भारतीय मानक **IS 4521 : 2024**

Indian Standard

तेल कुओं और तेल कुओं के वेधन और पेट्रोलियम और प्राकृतिक गैस उद्योगों के अन्य अनुप्रयोगों में प्रयुक्त वायर रस्सियाँ — विशिष्टि

(तीसरा पुनरीक्षण)

Wire Ropes Used in Oil Wells and Oil Well Drilling and Other Applications of Petroleum and Natural Gas Industries — Specification

(Third Revision)

ICS 75.180.10; 77.140.65

भारतीय मानक ब्यूरो
BUREAU OF INDIAN STANDARDS
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October 2024 **Price Group 11**

Wire Ropes and Wire Products Sectional Committee, MED 10

FOREWORD

This Indian Standard (Third Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Wire Ropes and Wire Products Sectional Committee had been approved by the Mechanical Engineering Division Council.

This standard was first issued in 1968 and revised in 1977 and 2001. The standard is being revised again for incorporating the modifications found necessary as a result of experience gained with the use of this standard. Also, the major changes in the standard in this revision are given below:

a) The scope of the standard has been modified;
b) Minimum breaking force of the wires have been modified;
c) Size, construction, core, tolerance in rope diameter and grades for wire ropes have been modified;
d) New rope grade of 2160 has been added with the revision of the standards; and
e) Table 9 has been added with the revision of the standard.

The requirements for galvanized wire strands and well measuring wire, though they do not come under the definitions of wire ropes are also covered.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test shall be rounded-off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded-off value should be the same as that of the specified value in this standard

Indian Standard

WIRE ROPES USED IN OIL WELLS AND OIL WELL DRILLING AND OTHER APPLICATIONS OF PETROLEUM AND NATURAL GAS INDUSTRIES — SPECIFICATION

(Third Revision)

1 SCOPE

This standard covers the requirements for bright or galvanized wire ropes. Well measuring wire and well measuring strands for petroleum and natural gas industries. Following are typical oil field and other applications:

a) Rod and tubing pull lines;
b) Rod hanger lines;
c) Sand lines;
d) Cable-tool drilling, cleanout and cleaning lines;
e) Rotary drilling lines;
f) Winch lines;
g) Horsehead pumping unit lines;
h) Torpedo lines;
j) Mooring and anchor lines;
k) Cable tool casing lines;
m) Mast raising lines;
n) Guideline tensioner lines; and
p) Riser tensioner lines.

2 REFERENCES

The standards given below contain provisions, which through reference in this text constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of these standards:

IS No.	*Title*
IS 280 : 2006	Mild steel wire for general engineering purpose (*fourth revision*)
IS 2363 : 2022	Glossary of terms relating to wire ropes (*second revision*)
IS 6594 : 2018	Technical supply conditions for steel wire ropes and strands (*third revision*)

3 TERMINOLOGY

For the purpose of this standard, in addition to the following the definitions given in IS 2363 shall apply.

3.1 Rod — A bar, the end of which is slotted, tapered or screwed for the attachment of drill bit.

3.2 Rotary Drilling — A method of drilling in which rotation and thrust are applied to the bit, producing a continuous cutting action.

3.3 Torpedo Line — A small diameter galvanized wire rope used to lower the explosive down the hole when digging a well.

3.4 Tubing Line — A wire rope used for running in or pulling oil well rod and tubing.

4 SIZE, CONSTRUCTION, CORE, AND GRADES

4.1 Most common rope constructions and rope types are given in Tables 1 to 13. Common rope grades, cores and size ranges are given in these tables, however other sizes, intermediate grades (up to including 2160 grade) and core may be supplied as agreed between manufacturer and purchaser. Specific size range against individual construction may be as decided by manufacturer.

4.2 Specially developed constructions and other special type of ropes including rotation resistant ropes, compacted ropes and cushion core rope may also be supplied to fulfil specific requirement of rope application as agreed between manufacture and purchaser. Technical details of these ropes shall be as stated by manufacturer.

5 MINIMUM BREAKING FORCE

Minimum breaking force for most common sizes

and grades are given in Tables 1 to 13, higher minimum breaking force may be supplied if agreed between manufacturer and supplier. Minimum breaking force for the sizes and grades not covered in these tables may be calculated by formula specified in **6.6** of IS 6594.

Minimum breaking force for specially developed constructions and other special type of ropes including rotation resistant ropes, compacted ropes, cushion core ropes etc shall be as agreed between manufacturer and purchaser.

Table 1 Size, Breaking Force and Mass for 6 × 7 (6-1) Construction

(*Clauses* 4, 5, 6.4 *and* 9)

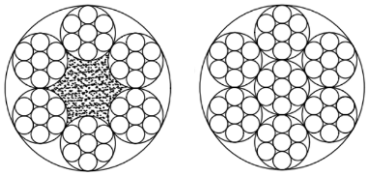
Typical Cross Section	Typical Construction	
	Rope Construction	Strand Construction
 WITH FIBRE CORE (CF) WITH STEEL CORE (CWS)	6 × 7	6-1

Table 1A

Sl No.	Nominal Diameter	Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of					
				1570		1770		1960	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	mm	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN
i)	6	12.9	14.2	18	20	21	23	23	25
ii)	8	22.9	25.2	32	36	37	41	40	45
iii)	9	28.9	31.8	41	46	46	51	51	57
iv)	10	35.7	39.3	51	56	57	64	63	70
v)	11	43.2	47.6	61	68	69	77	76	85
vi)	12	51.5	56.6	73	81	82	92	91	101
vii)	13	60.4	66.4	86	95	96	107	107	119
viii)	14	70.1	77.0	99	110	112	125	124	138
ix)	16	92	101	130	144	146	163	162	180
x)	18	116	127	164	183	185	206	205	228
xi)	19	129	142	183	203	206	229	228	254
xii)	20	143	157	202	225	228	254	253	281
xiii)	22	173	190	245	273	276	307	306	340
xiv)	24	206	226	291	325	329	366	364	405
xv)	26	242	266	342	381	386	429	427	475
xvi)	28	280	308	397	442	447	498	495	551
xvii)	30	322	354	455	507	513	572	568	633
xviii)	32	366	403	518	577	584	650	647	720
xix)	34	413	454	585	651	659	734	730	813
xx)	35	438	482	620	690	699	778	774	862
xxi)	36	463	510	656	730	739	823	818	911
xxii)	38	516	568	731	813	824	917	912	1 016
xxiii)	40	572	629	809	901	913	1 016	1 010	1 125

NOTE — To calculate the aggregate breaking force multiply the figures given in col (5), (7) and (9) by 1.111 and in col (6), (8) and (10) by 1.193. Wire strand core (CWS) may be used for rope diameter 12 mm and below.

Table 1B

Nominal Diameter		Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of			
				IPS		EIP	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
(1)		(2)	(3)	(4)	(5)	(6)	(7)
mm	Inch	kg/100 m	kg/100 m	kN	kN	kN	kN
6.35	1/4"	14.4	15.9	23.5	25.3	25.8	27.8
7.94	5/16"	22.5	24.8	36.5	39.2	40.1	43.1
9.5	3/8"	32.3	35.5	52.1	56	57.4	61.6
11.1	7/16"	44.0	48.4	70.5	75.8	77.6	83.4
12.7	1/2"	57.6	63.4	91.6	98.7	101	109
14.3	9/16"	73.1	80.4	116	125	127	137
15.9	5/8"	90.4	99.4	141	152	154	167
19.1	3/4"	130	143	202	217	222	238
22.2	7/8"	176	194	273	294	301	323
25.4	1"	231	254	353	380	389	418
28.6	1.1/8"	292	322	443	476	488	524
31.8	1.1/4"	361	398	543	584	597	642
38.1	1.1/2"	519	571	767	825	843	907

NOTE — To calculate the aggregate breaking force multiply the figures given in col (4), (6) and (8) by 1.111 and in col (5), (7) and (9) by 1.193. Wire strand core (CWS) may be used for rope diameter 12 mm and below.

Table 2 Size, Breaking Force and Mass for 6 × 19 Class Seale constructions and Warrington Constructions

(*Clauses* 4, 5, 6.4 *and* 9)

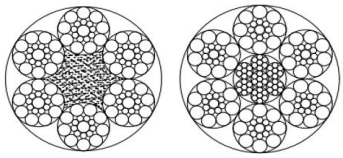
Typical Cross Section	Typical Construction	
	Rope Construction	Strand Construction
 WITH FIBRE CORE (CF) WITH STEEL CORE (CWR)	6 × 17S	8-8-1
	6 × 19S	9-9-1
	6 × 19W	6+6-6-1
	6 × 25S	9-9/6-1

Table 2A

Sl No.	Nominal Rope Diameter	Approximate Mass		Minimum Breaking Force corresponding to Rope Grade							
				1570		1770		1960		2160	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Cover	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	mm	kg/100 m	kN	kN	kN	kN	kN	kN	kN	kN	kN
i)	13	63.0	69.3	87.8	94.8	99.0	107	110	118	121	130
ii)	14	73.0	80.3	102	110	115	124	127	137	140	151
iii)	16	95.4	105	133	144	150	162	166	179	183	198
iv)	18	121	133	168	182	190	205	210	227	232	250
v)	19	135	148	188	203	211	228	234	253	258	279
vi)	20	149	164	208	224	234	253	260	280	286	309
vii)	22	180	198	252	272	284	306	314	339	346	374
viii)	24	215	236	299	323	337	364	374	403	412	445
ix)	26	252	277	351	379	396	428	439	474	483	522
x)	28	292	321	407	440	459	496	509	549	561	605
xi)	29	313	345	437	472	493	532	546	589	601	649
xii)	32	382	420	532	575	600	648	664	717	732	791
xiii)	35	456	502	637	687	718	775	795	858	876	946
xiv)	36	483	531	673	727	759	820	841	908	927	1 000
xv)	38	538	592	750	810	846	913	937	1 012	1 032	1 115
xvi)	40	596	656	831	898	937	1 012	1 038	1 121	1 144	1 235
xvii)	42	657	723	917	990	1 033	1 116	1 144	1 236	1 261	1 362
xviii)	44	721	794	1 006	1 086	1 134	1 225	1 256	1 356	1 384	1 495
xix)	45	755	830	1 052	1 136	1 186	1 281	1 314	1 419	1 448	1 563
xx)	46	788	867	1 100	1 187	1 240	1 339	1 373	1 482	1 513	1 634
xxi)	48	858	944	1 197	1 293	1 350	1 458	1 495	1 614	1 647	1 779
xxii)	49	895	984	1 248	1 347	1 407	1 519	1 558	1 682	1 717	1 854

Table 2A (*Concluded*)

Sl No.	Nominal Rope Diameter	Approximate Mass		Minimum Breaking Force corresponding to Rope Grade							
				1570		1770		1960		2160	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Cover	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	mm	kg/100 m	kN	kN	kN	kN	kN	kN	kN	kN	kN
xxiii)	50	932	1 025	1 299	1 403	1 465	1 581	1 622	1 751	1 787	1 930
xxiv)	51	969	1 066	1 352	1 459	1 524	1 645	1 687	1 822	1 860	2 008
xxv)	52	1 008	1 108	1 405	1 517	1 584	1 711	1 754	1 894	1 933	2 087
xxvi)	53	1 047	1 151	1 460	1 576	1 646	1 777	1 822	1 968	2 008	2 169
xxvii)	54	1 087	1 195	1 515	1 636	1 708	1 845	1 892	2 043	2 085	2 251
xxviii)	55	1 127	1 240	1 572	1 697	1 772	1 914	1 962	2 119	2 163	2 335
xxix)	56	1 168	1 285	1 630	1 760	1 837	1 984	2 035	2 197	2 242	2 421
xxx)	58	1 253	1 379	1 748	1 888	1 971	2 128	2 182	2 356	2 405	2 597
xxxi)	60	1 341	1 476	1 871	2 020	2 109	2 277	2 336	2 522	2 574	2 779

NOTE — To calculate the aggregate breaking force, multiply the figures shown in col (5), (7) and (9) and (11) by 1.163 and columns col (6), (8) and (9) and (12) by 1.25.

Table 2B

Nominal Diameter		Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of					
				IPS		EIP		EEIP	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
mm	inch	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN
6.35	1/4"	15.0	16.5	24.4	26.2	26.8	30.2	-	-
7.94	5/16"	23.5	25.8	37.9	40.7	41.7	46.9	-	-
9.5	3/8"	33.6	37.0	54.3	58.4	59.7	67.2	65.7	73.8
11.1	7/16"	45.9	50.5	73.6	79.1	81	90.7	89	99.6
12.7	1/2"	60.1	66.1	95.2	102	105	118	115	130
14.3	9/16"	76.2	83.8	120	129	133	149	145	165
15.9	5/8"	94.2	104	149	157	164	183	180	202
19.1	3/4"	136	150	212	228	233	262	256	288
22.2	7/8"	184	202	286	308	315	354	347	390
25.4	1"	240	264	372	399	409	460	450	506
28.6	1.1/8"	305	335	468	503	515	578	566	636
31.8	1.1/4"	377	415	575	617	633	711	696	782
34.9	1.3/8"	454	499	691	743	761	854	836	943
38.1	1.1/2"	541	595	818	880	898	1 010	987	1 110
41.3	1.5/8"	636	699	952	1 020	1 050	1 170	1 150	1 300
44.5	1.3/4"	738	812	1 100	1 180	1 210	1 360	1 330	1 500
47.6	1.7/8"	844	929	1 250	1 350	1 380	1 550	1 520	1 710
50.8	2"	962	1 058	1 420	1 530	1 570	1 760	1 730	1 930
54	2.1/8"	1 087	1 195	1 590	1 710	1 750	1 970	1 930	2 160
57.2	2.1/4”	1 219	1 341	1 780	1 910	1 960	2 200	2 150	2 420
60.3	2.3/8”	1 355	1 490	1 980	2 120	2 180	2 440	2 390	2 690
NOTE — To calculate the aggregate breaking force, multiply the figures shown in col (4), (6) and (8) by 1.163 and col (5), (7) and (9) by 1.25.									

Table 3 Size, Breaking Force and Mass for 6 × 19 Class Filler Constructions

(*Clauses* 4, 5, 6.4 *and* 9)

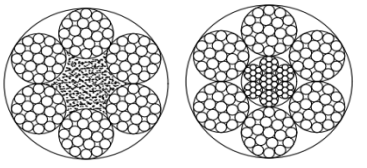
Typical Cross Section	Typical Construction	
	Rope Construction	Strand Construction
 WITH FIBRE CORE (CF) WITH STEEL CORE (CWR)	6 × 21F	10-5F-5-1
	6 × 25F	12-6F-6-1
	6 × 29F	14-7F-7-1

Table 3A

Sl No.	Nominal Diameter	Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of							
				1570		1770		1960		2160	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
	mm	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
i)	8	24.3	26.8	34	37	38	41	42	46	47	50
ii)	9	30.8	33.9	43	46	48	52	54	58	59	64
iii)	10	38	41.8	53	57	60	65	66	71	73	79
iv)	11	46	50.6	64	69	72	78	80	86	88	95
v)	12	54.7	60.2	76	82	86	93	95	103	105	113
vi)	13	64.3	70.7	90	97	101	109	112	121	123	133
vii)	14	74.5	82	104	112	117	127	130	140	143	154
viii)	16	97.3	107	136	147	153	165	169	183	187	202
ix)	18	123	135	172	186	194	209	214	232	236	255
x)	19	137	151	191	207	216	233	239	258	263	284
xi)	20	152	167	212	229	239	258	265	286	292	315
xii)	22	184	202	257	277	289	312	320	346	353	381
xiii)	24	219	241	305	330	344	372	381	412	420	454
xiv)	25	238	261	331	358	374	403	414	447	456	492
xv)	26	257	283	358	387	404	436	447	483	493	533
xvi)	28	298	328	416	449	469	506	519	560	572	618
xvii)	32	389	428	543	586	612	661	678	732	747	807
xviii)	36	493	542	687	742	775	837	858	926	945	1 021
xix)	38	549	604	766	827	863	932	956	1 032	1 053	1 138
xx)	40	608	669	848	916	956	1 033	1 059	1 144	1 167	1 260
xxi)	44	736	810	1 026	1 109	1 157	1 250	1 281	1 384	1 412	1 525
xxii)	48	876	964	1 222	1 319	1 377	1 487	1 525	1 647	1 681	1 815

Table 3A (*Concluded*)

Sl No.	Nominal Diameter	Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of							
				1570		1770		1960		2160	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
	mm	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
xxiii)	52	1 028	1 131	1 434	1 548	1 616	1 745	1 790	1 933	1 972	2 130
xxiv)	56	1 192	1 311	1 663	1 796	1 874	2 024	2 076	2 242	2 287	2 470
xxv)	60	1 369	1 506	1 909	2 061	2 152	2 324	2 383	2 573	2 626	2 836

NOTE — To calculate the aggregate breaking force multiply the figures given in col (5), (7) and (9) and (11) by 1.163 and in col (6), (8) and (10) and (12) by 1.25. Wire strand core (CWS) may be used for rope diameter 12 mm and below.

Table 3B

Nominal Diameter		Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of					
				IPS		EIP		EEIP	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
mm	inch	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
6.35	1/4"	15.0	16.5	24.4	26.2	26.8	30.2	-	-
7.94	5/16"	23.5	25.8	37.9	40.7	41.7	46.9	-	-
9.5	3/8"	33.6	37.0	54.3	58.4	59.7	67.2	65.7	73.8
11.1	7/16"	45.9	50.5	73.6	79.1	81	90.7	89	99.6
12.7	1/2"	60.1	66.1	95.2	102	105	118	115	130
14.3	9/16"	76.2	83.8	120	129	133	149	145	165
15.9	5/8"	94.2	104	149	157	164	183	180	202
19.1	3/4"	136	150	212	228	233	262	256	288
22.2	7/8"	184	202	286	308	315	354	347	390
25.4	1"	240	264	372	399	409	460	450	506
28.6	1.1/8"	305	335	468	503	515	578	566	636
31.8	1.1/4"	377	415	575	617	633	711	696	782
34.9	1.3/8"	454	499	691	743	761	854	836	943
38.1	1.1/2"	541	595	818	880	898	1 010	987	1 110
41.3	1.5/8"	636	699	952	1 020	1 050	1 170	1 150	1 300
44.5	1.3/4"	738	812	1 100	1 180	1 210	1 360	1 330	1 500
47.6	1.7/8"	844	929	1 250	1 350	1 380	1 550	1 520	1 710
50.8	2"	962	1 058	1 420	1 530	1 570	1 760	1 730	1 930
54	2.1/8"	1 087	1 195	1 590	1 710	1 750	1 970	1 930	2 160
57.2	2.1/4	1 219	1 341	1 780	1 910	1 960	2 200	2 150	2 420
60.3	2.3/8"	1 355	1 490	1 980	2 120	2 180	2 440	2 390	2 690

NOTE — To calculate the aggregate breaking force, multiply the figures shown in col (4), (6) and (8) by 1.163 and col (5), (7) and (9) by 1.25.

Table 4 Size, Breaking Force and Mass for 6 × 36 Class and 6 × 26 SW Construction

(*Clauses* 4, 5, 6.4 *and* 9)

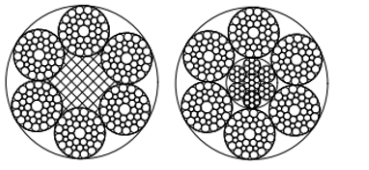
Typical Cross Section	Typical Construction	
	Rope Construction	Strand Construction
 WITH FIBRE CORE (CF) WITH STEEL CORE (CWR)	6 × 26SW	10-5+5-5-1
	6 × 31 SW	12-6 + 6-6-1
	6 × 36 SW	14-7 + 7-7-1
	6 × 41 SW	16-8 + 8-8-1
	6 × 49 SWS	16-8 + 8-8-8-1
	6 × 46SW	18-9+9-9-1
	6 × 55 SWS	16-8 + 8-8-8/6-1
	6 × 52SW	18-9+9-9/6-1
	6 × 41SF	16-8F-8-8-1

Table 4A

Sl No.	Nominal Diameter	Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of							
				1570		1770		1960		2160	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
	mm	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
i)	8	24.3	26.8	33	36	37	40	41	45	46	49
ii)	9	30.8	33.9	42	45	47	51	52	57	58	62
iii)	10	38	41.8	52	56	58	63	65	70	71	77
iv)	11	46	50.6	63	68	71	76	78	85	86	93
v)	12	54.7	60.2	75	81	84	91	93	101	103	111
vi)	13	64.3	70.7	88	95	99	107	109	118	120	130
vii)	14	74.5	82	102	110	114	124	127	137	140	151
viii)	16	97.3	107	133	143	149	161	166	179	182	197
ix)	18	123	135	168	181	189	204	209	226	231	249
x)	19	137	151	187	202	211	228	233	252	257	278
xi)	20	152	167	207	224	234	252	259	279	285	308
xii)	22	184	202	251	271	283	305	313	338	345	372
xiii)	24	219	241	298	322	336	363	372	402	410	443
xiv)	25	238	261	324	350	365	394	404	436	445	481
xv)	26	257	283	350	378	395	426	437	472	482	520
xvi)	28	298	328	406	439	458	494	507	548	559	603
xvii)	32	389	428	530	573	598	646	662	715	730	788
xviii)	36	493	542	671	725	757	817	838	905	924	997
xix)	38	549	604	748	808	843	911	934	1 008	1029	1 111
xx)	40	608	669	829	895	934	1 099	1 035	1 117	1 140	1 231
xxi)	44	736	810	1 003	1 083	1 130	1 221	1 252	1 352	1 380	1 490
xxii)	48	876	964	1 193	1 289	1 345	1 453	1 490	1 609	1 642	1 773

Table 4A (*Concluded*)

Sl No.	Nominal Diameter	Approximate Mass		Minimum Breaking Force Corresponding to Rope Grade of							
				1570		1770		1960		2160	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
	mm	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
xxiii)	52	1 028	1 131	1 401	1 513	1 579	1 705	1 748	1 888	1 927	2 081
xxiv)	56	1 192	1 311	1 624	1 754	1 831	1 978	2 028	2 190	2 235	2 413
xxv)	60	1 369	1 506	1 865	2 014	2 102	2 270	2 328	2 514	2 565	2 771
NOTE — To calculate the aggregate breaking force multiply the figures given in col (5), (7) and (9) and (11) by 1.19 and in col (6), (8) and (10) and (12) by1.28.Wire strand core (CWS) may be used for rope diameter 12 mm and below.											

Table 4B

Nominal Diameter		Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of					
				IPS		EIP		EEIP	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
(1)		(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
mm	Inch	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN
6.35	1/4"	15.3	16.9	24.4	26.2	26.8	30.2	-	-
7.94	5/16"	24.0	26.4	37.9	40.7	41.7	46.9	-	-
9.5	3/8"	34.3	37.7	54.3	58.4	59.7	67.2	65.7	73.8
11.1	7/16"	46.8	51.5	73.6	79.1	81	90.7	89	99.6
12.7	1/2"	61.3	67.5	95.2	102	105	118	115	130
14.3	9/16"	77.7	85.5	120	129	133	149	145	165
15.9	5/8"	96.1	106	149	157	164	183	180	202
19.1	3/4"	139	153	212	228	233	262	256	288
22.2	7/8"	187	206	286	308	315	354	347	390
25.4	1"	245	270	372	399	409	460	450	506
28.6	1.1/8"	311	342	468	503	515	578	566	636
31.8	1.1/4"	384	423	575	617	633	711	696	782
34.9	1.3/8"	463	509	691	743	761	854	836	943
38.1	1.1/2"	552	607	818	880	898	1 010	987	1 110
41.3	1.5/8"	649	713	952	1 020	1 050	1 170	1 150	1 300
44.5	1.3/4"	753	828	1 100	1 180	1 210	1 360	1 330	1 500
47.6	1.7/8"	861	948	1 250	1 350	1 380	1 550	1 520	1 710
50.8	2"	981	1 079	1 420	1 530	1 570	1 760	1 730	1 930
54	2.1/8"	1 109	1 219	1 590	1 710	1 750	1 970	1 930	2 160
57.2	2.1/4	1 244	1 368	1 780	1 910	1 960	2 200	2 150	2 420
60.3	2.3/8"	1 382	1 521	1 980	2 120	2 180	2 440	2 390	2 690

NOTE — To calculate the aggregate breaking force, multiply the figures shown in col (5), (7) and (9) by 1.163 and col (6), (8) and (10) by 1.25.

Table 5 Size, Breaking Force and Mass for Filler constructions of 8 × 19 Class

(*Clauses* 4, 5, 6.4 *and* 9)

Typical Cross Section	Typical Construction	
	Rope Construction	Strand Construction
	8 × 21F	10-5F-5-1
	8 × 25F	12-6F-6-1

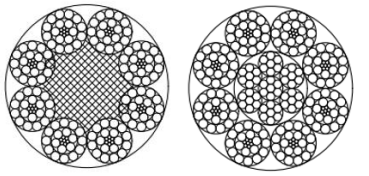


Table 5A

Sl No.	Nominal Rope Diameter	Approximate Mass kg/100 m	Minimum Breaking Force Corresponding to Rope Grade of			
			1570	1770	1960	2160
		Steel Core (CWR)	Steel Core (CWR)	Steel Core (CWR)	Steel Core (CWR)	Steel Core (CWR)
	mm	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	8	27.8	35	39	43	48
ii)	9	35.2	44	50	55	61
iii)	10	43.5	54	61	68	75
iv)	11	52.6	66	74	82	91
v)	12	62.6	78	88	98	108
vi)	13	73.5	92	104	115	126
vii)	14	85.2	107	120	133	147
viii)	16	111	139	157	174	192
ix)	18	141	176	199	220	242
x)	19	157	196	221	245	270
xi)	20	174	218	245	272	299
xii)	22	210	263	297	329	362
xiii)	24	251	313	353	391	431
xiv)	25	272	340	383	424	468
xv)	26	294	368	414	459	506
xvi)	28	341	426	481	532	587
xvii)	32	445	557	628	695	766
xviii)	36	564	705	795	880	970
xix)	38	628	785	885	980	1 080
xx)	40	696	870	981	1 086	1 197
xxi)	44	842	1 053	1 187	1 314	1 449
xxii)	48	1 002	1 253	1 413	1 564	1 724
xxiii)	52	1 176	1 471	1 658	1 836	2 023
xxiv)	53	1 222	1 528	1 722	1 907	2 102
xxv)	54	1 268	1 586	1 788	1 980	2 182
xxvi)	56	1 364	1 706	1 923	2 129	2 346
xxvii)	58	1 463	1 830	2 063	2 284	2 517
xxviii)	60	1 566	1 958	2 207	2 444	2 694
NOTE — To calculate the aggregate breaking force, multiply the figures shown in col (4), (5) and (6) by 1.33.						

Table 5B

Sl No.	Nominal Rope Diameter		Approximate Mass kg/100 m	Minimum Breaking Force Corresponding to Rope Grade of		
				IPS	EIP	EEIP
			Steel Core (CWR)	Steel Core (CWR)	Steel Core (CWR)	Steel Core (CWR)
	mm	inch	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	6.35	1/4"	17.5	26.2	30.2	-
ii)	7.94	5/16"	27.4	40.7	46.9	-
iii)	9.5	3/8"	39.2	58.4	67.2	73.8
iv)	11.1	7/16"	53.6	79.1	90.7	99.6
v)	12.7	1/2"	70.1	102	118	130
vi)	14.3	9/16"	88.9	129	149	165
vii)	15.9	5/8"	110	157	183	202
viii)	19.1	3/4"	159	228	262	288
ix)	22.2	7/8"	214	308	354	390
x)	25.4	1"	281	399	460	506
xi)	28.6	1.1/8"	356	503	578	636
xii)	31.8	1.1/4"	440	617	711	782
xiii)	34.9	1.3/8"	530	743	854	943
xiv)	38.1	1.1/2"	631	880	1 010	1 110
xv)	41.3	1.5/8"	742	1 020	1 170	1 300
xvi)	44.5	1.3/4"	861	1 180	1 360	1 500
xvii)	47.6	1.7/8"	985	1 350	1 550	1 710
xviii)	50.8	2"	1 122	1 530	1 760	1 930
xix)	54	2.1/8"	1 268	1 710	1 970	2 160
xx)	57.2	2.1/4	1 423	1 910	2 200	2 420
xxi)	60.3	2.3/8"	1 581	2 120	2 440	2 690
NOTE — To calculate the aggregate breaking force, multiply the figures shown in col (4), (5) and (6) by 1.33.						

Table 6 Size, Breaking Force and Mass for 8 × 36 Class and 8 × 26SW Construction

(*Clauses* 4, 5, 6.4 *and* 9)

Typical Cross Section	Typical Construction	
	Rope Construction	Strand Construction
	8 × 26SW	10-5+5-5-1
	8× 31 SW	12-6 + 6-6-1
	8 × 36 SW	14-7 + 7-7-1
	8 × 41 SW	16-8 + 8-8-1
	8 × 49 SW	16-8 + 8-8-8-1
	8× 55 SWS	16-8 + 8-8-8/6-1
	8 × 46 SW	18-9+9-9-1
	8 × 52 SW	18-9+9-9/6-1

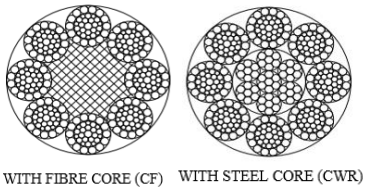


Table 6A

Sl No.	Nominal Diameter	Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of							
				1570		1770		1960		2160	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	mm	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN	kN	kN
i)	16	-	111	-	136	-	153	-	170	-	187
ii)	18	-	141	-	172	-	194	-	215	-	237
iii)	19	-	157	-	192	-	216	-	239	-	264
iv)	20	-	174	-	212	-	239	-	265	-	292
v)	22	-	210	-	257	-	290	-	321	-	354
vi)	24	-	251	-	306	-	345	-	382	-	421
vii)	25	-	272	-	332	-	374	-	414	-	457
viii)	26	-	294	-	359	-	405	-	448	-	494
ix)	28	-	341	-	416	-	469	-	520	-	573
x)	32	-	445	-	544	-	613	-	679	-	748
xi)	36	-	564	-	688	-	776	-	859	-	947
xii)	38	-	628	-	767	-	864	-	957	-	1 055
xiii)	40	-	696	-	850	-	958	-	1 061	-	1 169
xiv)	44	-	842	-	1 028	-	1 159	-	1 283	-	1 414
xv)	48	-	1 002	-	1 223	-	1 379	-	1 527	-	1 683
xvi)	52	-	1 176	-	1 436	-	1 619	-	1 792	-	1 975
xvii)	56	-	1 364	-	1 665	-	1 877	-	2 079	-	2 291
xviii)	60	-	1 566	-	1 912	-	2 155	-	2 386	-	2 630

NOTE — To calculate the aggregate breaking force multiply the figures given in col (5), (7) and (9) and (11) by 1.220 and in col (6), (8) and (10) and (12) by 1.364

Table 6B

Sl No.	Nominal Rope Diameter		Approximate Mass kg/100 m	Minimum Breaking Force Corresponding to Rope Grade of		
				IPS	EIP	EEIP
			Steel Core (CWR)	Steel Core (CWR)	Steel Core (CWR)	Steel Core (CWR)
	mm	Inch		kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	6.35	1/4"	17.5	26.2	30.2	-
ii)	7.94	5/16"	27.4	40.7	46.9	-
iii)	9.5	3/8"	39.2	58.4	67.2	73.8
iv)	11.1	7/16"	53.6	79.1	90.7	99.6
v)	12.7	1/2"	70.1	102	118	130
vi)	14.3	9/16"	88.9	129	149	165
vii)	15.9	5/8"	110	157	183	202
viii)	19.1	3/4"	159	228	262	288
ix)	22.2	7/8"	214	308	354	390
x)	25.4	1"	281	399	460	506
xi)	28.6	1.1/8"	356	503	578	636
xii)	31.8	1.1/4"	440	617	711	782
xiii)	34.9	1.3/8"	530	743	854	943
xiv)	38.1	1.1/2"	631	880	1 010	1 110
xv)	41.3	1.5/8"	742	1 020	1 170	1 300
xvi)	44.5	1.3/4"	861	1 180	1 360	1 500
xvii)	47.6	1.7/8"	985	1 350	1 550	1 710
xviii)	50.8	2"	1 122	1 530	1 760	1 930
xix)	54	2.1/8"	1 268	1 710	1 970	2 160
xx)	57.2	2.1/4	1 423	1 910	2 200	2 420
xxi)	60.3	2.3/8"	1 581	2 120	2 440	2 690
NOTE — To calculate the aggregate breaking force, multiply the figures shown in col (4), (5) and (6) by 1.33.						

Table 7 Size, Breaking Force and Mass for 18 × 7 Class

(*Clauses* 4, 5, 6.4 *and* 9)

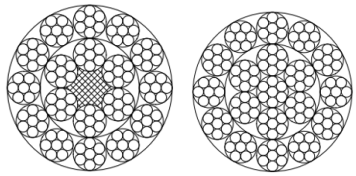
Typical Cross Section	Typical Construction	
	Rope Construction	Strand Construction
 WITH FIBRE CORE (CF) WITH STEEL CORE (CWS)	17 × 7 (11 × 7 : 6 × 7-FC)	6-1
	18 × 7 (12 × 7 : 6 × 7-FC)	6-1
	18 × 19S (12 × 19S : 6 × 19S -FC)	9-9-1
	18 × 19S (12 × 19S : 6 × 19S -1 × 19S)	9-9-1

Table 7A

Sl No.	Nominal Diameter	Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of					
				1770		1960		2160	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
	mm	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(9)	(10)	(11)
i)	6	13.8	14.5	20	21	22	23	25	26
ii)	7	18.8	19.7	28	28	31	32	34	35
iii)	8	24.5	25.7	36	37	40	41	44	45
iv)	9	31	32.6	46	47	51	52	56	57
v)	10	38.3	40.2	56	58	62	64	69	71
vi)	11	46.3	48.6	68	70	76	78	83	86
vii)	12	55.1	57.9	81	84	90	93	99	102
viii)	13	64.7	67.9	95	98	106	109	116	120
ix)	14	75	78.8	111	114	122	126	135	139
x)	16	98	103	144	149	160	165	176	181
xi)	18	124	130	183	188	202	208	223	230
xii)	19	138	145	204	210	225	232	248	256
xiii)	20	153	161	226	232	250	257	275	283
xiv)	22	185	195	273	281	302	311	333	343
xv)	24	220	232	325	335	360	370	396	408
xvi)	25	239	251	352	363	390	402	430	443
xvii)	26	259	272	381	393	422	435	465	479
xviii)	28	300	315	442	455	490	504	540	556
xix)	32	392	412	577	595	639	659	705	726
xx)	36	496	521	731	753	809	833	892	918
xxi)	38	553	580	814	839	902	929	994	1 023
xxii)	40	612	643	902	929	999	1 029	1 101	1 134
NOTE — To calculate the aggregate breaking force multiply the figures given in col (5),(7), and (9) by 1.282 and in col (6), (8), and (10) by 1.319.									

Table 7B

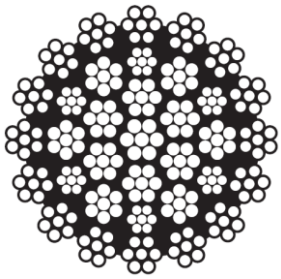
Sl No.	Nominal Diameter		Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of			
					IPS		EIP	
			Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
			(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
	mm	Inch	kg/100 m	kg/100 m	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
i)	6.35	1/4"	15.4	16.2	22.3	22.3	24.6	24.6
ii)	7.94	5/16"	24.1	25.3	34.7	34.7	38.3	38.3
iii)	9.5	3/8"	34.5	36.3	49.7	49.7	54.5	54.5
iv)	11.1	7/16"	47.2	49.5	67.4	67.4	73.9	73.9

Table 7B (*Concluded*)

Sl No.	Nominal Diameter		Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of			
					IPS		EIP	
			Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
			(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
	mm	Inch	kg/100 m	kg/100 m	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
v)	12.7	1/2"	61.7	64.8	87.6	87.6	95.8	95.8
vi)	14.3	9/16"	78.3	82.2	110	110	121	121
vii)	15.9	5/8"	96.8	102	136	136	149	149
viii)	19.1	3/4"	140	147	194	194	214	214
ix)	22.2	7/8"	189	198	262	262	289	289
x)	25.4	1"	247	259	341	341	375	375
xi)	28.6	1.1/8"	313	329	429	429	472	472
xii)	31.8	1.1/4"	387	407	527	527	579	579
xiii)	34.9	1.3/8"	466	490	634	634	697	697
xiv)	38.1	1.1/2"	556	584	751	751	826	826
NOTE — To calculate the aggregate breaking force multiply the figures given in col (5), (7) and (9) by 1.282 and in col (6), (8) and (10) by 1.319.								

Table 8 Size, Breaking Force and Mass for 35(W) × 7 Class

(*Clauses* 4, 5, 6.4 *and* 9)

Typical Cross Section	Typical Construction	
	Rope Construction	Strand Construction
 WITH STEEL CORE (CWS)	28 × 7 (16 × 7 : 4 × 7 +4 × 7 – 4 × 7)	6-1
	35 × 7 (16 × 7 : 6 × 7 + 6 × 7 – 6 × 7 – 1 × 7)	6-1
	40 × 7 [18 x 7 : 7 × 7 + 7 × 7 – 7 × 7 – 1 × 7)	6-1
	35 × 19S (16 × 19S : 6 × 19S + 6 × 19S - 6 × 19S – 1 × 19S)	9-9-1

Sl No.	Nominal Diameter	Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of					
				1770		1960		2160	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
	mm	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
i)	8	-	29.1	-	40.8	-	45.2	-	49.8
ii)	10	-	45.4	-	63.7	-	70.6	-	77.8
iii)	11	-	54.9	-	77.1	-	85.4	-	94.1
iv)	12	-	65.4	-	91.8	-	102	-	112
v)	13	-	76.7	-	108	-	119	-	131
vi)	14	-	89	-	125	-	138	-	152
vii)	16	-	116	-	163	-	181	-	199

Table 8 (*Concluded*)

Sl No.	Nominal Diameter	Approximate Mass		Minimum Braking Force Corresponding to Rope Grade of					
				1770		1960		2160	
		Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core	Fibre Core	Steel Core
		(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)	(CF)	(CWR)
	mm	kg/100 m	kg/100 m	kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
viii)	18	-	147	-	206	-	229	-	252
ix)	19	-	164	-	230	-	255	-	281
x)	20	-	182	-	255	-	282	-	311
xi)	22	-	220	-	308	-	342	-	376
xii)	24	-	262	-	367	-	406	-	448
xiii)	25	-	284	-	398	-	441	-	486
xiv)	26	-	307	-	431	-	477	-	526
xv)	28	-	356	-	500	-	553	-	610
xvi)	29	-	382	-	536	-	593	-	654
xvii)	30	-	409	-	573	-	635	-	700
xviii)	32	-	465	-	652	-	723	-	796
xix)	34	-	525	-	737	-	816	-	899
xx)	35	-	556	-	781	-	864	-	953
xxi)	36	-	588	-	826	-	914	-	1 008
xxii)	38	-	656	-	920	-	1 019	-	1 123
xxiii)	40	-	726	-	1 020	-	1 129	-	1 244
xxiv)	42	-	801	-	1 124	-	1 245	-	1 372
xxv)	44	-	879	-	1 234	-	1 366	-	1 505
xxvi)	45	-	919	-	1 290	-	1 429	-	1 575
xxvii)	46	-	961	-	1 348	-	1 493	-	1 645
xxviii)	48	-	1 046	-	1 468	-	1 626	-	1 792
xxix)	50	-	1 135	-	1 593	-	1 764	-	1 944
xxx)	51	-	1 181	-	1 657	-	1 835	-	2 023
xxxi)	52	-	1 228	-	1 723	-	1 908	-	2 103
xxxii)	54	-	1 324	-	1 858	-	2 058	-	2 267
xxxiii)	55	-	1 373	-	1 928	-	2 134	-	2 352
xxxiv)	56	-	1 424	-	1 998	-	2 213	-	2 439
xxxv)	58	-	1 527	-	2 144	-	2 374	-	2 616
xxxvi)	60	-	1 634	-	2 294	-	2 540	-	2 799

Table 9 Large Diameter 6 Stranded Ropes

(*Clauses* 4, 5 *and* 9)

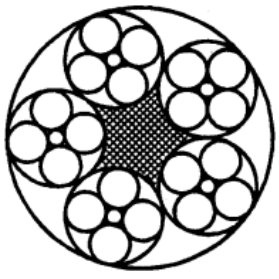
Rope diameter larger than 60 mm (or 2.3/8”) for 6 stranded ropes, shall be as per following table. Construction or large diameter rope shall be as decided by manufacturer or as agreed between manufacturer and purchaser.

Sl No.	Nominal Diameter		Approximate Mass	Minimum Breaking Force Corresponding to Rope Grade of
			Steel Core (CWR)	Steel Core (CWR)
	mm	inch	kg/100 m	kN
(1)	(2)	(3)	(4)	(5)
i)	63.5	2.1/2"	1 730	2 950
ii)	66.7	2.5/8"	1 910	3 240
iii)	69.9	2.3/4"	2 080	3 530
iv)	73	2.7/8"	2 280	3 840
v)	76.2	3"	2 470	4 160
vi)	79.4	3.1/8"	2 680	4 490
vii)	82.6	3.1/4"	2 900	4 830
viii)	85.7	3.3/8"	3 130	5 180
ix)	88.9	3.1/2"	3 380	5 520
x)	95.3	3.3/4"	3 870	6 270
xi)	102	4"	4 400	6 340
xii)	108	4.1/4"	4 960	7 110
xiii)	114	4.1/2"	5 570	7 900
xiv)	121	4.3/4"	6 200	8 730
xv)	127	5"	6 870	9 590
xvi)	133	5.1/4"	7 410	9 960
xvii)	140	5.1/2"	8 110	1 0,800
xviii)	146	5.3/4"	8 870	1 1,700
xix)	152	6"	9 680	1 2,700

NOTE — The breaking force values above apply to wire ropes with bright or zinc-coated quality B wires. The values of breaking force for wire ropes with a heavier mass of coating than quality B may be lower than those given above.

Table 10 Size, Breaking Force and Mass for 5 × 5 (4-1) Construction

(*Clauses* 4, 5 *and* 6.4)



5x5(4–1)–CF

Sl No.	Nominal Rope Diameter	Approximate Mass	Minimum Breaking Force Corresponding to Rope Grade of	
			1570	1770
		Fibre Core (CF)	Fibre Core (CF)	
	mm	kg/100 m	kN	kN
(1)	(2)	(3)	(4)	(5)
i)	3	2.89	4.5	5.1
ii)	4	5.14	8.0	9.0
iii)	5	8.03	12.5	14.1
iv)	6	11.56	18.0	20.3
v)	7	15.74	24.5	27.6
vi)	8	20.56	32.0	36.1

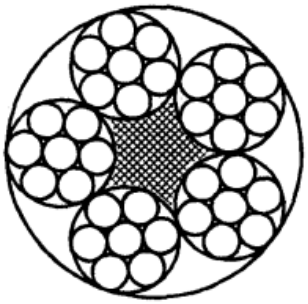
NOTES

1 Interpolation is allowed in steps of 0.2 mm since ropes in decimal of millimeter are required in actual practice.

2 To calculate aggregate braking force, multiply the figures shown in col (5) and (6) by 1.127.

Table 11 Size, Breaking Force and Mass for 5 × 7 (6-1) Construction

(*Clauses* 4, 5, 9 *and* 11)



5x7(6−1)−CF

Sl No.	Nominal Rope Diameter	Approximate Mass	Minimum Breaking Force Corresponding to Rope Grade of	
			1570	1770
		Fibre Core (CF)	Fibre Core (CF)	
	mm	kg/100 m	kN	kN
(1)	(2)	(3)	(4)	(5)
i)	3	3.11	4.9	5.5
ii)	4	5.52	8.7	9.8
iii)	5	8.63	13.6	15.4
iv)	6	12.43	19.6	22.1
v)	7	16.92	26.7	30.1
vi)	8	22.10	34.9	39.3

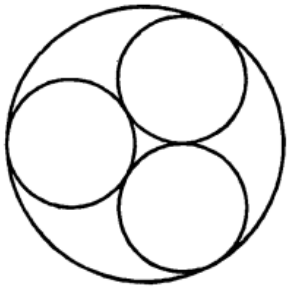
NOTES

1 Interpolation is allowed in steps of 0.2 mm since ropes in decimal of millimeter are required in actual practice.

2 To calculate aggregate breaking force, multiply the figures shown in col (5) and (6) by 1.127.

Table 12A Size, Breaking Force and Mass for Galvanized Wire Guy Strand of 3(3-0) Wire Construction

(*Clauses* 4 *and* 5)



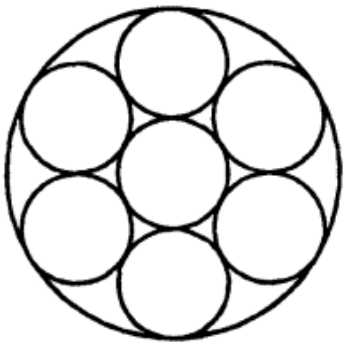
1×3(3–0)

Sl No.	Nominal Rope Diameter	Approximate Mass	Minimum Breaking Force Corresponding to Rope Grade of
	mm	kg/100 m	kN
(1)	(2)	(3)	(4)
i)	6.2	15.41	23.3
ii)	8.3	27.62	41.7
iii)	9.3	34.68	52.3

NOTE — To calculate aggregate breaking force, multiply the figures shown in col (5) by 1.03.

Table 12B Size, Breaking Force and Mass for Galvanized Wire Guy Strand of 7(6-1) Wire Construction

(*Clauses* 4 *and* 5)



1×7(6–1)

Sl No.	Nominal Rope Diameter	Approximate Mass	Minimum Breaking Force Corresponding to Rope Grade of		
			450	1230	1570
	mm	kg/100 m	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)
i)	3	4.5	2.2	6.0	7.7
ii)	4	8.0	3.9	10.7	13.7
iii)	5	12.5	6.1	16.7	21.4
iv)	5.5	15.2	7.4	20.3	25.9

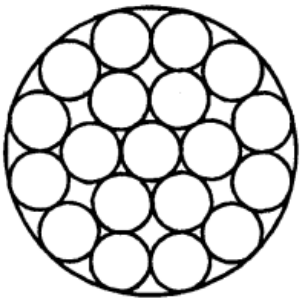
Table 12B (*Concluded*)

Sl No.	Nominal Rope Diameter	Approximate Mass	Minimum Breaking Force Corresponding to Rope Grade of		
			450	1230	1570
	mm	kg/100 m	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)
v)	6	18.1	8.8	24.1	30.8
vi)	7	24.6	12.0	32.8	41.9
vii)	8	32.1	15.7	42.8	54.7
viii)	9	40.7	19.8	54.2	69.2
ix)	11	60.7	29.6	81.0	103
x)	13	84.8	41.4	113	144
xi)	14	98.4	48.0	131	167
xii)	16	128	62.7	171	219

NOTE — To calculate aggregate breaking force, multiply the figures shown in col (5), (6) and (7) by 1.111.

Table 12C Size, Breaking Force and Mass for Galvanized Wire Guy Strand of 19(12/6-1) or (12 : 6-1) Wire Construction

(*Clauses* 4 *and* 5)



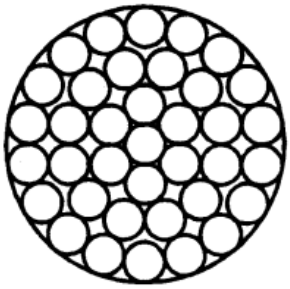
1×19 M (12/6–1)
1×19 J (12:6–1)

Sl No.	Nominal Rope Diameter	Approximate Mass	Minimum Breaking Force Corresponding to Rope Grade of		
			450	1230	1570
	mm	kg/100 m	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)
i)	13	83.7	39.9	109	139
ii)	14	97.1	46.3	127	162
iii)	16	127	60.5	165	211
iv)	19	179	85.3	233	298
v)	22	240	114	313	399
vi)	25	310	148	404	515

NOTE — To calculate aggregate breaking force, multiply the figures shown in col (5), (6) and (7) by 1.136.

Table 12D Size, Breaking Force and Mass for Galvanized Wire Guy Strand of 37 (18/12/6-6) or (18 : 12 : 6-1) Wire Construction

(*Clauses* 4 *and* 5)



1x37 M (18/12-6-1)
1x37 J (18:12:6-1)

Sl No.	Nominal Rope Diameter	Approximate Mass	Minimum Breaking Force Corresponding to Rope Grade of		
			450	1230	1570
	mm	kg/100 m	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)
i)	25	306	146	399	509
ii)	29	411	196	536	684
iii)	32	501	239	653	833

NOTE — To calculate aggregate breaking force, multiply the figures shown in col (5), (6) and (7) by 1.136.

Table 13 Requirements for Well Measuring Wire

(*Clauses* 4 *and* 5)

Sl No.	Nominal Wire Diameter	Tolerance on Wire Diameter	Approx Wire Mass	Elongation on 250mm Gauge Length, Percent		Breaking Force of Wire	Minimum Number of Twist of 100 × Nominal Wire Diameter
				Min	*Max*	*Min*	
	mm	mm	kg/100 m			kN	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
i)	1.70	± 0.03	1.78	1.5	3.00	3.7	32
ii)	1.80	± 0.03	2.00	1.5	3.00	4.1	30
iii)	2.00	± 0.03	2.47	1.5	3.00	5.0	25
iv)	2.36	± 0.03	3.43	1.5	3.00	7.0	25

6 GENERAL REQUIREMENTS

The wire ropes, wire strands and wires shall conform to IS 6594 and shall also meet the following requirements.

6.1 The wire for guy strands shall be of mild steel of condition ‘soft’ complying with IS 280 having a minimum tensile strength of 450 N/mm^2.

6.2 Core

Cores of stranded ropes shall normally be of steel or fiber, although other types, such as composites (for

example, steel plus fibers or plastics) or cores made of solid polymer, may also be supplied. The purchaser should specify the type of core. Use of jute core is not permitted. Steel core maybe of independent wire rope core or wire strand core as required.

6.3 Joints

If joints are necessary in wires over 0.4 mm, they shall have their ends joined by brazing or welding. Wires up to and including 0.4 mm, may be joined by twisting or by ends being simply inserted into the strand formation. For stranded ropes, the minimum distance between joints within one strand shall be '18 × rope nominal diameter'. In well-measuring wires no joints shall be used.

6.4 Mass

The masses given in Tables 1 to 10 are for fully greased ropes. The ropes, which are not greased, may be lighter.

6.5 Lay of the Rope

The lay of the rope shall be either langs lay or ordinary lay and shall be right hand or left hand as specified by the purchaser. If not otherwise specified, right hand ordinary lay rope shall be furnished. The torpedo line shall be right hand ordinary lay. Alternate lay may also be supplied as agreed between manufacturer and purchaser.

6.6 Length of Lay

For ropes 5 × 5, 5 × 7 and 6 × 7 constructions, the length of lay shall not exceed eight times the nominal diameter of the rope. For ropes of all other constructions covered by this specification, the length of lay shall not exceed $7\frac{1}{4}$ times the nominal diameter of the finished rope. The length of lay for the guy strands shall not be more than 16 times the nominal diameter of the strand.

7 GALVANIZING

The wire ropes, strands and wires shall be supplied as bright or galvanized. The type of galvanizing shall be as agreed to between the purchaser and the supplier. Where zinc coated (galvanized) is specified, this may also include zinc alloy Zn95/Al5 for improved corrosion resistance.

8 LUBRICATION

All wire ropes shall be lubricated thoroughly by a suitable compound during manufacturing process unless otherwise specified. Lubrication for strands and wires shall be as agreed to between the purchaser and the manufacturer.

9 ROPE GRADES

The rope grades for the common class and construction of rope are given in the Table 1 to 11. Common grades are 450, 1230, 1570, 1770, 1960, 2160, IPS, EIP and EEIP (Grade 450 and 1230 are for strand only). Intermediate grades may be supplied by agreement between the purchaser and the manufacturer.

NOTE — Not all wire ropes (for example, large diameter wire ropes that is, above 60 mm diameter ropes) will necessarily have a nominated rope grade, however, manufacturer may decide the rope grade to achieve the designated minimum breaking force of rope.

10 WIRE TENSILE STRENGTH GRADES

For those wire ropes where a wire rope grade is applicable, the tensile strength grade of wire shall be subject to limits given in following table:

Range of Wire Tensile Strength Grades

Sl No.	*Rope Grade*	*Wire Tensile Strength Grades* (N/mm^2)
(1)	(2)	(3)
i)	1570	1370 to 1770
ii)	1770	1570 to 1960
iii)	1960	1770 to 2160
iv)	2160	1960 to 2160
v)	IPS	1570 to 1960
vi)	EIP	1770 to 2160
vii)	EEIP	1960 to 2160

For those wire ropes (for example, larger diameter wire ropes) where a wire rope grade is not applicable, the tensile strength grades of the wires shall be one, or a combination of 1370, 1570, 1770, 1960 and 2160 or intermediate as decided by manufacturer. All wires of the same nominal wire diameter in the same wire layer shall be of the same tensile strength grade.

11 TOLERANCE IN ROPE DIAMETER

The measured (actual) diameter of stranded ropes shall be within the tolerances given in following table:

Sl No.	*Nominal Diameter of rope 'd'* mm	*Tolerance as percentage of Nominal Diameter*
(1)	(2)	(3)
i)	$2 \leq d < 4$	- 0, + 8
ii)	$4 \leq d < 6$	- 0, + 7
iii)	$6 \leq d < 8$	- 0, + 6
iv)	$d \geq 8$	- 0, + 5

The measured diameter of guy strands shall be within 0 percent to 5 percent. Diameter of well measuring wire shall be as per Table 11.

12 MARKING

12.1 The size, construction, rope grade, lay, core, coating and length of wire rope, reel/coil no along with the order number of purchaser and any other marking which may be specified by the purchaser shall be legibly mentioned on a suitable tag securely attached, when wire ropes are supplied in coils. In case wire ropes are supplied in reels, the information maybe stenciled on both sides of the reels or stenciled on one side of the reel and a suitable tag giving the same information may be attached on the other side of the reel.

12.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Wire Ropes and Wire Products Sectional Committee, MED 10

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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