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Second edition
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Steel wire ropes — Spliced eye terminations for slings

Câbles en acier — Oeils épissés pour élingues

Reference number
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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 105, *Steel wire ropes*.

This second edition cancels and replaces the first edition (ISO 8794:1986), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Clause 3 has been modified (terms and definitions);

— 7.1 has been added (general);

— 7.2 has been modified (tensile test to destruction);

— 7.3 has been modified (durability test);

— 7.4 has been added (qualified results of prototype test);

— Annex B has been added (method 2: specification for hand-splicing of Flemish eye termination);

— Annex C has been added (method 3: specification for machine-aided hand-splicing of turn-back eye termination.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Steel wire ropes — Spliced eye terminations for slings

1 Scope

This document specifies minimum requirements for spliced eye terminations for wire rope slings.

Prototype tests covering the type acceptance of splice methods are also specified in this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

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

ISO 17893, *Steel wire ropes — Definitions, designation and classification*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 17893 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
spliced eye termination
loop or eye at the end of a rope made by tucking the ends of the strands back into the main body of the rope

3.1.1
hand-splicing of turn-back eye termination
turn-back eye formed at a rope end secured by means of hand-splicing

3.1.2
hand-splicing of Flemish eye termination
Flemish eye formed at a rope end secured by means of hand-splicing

3.1.3
machine-aided hand-splicing of turn-back eye termination
turn-back eye formed at a rope end by means of a press machine with a plug for tucking and secured by hand-splicing

3.2
tuck
single reeving of a strand to be spliced under a specified number of strands in the wire rope

4 Type of wire ropes

Six round stranded steel wire ropes with fibre or steel core in ordinary lay specified in ISO 2408 are suitable for provision of spliced eye terminations. This method could apply to other type of steel wire ropes for spliced eye terminations.

5 Splicing operation

5.1 The splicing operation shall only be carried out by qualified splicers. The supplier shall be responsible for ensuring that splicers are properly trained and qualified.

5.2 Examples of approved splicing methods are specified in the Annex A, Annex B and Annex C.

5.3 The splice shall be as one of the descriptions below:

— the splice shall have at least five tucks for each strand, at least three of them with the whole strand;

— the splice shall be made three full strands with four tucks and other three full strands with five tucks comprising.

NOTE 1 Depending on the rope size, rope construction and the splicing method, more tucks per strand than given above can be necessary.

NOTE 2 To get a smooth run-out of the splice, it can be advantageous to make the last tuck or the last two tucks with the half of the wires cut out of the strands.

NOTE 3 Certain national and international conventions exist for regulating the types of spliced eye terminations to be used in specific applications, e.g. dock works. It is important to take account such regulations when this document is applied.

5.4 Slings using other splicing methods that conform to the requirements of this document can also be accepted.

5.5 The wire ends of the spliced strands should be covered with a suitable serving at the option of the purchaser.

6 Design requirements of the spliced eye termination

The design breaking strength of a spliced eye termination shall be at least 80 % of the minimum breaking force of the respective wire rope as specified in ISO 2408.

If a steel core is spliced at least three tucks with the strands, it may be considered as a load-bearing part of the rope.

7 Prototype tests

7.1 General

7.1.1 Prototype test condition

Prototype testing should be carried out before manufacture or if there are any changes in the conditions as follow:

— when a greater change happened in the structures, raw materials or processes, which may affect product performance during the production;

— if manufacture considers necessary, when it is discontinued for a period and then production is resumed;

— if the delivery inspection results are quite different from the design requirement;

— if required by purchaser.

7.1.2 Samples

The tests shall be carried out on three rope sizes which shall represent, respectively, the smallest, middle and largest of those sizes for which the system is recommended.

Two tests shall be carried out on each size of wire rope for which the splicing method is recommended.

The tests shall be carried out on the highest level of tensile grade for which the system is recommended.

7.1.3 Safety terms

Safety in the test should be a major concern for the operator of the machine, for observers and the surroundings. Uncontained wires, during testing, can impact and penetrate objects at a great distance. Adequate safety shields directly around samples, as well as around the operator and observers, should be used as a minimum.

7.2 Tensile test to destruction

7.2.1 Test machine

The test machine shall be in conformance with ISO 7500-1. In general, the test shall be carried out at ambient temperature within the limits of 10 °C to 35 °C according to ISO 3108.

7.2.2 Procedure

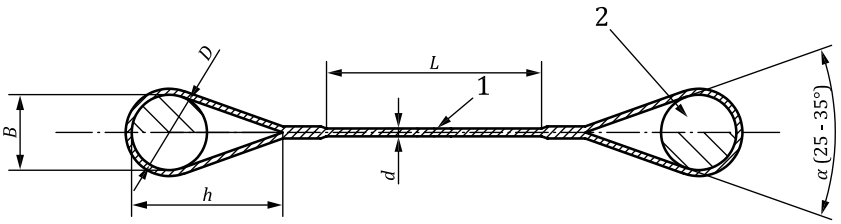
A spliced eye termination shall be formed without a thimble at each end of each test piece. See Figure 1. The minimum distance L between the tails of the splices shall be in accordance with Table 1. The force shall be applied by means of round pins having a suitable diameter, threaded through the eye termination. Not more than 60 % of the design breaking force of the spliced eye termination shall be applied quickly; thereafter the force shall be applied steadily at a rate of not more than 0,5 % of the design breaking force of the spliced eye termination until the actual breaking force is reached.

Table 1 — The minimum distance L between the tails of the splices

Dimensions in millimetres

Nominal diameter of steel wire rope d	Minimum distance L between the tails of the splices	
	Stranded rope	Spiral rope
$d \leq 6$	≥ 300	≥ 500
$6 < d \leq 20$	≥ 600	≥ 1 000
$20 < d \leq 60$	≥ 30d	≥ 50d
$d > 60$	≥ 3 000	

NOTE For large diameter rope, a minimum of six rope lay lengths can be required to achieve the minimum breaking force.



Key

1 steel wire rope

2 round pin

h length from the throat to the bearing point of the eye: $h \geq 15d$

d nominal diameter of wire rope

D diameter of the round pin: $D \geq 4d$

L minimum distance between the tails of the splices (see Fig 1)

B the width of the eye under no force

-- The length (*h*) of soft eye from the throat to the bearing point of the eye shall be at least 15 times of nominal diameter of the rope.

The width of eye *B* under no force should be approximately half of length (*h*).

Under testing, the included angle '*α*' shall be between 25 ° and 35 °. See figure 1.

Figure 1 — Tensile test sample

7.2.3 Qualified results of tensile test

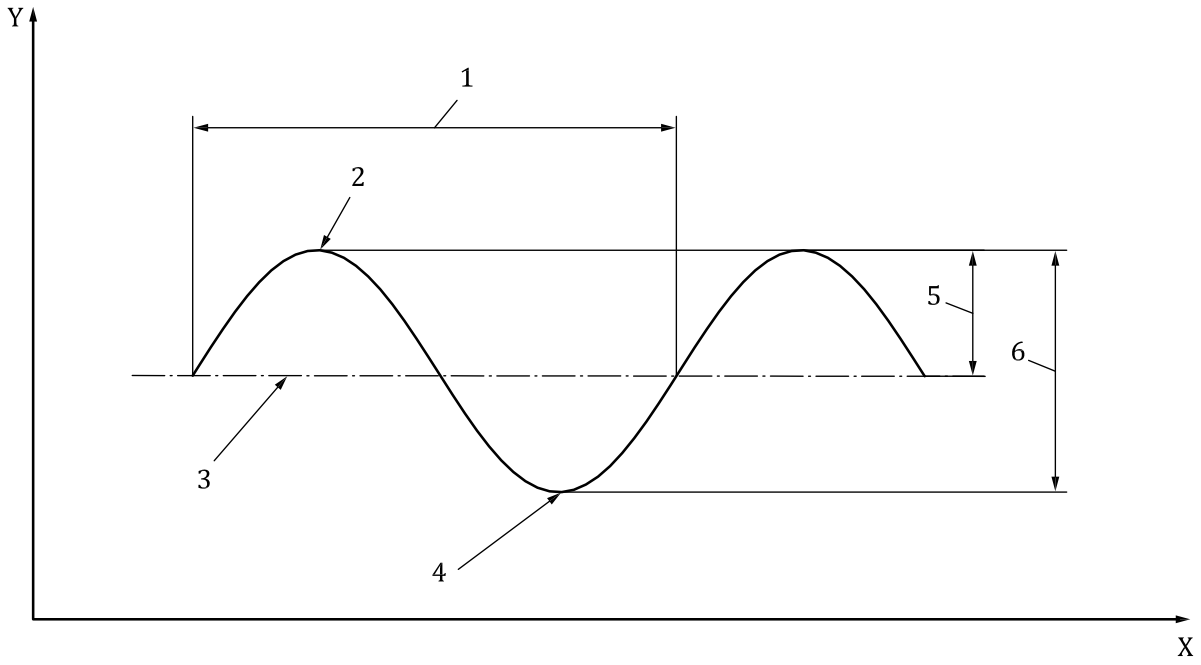
The assembly shall have passed the tensile test to destruction if breaking load of both samples is in excess of 80 % of the minimum breaking force of the wire rope.

7.3 Durability test

7.3.1 Test conditions

The tests shall be carried out in a tensile fatigue machine which shall be capable of producing substantially the same stress pattern at both the fixed and moving ends and should be able to record stress curves and cycles. See Figure 2.

In general, the test shall be carried out at ambient temperature within the limits of 10 °C to 35 °C according to ISO 3108.



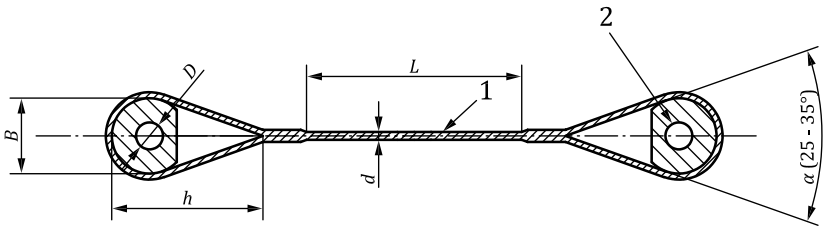
Key

X time
Y stress
1 one stress cycle
2 maximum stress, σ_{max}
3 mean stress, σ_m
4 minimum stress, σ_{min}
5 range of stress, σ_a
6 stress amplitude, $\Delta\sigma_a$

Figure 2 — Durability test cycle

7.3.2 Procedure

The assemblies shall have a spliced eye termination at each end and shall be fitted with solid thimbles. The length of clear rope between the tails of the splices shall be as for the prototype tensile test, see Figure 3.



Key

1 steel wire rope
2 solid thimble
h length from the throat to the bearing point of the eye
d nominal diameter of wire rope
D diameter of the round pin in solid thimble
B width of the eye under no force
L length of specimen, above 30*d*

Note 1 The solid thimbles fitted for durability test can be removed from the spliced eyes when the tensile test is carried out. The diameter of the round pin used in fatigue test depends on the size of solid thimbles.

Note 2 If 20 mm < $d \leq 60$ mm, $L \geq 30d$ mm; if $d > 60$ mm, $L \geq 3\,000$ mm.

Figure 3 — Durability test sample

Each assembly shall be subject to a cyclic tension along the rope axis from 15 % to 30 % of the minimum breaking force of the rope as specified in ISO 2408.

The machine frequency shall not exceed 5 Hz.

7.3.3 Qualified results of durability test

To comply with this document each of the six assemblies selected for prototype tests shall withstand 20 000 cycles first, after which the breaking force of the assembly shall not be less than 70 % of the minimum breaking force of the rope.

7.4 Qualified results of prototype test

Samples for each rope size shall have passed the tests described in 7.2 and 7.3.

