भारतीय मानक **IS 1855 : 2024**

Indian Standard

खानों में वेष्टन द्वारा और व्यक्ति-रोहन द्वारा ढुलाई के लिए लड़दार इस्पात के तार के रस्से — विशिष्टि

(चौथा पुनरीक्षण)

Stranded Steel Wire Ropes for Winding and Man-Riding Haulages in Mines — Specification

(Fourth Revision)

ICS 73.100.40; 77.140.65

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Wire Ropes and Wire Products Sectional Committee, MED 10

FOREWORD

This Indian Standard (Fourth 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 published in 1961 and was revised in 1977, 2003 and 2022. 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 with this revision are given below:

a) The scope of the standard has been modified;

b) Provision for minimum breaking force has been modified; and

c) Requirements for wire rope core has been modified in **6.2**.

All the necessary information regarding the conditions, under which the rope is to be used together with other particulars, laid down in Annex A, shall be supplied with the enquiry and order.

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

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 or analysis, 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

STRANDED STEEL WIRE ROPES FOR WINDING AND MAN-RIDING HAULAGES IN MINES — SPECIFICATION

(Fourth Revision)

1 SCOPE

This standard covers general requirements for stranded steel wire ropes for winding and man-riding haulages in mines. Most common rope constructions and rope types are given in following table. Common rope grades, cores and size ranges are identified by x mark. Specially developed constructions including compacted ropes, cushion core rope and plastic valley filled ropes may be used to fulfill specific requirement of the installation if agreed between manufacturer and purchaser.

Sl No.	*Construction*	*Type*	*Rope Grade*					*Core*		*Rope Size* (Diameter, in mm)	*Table*
			1230	1420	1570	1770	1960	Fibre	Steel		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
i)	6 × 7 (6 – 1)	Round strand	–	–	×	×	×	×	×	13 to 29	1
ii)	6 × 15 S (7 – 7 –1)		–	–	×	×	×	×	×	13 to 32	2
iii)	6 × 17 S (8 – 8 –1)				×	×	×	×	×	13 to 35	
iv)	6 × 19 S (9 – 9 – 1)				×	×	×	×	×	13 to 38	
v)	6 × 26 SW (10 –5 + 5 – 5 – 1)		–	–	×	×	×	×	×	25 to 41	3
vi)	6 × 31 SW (12 –6 + 6 – 6 – 1)				×	×	×	×	×	29 to 44	
vii)	6 × 36 SW (14 – 7 + 7 – 7 – 1)				×	×	×	×	×	35 to 51	
viii)	6 × 41 SW (16 – 8 + 8 – 8 – 1)				×	×	×	×	×	38 to 60	
ix)	6 × 49 SWS (16 – 8 + 8 – 8 – 8 – 1)				×	×	×	×	×	51 to 64	
x)	6 × 46 SW (18 – 9 + 9 – 9 - 1)				×	×	×	×	×	51 to 64	
xi)	6 × 52 SW (18 - 9 + 9 - 9/6 - 1)				×	×	×	×	×	51 to 64	
xii)	17 × 7 [11 × 7 (6 – 1) : 6 × 7(6 – 1)]	Multi strand	×	×	×	×	×	×	×	16 to 35	4
xiii)	18 × 7 [12 × 7 (6 – 1) : 6 × 7 (6 – 1)]		×	×	×	×	×	×	×	16 to 35	

Sl No.	*Construction*	*Type*	*Rope Grade*					*Core*		*Rope Size* (Diameter, in mm)	*Table*
			1230	1420	1570	1770	1960	Fibre	Steel		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
xiv)	34 × 7 [17 × 7 (6 – 1) : 11 × 7(6 – l)/6 × 7 (6 – 1)]	Rotation resistant	×	×	×	×	×	×	×	19 to 60	5
xv)	36 × 7 [18 × 7(6 – 1) : 12 × 7 (6 – 1)/6 × 7(6 – 1)]		×	×	×	×	×	×	×	19 to 60	
xvi)	35 × 7 [16 × 7 (6 – 1) : 6 × 7 (6 – 1) + 6 × 7 (6 – 1) – 6 × 7 (6 – 1) – 1×7(6-1)				×	×	×		×	19 to 60	8
xvii)	40 × 7 [18 × 7 (6 – 1) : 7 × 7 (6 – 1) + 7 × 7 (6 – 1) – 7 × 7 (6 – 1) – 1 × 7 (6 – 1)]				×	×	×		×	19 to 60	8
xviii)	35 × 19 S [16 × 19S (9 – 9 – 1) : 6 × 19 S (9 – 9 – 1) + 6 × 19S (9 – 9 – 1) – 6 × 19 S (9 – 9 – 1) – 1 × 19S (9 – 9 – 1)				×	×	×		×	19 to 60	8
xix)	* 15 × 7				×	×	×		×	19 to 60	8
xx)	* 16 × 7				×	×	×		×	19 to 60	8
xxi)	6 × V 8 (7 – Δ)	Flattened strand	–	–	×	×	×	×	×	16 to 32	6
xxii)	6 × V 9 (8 – Δ)				×	×	×	×	×	16 to 32	
xxiii)	6 × V 22 (9/12 – Δ)		–	–	×	×	×	×	×	25 to 36	7
xxiv)	6 × V 25 (12/12 – Δ)				×	×	×	×	×	25 to 44	
xxv)	6 × V 28 (15/12 – Δ)				×	×	×	×	×	32 to 56	
xxvi)	6 × V 31 (18/12 – Δ)				×	×	×	×	×	36 to 64	

*15 × 7 and 16 × 7 construction rope shall have IWRC having more than 7 strands for flexibility and lay direction shall be opposite to rope lay direction for rotational resistance property.

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 1804 : 2004	Steel wire ropes — Fibre main cores — Specification (*fourth revision*)
IS 1835 : 1976	Specification for round steel wire for ropes (*third revision*)
IS 2363 : 2022	Glossary of terms relating to wire ropes (*second revision*)
IS 9182 (Part 1) : 1993	Lubricants for wire ropes and fire cores — Specification: Part 1 Lubricants for fibre core of wire ropes (*first revision*)
IS 13917 : 2003	Stranded wire ropes for mine hoisting — Technical delivery requirements (*first revision*)

3 TERMINOLOGY

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

4 ROPE SIZE AND TOLERANCE

Most common size of rope, designated, as 'nominal diameter' are given in Table 1 to Table 7; however other size may be given as agreed between the manufacturer and purchaser. The actual diameter of the rope as supplied shall be within + 4, - 1 percent of the nominal diameter.

5 MINIMUM BREAKING FORCE

Minimum breaking force shall be as given in Table 1 to Table 8 or higher values as agreed between manufacturer and purchaser. Minimum breaking force for compacted ropes and specially developed ropes may be as agreed between manufacturer and purchaser.

NOTE — The actual breaking force shall not fall below the minimum breaking force values and may be obtained through Method A or B (including foot notes) as specified in IS 13917.

6 GENERAL REQUIREMENTS

The wire rope shall conform to IS 13917 in addition to the requirements given below:

6.1 Wire

The chemical composition of the raw material for producing wires to be used in the rope shall conform to any of the Grades 1, 2 and 3 of IS 1835.

6.2 Core

Core shall be fibre core or steel core as per **6.2.1** and **6.2.2**.

6.2.1 *Fibre Core*

The core shall be made from natural hard fibre, either manila (abaca) or sisal, and shall conform to the requirements laid down in IS 1804.

6.2.2 *Steel Core*

Whenever steel main core is specified, it shall be an independent wire rope core (CWR), except for multi-strand rotation resistant ropes where wire strand cores (CWS) shall be used. In case of inner core of multi-strand rotation resistant rope is having 3 or 4 number of strands in first inner layer, there may not have essentially a central core. The tensile designation of the wires for steel core and core wires in the strands of the rope shall not exceed the tensile grade of the main rope wires, however, it can be up to one grade lower than the main rope wires. In case of shaped wires from strand core, **4.3** of IS 13917 shall be referred.

NOTE — The use of steel core has certain advantages in adverse conditions, such as corrosive atmosphere, multi-layer winding leading to crushing of rope, and deep shaft winding leading to considerable stretch in the rope.

6.3 Joints

6.3.1 Joints in wires at the final stage shall be avoided as far as possible, but where necessary, those shall be spread as widely as possible in the strand and in no case more than one wire shall be joined in a strand length of every 1 000 m or part. Total number of such joints shall not be more than 3 in any length of rope.

6.3.2 The joints shall be as far as possible electrically welded or brazed.

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6.3.3 Tucked joints shall not be permitted.

6.4 Lay

6.4.1 *Direction of Lay*

The rope shall be of Lang's lay unless otherwise specified by the purchaser (zZ or sS).

6.4.2 *Length of Lay*

The length of lay of ropes shall not exceed 8 times the nominal diameter.

6.5 Mass

6.5.1 The rope mass values shown in Table 1 to Table 8 are of fully lubricated ropes. The ropes, which are not lubricated, may be lighter.

6.5.2 The actual rope mass shall meet the requirements of IS 13917.

NOTE — Rope mass values for the rope not covered in the Table 1 to Table 8 shall be as agreed between manufacturer and supplier.

7 GALVANIZING

Galvanizing shall meet the requirement of IS 13917.

8 LUBRICATION

8.1 The ropes shall be thoroughly lubricated with an appropriate lubricant specified in IS 13917 unless otherwise requested by the purchaser specifically.

8.2 Galvanized ropes for friction winder shall be lubricated with a lubricant, which will be resistant to slippage.

8.3 Fibre core shall be lubricated with a suitable lubricant as specified in IS 9182 (Part 1) and shall have retention of lubricant after rope making (in new condition):

a) to an extent of minimum 12 percent by mass of dry fire core for general winding ropes; and

b) to an extent of minimum 8 percent by mass of dry fire core for friction winder ropes.

9 FREEDOM FROM DEFECTS

The completed ropes shall be free from defects like loose wires and strands, kink, protrusion of core and other irregularities that can be detected visually. The ropes shall be evenly laid and shall remain in condition when properly unwound from the reel.

10 SAMPLING PLAN

10.1 Lot

Steel wire rope of same size manufactured using the same set of strands and same type of core under identical condition of production, shall constitute a lot.

NOTE — Manufacturer shall provide evidence for the tractability of the individual rope lengths to the parent rope to establish that those represent the lot as defied above.

10.2 For ascertaining the conformity of a lot, the following sampling plan shall be made:

a) Dimensional checking — 100 percent; or

b) Breaking force test — one sample from a lot

11 PREFORMING

Round and flattened strand ropes shall be preformed unless otherwise agreed upon. Multi-strand rotation resistant ropes may at the option of the manufacturer be supplied as non-preformed. Manufacturer shall provide at least one seizing at the rope ends for all round and flattened strand ropes and two to three seizing's of appropriate length and distance in case of rotation resistant ropes.

12 TEST

The wire ropes shall meet the test requirements and compliance criteria as laid down in IS 13917.

13 PACKING AND MARKING

3.1 Packing

Packing shall be done as per IS 13917.

13.2 Marking

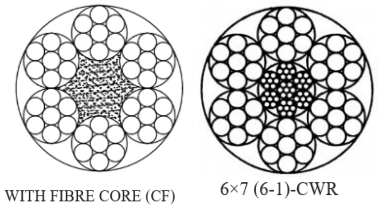
The reel number, nominal rope size, construction, rope grade, direction of lay, core, coating, length, purchaser's order reference and any other marking which may be specified by the purchaser shall be legibly displayed on both sides of reel flanges through suitable tags or stenciling.

13.3 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.

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

(*Clauses* 4, 5, 6.5.1 *and* 6.5.2)

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

Sl No.	Nominal Diameter	Nominal Mass		Minimum Breaking Force Corresponding to Rope Grade of					
				1570		1770		1960	
		Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)
	mm	kg/100		kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	13	60.4	66.4	88.1	95.2	99.4	107	110	119
ii)	14	70.1	77.0	102	110	115	124	128	138
iii)	16	91.5	101	134	144	151	163	167	180
iv)	18	116	127	169	183	191	206	211	228
v)	19	129	142	188	203	212	229	235	254
vi)	20	143	157	209	225	235	254	260	281
vii)	21	158	173	230	248	259	280	287	310

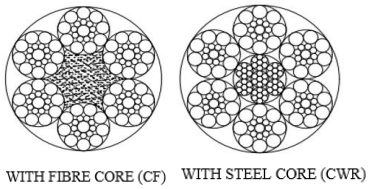
Table 1 (*Concluded*)

Sl No.	Nominal Diameter	Nominal Mass		Minimum Breaking Force Corresponding to Rope Grade of					
				1570		1770		1960	
		Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)
	mm	kg/100		kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
viii)	22	173	190	252	273	285	307	315	340
ix)	24	206	226	300	324	339	366	375	405
x)	25	223	246	326	352	367	397	407	440
xi)	26	242	266	353	381	397	429	440	475
xii)	27	261	287	380	411	429	463	475	513
xiii)	28	280	308	409	442	461	498	510	551
xiv)	29	301	331	439	474	495	534	548	591

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.

Table 2 Breaking Force and Mass for 6 × 15 S (7 –7 –1), 6 × 17 S (8 –8 –1) and 6 × 19 S (9 –9 –1) Construction Ropes

(*Clauses* 4, 5, 6.5.1 *and* 6.5.2)

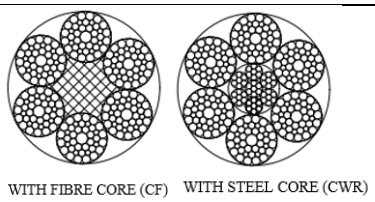
Typical Cross Section	Typical Construction	
 WITH FIBRE CORE (CF) WITH STEEL CORE (CWR)	Rope Construction	Strand Construction
	6 × 15S	7-7-1
	6 × 17S	8-8-1
	6 × 19S	9-9-1

Sl No.	Nominal Diameter	Nominal Mass		Minimum Breaking Force Corresponding to Rope Grade of					
				1570		1770		1960	
		Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)
	mm	kg/100		kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	13	63.0	69.3	87.8	94.8	99.0	107	110	118
ii)	14	73.0	80.3	102	110	115	124	127	137
iii)	16	95.4	105	133	144	150	162	166	179
iv)	18	121	133	168	182	190	205	210	227
v)	19	135	148	188	203	211	228	234	253
vi)	20	149	164	208	224	234	253	260	280
vii)	21	164	181	229	247	258	279	286	309
viii)	22	180	198	252	272	284	306	314	339
ix)	24	215	236	299	323	337	364	374	403
x)	25	233	256	325	351	366	395	405	438
xi)	26	252	277	351	379	396	428	439	474
xii)	27	272	299	379	409	427	461	473	511
xiii)	28	292	321	407	440	459	496	509	549
xiv)	29	313	345	437	472	493	532	546	589
xv)	32	382	420	532	575	600	648	664	717
xvi)	35	456	502	637	687	718	775	795	858
xvii)	38	538	592	750	810	846	913	937	1012

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

Table 3 Breaking Force and Mass for 6 × 26 SW (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) and 6 × 49 SWS (16 – 8 + 8 – 8 – 8 – 1) Construction Ropes

(*Clauses* 4, 5, 6.5.1 *and* 6.5.2)

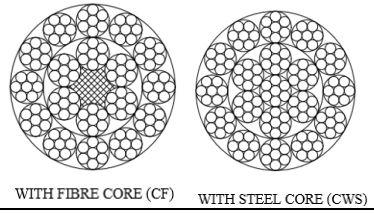
Typical Cross Section	Typical Construction	
	Rope Construction	Strand Construction
	6 × 26SW	10 – 5 + 5 – 5 – 1
	6 × 31 SW	12 – 6 + 6 – 6 – 1
	6 × 36 SW	14 – 7 + 7 – 7 – 1
	6 × 41 SW	16 – 8 + 8 – 8 – 1
	6 × 49SWS	16 – 8 + 8 – 8 – 8 – 1
	6 × 46SW	18 – 9 + 9 – 9 – 1
	6 × 52SW	18 – 9 + 9 – 9/6 – 1

Sl No.	Nominal Diameter	Nominal Mass		Minimum Breaking Force Corresponding to Rope Grade of					
				1570		1770		1960	
		Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)
	mm	kg/100		kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	25	238	261	324	350	365	394	404	436
ii)	26	257	283	350	378	395	426	437	472
iii)	28	298	328	406	439	458	494	507	548
iv)	29	320	352	436	470	491	530	544	587
v)	32	389	428	530	573	598	646	662	715
vi)	35	466	512	634	685	715	773	792	855
vii)	36	493	542	671	725	757	817	838	905
viii)	38	549	604	748	808	843	911	934	1 008
ix)	40	608	669	829	895	934	1 009	1 035	1 117
x)	41	639	703	871	940	982	1 060	1 087	1 174
xi)	42	671	738	914	987	1 030	1 112	1 141	1 232
xii)	44	736	810	1 003	1 083	1 130	1 221	1 252	1 352
xiii)	48	876	964	1 193	1 289	1 345	1 453	1 490	1 609
xiv)	51	989	1 088	1 347	1 455	1 519	1 640	1 682	1 816
xv)	52	1 028	1 131	1 401	1 513	1 579	1 705	1 748	1 888
xvi)	56	1 192	1 311	1 624	1 754	1 831	1 978	2 028	2 190
xvii)	60	1 369	1 506	1 856	2 014	2 102	2 270	2 328	2 514
xviii)	64	1 557	1 713	2 121	2 291	2 392	2 583	2 648	2 860

NOTE — To calculate the aggregate breaking force, multiply the figures given in col (4), (6) and (8) by 1.19 and in col (5), (7) and (9) by 1.28.

Table 4 Breaking Force and Mass for 17 × 7 (6 –1) and 18 × 7 (6 –1) Construction Ropes

(*Clauses* 4, 5, 6.5.1 *and* 6.5.2)

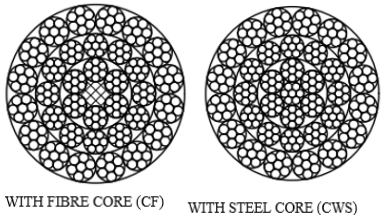
Typical Cross Section	Typical Construction	
	Rope Construction	Strand Construction
 WITH FIBRE CORE (CF) WITH STEEL CORE (CWS)	17 × 7 (11 × 7 : 6 × 7 - FC)	6-1
	17 × 7 (11 × 7 : 6 × 7 - 1 × 7)	6-1
	18 × 7 (12 × 7 : 6 × 7 - FC)	6-1
	18 × 7 (12 × 7 : 6 × 7 - 1 × 7)	6-1

Sl No.	Nominal Diameter	Nominal Mass		Minimum Breaking Force Corresponding to Rope Grade of									
				1230		1420		1570		1770		1960	
		Fibre core (CF)	Steel core (CWS)	Fibre core (CF)	Steel core (CWS)	Fibre core (CF)	Steel core (CWS)	Fibre core (CF)	Steel core (CWS)	Fibre core (CF)	Steel core (CWS)	Fibre core (CF)	Steel core (CWS)
	mm	kg/100		kN	kN	kN	kN	kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
i)	16	98	103	100	103	116	119	128	132	144	149	160	165
ii)	19	138	145	141	146	163	168	181	186	204	210	225	232
iii)	20	153	161	226	161	181	186	200	206	226	232	250	257
iv)	22	185	195	190	195	219	225	242	249	273	281	302	311
v)	24	220	232	226	232	261	268	288	297	325	335	360	370
vi)	25	239	251	245	252	283	291	313	322	352	363	390	402
vii)	26	259	272	265	273	306	315	338	348	381	393	422	435
viii)	27	279	293	286	294	330	340	365	376	411	423	455	469
ix)	28	300	315	307	316	355	365	392	404	442	455	490	504
x)	32	392	412	401	413	463	477	512	527	577	595	639	659
xi)	35	469	492	480	494	554	571	613	631	691	711	765	788

NOTE — To calculate the aggregate breaking force, multiply the figures given in col (4), (6), (8), (10) and (12) by 1.28 and in col (5), (7), (9), (11) and (13) by 1.32.

Table 5 Breaking Force and Mass for 34 × 7 (6 – 1) and 36 × 7 (6 – 1) Construction Ropes

(*Clauses* 4, 5, 6.5.1 *and* 6.5.2)

Typical Cross Section	Typical Construction	
	Rope Construction	Strand Construction
	34 × 7 (17 × 7 : 11 × 7/6 × 7 – FC)	6-1
	34 × 7 (17 × 7 : 11 × 7/6 × 7 – 1 × 7)	6-1
	36 × 7 (18 × 7 : 12 × 7/6 × 7 – FC)	6-1
	36 × 7 (18 × 7 : 12 × 7/6 × 7 – 1 × 7)	6-1
	60 × 7 (24 × 7 : 18 × 7 : 12 × 7 : 6 × 7 – FC)	6-1

Sl No.	Nominal Diameter	Nominal Mass		Minimum Breaking Force Corresponding to Rope Grade of									
				1230		1420		1570		1770		1960	
		Fibre Core (CF)	Steel Core (CWS)	Fibre Core (CF)	Steel Core (CWS)	Fibre Core (CF)	Steel Core (CWS)	Fibre Core (CF)	Steel Core (CWS)	Fibre Core (CF)	Steel Core (CWS)	Fibre Core (CF)	Steel Core (CWS)
	mm	kg/100		kN	kN	kN	kN	kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
i)	19	141	145	139	141	160	163	177	180	199	203	221	225
ii)	22	189	195	186	190	215	219	237	242	267	273	296	302
iii)	25	244	251	240	245	277	283	306	312	345	352	382	390
iv)	26	264	272	260	265	300	306	331	338	374	381	414	422
v)	28	306	315	301	307	348	354	384	392	433	442	480	489
vi)	30	351	362	346	352	399	407	441	450	497	507	551	562
vii)	32	400	412	393	401	454	463	502	512	566	577	627	639
viii)	34	451	465	444	453	512	523	567	578	639	651	707	721
ix)	36	506	521	498	508	575	586	635	648	716	730	793	809

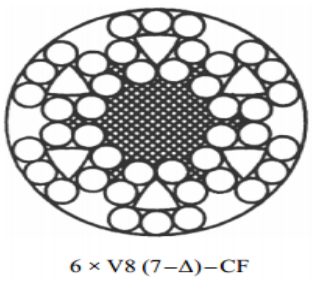
Table 5 (*Concluded*)

Sl No.	Nominal Diameter	Nominal Mass		Minimum Breaking Force Corresponding to Rope Grade of									
				1230		1420		1570		1770		1960	
		Fibre Core (CF)	Steel Core (CWS)	Fibre Core (CF)	Steel Core (CWS)	Fibre Core (CF)	Steel Core (CWS)	Fibre Core (CF)	Steel Core (CWS)	Fibre Core (CF)	Steel Core (CWS)	Fibre Core (CF)	Steel Core (CWS)
	mm	kg/100		kN	kN	kN	kN	kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
x)	38	563	580	555	566	640	653	708	722	798	814	884	901
xi)	40	624	643	614	627	709	723	784	800	884	902	979	999
xii)	41	656	676	646	658	745	760	824	840	929	947	1 029	1 049
xiii)	44	755	778	743	758	858	875	949	968	1 070	1 091	1 185	1 208
xiv)	48	899	926	885	902	1 021	1 042	1 129	1 152	1 273	1 298	1 410	1 438
xv)	51	1 015	1 046	999	1 019	1 153	1 176	1 275	1 300	1 437	1 466	1 592	1 623
xvi)	52	1 055	1 087	1 038	1 059	1 199	1 223	1 325	1 352	1 494	1 524	1 655	1 687
xvii)	55	1 180	1 216	1 162	1 185	1 341	1 368	1 483	1 512	1 672	1 705	1 851	1 888
xviii)	56	1 224	1 261	1 204	1 228	1 390	1 418	1 537	1 568	1 733	1 767	1 919	1 957
xix)	60	1 405	1 447	1 382	1 410	1 596	1 628	1 765	1 800	1 989	2 029	2 203	2 247

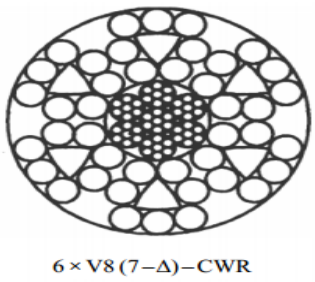
NOTE — To calculate the aggregate breaking force, multiply the figures given in col (4), (6), (8), (10) and (12) by 1.33 and in col (5), (7), (9), (11) and (13) by 1.346.

Table 6 Breaking Force and Mass for 6 × V 8 (7 –Δ) and 6 × V 9 (8 –Δ) Construction Ropes

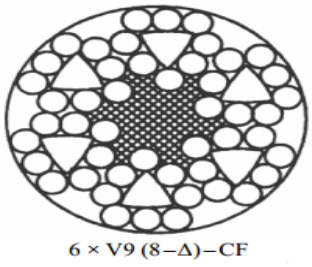
(*Clauses* 4, 5, 6.5.1 *and* 6.5.2)



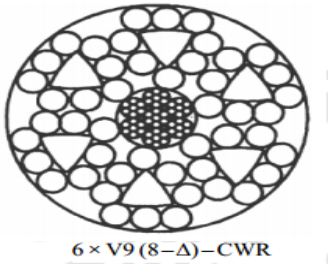
6 × V8 (7–Δ)–CF



6 × V8 (7–Δ)–CWR



6 × V9 (8–Δ)–CF



6 × V9 (8–Δ)–CWR

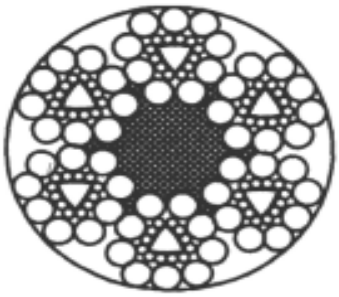
Sl No.	Nominal Diameter	Nominal Mass		Minimum Breaking Force Corresponding to Rope Grade of					
				1570		1770		1960	
		Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)
	mm	kg/100		kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	16	105	114	145	154	164	174	182	193
ii)	19	148	161	205	218	231	245	256	272
iii)	20	164	179	227	241	256	272	284	301
iv)	21	181	197	251	266	283	300	313	332
v)	22	198	216	275	292	310	329	343	364
vi)	24	236	257	327	347	369	391	409	434
vii)	25	256	279	355	377	400	425	443	470
viii)	26	277	302	384	408	433	459	480	509
ix)	29	345	376	478	507	539	572	597	633
x)	32	420	458	582	617	656	696	727	771

NOTES

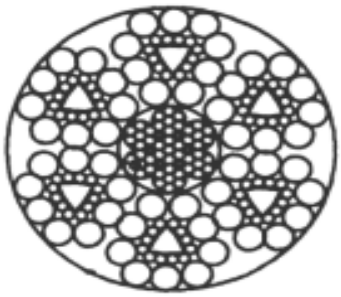
1 To calculate the aggregate breaking force, multiply the figures given in col (4), (6) and (8) by 1.137 and in col (5), (7) and (9) by 1.21.
2 In case of Δ wire, 3 or more round wires may also be used.

Table 7 Breaking Force and Mass for 6 × V 22 (9/12 – Δ), 6 × V 25 (12/12 – Δ), 6 × V 28 (15/12 – Δ) and 6 × V 31 (18/12 – Δ) Construction Ropes

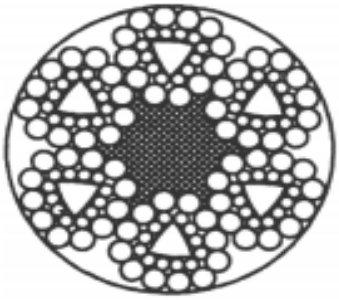
(*Clauses* 4, 5, 6.5.1 *and* 6.5.2)



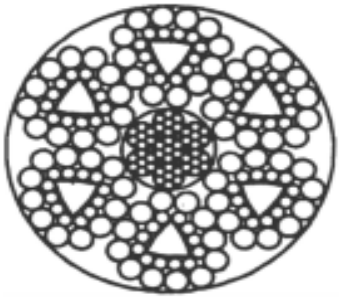
6×V 22(9/12-Δ)-CF



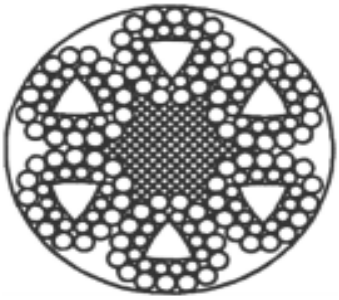
6×V 22(9/12-Δ)-CWR



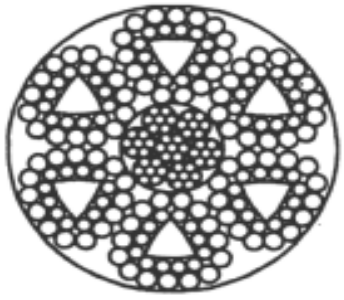
6×V 25(12/12-Δ)-CF



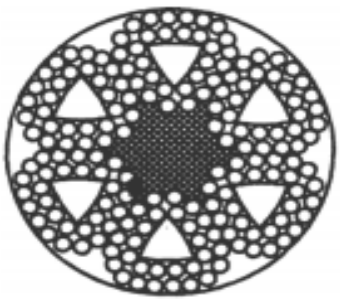
6×V 25(12/12-Δ)-CWR



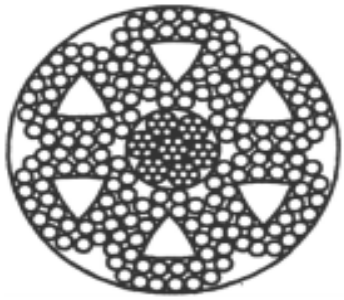
6×V 28(15/12-Δ)-CF



6×V 28(15/12-Δ)-CWR



6×V 31(18/12-Δ)-CF



6×V 31(18/12-Δ)-CWR

Sl No.	Nominal Diameter	Nominal Mass		Minimum Breaking Force Corresponding to Rope Grade of					
				1570		1770		1960	
		Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)	Fibre Core (CF)	Steel Core (CWR)
	mm	kg/100		kN	kN	kN	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
i)	25	256	279	344	365	388	412	430	456
ii)	26	277	302	373	395	420	445	465	493
iii)	28	321	350	432	458	487	516	539	572
iv)	29	345	376	463	491	522	554	579	613
v)	32	420	458	564	598	636	674	704	747
vi)	35	502	548	675	715	761	807	843	893
vii)	36	531	579	714	757	805	853	892	945
viii)	40	656	715	882	934	994	1 054	1 110	1 167
ix)	44	794	865	1 067	1 131	1 203	1 275	1 332	1 412
x)	48	945	1 030	1 270	1 346	1 431	1 571	1 585	1 680
xi)	51	1 066	1 163	1 433	1 519	1 616	1 713	1 789	1 896
xii)	52	1 109	1 209	1 490	1 579	1 680	1 780	1 860	1 972
xiii)	56	1 286	1 402	1 728	1 832	1 948	2 065	2 157	2 287
xiv)	60	1 476	1 609	1 984	2 103	2 237	2 370	2 477	2 625
xv)	64	1 679	1 831	2 257	2 392	2 545	2 697	2 818	2 986

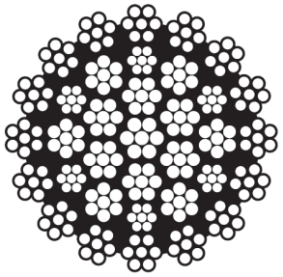
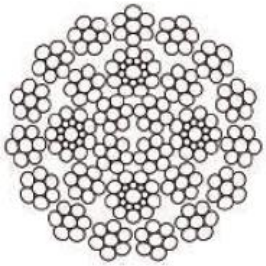
NOTES

1 To calculate the aggregate breaking force, multiply the figures given in col (4), (6) and (8) by 1.177 and in col (5), (7) and (9) by 1.25.

2 In case of Δ wire, 3 or more round wires may also be used.

Table 8 Breaking Force and Mass for 35 × 7 (6 – 1) and 35 × 19S (9 – 9 - 1) Construction 35(W) × 7 Class and 15 × 7 Class Ropes

(*Clauses* 5, 6.5.1 *and* 6.5.2)

Typical Cross Section	Typical Construction	
 WITH STEEL CORE (CWS)  WITH STEEL CORE (CWR)	Rope Construction	Strand Construction
	35 × 7 (16 × 7 : 6 × 7 + 6 × 7 – 6 × 7 – 1 × 7)	6-1
	40 × 7 [18 × 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
	15 × 7 : IWRC	6-1
	16 × 7 : IWRC	6-1

Sl No.	Nominal Diameter	Approximate Mass	Minimum Braking Force Corresponding to Rope Grade of		
			1570	1770	1960
		Steel Core	Steel Core	Steel Core	Steel Core
		(CWR)	(CWR)	(CWR)	(CWR)
	mm	kg/100 m	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)
i)	19	164	204	230	255
ii)	20	182	226	255	282
iii)	22	220	274	308	342
iv)	24	262	326	367	406
v)	25	284	353	398	441
vi)	26	307	382	431	477
vii)	28	356	443	500	553
viii)	29	382	475	536	593
ix)	30	409	509	573	635
x)	32	465	579	652	723
xi)	34	525	653	737	816
xii)	35	556	692	781	864
xiii)	36	588	732	826	914
xiv)	38	656	816	920	1 019

Table 8 (*Concluded*)

Sl No.	Nominal Diameter	Approximate Mass	Minimum Braking Force Corresponding to Rope Grade of		
			1570	1770	1960
		Steel Core	Steel Core	Steel Core	Steel Core
		(CWR)	(CWR)	(CWR)	(CWR)
	mm	kg/100 m	kN	kN	kN
(1)	(2)	(3)	(4)	(5)	(6)
xv)	40	726	904	1 020	1 129
xvi)	42	801	997	1 124	1 245
xvii)	44	879	1 094	1 234	1 366
xviii)	45	919	1 145	1 290	1 429
xix)	46	961	1 196	1 348	1 493
xx)	48	1 046	1 302	1 468	1 626
xxi)	50	1 135	1 413	1 593	1 764
xxii)	51	1 181	1 470	1 657	1 835
xxiii)	52	1 228	1 528	1 723	1 908
xxiv)	54	1 324	1 648	1 858	2 058
xxv)	55	1 373	1 710	1 928	2 134
xxvi)	56	1 424	1 772	1 998	2 213
xxvii)	58	1 527	1 901	2 144	2 374
xxviii)	60	1 634	2 035	2 294	2 540

ANNEX A

(*Foreword*)

INFORMATION TO BE GIVEN WITH THE ENQUIRY OR ORDER

The information to be given with the enquiry or order is detailed below. It is recommended that the information should be supplied in the tabular form as illustrated in Table 9.

A-1 PARTICULARS OF SHAFT

a) Depth — From lowest working level in shaft to bank, vertical distance from bank to center of head pulley;

b) Whether up cast, downcast, or both;

c) Whether wet or dry, and approximate range of temperature variation;

d) Whether shaft water is known to be of an injurious nature; its *p*H value and chloride content, if available; and

e) Whether steam is exhausted into the shaft, and whether there are any other special circumstances likely to affect the rope.

A-2 PARTICULARS OF WINDING ENGINE DRUM

a) *Type of drum*:

1) If parallel type, give diameter, width and distance of fist and last live turns from centerline of drum;

2) If conical type, give minimum and maximum diameters, width and distance of fist and last working turns from centerline of drum; and

3) If cylindro-conical type, give maximum and minimum diameters, distance of fist and last live turns from centre-line of drum, number of working turns on the minimum diameter, number of turns on the scroll, width of drum, width of scroll and width of parallel portion of drum:

b) Nature and arrangement of drum lagging or cladding material and particulars of any grooving; and

c) Whether rope is wound on itself; if so, number of layers.

A-3 PARTICULARS OF DRIVING SHEAVE

a) Diameter; and

b) Rope groove lining.

A-4 PARTICULARS OF PITHEAD PULLEYS AND POSITION WITH RESPECT TO WINDING ENGINE

a) Horizontal and vertical distance between centres of pithead pulleys and whether the vertical centreline of or between the pulleys coincides with the centreline of the drum or sheave;

b) Diameter of pithead pulley at the bottom of groove;

c) Diameter of any guide sheave and its position with respect to the pithead pulley or driving sheave;

d) Height of centre of head pulley above centre of drum or ground type driving sheave;

e) Horizontal distance between centre of drum or ground type driving sheave and rope hanging in shaft; and

f) Inside and outside fleet angles.

A-5 MAXIMUM WINDING SPEED IN METRES PER SECOND

A-6 MAXIMUM ACCELERATION IN METRES PER SECOND PER SECOND OF ROPE WHEN RAISING FULL LOAD

A-7 MAXIMUM LOAD AND NORMAL LOAD SUSPENDED FROM THE WINDING ROPE CAPPING INCLUDING THE MASS OF ANY BALANCE ROPE AND ITS ATTACHMENTS

A-8 TYPE OF CAGE GUIDES

A-9 PARTICULARS OF ROPE REQUIRED OR PROPOSED

a) Length, in m;

b) Nominal diameter, in mm;

c) Construction;

d) Minimum breaking force, in kN;

e) Round strand or flattened strand Lang's lay or ordinary lay, right hand or left hand, preformed or non-preformed;

f) Rope grade;

g) If the wire is to be galvanized, state type; and

h) Material of main core, fibre or wire.

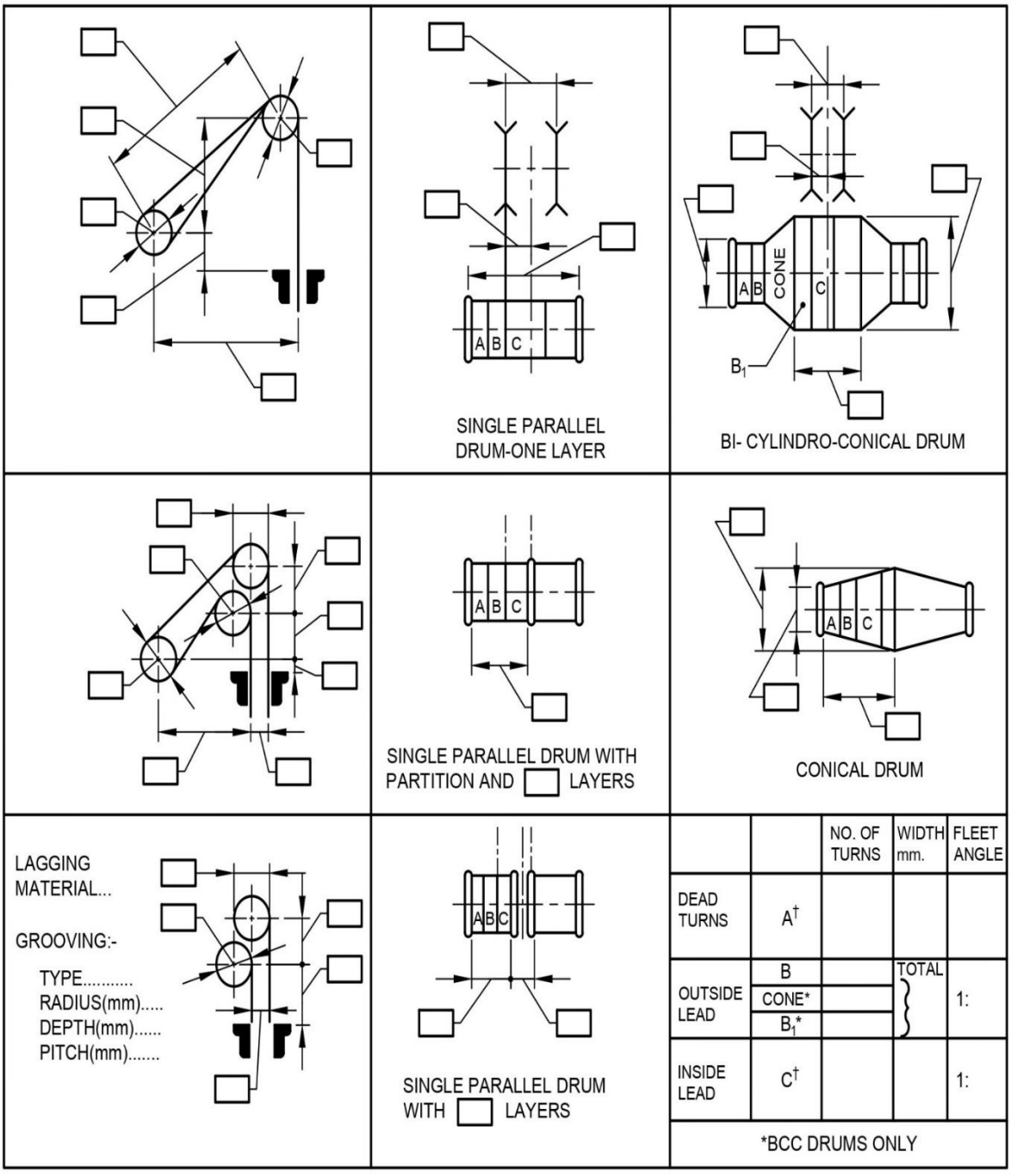
A-10 PARTICULARS OF INSPECTION AND TESTING REQUIRED

A-11 WHETHER TO BE DELIVERED ON REEL HAVING LIMITING DIMENSIONS

Table 9 Enqiry or Order Form for Winding Rope Round Strand or Flattened Strand Only
(*Annex* A)

Mine	Engine
(1)	(2)
1 Shaft Data	a) Up cast or downcast b) Wet or dry c) Approximate working temperature range (°C) d) Approximate analysis of shaft water if $\text{injurious} = \frac{\text{pH value}}{\text{Chloride (as } Cl_2\text{) parts per million}}$
a) *Depth* — lowest working level to bank (m) b) Type of cage guides c) Any special circumstances in shaft (for example, exhaust steam)	
2 Rope Loading	
a) Maximum working load, excluding rope, but including cage, balance rope, etc (kg)	
3 Data of Rope Required or Proposed	a) Maximum winding speed (m/s) b) Maximum acceleration or retardation under full load conditions (m/s^2)
a) Length (m) b) Diameter (mm) c) Lay (Lang's or ordinary, right hand or left hand) d) Whether preformed e) Construction f) Rope grade g) Minimum breaking force (kN) h) Whether galvanized and type required j) Material and construction of main core k) To be delivered on reel having limiting dimensions, if any m) Details of special tests and inspection	

4 Drum and head gear, type of drum or driving sheave



NOTE — All diameters are to bottom of rope groove.

† If the rope coil is from right to left, *A* and *C* are reversed.

ANNEX B

(*Foreword*)

COMMITTEE COMPOSITION

Wire Ropes and Wire Products Sectional Committee, MED 10

Organization	*Representative(s)*
Directorate General of Mines Safety, Dhanbad	SHRI D. B. NAIK **(*Chairperson*)** SHRI VIJAY BARAPATRE (*Alternate*)
Bharat Heavy Electrical Limited, New Delhi	SHRI BHASKARJIT BARUA SHRI RAMAN BHARIHOKE (*Alternate*)
Bharat Wire Ropes Limited, Mumbai	SHRI MAHENDER SINGH ARORA SHRI MAYANK MITTAL (*Alternate*)
Central Institute of Mining and Fuel Research, Dhanbad	DR MANOJ KUMAR SINGH, DR DEBASISH BSSAK (*Alternate*)
Directorate General Factory Advice Service and Labour Institutes, Mumbai	SHRI SAMIR PANDEY SHRI N. VARADHARAJAN (*Alternate*)
Maccaferri Environment Solutions Pvt. Limited, Navi Mumbai	SHRIMATI MINIMOL KORULLA SHRI RUDRA BUDDHABHATTI (*Alternate*)
Ministry of Ports, Shipping and Waterways, New Delhi	SHRI ANIL PRUTHI SHRI RAMJI SINGH (*Alternate*)
Nanda and Miller Co, Kolkata	SHRI J. P. GOENKA
National Test House, Kolkata	SHRI SURESH PARWAL SHRI ANGAD VERMA (*Alternate*)
Oil and Natural Gas Corporation Limited, New Delhi	SHRI RITUJIT HAZARIKA SHRI RAKESH KUMAR SRIVASTAVA (*Alternate*)
Orient Wire Ropes, Indore	SHRI RUSHIKESH AKARTE
Otis Elevator Company (India) Limited, Bengaluru	SHRI SHRIHARI VISPUTE
Schindler India Private Limited, Mumbai	SHRI NITIN VITHAL KADAM SHRI KETAN KSHIRSAGAR (*Alternate*)
TK Elevator India Private Limited, Navi Mumbai	SHRI VISHNU PARASHAR SHRI DEEPAK BALANI (*Alternate*)
Usha Martin Industries Limited, Ranchi	SHRI SUBRATA DUTTA SHRI SANDEEP JAISWAL (*Alternate*)
Vedanta Limited, Mumbai	SHRI RAKESH SINGHIV
BIS Directorate General	SHRI K. V. RAO, SCIENTIST 'F'/SENIOR DIRECTOR AND HEAD (MECHANICAL ENGINEERING) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary
SHRI SANDEEP KESHAV
SCIENTIST 'C'/ DEPUTY DIRECTOR
(MECHANICAL ENGINEERING), BIS

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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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