BRITISH STANDARD

BS EN 12385-2:2002 +A1:2008

Steel wire ropes — Safety —

Part 2: Definitions, designation and classification

ICS 01.040.77; 77.140.65

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The start and finish of text introduced or altered by amendment is indicated in the text by tags. Tags indicating changes to CEN text carry the number of the CEN amendment. For example, text altered by CEN amendment A1 is indicated by ▶A1⟩ ⟨A1◀.

The UK participation in its preparation was entrusted to Technical Committee MHE/2, Wire ropes.

A list of organizations represented on this committee can be obtained on request to its secretary.

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NORME EUROPÉENNE

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English Version

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Stahldrahtseile - Sicherheit - Teil 2: Begriffe, Bezeichnungen und Klassifizierung

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Foreword

This document (EN 12385-2:2002+A1:2008) has been prepared by Technical Committee CEN/TC 168, "Chains, ropes, webbing, slings and accessories - Safety", the secretariat of which is held by BSI.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by September 2008, and conflicting national standards shall be withdrawn at the latest by September 2008.

This document includes Amendment 1, approved by CEN on 2008-02-14.

This document supersedes EN 12385-2:2002.

The start and finish of text introduced or altered by amendment is indicated in the text by tags A1 A1.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annexes ZA and ZB, which are integral parts of this document.

The other parts of this European Standard are:

Part 1: *General requirements*

Part 3: *Information for use and maintenance*

Part 4: *Stranded ropes for general lifting applications*

Part 5: *Stranded ropes for lifts*

Part 6: *Stranded ropes for mine shafts*

Part 7: *Locked coil ropes for mine shafts*

Part 8: *Stranded hauling and carrying-hauling ropes for cableway installations designed to carry persons*

Part 9: *Locked coil carrying ropes for cableway installations designed to carry persons*

Part 10: *Spiral ropes for general structural applications*

Part 1 provides the general requirements of Parts 4 to 10.

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Introduction

This part of this European Standard has been prepared to support Parts 4 to 10 that concern themselves with the particular requirements for steel wire ropes for use in specific applications.

The rope designation system described in clause 4 is provided with the intention of it being used to describe the rope in the certificate or inspection document referred to in the other Parts.

The rope classification system described in clause 5 is provided to define which constructions apply to a specific rope class.

The designation and classification systems described in clauses 4 and 5 respectively may also be used for ropes not covered by the other parts of this standard.

1 Scope

This part of this European Standard defines terms, specifies designations and classifies steel wire ropes and is for use in conjunction with all other parts of this standard.

It applies to ropes that have been manufactured after the date of issue of the standard.

2 Normative references

Not applicable.

3 Terms and definitions

For the purposes of this part of EN 12385, the following terms and definitions apply.

3.1 Wires

3.1.1
outer wires
all wires positioned in the outer layer of a spiral rope or in the outer layer of wires in the outer strands of a stranded rope

3.1.2
inner wires
all wires of intermediate layers positioned between the centre wire and outer layer of wires in a spiral rope or all other wires except centre, filler, core and outer wires in a stranded rope

3.1.3
filler wires
wires used in filler constructions to fill up the interstices between wire layers, see Figure 8

3.1.4
centre wires
wires positioned either at the centre of a spiral rope or the centres of strands of a stranded rope

3.1.5
core wires
all wires of the core of a stranded rope

3.1.6
load-bearing wires
those wires in a rope which are regarded as contributing towards the breaking force of the rope

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3.1.7
layer of wires
an assembly of wires having one pitch circle diameter. The exception is Warrington layer comprising large and small wires where the smaller wires are positioned on a larger pitch circle diameter than the larger wires. The first layer is that which is laid immediately over the strand centre

NOTE Filler wires do not constitute a separate layer.

3.1.8
stitching wire or strand
single wire or strand used for the stitching of flat ropes

3.1.9
serving wire or strand
single wire or strand used for making a close-wound helical serving to retain the elements of a rope in their assembled position

3.1.10
wire tensile strength grade (*R*)
a level of requirement of tensile strength of a wire and its corresponding range. It is designated by the value according to the lower limit of tensile strength and is used when specifying wire and when determining the calculated minimum breaking force or calculated minimum aggregate breaking force of a rope, expressed in N/mm^2

3.1.11
wire tensile strength (R_m)
the ratio between the maximum force obtained in a tensile test and the nominal cross-sectional area of the test piece, expressed in N/mm^2

3.1.12
finish and quality of coating
the condition of the surface finish of the wire e.g. uncoated (bright), zinc coated, zinc alloy coated or other protective coating and the class of coating, e.g. class B zinc coating, defined by the minimum mass of coating and the adherence of the coating to the steel below

3.1.13
mass of coating
the mass of coating (obtained by a prescribed method) per unit of surface area of the uncoated wire, expressed in g/m^2

3.2 Strand types

3.2.1
strand
an element of rope consisting of an assembly of wires of appropriate shape and dimensions laid helically in the same direction in one or more layers around a centre

NOTE Strands containing three or four wires in the first layer, or certain shaped strands (e.g. ribbon) cannot have a centre.

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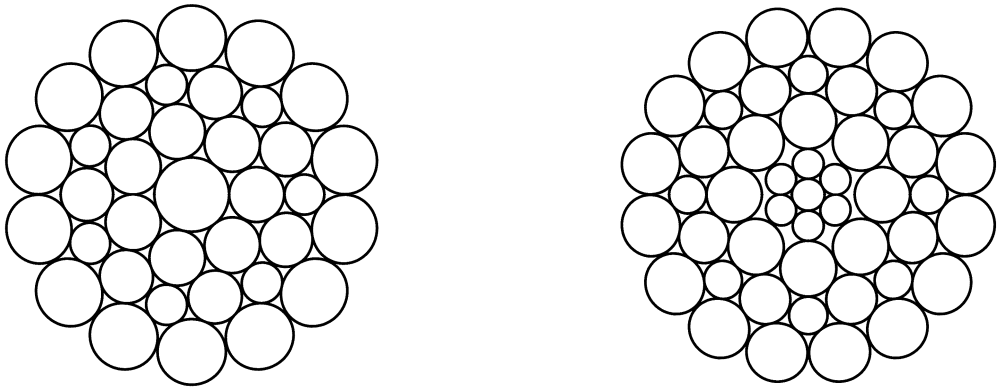
3.2.2
round strand
a strand with a perpendicular cross-section which is approximately the shape of a circle, see Figure 1



a) Strand with one centre wire b) Strand with (1-6) built-up centre

Figure 1 — Round strand with different centres

3.2.3
triangular strand (*V*)
a strand with a perpendicular cross-section which is approximately the shape of a triangle, see Figure 2

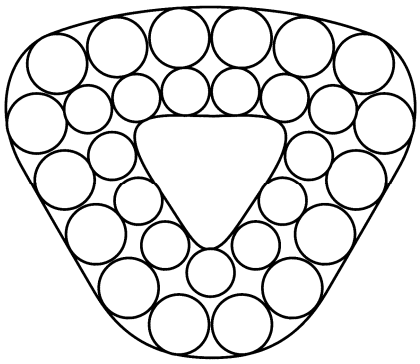


Figure 2 — Triangular strand with triangular (*V*) centre wire

NOTE Triangular strands can have built-up centres e.g. 3 × 2 + 3F, K1V-6, K3/9 etc.

3.2.4
oval strand (Q)
a strand having a perpendicular cross-section which is approximately the shape of an oval, see Figure 3

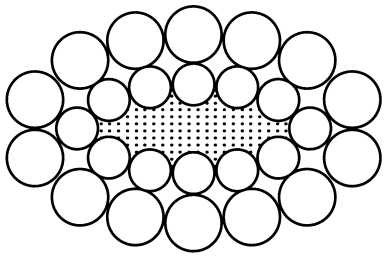


Figure 3 — Oval strand having oval shaped centre

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3.2.5
flat ribbon strand (*P*)
a strand without a centre wire with a perpendicular cross-section which is approximately the shape of a rectangle, see Figure 4

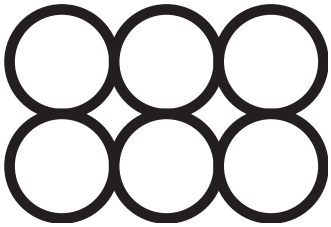

Figure 4 — Flat ribbon strand

3.2.6
single lay strand
strand which contains only one layer of wires, see Figure 5

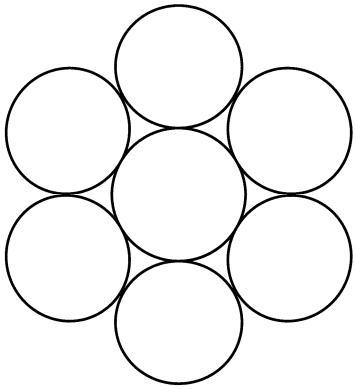

Figure 5 — Single lay strand

3.2.7
parallel lay strand
strand which contains at least two layers of wires, all of which are laid in one operation (in the same direction)

NOTE 1 Also known as equal lay.

NOTE 2 The lay length of all the wire layers is equal and the wires of any two superimposed layers are parallel resulting in linear contact.

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3.2.8
Seale
parallel lay strand construction with the same number of wires in both layers, see Figure 6

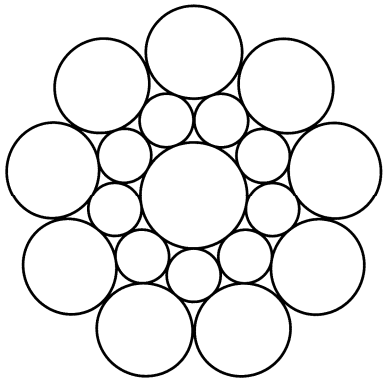

Figure 6 — Seale construction

3.2.9
Warrington
parallel lay strand construction having an outer layer containing alternately large and small wires and twice the number of wires as the inner layer, see Figure 7

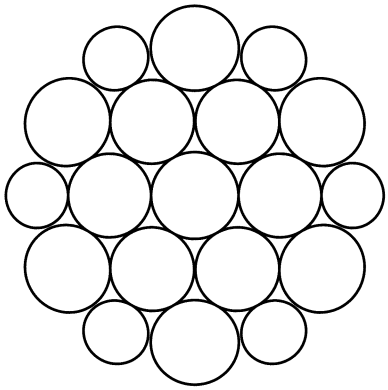

Figure 7 — Warrington construction

3.2.10
filler
parallel lay strand construction having an outer layer containing twice the number of wires than the inner layer, with filler wires laid in the interstices between the layers, see Figure 8

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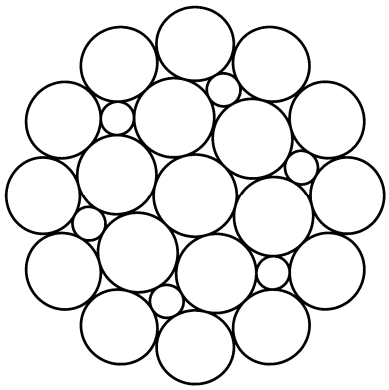

Figure 8 — Filler construction

3.2.11
combined parallel lay
parallel lay strand construction having three or more layers laid in one operation and formed from a combination of the strand types 3.2.8 to 3.2.10, see Figure 9.

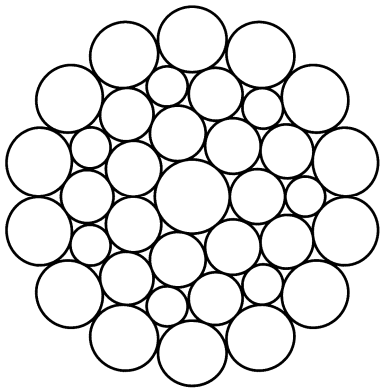

Figure 9 — Combined parallel lay, example: Warrington - Seale

3.2.12
multiple operation lay strand
construction containing at least two layers of wires in which successive layers are laid in more than one operation

3.2.13
cross-lay (*M*)
strand which contains more than one layer of wires, all laid in the same direction. The wires of superimposed wire layers cross one another and make point contact

3.2.14
compound lay (*N*)
strand which contains a minimum of three layers of wires, the outer layer of which is laid in a separate operation, but in the same direction as the others, over a parallel lay construction forming the inner layers

3.2.15
compacted strand (*K*)
a strand which has been subjected to a compacting process such as drawing, rolling or swaging whereby the metallic cross-sectional area of the wires remains unaltered whereas the shape of the wires and the dimensions of the strand are modified, see Figure 10

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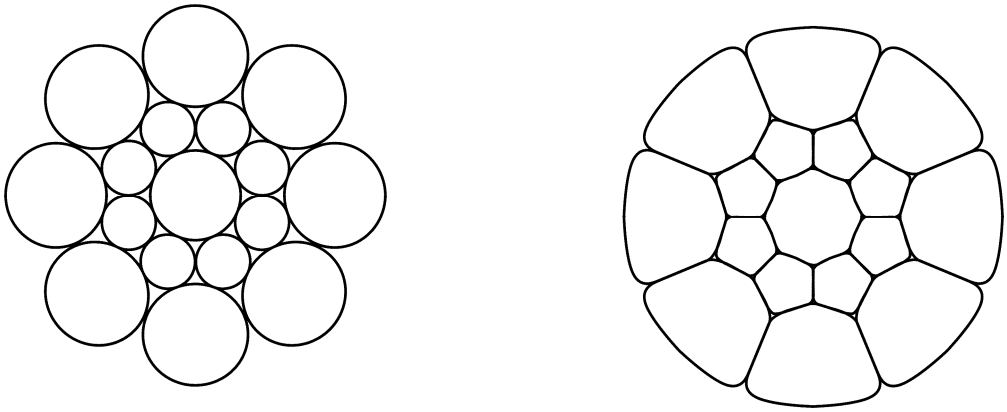

a) Strand before compacting b) Strand after compacting

Figure 10 — Compacted round strand

3.3 Core types

3.3.1
core (*C*)
central element of a round rope around which are laid helically the strands of a stranded rope or the unit ropes of a cable laid rope

3.3.2
fibre core (*FC*)
core made from either natural fibres (NFC) or synthetic fibres (SFC)

NOTE Fibre cores are normally produced in the sequence fibres to yarns, yarns to strands and strands to rope.

3.3.3
steel core (*WC*)
core made from steel wires arranged as a wire strand (WSC) or as an independent wire rope (IWRC)

NOTE The steel core and/or its outer strands can also be covered with either fibre or solid polymer.

3.3.4
solid polymer core (*SPC*)
core consisting of a solid polymer material having a round shape or a round shape with grooves. It may also contain an internal element of wire(s) or fibre

3.4 Lubricants and preservation agents

3.4.1
rope lubricant
a material applied during the manufacture of a strand, core or rope for the purpose of reducing internal friction and/or assisting in providing protection against corrosion

3.4.2
impregnating agent
a material used in the manufacture of natural fibre cores, coverings and inserts for the purpose of inhibiting rotting and decay

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3.4.3
preservation agent
a material, usually some form of blocking compound, applied during and/or after manufacture of the rope and/or to fibre inserts and coverings for the purpose of providing protection against corrosion

3.5
Insert (*I*)
fibre or solid polymers so positioned as to separate adjacent strands or wires in the same or overlying layers, or fill the interstices of the rope

3.6 Rope types

3.6.1 Stranded ropes

3.6.1.1
stranded rope
an assembly of several strands laid helically in one or more layers around a core (single-layer rope) or centre (rotation-resistant or parallel-closed rope).

NOTE Stranded ropes consisting of three or four outer strands can, or cannot, have a core.

3.6.1.2
single-layer rope
stranded rope consisting of one layer of strands laid helically around a core, see Figure 11

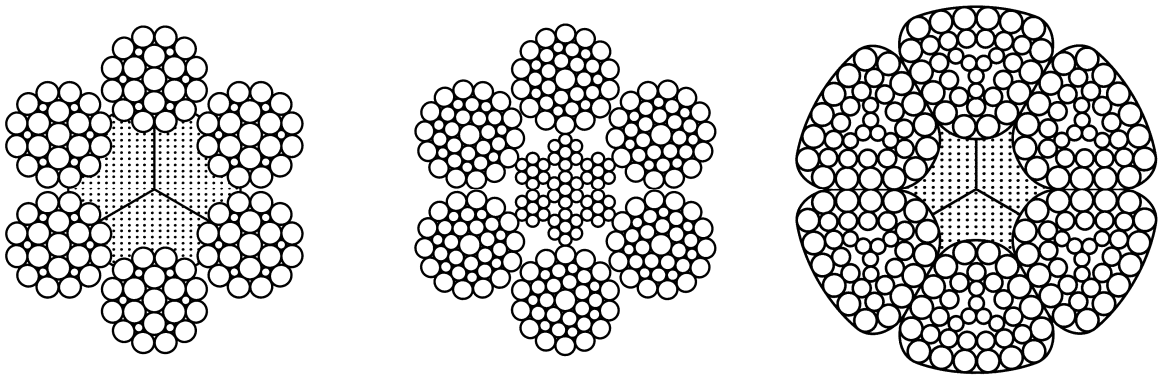

Figure 11 — Examples of single-layer stranded ropes

3.6.1.3
rotation-resistant rope
stranded rope designed to generate reduced levels of torque and rotation when loaded see Figure 12

NOTE Rotation-resistant ropes generally comprise an assembly of at least two layers of strands laid helically around a centre, the direction of lay of the outer strands being opposite to that of the underlying layer.

NOTE Ropes having three or four strands can also be designed to exhibit rotational-resistant properties.

NOTE Rotation-resistant ropes have previously been referred to as multi-strand and non-rotating ropes.

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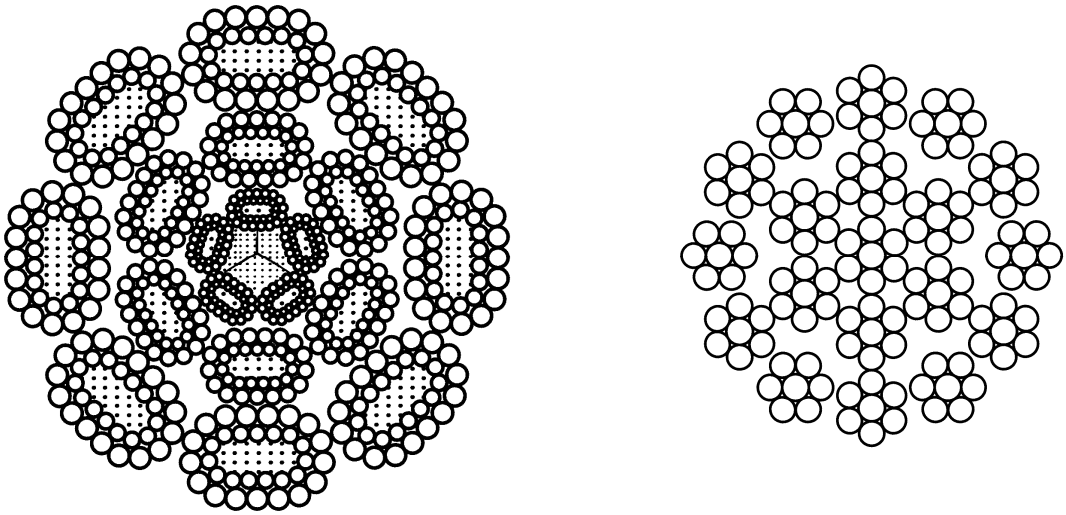

Figure 12 —Examples of rotation-resistant ropes

3.6.1.4
parallel-closed rope:
stranded rope consisting of at least two layers of strands laid helically in one closing operation around a strand or fibre centre, see Figure 13

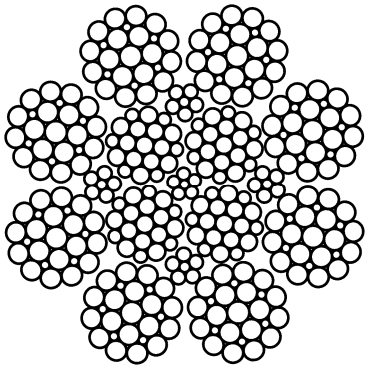

Figure 13 —Example of parallel-closed rope

3.6.1.5
compacted strand rope:
rope in which the strands, prior to closing of the rope, are subjected to a compacting process such as drawing, rolling or swaging

3.6.1.6
compacted (swaged) rope:
rope which is subjected to a compacting (usually swaging) process after closing the rope, thus reducing its diameter

3.6.1.7
cable-laid rope*:*
an assembly of several (usually six) round stranded ropes (referred to as unit ropes) closed helically around a core (usually a seventh rope), see Figure 14

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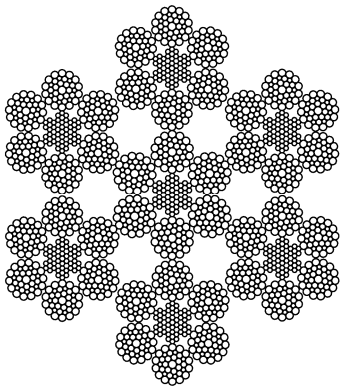

Figure 14 — Example of a cable-laid rope

3.6.1.8
braided rope
an assembly of several round strands braided in pairs, see Figure 15

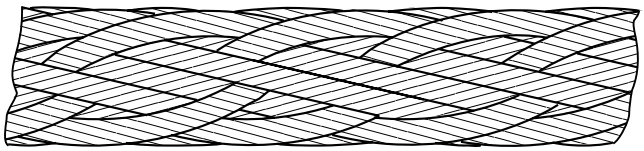

Figure 15 — Example of braided rope

3.6.1.9
electro-mechanical rope
a stranded or spiral rope containing electrical conductors, see Figure 16

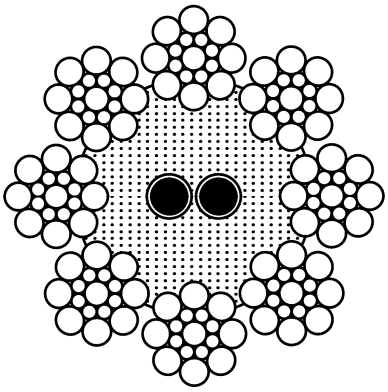

Figure 16 — Example of stranded rope with conductors

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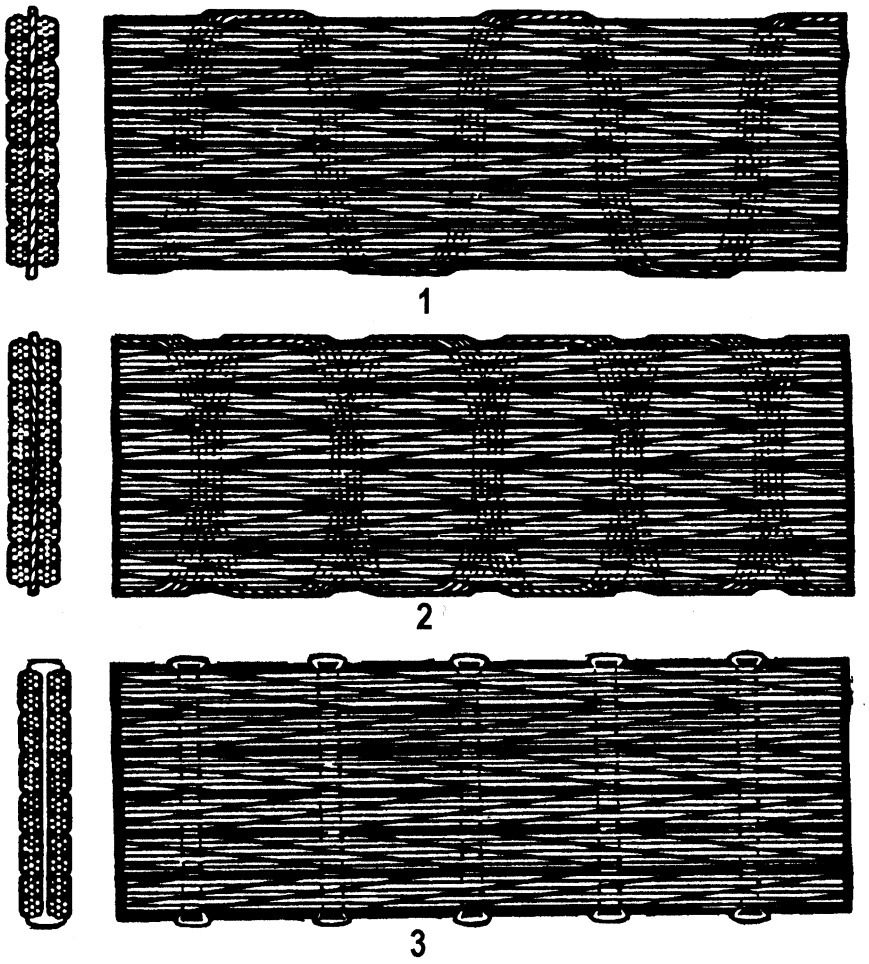
3.6.1.10
flat rope
an assembly of unit ropes known as reddies, each comprising four strands. Usually 6,8 or 10 reddies, alternating left and right direction of lay, are laid side by side and held in position by stitching wires, strands or rivets, see Figure 17



Key
1 Single stitched
2 Double stitched
3 Rivetted

Figure 17 — Example of flat rope with different stitching

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3.6.2 Spiral ropes

3.6.2.1
spiral rope
an assembly of at least two layers of wires laid helically over a central round wire, built-up strand or parallel-lay strand. At least one layer of wires is laid in the opposite direction i.e. contra-lay, to that of the other layer(s) to optimise rotational characteristics,

3.6.2.2
spiral strand rope
spiral rope comprising only round wires, see Figure 18

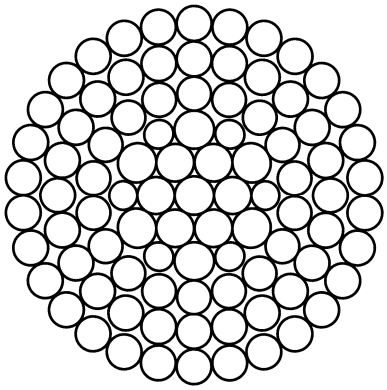

Figure 18 — Example of spiral strand rope

3.6.2.3
half-locked coil rope
spiral rope having an outer layer of alternate half-lock (H-shaped) and round wires, see Figure 19

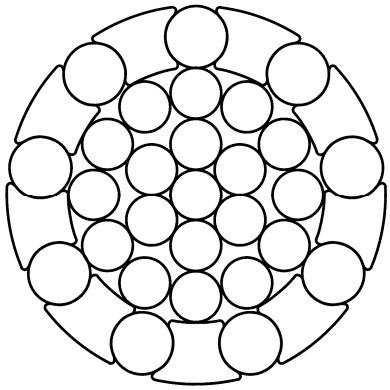

Figure 19 — Example of half-locked coil rope

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