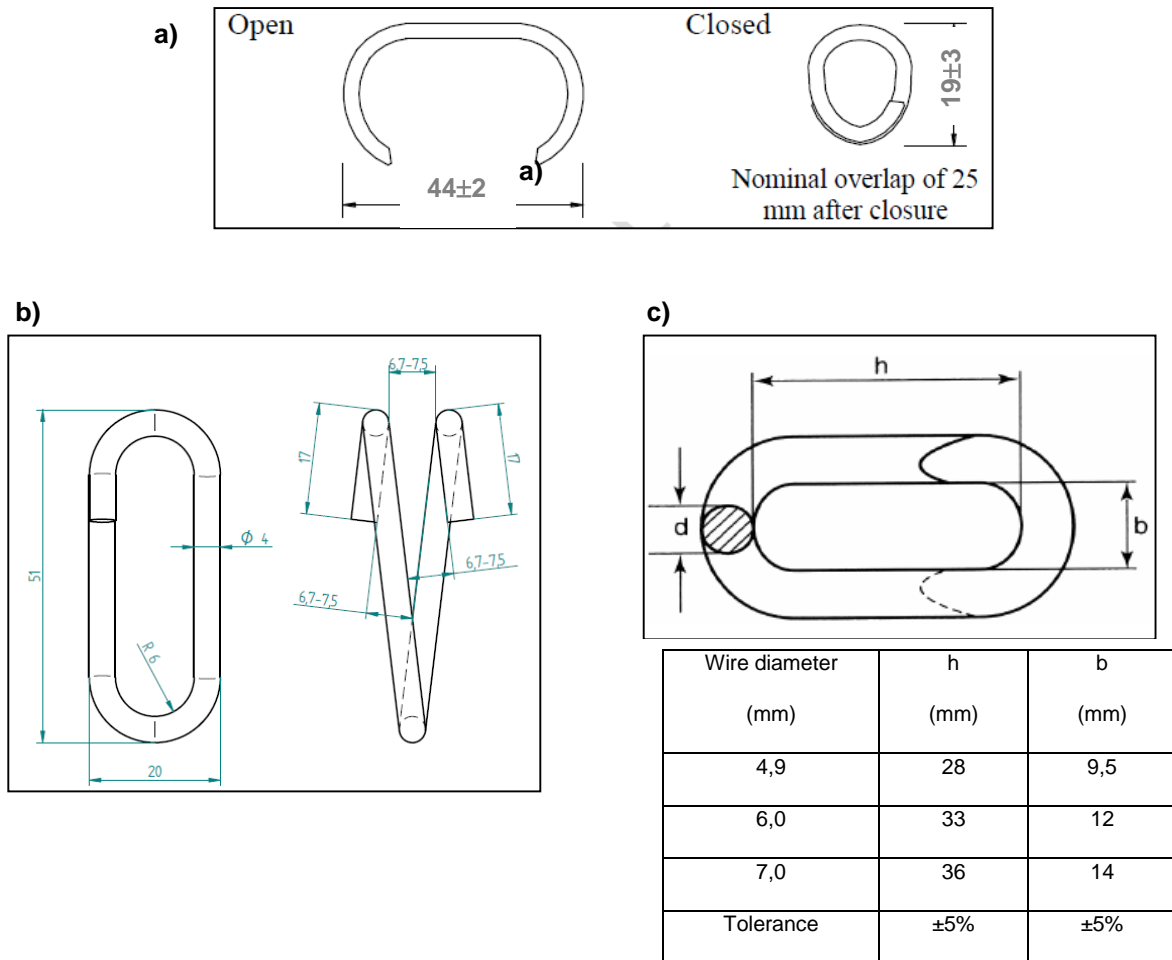


Figure 7 (Informative) – Shape and dimensions of: a) rings, b) clips, c) lap-links

2.2.6 Corrosion protection: non-ferrous metallic coating- type and class of coating mass

The type of non-ferrous metallic Zinc and/or Zinc / Aluminium alloy coating on wires (informative types are: Zn, Zn/95/Al5, Zn90/Al10 or other advanced coating) and minimum coating mass on wires (in g/m²) shall be verified in accordance with cl. 5.2.2 in EN 10244-2. The adherence wrapping test on non-ferrous metallic coated mesh wires shall be carried out in accordance with cl. 6 in EN 10218-1. The verification shall be carried out by checking the inspection documents of incoming wire products and by additional checking according to the manufacturer’s control plan.

The coating type (Zn, Zn95/Al5, Zn90/Al10 or other advanced coating) and class of coating of inserted ropes shall be performed by checking the inspection documents of incoming wire products and by additional checking according to the manufacturer’s control plan.

The TAB shall inform the manufacturer of outcomes of the comparison of test results with Table 1 and Table 2 in EN 10244-2 for Class A and/or in specific case for Class E (when PA6 additional organic coating is used) for mesh, edge wire and lacing wire as well and according to Table 2 in EN 10264-1, class A, for inserted rope wires. The TAB shall also inform the manufacturer about the comparison of test results with quality of adherence of coating tested according to cl.6, EN 10218-1 (wrapping test 0/5), scale 2 (Figure 1, EN 10244-2).

2.2.7 Additional corrosion protection: organic coating

2.2.7.1 Organic coating on wire

The diameter (in mm) and coating thickness of organic coated mesh wires (possible types of organic coating are: PVC in accordance with EN 10245-2, PE in accordance with EN 10245-3, PA6 in accordance with EN 10245-5) together with concentricity (in %) shall be verified in accordance with cl. 5.2.4 in EN 10245-1. The verification shall be carried out by checking the inspection documents of incoming wire products and by additional checking according to the manufacturer's control plan.

The diameter and coating thickness on ropes shall be verified by checking the inspection documents of incoming rope products and by additional checking according to the manufacturer's control plan.

The TAB shall inform the manufacturer of outcomes of the comparison of test results with cl. 6.5 in EN 10223-3 and Table 2 in EN 10218-2.

2.2.7.2 Organic coating in double twist region of mesh

Coating integrity in double twist region of mesh (without inserted ropes) tested according to Annex A in this EAD shall be verified at 50 % of mean value of tensile strength of mesh (without inserted ropes) as defined in Clause 2.2.8 in this EAD.

The TAB shall inform the manufacturer of outcomes of the comparison of test results with cl. 6.6 in EN 10223-3.

2.2.8 Tensile resistance of mesh ρ_m (in kN/m)

The mechanical resistance of double twisted wire mesh shall be given in ETA as the mean value of tensile strength ρ_m (in kN/m) and its tolerance corresponding to 95% level of confidence of mesh in the direction parallel with the axis of twist. This shall be calculated from at least three test results. For mesh size/wire diameter configuration the mean value of tensile strength and its tolerance shall be recorded in ETA. The test procedure for mesh not reinforced with ropes is in accordance with cl. 9 in EN 10223-3. The test procedure for mesh reinforced with ropes is according to Annex B of this EAD. If any type of reinforced mesh (mesh with inserted rope) has not been tested, the mean value of tensile strength ρ_m (in kN/m) can be defined as for the not reinforced mesh of the same type.

2.2.9 Punching resistance of mesh F_m (in kN) and deflection δ_m (in mm)

The mean value of punching resistance F_m (in kN) and mean value of deflection δ_m (in mm) (tested according to Annex B in ISO/FDIS 17746) of mesh and their tolerances corresponding to 95% level of confidence shall be recorded in ETA. If any type of reinforced mesh (mesh with inserted rope) has not been tested, the punching resistance F_m (in kN) and mean value of deflection δ_m (in mm) can be defined as for the not reinforced mesh of the same type.

2.2.10 Durability

2.2.10.1 Sulphur dioxide test with general condensation of moisture of mesh samples

Sulphur dioxide test with discontinuous exposure on mesh samples (at least one sample for each mesh designation) made from Zn, Zn/Al alloy and Zn/Al alloy + organic or equivalent advanced coated wires shall be carried out according to cl. 7.6.1 and cl. 7.6.2 in EN 10223-3. For Zn/Al alloy and Zn/Al alloy + organic coated or equivalent advanced coated mesh samples, the number of cycles of discontinuous exposure after which each mesh sample does not show more than 5% of DBR (Dark Brown Rust) shall be given in ETA. For Zn/Al + organic coated mesh samples the permeated rust shall be evaluated without removing the organic coating.

2.2.10.2 Neutral salt spray test with general condensation of moisture of mesh samples

Neutral salt spray (NSS) test on mesh samples (at least one sample) made from Zn, Zn/Al alloy and Zn/Al alloy + organic or equivalent advanced coated wires shall be carried out according to cl. 7.6.1 and cl. 7.6.2 in EN 10223-3. For Zn, Zn/Al alloy and Zn/Al alloy + organic coating or equivalent advanced coated mesh samples, the number of hours of exposure after which each mesh sample does not show more than 5% of DBR (Dark Brown Rust) shall be given in ETA. For Zn/Al + organic coated mesh samples the permeated rust shall be evaluated without removing the organic coating.

2.2.10.3 UV resistance tests on organic coating material

The raw organic material durability shall be demonstrated by method of exposition according to cl. 6.7.3 in EN 10223-3. The average relationship of initial and retained tensile strength and elongation in % resulting calculated from at least three samples shall be given in ETA.

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 2003/728/EC(EU)

The system is: [1]

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 2.

Table 2 – 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 in accordance with a prescribed test plan] | | | | | |
| Manufacturer`s production | | | | | |
| 1 | Product: | | | | |
| | Mesh dimensions, mesh size | 2.2.1 | 2.2.1 | 1 sample / type | 1 / day |
| | Product dimensions | 2.2.5 | 2.2.5 | 1 sample / type | 1 / day |
| | Connection component dimensions | 2.2.5 | 2.2.5 | 1 sample / type | 1 / day |
| | Coating integrity | 2.2.7.2 | 2.2.7.2 | 1 samples / type | 1 / year |
| | Tensile resistance of mesh | 2.2.8 | 2.2.8 | 3 samples / type | 2 / year |
| | Sulphur dioxide test | 2.2.10.1 | 2.2.10.1 | 1 sample / mesh type and wire diameter | 1 / 2 years |
| Neutral salt spray test | 2.2.10.2 | 2.2.10.2 | 1 sample / mesh type and wire diameter | 1 / 2 years | |
| UV resistance | 2.2.10.3 | 2.2.10.3 | According to control plan | 1 / 2 years | |
| Incoming product | | | | | |
| 2 | Metallic coated wire: | | | | |
| | Outer diameter | 2.2.2 | Manufacturer`s technical file | Inspection certificate of supplier, type 3.1 EN 10204 | Every shipment |
| | Adherence | 2.2.2 | | | |
| Coating mass | 2.2.6 | | | | |
| 3 | Rope characteristics: | | | | |
| | Designation | 2.2.4 | | Inspection certificate of supplier, type 3.1 EN 10204 | 1 / year |
| | Wire tensile strength grade | 2.2.4 | | | |
| | Non-ferrous metallic coating type and mass | 2.2.6 | | | |
| Breaking force | 2.2.4 | | | | |
| 4 | Organic coated wire: | | | | |
| | Outer diameter | 2.2.7 | | Inspection certificate of supplier, type 3.1 EN 10204 | Every shipment |
| | Visual | 2.2.7 | | | |
| | Thickness/concentricity | | | | |
| | Organic coated rope: | 2.2.4 | | | |
| | Outer diameter | 2.2.4 | | | |
| Visual | 2.2.4 | | | | |
| Coating thickness | 2.2.4 | | | | |
| 5 | Wire mechanical characteristics: | | | | |
| | Tensile strength | 2.2.3 | | Inspection certificate of supplier, type 3.1 EN 10204 | Every shipment |
| | | | | In addition 1 / each diameter | |

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 double twisted steel wire mesh reinforced or not with ropes are laid down in Table 3.

Table 3 – 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 | | | | | |
| 1 | Ascertain that the factory production control with the staff and equipment are suitable to ensure a continuous and orderly manufacturing of the double twisted steel wire mesh reinforced or not with ropes | - | Laid down in control plan | - | 1 |
| Continuing surveillance, assessment and evaluation of factory production control | | | | | |
| 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 |

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 10223-3 | Steel wire and wire products for fencing and netting - Part 3: Hexagonal steel wire mesh products for civil engineering purposes |
| 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 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 10264-1 | Steel wire and wire products. Steel wire for ropes. Part 1: General requirements |
| EN 10264-2 | Steel wire and wire products. Steel wire for ropes. Part 2: Cold drawn non alloy steel wire for ropes for general applications |
| 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 10245-1 | Steel wire and wire products. Organic coatings on steel wire. Part 1: General rules |
| EN 10245-3 | Steel wire and wire products - Organic coatings on steel wire - Part 3: PE coated wire |
| EN 10245-2 | Steel wire and wire products. Organic coatings on steel wire. Part 2: PVC finished wire |
| EN 10245-5 | Steel wire and wire products. Organic coatings on steel wire. Part 5: Polyamide coated wire |
| ISO/FDIS 17746 | Steel wire rope net panels and rolls — Definitions and specifications |
| EN ISO 9223 | Corrosion of metals and alloys. Corrosivity of atmospheres. classification, determination and estimation (ISO 9223:2012) |

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 prepared for the evaluation of the integrity of the polymer coating inside the double twists of the net is made of panel central ones.

A.3 Sampling

For each type of double twist wire mesh produced with organic coated wire 1 panel (see Figure A.1) in order to perform the longitudinal tensile test (according to cl. 9, EN 10223-3), shall be sampled.

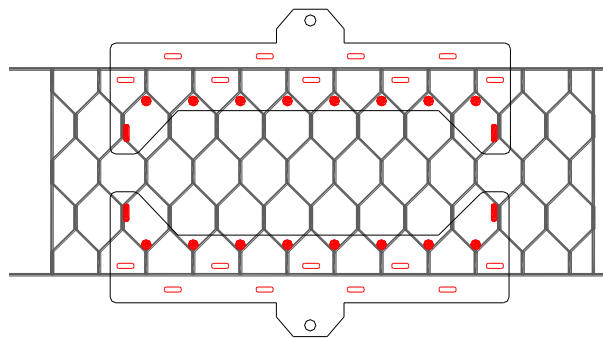


Figure A.1 - Panel

Each panel samples is subject to tensile strength test according to cl.9, EN 10223-3, up to 50% of the mean tensile strength values.

For each tensioned panel the double twist region (sample) will be verified (see Figures A.2, A.3 and A.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 Figures A.2, A.3 and A.4.

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

- n. 16 wire sections for 10 x 12 mesh type
- n. 16 wire sections for 8 x 10 mesh type
- n. 20 wire sections for 6 x 8 mesh type

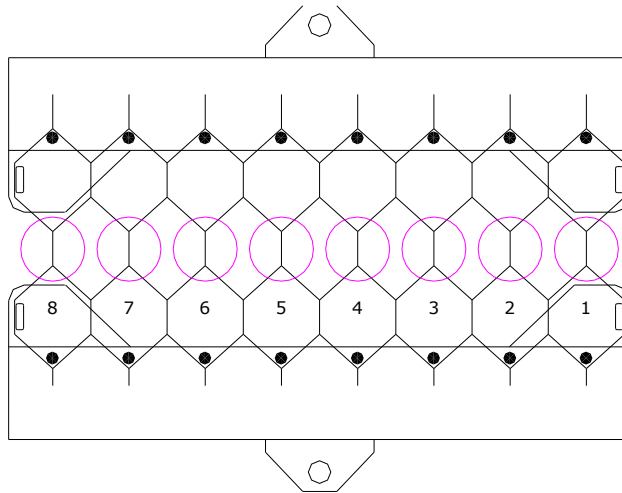


Figure A.2 – Sample for 10 x 12 mesh type

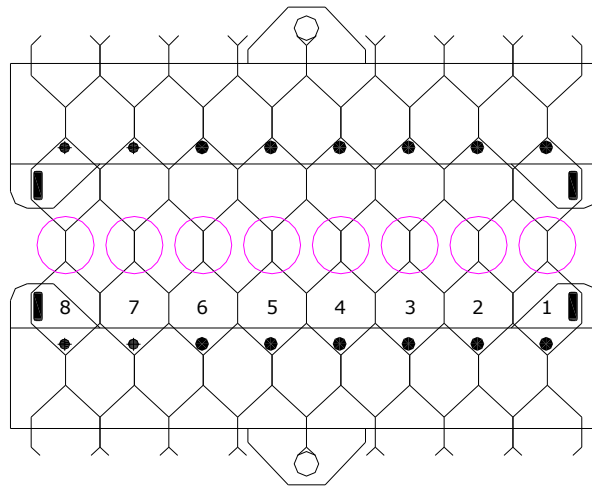


Figure A.3 – Sample for 8 x 10 mesh type

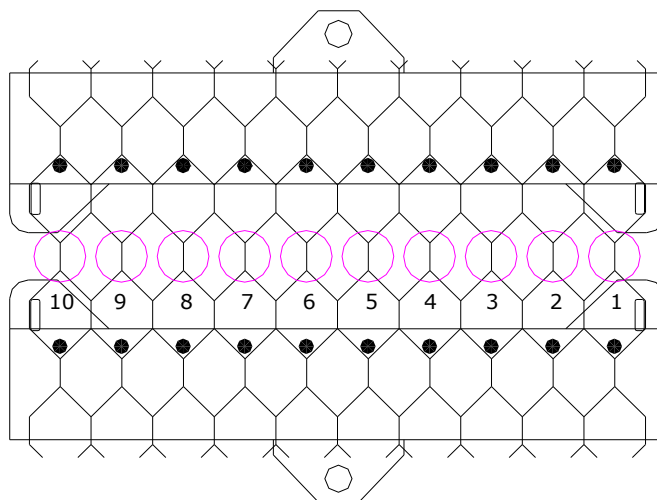


Figure A.4 – Sample for 6 x 8 mesh type

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 shall be classified into 4 categories:

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 mean values of tensile strength of mesh (whenever the underlying steel wire is clearly visible), the integrity is not fulfilled and the test cannot be accepted.

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 – TENSILE TEST ON DOUBLE TWISTED WIRE MESH REINFORCED WITH WIRE ROPES

B.1 Scope

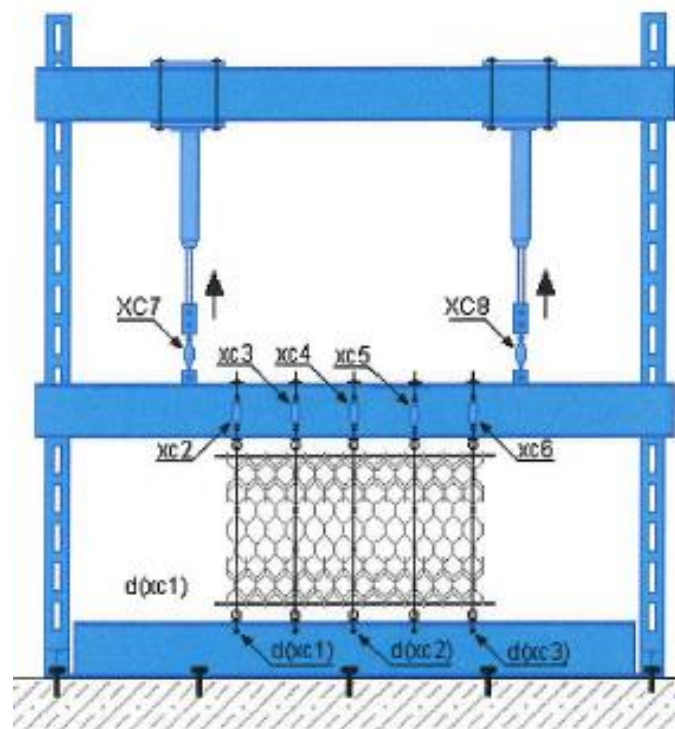
The aim of this test is to determine the tensile strength of double twisted steel wire mesh reinforced with ropes.

B.2 Test Specimen

The width of a specimen shall not be less than six repetitions of a mesh pattern, nor shall the length be less than ten repetitions (Figure B.1).

B.3 Test apparatus

The test apparatus consists from traction machine and rigid steel heads to allow the specimen to be connected to them.



- | | |
|-------------------------|---|
| XC7, XC8 | load gauges for measurement of total tensile force of mesh specimen |
| xc2, xc3, xc4, xc5, xc6 | load gauges for measurement of tensile forces in individual ropes |

Figure B.1 – Double twisted wire mesh with woven ropes – test method

B.4 Test procedure

The tests shall be run with the load applied parallel to the axis of woven ropes. Insert the rope and wires of mesh into the machine grips and the axially free sliding adjustable spreader system attachment points such that the gripped ropes and wires will be maintained in the mesh geometry characteristic of field use and attached in such a manner as to eliminate failure at the grips. The load is then applied at a uniform rate 10 to 6 mm/minute. The load shall initially be taken to a preload of 4 kN of the specified minimum strength and the machine head travel stopped. The mesh gage dimensions shall be recorded at this time and taken as the initial dimensions of the specimen where such dimensions are required. Loading shall then continue uniformly in increments of 10% of the specified minimum strength until first fracture of rope occurs.

Uniform distribution of applied tensile load into all ropes is the key issue of proper testing. The tensile force in ropes shall increase directly, while the tensile strength in the wire meshes, due to twisting layout of the wires, shall increase indirectly. The acceptable failure mode is by breaking of one of the ropes.

B.5 Test report

The test report shall contain:

- Name of laboratory and name of operator who performed the tests;
- Date of test;
- Detailed and particular description of test specimen: mesh construction, mesh size, component characteristics (diameter of wires, construction of ropes, breaking forces);
- Nominal dimensions of test specimen;
- Description of testing apparatus;
- Description of failure mode;
- Total load at collapse;
- Tensile forces in individual ropes at collapse;
- Elongation at break.