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Steel wire rope net panels and rolls — Definitions and specifications

Panneaux et rouleaux de filet en câble d'acier — Définitions et spécifications

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Foreword

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 17, *Steel*, Subcommittee SC 17, *Steel wire rod and wire products*.

Steel wire rope net panels and rolls — Definitions and specifications

1 Scope

This International Standard specifies the characteristics of steel wire rope net panels and rolls for retaining of unstable slopes controlling and preventing rockfalls and loose debris flow along roads, highways and railway, urban areas, mines and quarries, and for snow avalanche protection.

Steel wire rope net panels and rolls are produced from metallic-coated wire ropes.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 2408, *Steel wire ropes for general purposes — Minimum requirements*

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 7989-1, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 1: General principles*

ISO 7989-2:2007, *Steel wire and wire products — Non-ferrous metallic coatings on steel wire — Part 2: Zinc or zinc-alloy coating*

ISO 10474, *Steel and steel products — Inspection documents*

ISO 22034-1, *Steel wire and wire products — Part 1: General test methods*

EN 10204, *Metallic products — Types of inspection documents*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1
wire rope net panel
panel made from *wire rope* (3.2) or ropes arranged in a plain structure and connected at the points of overlapping by wire knots, by interlinking of the wire ropes or by metallic *clips* (3.5)

3.2
wire rope
standard steel wire ropes according to ISO 2408

3.3
wire rope net sizes
average value of the net dimensions

Note 1 to entry: Distance between two ropes in the same direction.

3.4
knot
point of connecting, overlapping or crossing of the net wire ropes

Note 1 to entry: A knot can be released using wires, *clips* (3.5) or by twisting the wrapping ropes.

3.5
clips
metallic shell-like elements with fastening tabs to be used for forming connections between adjacent ropes

3.6
knot without clips
knot (3.4) of panel in which the overlapping points of the wrapping ropes are connected by twisting the *wire ropes* (3.2)

3.7
nominal net size
distance between two junctions when measured along any single rope

3.8
dimensions of a panel
length and width expressed in metres

3.9
advanced metallic coating
metallic coating with a not specified composition having a superior corrosion resistance

4 Description of use and applications

The typical use for the considered products is retaining of unstable slopes, controlling and preventing rockfalls and loose debris flow along roads, highways and railway, urban areas, mines and quarries, and for snow avalanche protection.

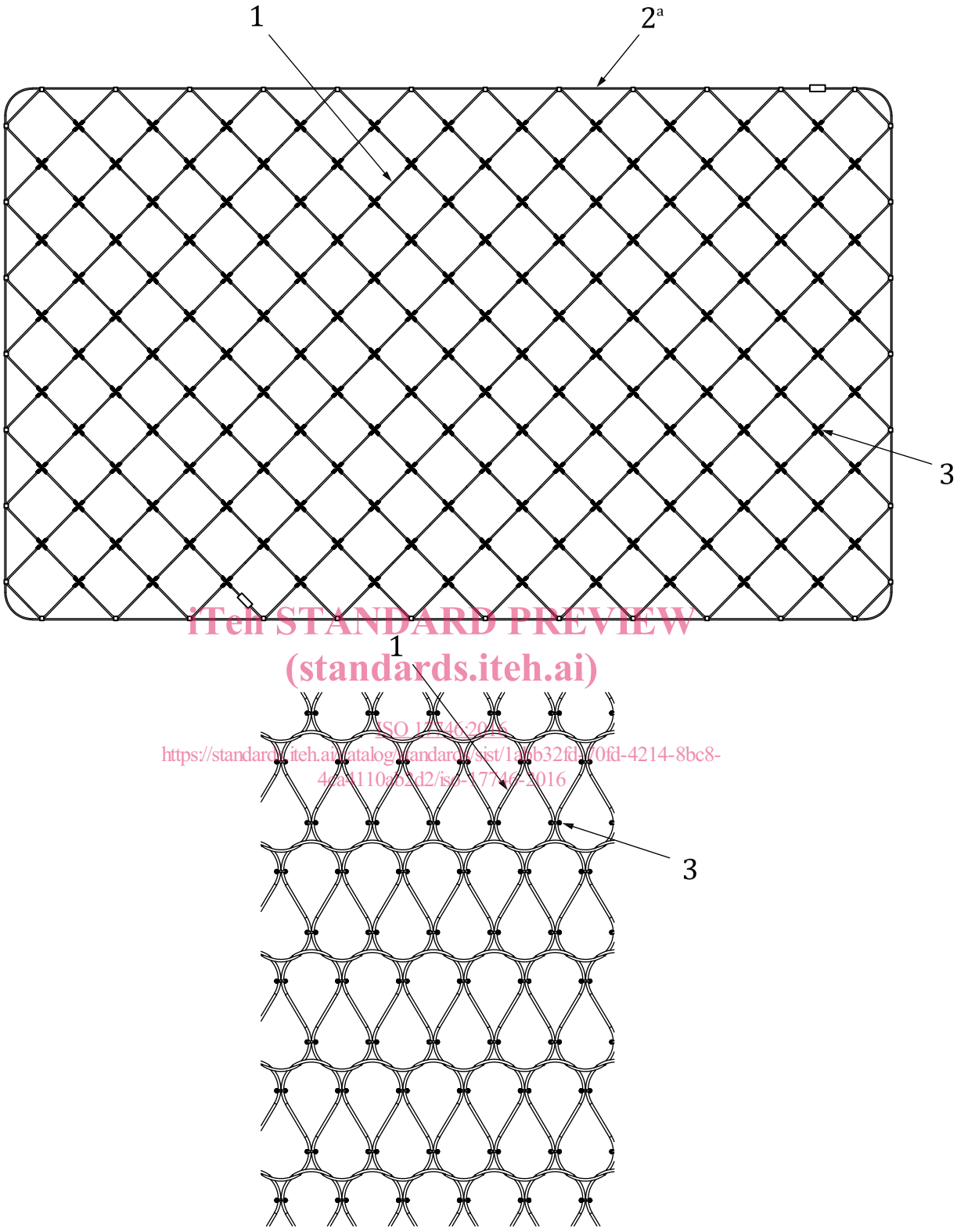
Figure 1 shows some relevant examples of applications of wire rope net panels.

5 Wire rope net panels

5.1 General

Wire rope net panels are made of square nets or other shapes (e.g. triangular, jersey, rhomboidal, etc.) of nets manufactured with one or more than one rope as shown in Figure 1.

Wire rope net can be manufactured both in panels and in rolls.



Key

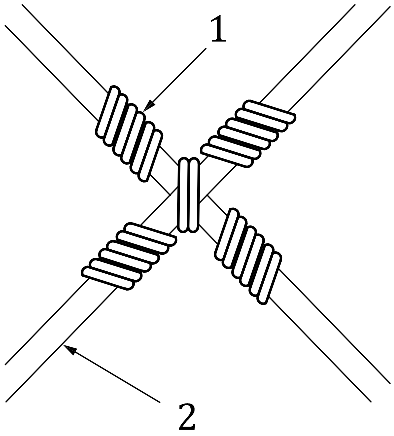
1 net rope
2 perimetral rope
3 knot
a Optional.

Figure 1 — Examples of wire rope net panels and their components

The knot can be made in the different ways described in 5.2 to 5.4.

5.2 Double knot

This kind of knot (see Figure 2) is made by two bindings, each one obtained by looping a pair of steel 3,00 mm wires coated with a zinc-aluminium-5 % alloy. The two bindings tightly envelop the ropes crossing each other.



Key

1 steel wire

2 net rope

Figure 2 — Example of double knot

The use of single knot may be agreed between the supplier and purchaser, provided that performance to punching tests of the panel meets the project requirement.

5.3 Clips or staple knot

In this kind of panel (see Figure 3), the overlapping points of the wrapping rope are connected using electro-plated clips, which are made of two half-shells pressure-closed.

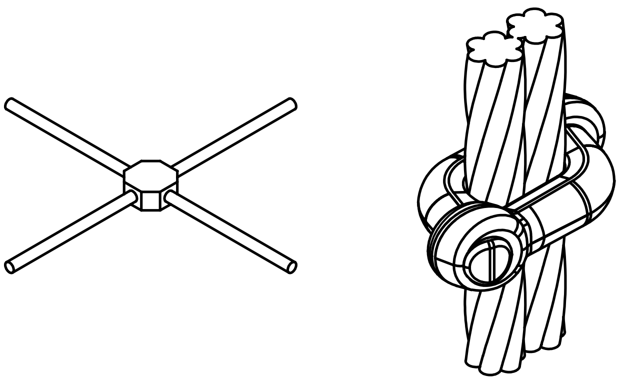


Figure 3 — Examples of clips knot and staple knot (patented)

5.4 Without connection clips

See Figure 4.

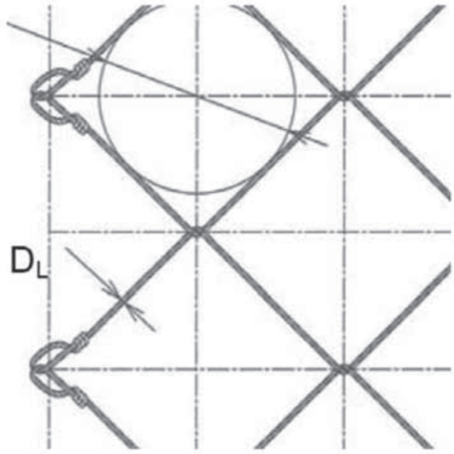


Figure 4 — Example of wire rope net where knot is formed without connection clips

The main properties of the wire ropes panels are specified in Table 1.

Table 1 — Main properties of wire ropes panel

Items	Nominal net size[a] mm	Net wire ropes		Peripheral wire ropes (optional)	
		Diameter (mm) and type[b]	Minimum breaking load (kN)	Diameter (mm) and type[b]	Minimum breaking load (kN)
Wire rope net panel Double knot	250 × 250	8 mm 6 × 7 + WC	40,7	10 mm 6 × 19 + WC	63,0
	300 × 300	10 mm 6 × 19 + WC	63,0	12 mm 6 × 19 + WC	90,7
	400 × 400	12 mm 6 × 19 + WC	90,7	14 mm 6 × 19 + WC	124,0
				16 mm 6 × 19 + WC	161,0
Wire rope net panel Clips knot	200 × 200	8 mm 6 × 7 + WC	40,7	10 mm 6 × 19 + WC	63,0
	250 × 250			12 mm 6 × 19 + WC	90,7
	300 × 300			14 mm 6 × 19 + WC	124,0
				16 mm 6 × 19 + WC	161,0
Wire rope net rolls without connection clips	250 × 250	8,6 mm (3 × 4) mm	61,4	12 mm 6 × 19 + WC	90,7
	275 × 275	6,6 mm (3 × 3) mm	36,7	16 mm 6 × 19 + WC	161,3

a The tolerance on the net nominal size is ±10 % but can change in relation to the panel dimensions.

b Rope type (see ISO 2408), rope grade 1 770 N/mm^2.

Other net sizes are possible, in accordance with project design requirements.

6 Properties of wire used in knots

6.1 Mechanical properties

The tensile strength of the wire used in knot shall be a minimum of 350 N/mm^2. The tensile strength of the wire used in knot shall be tested in accordance with ISO 22034-1.

6.2 Coating properties

The steel wire used in knot must be a nominal minimum diameter of 3,00 mm and coated with a zinc-aluminium alloy in accordance with the ISO 7989-1 and ISO 7989-2, class A. Method of assessment and acceptance criteria for zinc and zinc alloy coating weight are prescribed in ISO 7989-2:2007, Clause 5.

Lower wire diameters may be used provided that performance characteristics of the whole net panel can be demonstrated to be appropriate for the intended use.

The corrosion resistance of the connections (clips, staples, etc.) shall exceed the corrosion resistance of the ropes after the manufacturing.

7 Wire rope properties

Wire ropes used in wire rope net panels shall be in accordance with ISO 2408:2004, Table 1. Non-ferrous metallic coatings on steel wire shall be in accordance with ISO 7989-2, class A or class B.

8 Rope net properties

8.1 Ageing and corrosion resistance

8.1.1 Zn class B

When subjected to the neutral salt spray test according to the procedures in ISO 9227, after a period of 200 h of exposure, the net samples shall not show more than 5 % of DBR.

8.1.2 Zn class A

When subjected to the neutral salt spray test according to the procedures in ISO 9227, after a period of 500 h of exposure, the net samples shall not show more than 5 % of DBR.

8.1.3 Zn95Al5 class B

When subjected to the neutral salt spray test according to the procedures in ISO 9227, after a period of 500 h of exposure, the net samples shall not show more than 5 % of DBR.

8.1.4 Zn95Al5 class A

When subjected to the neutral salt spray test according to the procedures in ISO 9227, after a period of 1 000 h of exposure, the net samples shall not show more than 5 % of DBR.

8.1.5 Advanced metallic coatings (as Zn90Al10) class B

When subjected to the neutral salt spray test according to the procedures in ISO 9227, after a period of 1 000 h of exposure, the net samples shall not show more than 5 % of DBR.

8.1.6 Advanced metallic coatings (as Zn90Al10) class A

When subjected to the neutral salt spray test according to the procedures in ISO 9227, after a period of 2 000 h of exposure, the net samples shall not show more than 5 % of DBR.

8.1.7 Additional organic coating

Wire ropes used in wire rope net panel could be additionally organic coated. The polymeric coating material mechanical characteristics (tensile strength and elongation), after exposure to UV-rays, the

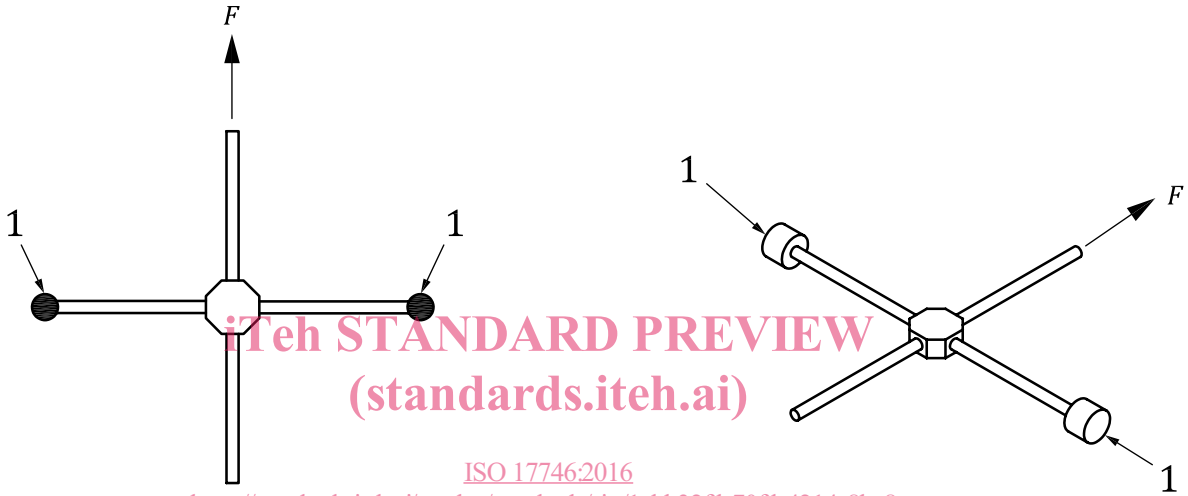
number of hours QUV-A (ISO 4892-3 exposure mode 1) shall not decrease by more than 25 % from the initial test results. These results cannot be compared to ISO 9227.

8.2 Maximum breaking load of knot

For wire knots (double or single) and clips knots, the value of the maximum breaking load shall be evaluated using the "test on knot" as reported below. See Figure 5.

For the test, the element is mounted in a calibrated test traction rig. The test should allow the evaluation of the slipping force of the rope through the knot. Tests shall be performed on a minimum number of three samples.

The tensile test machine shall be of class 1 according to ISO 7500-1 (definition of class of testing machine).



Key

F traction force

1 fixed end

Figure 5 — Scheme for test on knot — Maximum slipping force

8.3 Maximum load of tear break of knot

For wire knots (double or single) and clips knots, the value of the maximum load of tear break shall be evaluated using the "test on knot" as reported below.

The value of the maximum load of tear break shall be evaluated using the following test procedure (see Figure 6).

For the test with the element, mount the element in a calibrated test traction. The test should allow the evaluation of the breaking force of the knot defined as maximum load of tear break.

The testing machine shall be of class 1 according to ISO 7500-1.

Tests shall be performed on a minimum number of three samples.