BS 302 : Part 5 : 1987
UDC 677.721 : 622.67

British Standard

Stranded steel wire ropes

Part 5. Specification for ropes for hauling purposes

Câbles toronnés en acier
Partie 5. Câbles de hâlage — Spécifications

Litzenseile aus Stahldrähten
Teil 5. Förderseile

British Standards Institution

Foreword

This Part of BS 302 has been prepared under the direction of the Mechanical Handling Standards Committee. It is one Part of a combined revision of BS 302 : 1968, BS 236 : 1968, BS 329 : 1968, BS 330 : 1968, BS 365 : 1968 and BS 3530 : 1968, which are withdrawn. BS 302 is now published in six Parts and takes account of both national and international developments since 1968.

This Part (Part 5) specifies requirements for ropes for hauling purposes additional to the general requirements in Part 1. Other Parts specify the additional requirements for other particular uses of ropes:

Part 2 Specification for ropes for general purposes
Part 3 Specification for zinc coated ropes for ships
Part 4 Specification for ropes for lifts
Part 6 Specification for ropes for mine hoisting

Two further Parts are in preparation, covering larger diameter ropes (64 mm to 205 mm diameter) and higher strength ropes and will be Parts 7 and 8 respectively.

In line with the principles of international standard ISO 2408, published by the International Organization for Standardization (ISO), the constructions are grouped according to the number of outer wires in the strands. The general requirements of BS 302 : Part 1 and the methods used for calculating breaking loads and approximate masses comply with ISO 2408. In respect of individual usages the ropes in Parts 2 and 3 are fully in accordance with ISO 2408 and those in section two of Part 4 are in accordance with ISO 4344. In each of these Parts however, certain additional ropes still in common use in the UK have been included.

In line with current international practice, the term 'zinc coated' has been adopted in this standard in place of 'galvanized'. The terms are synonymous.

Purchasers ordering to BS 302 are advised to specify in their purchasing contract that the manufacturer operate a quality system in compliance with the appropriate Part of BS 5750, or suitable equivalent, to ensure themselves that products claimed to comply with BS 302 consistently achieve the required level of quality.

Wire rope users will find valuable information in the companion publication BS 6570 'Code of practice for the selection, care and maintenance of steel wire ropes'.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Contents

Specification

1 Scope

This Part of BS 302 specifies the requirements for round and triangular strand steel wire ropes for hauling purposes and is for use in conjunction with BS 302 : Part 1.

NOTE 1. Information to be supplied by the purchaser on the enquiry and order is given in appendix F of BS 302 : Part 1 : 1987.

NOTE 2. The titles of the publications referred to in this standard are listed on the inside back cover.

2 Definitions

For the purposes of this Part of BS 302, the definitions given in BS 302 : Part 1 apply.

3 Compliance

Ropes in accordance with BS 302 : Part 5 shall comply with this Part and with BS 302 : Part 1.

4 Wire rope constructions and sizes

Constructions and size ranges shall be as given in table 1.

NOTE. In the absence of a precise indication by the purchaser on the enquiry and order, the choice of construction within a group is at the discretion of the supplier.

5 Material

5.1 Wire

5.1.1 *General.* The wire used for the manufacture of wire ropes in accordance with BS 302 : Part 5, excluding the wire used in the cores of triangular strands, shall comply with BS 2763 as follows.

(a) For man-riding haulage installations: sections one and three.

(b) For other purposes: sections one and two. For these ropes the reverse bend test clause in BS 2763 shall be applied.

5.1.2 *Wire finish.* The wire shall be Class Z zinc coated or bright. The zinc coating shall comply with BS 2763.

5.1.3 *Tensile grades of wire.* All wires except king wires, wires comprising the triangular strand core, and wires of the steel main core shall be of 1570 N/mm^2 * or 1770 N/mm^2 tensile grade.

For round strand ropes the king wires shall all be of one tensile grade selected from BS 2763.

For triangular strand ropes the strand core wires shall have a minimum tensile strength of 770 N/mm^2 in cores comprised of solid triangular wires or three round wires, and a minimum tensile strength of 1270 N/mm^2 in cores built up from more than three round wires.

NOTE. In order to achieve a required triangular shape some low carbon steel wires may be added.

Table 1. Wire rope constructions and sizes

Rope group	Description	Size range (diameter)	Typical construction
		mm	
6 x 7	Up to 7 outer wires in a strand, one layer of wire over a king wire.	8 to 38	6 x 7 (6/1)
6 x 19	8 to 12 outer wires in a strand two or three layers over a king wire. Wires equal laid.	13 to 44	6 x 19 (9/9/1)
6 x 8 TS	7 to 9 outer wires in a strand. One layer of wire over a single triangular wire or a multi-wire triangular core.	13 to 35	6 x 8 (7/V) 6 x 9 (8/V) 6 x 10 (9/V)
6 x 22 TS 6 x 25 TS	9 to 12 outer wires in a strand. Two layers of wire over a single triangular wire or a multi-wire triangular core.	13 to 48	6 x 22 (9/12/V) 13 mm to 35 mm 6 x 25 (12/12/V) 13 mm to 48 mm

*1 N/mm^2 = 1 MPa.

5.2 Rope main core

5.2.1 *General.* The main core of the rope shall be of fibre or steel.

5.2.2 *Fibre core.* Fibre cores shall comply with **3.2** of BS 302 : Part 1 : 1987.

5.2.3 *Steel core.* Where a steel core is used, it shall be an independent wire rope (IWRC) for rope sizes of 13 mm diameter and above. For sizes smaller than 13 mm diameter the steel core shall be either an IWRC or a wire strand (WSC).

All wires forming a steel main core, except king wires, shall be one tensile grade.

6 Direction of lay

Ropes shall be of right-hand or left-hand Lang's lay.

NOTE 1. It will need to be stated by the purchaser on his enquiry and order if left-hand lay is required, otherwise right-hand lay will be supplied.

NOTE 2. In the case of haulage ropes in which a long splice is to be made, the aspects of lay length and preforming require to be taken into consideration. The lay length is at the discretion of the manufacturer, but there may be cases when the purchaser will require to nominate the lay length specifically for long splicing purposes.

7 Lubrication

All cores except those of man-made fibre shall be suitably treated. The rope shall be fully lubricated during stranding and closing. All lubricants shall comply with **3.3** of BS 302 : Part 1 : 1987.

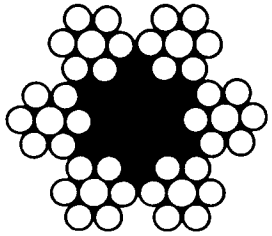
NOTE. The degree and type of lubrication should be agreed between the purchaser and the supplier.

8 Minimum breaking load

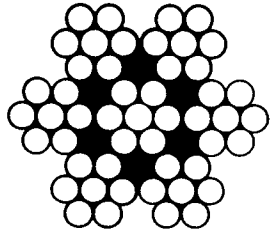
The minimum breaking loads shall be as given in tables 2 to 5.

NOTE. For guidance, these tables also give approximate masses of ropes, calculated as in **C.2** of BS 302 : Part 1 : 1987.

Table 2. 6 x 7 construction group: round strand



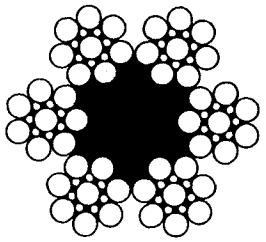
Round strand 6 x 7 (6/1)
Fibre core



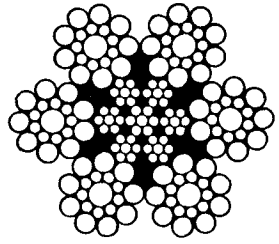
6 x 7 (6/1) WSC
(sometimes referred to as 7 x 7)

Nominal diameter	Minimum breaking force				Minimum breaking load				Approximate mass	
	1570 N/mm^2 tensile grade		1770 N/mm^2 tensile grade		1570 N/mm^2 tensile grade		1770 N/mm^2 tensile grade			
	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored
mm	kN	kN	kN	kN	t	t	t	t	kg/100 m	kg/100 m
8	33.4	36.1	37.6	40.7	3.40	3.68	3.83	4.15	22.1	24.4
9	42.2	45.7	47.6	51.5	4.30	4.66	4.85	5.25	28.0	30.9
10	52.1	56.4	58.8	63.5	5.31	5.75	5.99	6.47	34.6	38.1
11	63.1	68.2	71.1	76.9	6.43	6.95	7.25	7.84	41.9	46.1
12	75.1	81.2	84.6	91.5	7.66	8.28	8.62	9.33	49.8	54.9
13	88.1	95.3	99.3	107	8.98	9.71	10.1	10.9	58.5	64.4
14	102	110	115	125	10.4	11.2	11.7	12.7	67.8	74.7
16	133	144	150	163	13.6	14.7	15.3	16.6	88.6	97.5
18	169	183	190	206	17.2	18.7	19.4	21.0	112	123
19	188	203	212	229	19.2	20.7	21.6	23.3	125	138
20	208	225	235	254	21.2	22.9	24.0	25.9	138	152
21	230	249	259	280	23.4	25.4	26.4	28.5	153	168
22	252	273	284	308	25.7	27.8	29.0	31.4	167	184
24	300	325	338	366	30.6	33.1	34.5	37.3	199	219
26	352	381	397	430	35.9	38.8	40.5	43.8	234	258
28	409	442	461	498	41.7	45.1	47.0	50.8	271	299
29	438	474	494	534	44.6	48.3	50.4	54.4	291	320
32	534	577	602	651	54.4	58.8	61.4	66.4	354	390
35	639	690	720	778	65.1	70.3	73.4	79.3	424	467
38	753	814	849	918	76.8	83.0	86.5	93.6	500	550

Table 3. 6 x 19 construction group: round strand



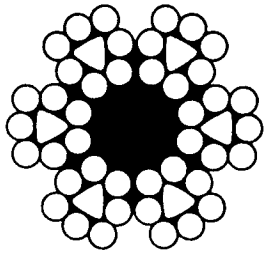
6 x 19 (9/9/1) FC



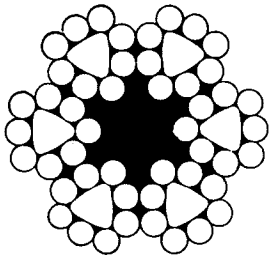
6 x 19 (9/9/1) IWRC

Nominal diameter	Minimum breaking force				Minimum breaking load				Approximate mass	
	1570 N/mm^2 tensile grade		1770 N/mm^2 tensile grade		1570 N/mm^2 tensile grade		1770 N/mm^2 tensile grade			
	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored
mm	kN	kN	kN	kN	t	t	t	t	kg/100 m	kg/100 m
13	87.6	94.5	98.7	106	8.93	9.63	10.1	10.8	61.0	67.3
14	102	110	114	124	10.4	11.2	11.6	12.6	70.8	78.0
16	133	143	150	161	13.6	14.6	15.3	16.4	92.4	102
18	168	181	189	204	17.1	18.5	19.3	20.8	117	129
19	187	202	211	227	19.1	20.6	21.5	23.1	130	144
20	207	224	234	252	21.1	22.8	23.9	25.7	144	159
21	228	246	258	278	23.2	25.1	26.3	28.3	159	176
22	251	271	283	305	25.6	27.6	28.8	31.1	175	193
24	298	322	336	363	30.4	32.8	34.3	37.0	208	229
26	350	378	395	426	35.7	38.5	40.3	43.4	244	269
28	406	438	458	494	41.4	44.6	46.7	50.4	283	312
29	436	470	491	530	44.4	47.9	50.1	54.0	304	335
32	531	572	598	645	54.1	58.3	61.0	65.7	370	408
35	635	685	716	772	64.7	69.8	73.0	78.7	442	488
36	671	724	757	817	68.4	73.8	77.2	83.3	468	516
38	748	807	843	910	76.2	82.3	85.9	92.8	521	575
40	829	894	935	1008	84.5	91.1	95.3	103	578	637
41	871	940	982	1059	88.8	95.8	100	108	607	669
44	1003	1082	1131	1220	102	110	115	124	699	771

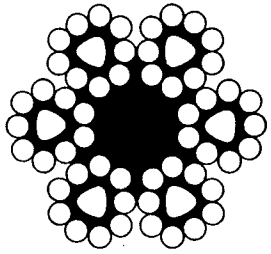
Table 4. 6 x 8 TS construction group: triangular strand



6 x 8 (7/V) FC



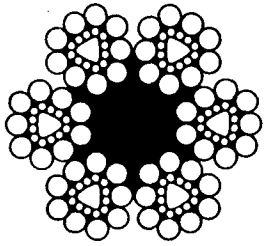
6 x 9 (8/V) FC



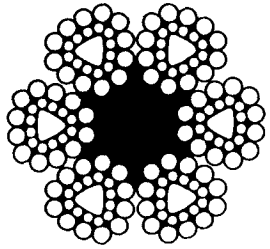
6 x 10 (9/V) FC

Nominal diameter	Minimum breaking force				Minimum breaking load				Approximate mass	
	1570 N/mm^2 tensile grade		1770 N/mm^2 tensile grade		1570 N/mm^2 tensile grade		1770 N/mm^2 tensile grade			
	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored
mm	kN	kN	kN	kN	t	t	t	t	kg/100 m	kg/100 m
13	96.0	102	108	115	9.79	10.4	11.0	11.7	69.3	75.5
14	111	118	126	133	11.3	12.0	12.8	13.6	80.4	87.6
16	145	154	164	174	14.8	15.7	16.7	17.7	105.0	114
18	184	195	208	220	18.8	19.9	21.2	22.4	133	145
19	205	218	231	245	20.9	22.2	23.5	25.0	148	161
20	227	241	256	272	23.1	24.6	26.1	27.7	164	179
21	251	266	283	300	25.6	27.1	28.8	30.6	181	197
22	275	292	310	329	28.0	29.8	31.6	33.5	198	216
24	327	347	369	391	33.3	35.4	37.6	39.9	236	257
26	384	408	433	459	39.1	41.6	44.1	46.8	277	302
28	446	473	502	533	45.5	48.2	51.2	54.3	321	350
29	478	507	539	572	48.7	51.7	54.9	58.3	345	376
32	582	617	656	696	59.3	62.9	66.9	70.9	420	458
35	696	739	785	833	70.9	75.3	80.0	84.9	502	548

Table 5. 6 x 22 TS and 6 x 25 TS construction groups: triangular strand



6 x 22 (9/12/V) FC



6 x 25 (12/12/V) FC

Nominal diameter	Minimum breaking force				Minimum breaking load				Approximate mass	
	1570 N/mm^2 tensile grade		1770 N/mm^2 tensile grade		1570 N/mm^2 tensile grade		1770 N/mm^2 tensile grade			
	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored	Fibre cored	Steel cored
mm	kN	kN	kN	kN	t	t	t	t	kg/100 m	kg/100 m
13	93.1	98.7	105	111	9.49	10.1	10.7	11.3	69.3	75.5
14	108	114	122	129	11.0	11.6	12.4	13.1	80.4	87.6
16	141	150	159	169	14.4	15.3	16.2	17.2	105	114
18	179	189	201	213	18.2	19.3	20.5	21.7	133	145
19	199	211	224	238	20.3	21.5	22.8	24.3	148	161
20	220	234	249	263	22.4	23.9	25.4	26.8	164	179
21	243	258	274	290	24.8	26.3	27.9	29.6	181	197
22	267	283	301	319	27.2	28.8	30.7	32.5	198	216
24	317	336	358	379	32.3	34.3	36.5	38.6	236	257
26	373	395	420	445	38.0	40.3	42.8	45.4	277	302
28	432	458	487	516	44.0	46.7	49.6	52.6	321	350
29	463	491	522	554	47.2	50.1	53.2	56.5	345	376
32	564	598	636	674	57.5	61.0	64.8	68.7	420	458
35	675	715	761	807	68.8	72.9	77.6	82.3	502	548
36	714	757	805	853	72.8	77.2	82.1	87.0	531	579
38	796	843	897	951	81.1	85.9	91.4	96.9	592	645
40	882	934	994	1054	89.9	95.2	101	107	656	715
44	1067	1131	1203	1275	109	115	123	130	794	865
48	1270	1346	1431	1517	129	137	146	155	945	1030

Publications referred to

BS 2763	Specification for round carbon steel wire for wire ropes
BS 5750*	Quality systems Part 2 Specification for manufacture and installation
BS 6570*	Code of practice for the selection, care and maintenance of steel wire ropes
ISO 2408*	Steel wire ropes for general purposes – Characteristics
ISO 4344*	Steel wire ropes for lifts

*Referred to in the foreword only.

This British Standard, having been prepared under the direction of the Mechanical Handling Standards Committee, was published under the authority of the Board of BSI and comes into effect on 30 June 1987.

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Committee reference MHE/2 Draft for comment 85/70789 DC

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The preparation of this British Standard was entrusted by the Mechanical Handling Standards Committee (MHE/-) to Technical Committee MHE/2, upon which the following bodies were represented:

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Association of Supervisory and Executive Engineers
British Coal
British Ports Association and the National Association of Ports Employers
British Railways Board
British Steel Industry (Wire Section)
Bureau Veritas
Chain Testers Association of Great Britain
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Federation of Wire Rope Manufacturers of Great Britain
Health and Safety Executive
Institution of Mechanical Engineers
Institution of Mining Engineers
Institution of Mining and Metallurgy
Ministry of Defence
National Association of Lift Makers
Zinc Development Association

Amendments issued since publication

Amd. No.	Date of issue	Text affected