

ELEVATOR ROPES



ushamartin.com

 **usha martin**

Usha Martin Limited, a Global Conglomerate, is a trusted name, having its presence worldwide. Whenever people require reliable performance of wire rope combined with highest levels of safety and cost effectiveness, Usha Martin is always the first choice.

We have a long history of sustainable growth and extensive experience of producing steel wire, wire ropes and other allied products for various applications and providing comprehensive service and support. We have always tried out innovative business practices in an effort to diversify our customer base by venturing into the international markets, moving up the value chain and fully integrating the business process.

We are one of the largest producers of steel wire, wire rope and allied products in the world and we are present across various continents with our Manufacturing facilities, Sales offices and Distribution centers.



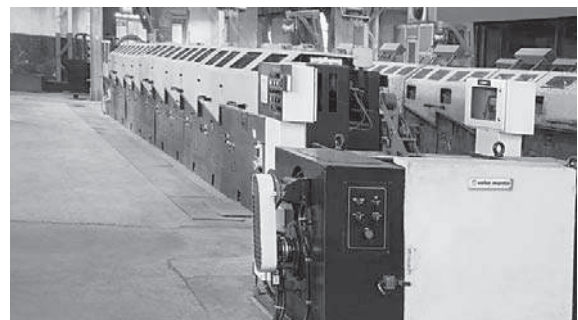
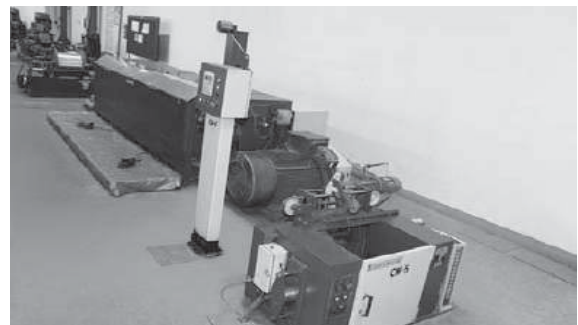
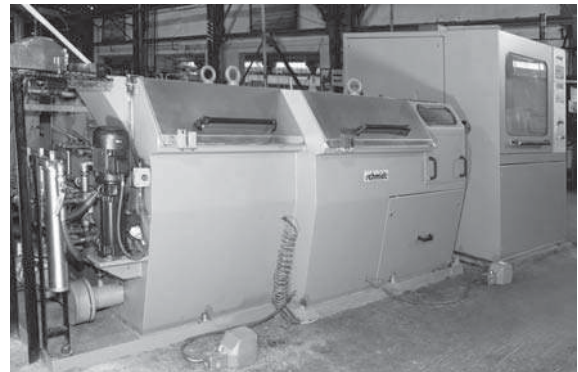
ELEVATOR ROPES

Elevator Ropes, unlike wire ropes for other application, demand much closer dimensional tolerances and stringent material quality levels to meet its tough safety requirements.

Usha Martin has been present in the elevator rope business for more than fifty years. Our wire ropes are designed to meet the quality levels of almost all the national and international standards. Our experience of producing the

highest quality products and our continuous effort for improvement permit us to satisfy even the most demanding product standards and OEM specifications.

Our product mix includes the Hoist Ropes, Compensating Ropes, Governor Ropes & Control Ropes used in Traction Drive Elevators and Roped Hydraulic Lifts.

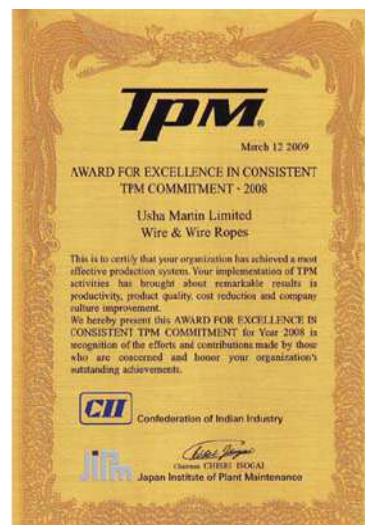


ACCREDITATION

Our ropes undergo tough quality tests, including endurance testing and on line magnetic evaluation to ensure that only the product meeting stringent quality levels reach our customers.

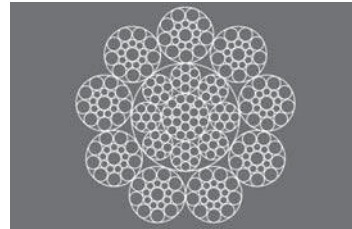
Our production and quality systems have been designed and are managed in accordance with our - Quality Management System administrated by ISO 9001 : 2008 and ISO 14001 : 2004.

Our endeavour to manage and deliver quality products has accredited us with the prestigious TPM - consistency award.



Product Design

The prerequisite for a good rope is good design. Usha Martin ropes are designed using a highly effective and specialized rope design system. This system combined with years of experience ensures that every rope is made with optimum design.



Raw Material Quality

Good raw material quality lays the foundation of high quality in the finished rope. Usha Martin is fully backward integrated having its own iron ore, coal mines with state-of-the-art steel melting, refining & rolling facilities. Steel for Elevator Wire ropes is tailor-made to achieve the highest levels of strength, ductility and endurance.



Latest Machinery

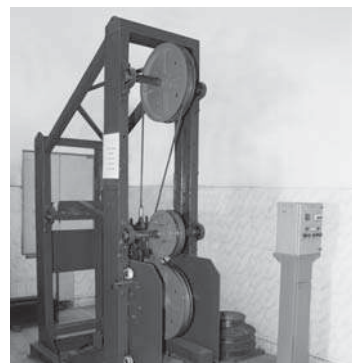
Besides rope design and good raw material quality the production equipment effect product quality the most.

We have an in-house machine design and manufacturing facilities which ensures that we have customized equipments incorporating latest technology.



Bending Fatigue Appraisal

Bend fatigue resistance is the ability of the wire rope to withstand repeated bending over drum / pulley under constant or fluctuating load. Our ropes undergo a 'comprehensive fatigue testing program' which has been devised not only to ensure that our ropes consistently deliver performance but also to provide information for product improvement and development.

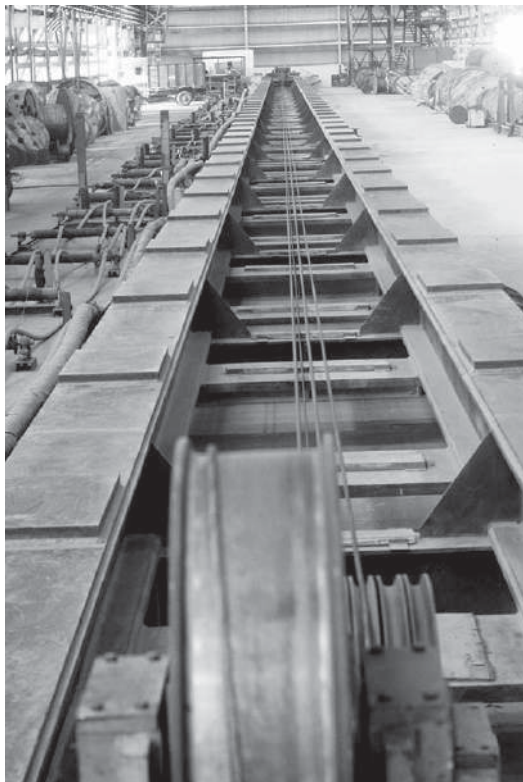


Pre-stretching

It is a specialized process opted for removing the constructional stretch (a permanent stretch which occurs shortly after the elevator rope is installed) from the wire rope. Our pre-stretched ropes are processed off-line, on a specially designed P/S bed, utilizing a longer length of rope and subjecting it to suitable load for sufficient number of cycles until it stabilizes. This process has been found to be the most effective in reducing the constructional stretch of a wire rope and is much superior to on-line pre-stretching.

Optimum Performance and Consistency

A simple way to ensure performance and consistency is to make sure that you are using Usha Martin Rope.



Unique Identification tag

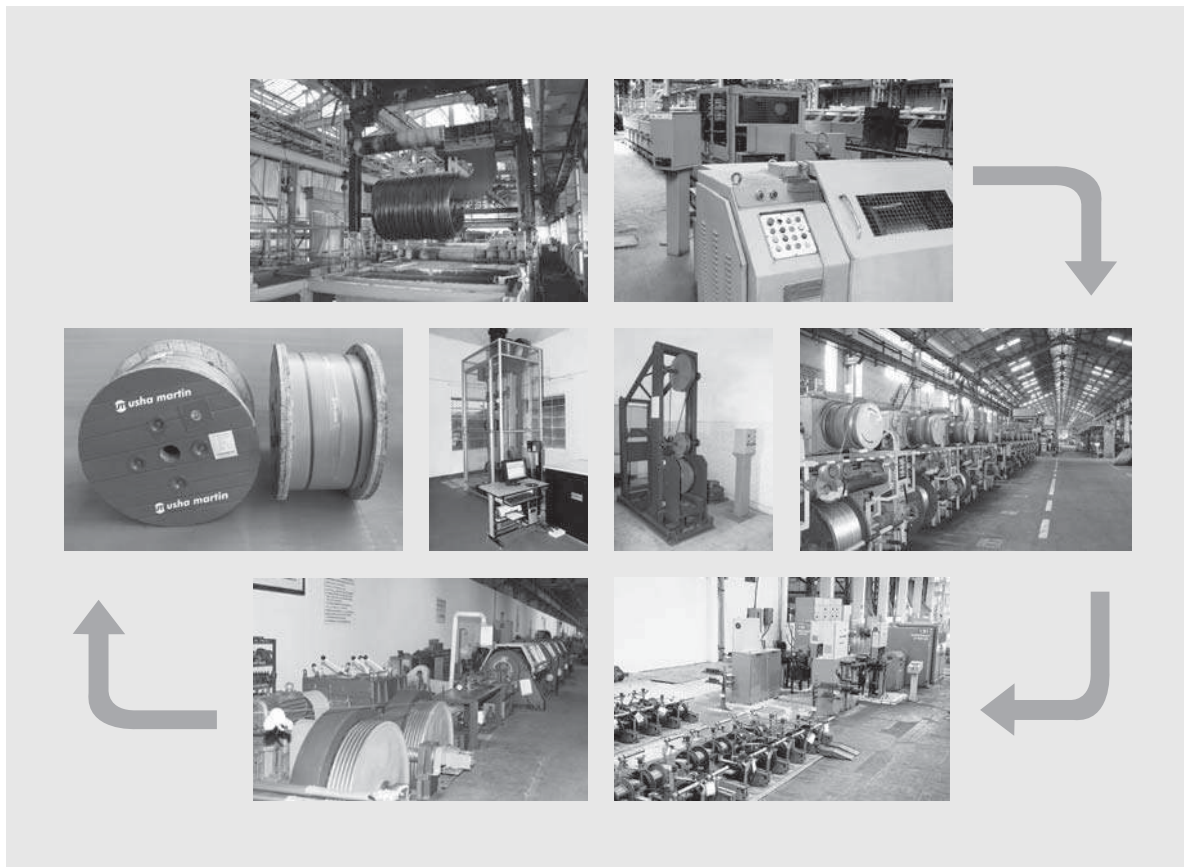


MANUFACTURING PROCESS

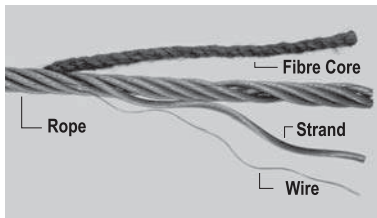
Manufacturing Machines

Some of these manufacturing machines are :

- State-of-the-art **Pickling** (cleaning & coating) **Plant**
- **Patenting Furnaces** employing latest technology
- Sophisticated **Die Shop**
- A number of Wire Drawing machines fitted with customized control mechanism
- **Stranding and Closing** machines of varying type & size, each having latest technology and excellent control systems



DEFINITION & CLASSIFICATION



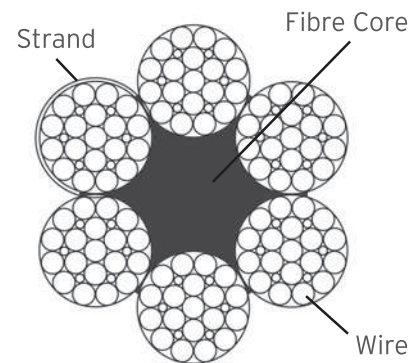
Wire Rope is an intricate device, a composite structure, made up of a number of individual units, called wires, which are designed and produced in such a manner that they always exist and work in some precise relationship with one another. This precise relationship of individual wires, which possess certain defined physical and mechanical characteristics,

ensures that the composite wire rope has strength, flexibility and durability essential for safe hoisting applications. Although other elements and factors are significant to successful operation of a wire rope, intended to be used in Elevators, the users of these wire ropes must have a clear understanding of fundamental characteristics of a wire rope to enable them to specify and procure correct wire rope for a particular application

Wire Rope Construction

A Wire rope has three main elements :

- a) Wire
- b) Strand
- c) Core



Wire

The basic component of a wire rope is the wire, which is made from steel in various sizes. The number of wires in a strand varies depending upon the usage of the wire rope.

A defined number of wires are spun helically around a central wire to form a strand. A number of such strands are then helically spun together over a core to form a wire rope. The way the wires are spun to form the strands and the way these strands are spun around the core greatly contribute to the overall performance characteristics of the wire rope.

Surface Finish

An elevator wire rope may have wires in either bright finish, which refers to a wire, which has no additional metallic coating to resist corrosion, or in galvanized finish, which means that the wire has a coating of zinc.

Elevator wire ropes are generally procured in bright finish and seldom as galvanized but the latter may be produced on demand.



Tensile Grade

The tensile grade of a wire rope refers to the tensile designation of its constituent wires. For example, in 1/2" 8 x 19S Dual or 9.5 mm 8 x 19W 1570 the expressions Dual and 1570 refer to the tensile strength of its constituent wires. A dual tensile grade normally implies that outer wires are of lower tensile and inner wires are of higher tensile, for example, 1180/1770 or 1370/1770.

Note : Standards such as ISO 4344 and EN 12385-5 refer these tensile designations in place of Iron, Traction and EHS grade which are commonly used in the United States. 1180/1770 or 1370/1770 grade may be used in place of Traction ropes and 1570/1770 grade in place of EHS ropes. The Iron grade has no equivalent in these International Standards as its lower tensile strength has generally made it obsolete in most hoisting applications. While some older equipment may still specify Iron Grade for Governor Rope applications, most newer equipment is using 1180/1770 grade material.

Strand

The geometrical arrangement of wires in the strand is called its construction. The most common strand constructions are Seale, Warrington and Filler (Filler Wire).

Seale

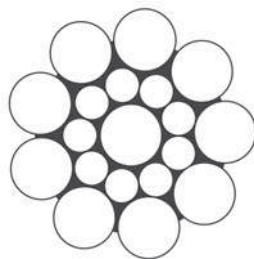
Seale has larger diameter of wires on the outer layer to resist abrasion and has an equal number of smaller wires on the inner layer to provide flexibility.

Warrington

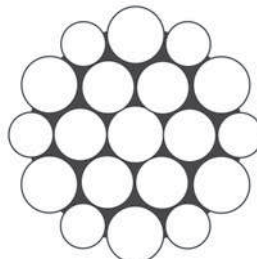
Warrington has an alternative arrangement of smaller and larger wires on the outer layer to combine flexibility with abrasive properties.

Filler (Filler Wire)

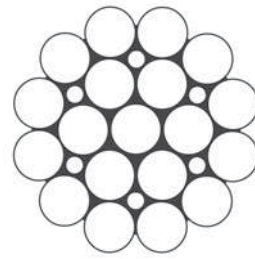
Filler Wire has smaller wires filling the empty spaces between the outer and inner wire layer and offers better fatigue properties along with good abrasion resistance.



Seale



Warrington



Filler (Filler Wire)

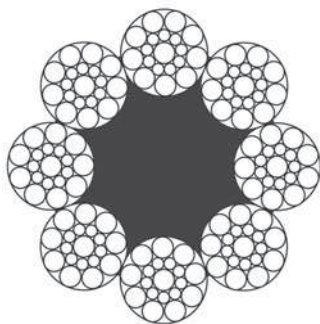
Core

It is the core, which provides support to the outer strands and offers integrity to the wire rope. A wire rope can have a steel core (wire strand core-WSC or independent wire rope core-IWRC) or a fibre core (Natural-Sisal or Synthetic-Polypropylene). For Elevator ropes IWRC is almost always preferred as steel core.

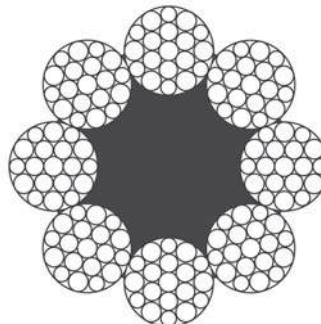
The fibre core provides increased flexibility to the wire rope and in some cases act as a reservoir of lubricant. An independent wire rope core is wire rope in itself, which is used to strengthen the rope and provide resistance to crushing. Its flexibility is however less than a wire rope with fibre core.

Wire Rope Construction

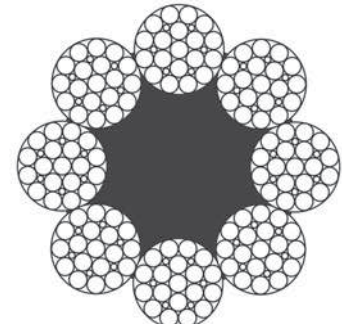
A wire rope is designated by the number of strands and the construction of its strand. For example 8x19S denotes that it is composed of 8 strands and each strand has 19 wires spun together to form a (S) Seale construction. Some other common strand constructions for elevator products are Warrington and Filler and are available in 6, 8 and 9 strand rope construction.



8 x 19S FC



8 x 19W FC



8 x 25F FC



Wire Rope Designation

A wire rope user is expected to specify the correct wire rope for the intended application. It is therefore necessary, besides complete knowledge of the application, to have a clear understanding regarding the basic symbols and terminology adopted to specify a wire rope.

Wire Rope Diameter

A wire rope is designated, first of all, by its size, which is called its 'Nominal Diameter'. For example in 1/2" 8x19S and 9.5mm 8x19W, the dimensions 1/2" and 9.5mm denote the Nominal Diameter of the wire rope.

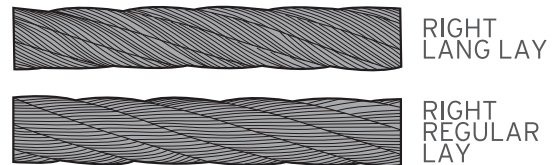
The nominal diameter of the wire rope is used to identify the product in any given table/chart of any product standard and at the same time it is used to calculate the applicable tolerances of rope diameter.

Lay Direction

Lay Direction denotes the direction of helical laying of strands around the core.

If the strands appear to move or rotate in clockwise direction, the rope is Right Lay. A Left Lay is opposite to a right lay and the strands appear to move in counter-clockwise direction.

In Ordinary (or Regular) Lay, the wires in the strand are laid in a direction opposite to that of the strand and appear more-or-less parallel to the rope axis; whereas in Lang Lay the wires in the strand are laid in the same direction in which the strands are laid in the wire rope and appear at an angle to the rope axis.



When ordering an Elevator rope provide as much information as possible.

The following is a general format used to specify a wire rope :

Example-1	1/2"	8x19S	IWRC	1370/1770	Bright	RHL
Example-2	9.5mm	8x19W	FC (Sisal)	1570	Galv	RHO
Specifies	Nominal Rope Diameter	Rope Construction	Core	Tensile Grade	Surface Coating of Wire	Lay Type & Direction

Note : The symbols used by different standards of Elevator Ropes, for instance EN 12385-5, may also be used to specify a wire rope.

Rope Diameter Tolerance

A wire rope cannot be produced to its absolute size and there is always some applicable tolerance. Usha Martin produces its wire ropes to tolerance levels specified in National Standards, International Standards and as specified by the OEMS.

Generally applicable rope diameter tolerance is as given below :

TABLE A

Suspension ropes for traction drive lifts and governor ropes	Rope Designation	Core Type	Nominal Rope Diameter	Tolerance as percentage of nominal diameter	
				Maximum at no load	Minimum at 10% of MBL
	6x19 8x19	Fibre	upto 10mm or 3/8"	+ 6	0
			above 10mm or 7/16"	+ 5	0
	6x19 8x19 9x19	Steel (IWRC)	upto 10mm or 3/8"	+ 3	- 1
			above 10mm or 7/16"	+ 2	- 2

TABLE B

Suspension ropes of roped hydraulic lifts and compensating ropes	Nominal Rope Diameter	Tolerance as percentage of nominal diameter	
		Maximum at no load	Minimum at no load
	6mm < d < 8mm 1/4" < d < 5/16"	+ 6	0
	> 8 mm > 3/8"	+ 5	0

Note : If not specified, we shall produce wire ropes meeting the diameter tolerance values specified in ISO 4344 and EN 12385-5



Extension of Wire Rope

When a wire rope is subjected to load, its constituent wires and strands try to pull down with accompanied reduction in overall size and an increase in wire rope length. This phenomenon is termed as Constructional Stretch and is very difficult to determine empirically because its extent depends primarily on the magnitude of applied load, rope construction and core besides other factors of smaller influence. These factors vary for each instance and are very difficult to quantify exactly. However, based on years of manufacturing experience and available data, the table given below summarizes approximate value of constructional stretch.

The major proportion of constructional stretch occurs immediately after installation of elevator ropes and gradually fades away with cycle of usage, the lighter the load the higher is the time needed for stabilization.

In addition to the above, when loaded, the rope

extends in a manner characterized by proportionality, that is stress is proportional to strain. This extension of wire rope is recoverable, meaning thereby that the rope length becomes same when the applied load is removed, and is termed as Elastic Stretch. A reasonable estimate of elastic stretch may be made by using the values and expression given below :

$$\text{Elastic Stretch (mm)} = [W \times L] / [E \times A]$$

W - Applied Load (N)

L - Rope Length (mm)

E - Modulus of Elasticity (N/mm²)

A - Metallic Area of Rope (mm²)

- 'E' value may be taken as 70,000 N/sq mm for 6 stranded fibre core rope; 55,000 N/sq mm for 8 strand fibre core ropes and 65,000 N/sq mm for 8 & 9 strand steel core ropes.
- Metallic Area of Rope is available with rope manufacturer

Pre-stretching

Pre-stretching is a technique for removing the constructional stretch, prior to use, by cyclically loading the cable until it shows no constructional stretch. It must however be remembered that repeated handling (particularly coiling / uncoiling) of the wire rope reduces the effect of pre-stretching, although temporarily, which is realized again when the wire rope is loaded after installation.

TABLE - C

	Constructional Stretch	Total Stretch
As manufactured wire rope		
6x19 Class with Fibre Core	0.25-0.50%	0.40-0.75%
8x19 Class with Fibre Core	0.50-0.75%	0.70-1.05%
8x19 Class with Steel Core	0.30-0.60%	0.45-0.85%
9x19 Class with Steel Core		
Pre-stretched wire rope		
6x19 Class with Fibre Core	0.10-0.25%	0.25-0.50%
8x19 Class with Fibre Core	0.20-0.35%	0.40-0.65%
8x19 Class with Steel Core	0.10-0.30%	0.25-0.60%
9x19 Class with Steel Core		

- The values stated above are sensitive to the influence of applied load and other test /site condition and has been given for general guidance only.
- The stretch of wire rope in an installation is greatly influenced by the efficiency of wire rope tensioning. If the tension is not equal on each rope of the set then each will stretch in proportion to the applied load and is likely to create vibration and will adversely affect rope performance.



Maintenance

The wires of all elevator ropes produced at Usha Martin are lubricated during stranding process with specialized lubricant and a controlled wiping is employed to regulate its quantity on the finished wire rope. The type of lubricant is carefully selected for each category of Elevator rope considering long service life of these wire ropes and further to ensure that traction is not affected adversely during usage. The natural fibre core is also impregnated with a compatible lubricant to protect the same during its storage and usage.

The lubricant applied during production, however, gradually diminishes during usage and requires to be replenished periodically with a suitable lubricant. The field lubrication is necessary to reduce wear of rope and sheaves, minimize friction between wires, protect wires from corrosion and increase service life of the wire rope.

Follow OEM instructions regarding field lubrication.

- A light viscosity oil with corrosion inhibitors and good penetration is preferred.
- The lubricant may be applied with a spray-can or paint brush or by any other suitable and efficient method.
- The re-lubrication schedule and quantity of lubricant should be decided by maintenance personnel considering atmospheric and technical factors.

Avoid

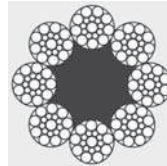
- Excessive Lubrication of hoist ropes - check traction, acceleration & deceleration after re-lubrication by running through complete cycle sufficient number of times.
- Lubrication of governor ropes - it may interfere with the designed safety function of the device. Check OEM's recommendation.

ROPE CLASS 8X19 WITH FIBRE CORE

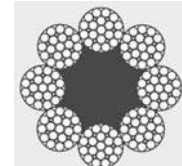
Preferred Rope Construction

8-strand wire rope with

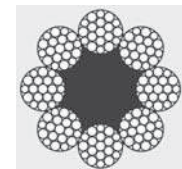
- Seale
- Filler or
- Warrington strand construction and a Fibre Core at the centre
 - Most frequently used world-wide
 - Good Bend Fatigue due to smaller wires
 - Good Elongation properties
 - Better Contact on drum and sheaves



8 x 19S (9-9-1) + FC



8 x 25F (12-6F-6-1) + FC



8 x 19W (6+6-6-1) + FC

TABLE 1 As per ISO 4344

Nominal Rope Diameter	#Equiv. Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force			
			Rope Grade			
			Dual Tensile			Single Tensile
			*1180/1770	1370/1770	**1570/1770	1570
mm	in.	kg/100m	kN	kN	kN	kN
8	5/16	21.8	25.7	28.1	30.8	29.4
9		27.5	32.5	35.6	38.9	37.3
9.5	3/8	30.7	36.2	39.7	43.6	41.5
10		34.0	40.1	44.0	48.1	46.0
11	7/16	41.1	48.6	53.2	58.1	55.7
12		49.0	57.8	63.3	69.2	66.2
12.7	1/2	54.8	64.7	70.9	77.5	74.2
13		57.5	67.8	74.3	81.2	77.7
14		66.6	78.7	86.1	94.2	90.2
14.3	9/16	69.5	82.1	-	98.3	-
15		76.5	90.3	98.9	108	104
16	5/8	87.0	103	113	123	118
17.5	11/16	104	123	-	147	-
18		110	130	142	156	149
19	3/4	123	145	159	173	166
20		136	161	176	192	184
20.6	13/16	144	170	-	204	-
22	7/8	165	194	213	233	223

Note: Rope sizes and breaking force not shown in the table, may be available on request and prior confirmation.

Equivalent Nominal Rope Diameter ('inch') is for reference only as the same has been superseded by metric units (mm)

* 1180/1770 rope grade is equivalent to Traction steel grade, 1370/1770 may also be used

** 1570/1770 rope grade is equivalent to EHS steel grade



TABLE 2 As per EN 12385-5

Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force		
		Rope Grade		
		Dual Tensile		Single Tensile
		1180/1770	1370/1770	1570
mm	kg/100m	kN	kN	kN
8	21.8	25.7	28.1	29.4
9	27.5	32.5	35.6	37.3
10	34.0	40.1	44.0	46.0
11	41.1	48.6	53.2	55.7
12	49.0	57.8	63.3	66.2
13	57.5	67.8	74.3	77.7
14	66.6	78.7	86.1	90.2
15	76.5	90.3	98.9	104
16	87.0	103	113	118
18	110	130	142	149
19	123	145	159	166
20	136	161	176	184
22	165	194	213	223

Note: Rope sizes and breaking force not shown in the table, may be available on request and prior confirmation.

TABLE 3 US Customary Units
Wire Rope conforms to the applicable sections of ISO 4344

Nominal Rope Diameter	#Equiv. Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force			
			Rope Grade			
			Dual Tensile			Single Tensile
			*1180/1770	1370/1770	**1570/1770	1570
in.	mm	lb./ft.	lbs.	lbs.	lbs.	lbs.
1/4	6.3	0.09	3,580	3,920	4,290	4,100
5/16	8	0.15	5,780	6,320	6,920	6,610
3/8	9.5	0.21	8,140	8,930	9,800	9,330
7/16	11	0.28	10,930	11,960	13,060	12,520
1/2	12.7	0.37	14,550	15,940	17,420	16,680
9/16	14.3	0.47	18,460	20,210	22,100	21,150
5/8	16	0.58	23,160	25,400	27,650	26,530
11/16	17.5	0.70	27,650	30,260	33,050	31,670
3/4	19	0.83	32,600	35,750	38,890	37,320
13/16	20.6	0.97	38,220	41,930	45,860	43,890
7/8	22	1.11	43,620	47,890	52,380	50,140
15/16	23.8	1.30	51,160	56,020	61,240	58,630
1	25.4	1.47	58,220	63,750	69,700	66,720
1-1/16	27	1.66	65,740	71,980	78,700	75,340

Note: Rope sizes and breaking force not shown in the table, may be available on request and prior confirmation.

Equivalent Nominal Rope Diameter ('mm') is for reference only

* 1180/1770 rope grade is equivalent to Traction steel grade, 1370/1770 may also be used

** 1570/1770 rope grade is equivalent to EHS steel grade

ROPE CLASS 8X19 WITH STEEL CORE

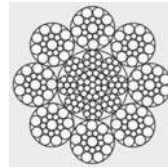
Preferred Rope Construction

8-strand wire rope with

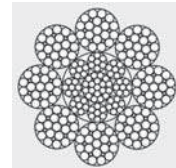
- Seale
- Filler or
- Warrington strand construction

and a Steel Core (IWRC) at the centre

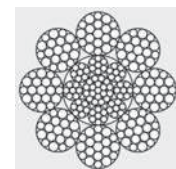
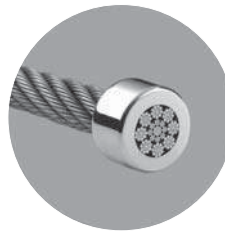
- Very Good Bend Fatigue values
- Very Good Elongation properties
- Better Crushing resistance
- Better Contact on drum and sheaves



8 x 19S (9-9-1) + IWRC



8 x 25F (12-6F-6-1) + IWRC



8 x 19W (6+6-6-1) + IWRC

TABLE 4 As per ISO 4344

Nominal Rope Diameter	#Equiv. Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force				
			Rope Grade				
			Dual Tensile			Single Tensile	
			*1180/1770	1370/1770	**1570/1770	1570	1770
mm	in.	kg/100m	kN	kN	kN	kN	kN
8	5/16	26.0	33.6	35.8	38.0	35.8	40.3
9		33.0	42.5	45.3	48.2	45.3	51.0
9.5	3/8	36.7	47.4	50.4	53.7	50.4	56.9
10		40.7	52.5	55.9	59.5	55.9	63.0
11	7/16	49.2	63.5	67.6	71.9	67.6	76.2
12		58.6	75.6	80.5	85.6	80.5	90.7
12.7	1/2	65.6	84.7	90.1	95.9	90.1	102
13		68.8	88.7	94.5	100	94.5	106
14		79.8	102	110	117	110	124
15		91.6	118	126	134	126	142
16	5/8	104	134	143	152	143	161
18		132	170	181	193	181	204
19	3/4	147	190	202	215	202	227
20		163	210	224	238	224	252
22	7/8	197	254	271	288	271	305

Note : Rope sizes and breaking force not shown in the table, may be available on request and prior confirmation.

Equivalent Nominal Rope Diameter ('Inch') is for reference only as the same has been superseded by metric units (mm)

* 1180 / 1770 rope grade is equivalent to Traction steel grade, 1370/1770 may also be used

** 1570 / 1770 rope grade is equivalent to EHS steel grade



TABLE 5 As per EN 12385-5

Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force			
		Rope Grade			
		Dual Tensile		Single Tensile	
		1370/1770	1570/1770	1570	1770
mm	kg/100m	kN	kN	kN	kN
8	26.0	35.8	38.0	35.8	40.3
9	33.0	45.3	48.2	45.3	51.0
10	40.7	55.9	59.5	55.9	63.0
11	49.2	67.6	71.9	67.6	76.2
12	58.6	80.5	85.6	80.5	90.7
13	68.7	94.5	100	94.5	106
14	79.8	110	117	110	124
15	91.6	126	134	126	142
16	104	143	152	143	161
18	132	181	193	181	204
19	147	202	215	202	227
20	163	224	238	224	252
22	197	271	288	271	305

Note : Rope sizes and breaking force not shown in the table, may be available on request and prior confirmation.

TABLE 6 US Customary Units
Wire Rope conforms to the applicable sections of ISO 4344

Nominal Rope Diameter	#Equiv. Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force				
			Rope Grade				
			Dual Tensile			Single Tensile	
			*1180/1770	1370/1770	**1570/1770	1570	1770
in.	mm	lb./ft.	lbs.	lbs.	lbs.	lbs.	lbs.
5/16	8	0.17	7,550	8,050	8,540	8,050	9,060
3/8	9.5	0.25	10,660	11,330	12,070	11,330	12,790
7/16	11	0.33	14,280	15,200	16,160	15,200	17,130
1/2	12.7	0.44	19,040	20,260	21,560	20,260	22,930
9/16	14.3	0.56	24,140	25,700	27,330	25,700	28,970
5/8	16	0.70	30,130	32,150	34,170	32,150	36,200
11/16	17.5	0.84	36,150	38,480	40,930	38,480	43,380
3/4	19	0.99	42,720	45,410	48,340	45,410	51,030
13/16	20.6	1.16	50,100	53,320	56,720	53,320	60,120
7/8	22	1.32	57,100	60,930	64,750	60,930	68,570

Note : Rope sizes and breaking force not shown in the table, may be available on request and prior confirmation.

Equivalent Nominal Rope Diameter ('mm') is for reference only

* 1180 / 1770 rope grade is equivalent to Traction steel grade, 1370/1770 may also be used

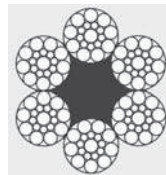
** 1570 / 1770 rope grade is equivalent to EHS steel grade

ROPE CLASS 6X19 WITH FIBRE CORE

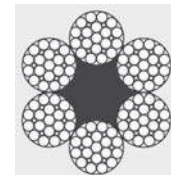
Preferred Rope Construction

6-strand wire rope with

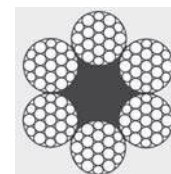
- Seale
- Filler or
- Warrington strand construction and a Fibre Core at the centre
- 6x19 is mostly used as Governor Rope
- Good Bend Fatigue values
- Good Elongation properties



6 x 19S (9-9-1) + FC



6 x 25F (12-6F-6-1) + FC



6 x 19W (6+6-6-1) + FC

TABLE 7 As per ISO 4344

Nominal Rope Diameter	#Equiv. Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force			
			Rope Grade			
			Dual Tensile		Single Tensile	
			*1180/1770	1370/1770	1570	**1770
mm	in.	kg/100m	kN	kN	kN	kN
6		12.9	16.3	17.8	18.7	21.0
6.3	1/4	14.2	17.9	-	-	23.2
6.5		15.2	19.1	20.9	21.9	24.7
8	5/16	23.0	28.9	31.7	33.2	37.4
9		29.1	36.6	40.1	42.0	47.3
9.5	3/8	32.4	40.8	44.7	46.8	52.7
10		35.9	45.2	49.5	51.8	58.4
11	7/16	43.4	54.7	59.9	62.7	70.7
12		51.7	65.1	71.3	74.6	84.1
12.7	1/2	57.9	72.9	79.8	83.6	94.2
13		60.7	76.4	83.7	87.6	98.7
14		70.4	88.6	97.0	102	114
14.3	9/16	73.4	92.4	-	-	119
15		80.8	102	111	117	131
16	5/8	91.9	116	127	133	150
17.5	11/16	110	138	-	-	179
18		116	146	160	168	189
19	3/4	130	163	179	187	211
20		144	181	198	207	234
20.6	13/16	152	192	-	-	248
22	7/8	174	219	240	251	283

Note : Rope sizes and breaking force not shown in the table, may be available on request and prior confirmation.

Equivalent Nominal Rope Diameter ('inch') is for reference only as the same has been superseded by metric units (mm)

* 1180 / 1770 rope grade is equivalent to Traction steel grade, 1370/1770 may also be used

** 1770 rope grade is equivalent to EHS steel grade



TABLE 8 As per EN 12385-5

Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force			
		Rope Grade			
		Dual Tensile		Single Tensile	
		1180/1770	1370/1770	1570	1770
mm	kg/100m	kN	kN	kN	kN
6	12.9	16.3	17.8	18.7	21.0
6.5	15.2	19.1	20.9	21.9	24.7
8	23.0	28.9	31.7	33.2	37.4
9	29.1	36.6	40.1	42.0	47.3
10	35.9	45.2	49.5	51.8	58.4
11	43.4	54.7	59.9	62.7	70.7
12	51.7	65.1	71.3	74.6	84.1
13	60.7	76.4	83.7	87.6	98.7
14	70.4	88.6	97.0	102	114
15	80.8	102	111	117	131
16	91.9	116	127	133	150
18	116	146	160	168	189
19	130	163	179	187	211
20	144	181	198	207	234
22	174	219	240	251	283

Note : Rope sizes and breaking force not shown in the table, may be available on request and prior confirmation.

TABLE 9 US Customary Units

Wire Rope conforms to the applicable sections of ISO 4344

Nominal Rope Diameter	#Equiv. Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force			
			Rope Grade			
			Dual Tensile		Single Tensile	
			*1180/1770	1370/1770	1570	**1770
in.	mm	lb./ft.	lbs.	lbs.	lbs.	lbs.
1/4	6.3	0.10	4,020	4,420	4,620	5,220
5/16	8	0.15	6,500	7,130	7,460	8,410
3/8	9.5	0.22	9,170	10,050	10,520	11,850
7/16	11	0.29	12,300	13,470	14,100	15,890
1/2	12.7	0.39	16,390	17,940	18,800	21,180
9/16	14.3	0.49	20,770	22,760	23,820	26,750
5/8	16	0.62	26,080	28,550	29,900	33,720
11/16	17.5	0.74	31,030	34,080	35,670	40,240
3/4	19	0.87	36,650	40,240	42,040	47,440
13/16	20.6	1.02	43,170	47,230	49,430	55,760
7/8	22	1.17	49,240	53,960	56,430	63,620
15/16	23.8	1.37	57,620	63,090	66,030	74,450
1	25.4	1.56	65,580	71,800	75,150	84,720
1-1/16	27	1.76	74,040	81,070	84,850	95,660

Note : Rope sizes and breaking force not shown in the table, may be available on request and prior confirmation.

Equivalent Nominal Rope Diameter ('inch') is for reference only

* 1180 / 1770 rope grade is equivalent to Traction steel grade, 1370/1770 may also be used

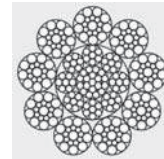
** 1770 rope grade is equivalent to EHS steel grade

ROPE CLASS 9X19 WITH STEEL CORE

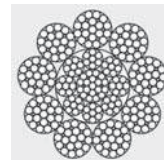
Preferred Rope Construction

9-strand wire rope with

- Seale
- Filler or
- Warrington strand construction and a Steel Core (IWRC) at the centre
 - Excellent Bend Fatigue values
 - Very Good Elongation properties
 - Very Good Crushing resistance
 - Enhanced Contact on drum and sheaves



9 x 19S (9-9-1) + IWRC



9 x 25F (12-6F-6-1) + IWRC

TABLE 10 SI Units

Wire Rope conforms to the applicable sections of ISO 4344 & EN 12385

Nominal Rope Diameter	#Equiv. Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force			
			Rope Grade			
			Dual Tensile		Single Tensile	
			1370/1770	*1570/1770	1570	1770
mm	in.	kg/100m	kN	kN	kN	kN
8	5/16	27.8	39.6	42.1	39.6	44.6
9		35.2	50.1	53.3	50.1	56.5
9.5	3/8	39.3	55.8	59.4	55.8	62.9
10		43.5	61.9	65.8	61.9	69.7
11	7/16	52.6	74.8	79.6	74.8	84.4
12		62.6	89.1	94.7	89.1	100
12.7	1/2	70.2	99.8	106	99.8	112
13		73.5	105	111	105	118
14		85.3	121	129	121	137
15		97.9	139	148	139	157
16	5/8	111	158	168	158	179
17.5		133	189	202	189	214
18		141	200	213	200	226
19	3/4	157	223	238	223	252
20		174	247	263	247	279
22	7/8	211	299	318	299	338

Note : Rope sizes and breaking force not shown in the table, may be available on request and prior confirmation.

Equivalent Nominal Rope Diameter ('inch') is for reference only

* 1570 / 1770 rope grade is equivalent to EHS steel grade



TABLE 11 US Customary Units
Wire Rope conforms to the applicable sections of ISO 4344

Nominal Rope Diameter	#Equiv. Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force			
			Rope Grade			
			Dual Tensile		Single Tensile	
			1370/1770	*1570/1770	1570	1770
in.	mm	lb./ft.	lbs.	lbs.	lbs.	lbs.
5/16	8	0.19	8,900	9,470	8,900	10,030
3/8	9.5	0.26	12,550	13,350	12,550	14,150
7/16	11	0.35	16,830	17,900	16,830	18,970
1/2	12.7	0.47	22,430	23,860	22,430	25,290
9/16	14.3	0.60	28,440	30,250	28,440	32,060
5/8	16	0.75	35,600	37,870	35,600	40,140
11/16	17.5	0.90	42,590	45,300	42,590	48,020
3/4	19	1.06	50,200	53,400	50,200	56,600
13/16	20.6	1.24	59,020	62,770	59,020	66,530
7/8	22	1.41	67,310	71,600	67,310	75,880

Note : Rope sizes and breaking force not shown in the table, may be available on request and prior confirmation.

Equivalent Nominal Rope Diameter in metric units ('mm') is for reference only

* 1570 / 1770 rope grade is equivalent to EHS steel grade

Safety Information

- Wire rope will fail if worn out, shock loaded, overloaded, misused, damaged, improperly maintained or abused.
- Always inspect wire rope for wear, damage or abuse before use.
- Never use a wire rope which is worn out, damaged, corroded or abused.
- Never overload or shock load a wire rope.
- Use the correct design factor for the application.
- Inform yourself : Read and understand the machinery manufacturers handbook and guidance from the wire rope manufacturer.
- Refer to applicable directives, regulations, standards and codes concerning inspection, examination and rope removal criteria.

All statements, technical information and recommendations contained herein are believed to be reliable, but no guarantee is given as to their accuracy and/or completeness. The user must determine the suitability of the product for his own particular purpose, either alone or in combination with other products and shall assume all risk and liability in connection therewith.

Whilst every attempt has been made to ensure accuracy in the content of the tables, the information contained in this catalogue does not form any part of a contract.

Corporate Office

USHA MARTIN LIMITED

2A, Shakespeare Sarani, 'Mangal Kalash', Kolkata - 700071
Phone: +91 33 3980 0300, Fax: +91 33 2282 9029/ 3980 0500
Email: feedback@ushamartin.com
CIN: L31400WB1986PLC091621

Domestic Offices

East Regional Office

USHA MARTIN LIMITED

2A, Shakespeare Sarani
'Mangal Kalash'
Kolkata - 700071
Phone: +91 33 3980 0300/ 0458
Fax: +91 33 2282 9029/ 3980 0500
Email: marketing-east@ushamartin.com

South Regional Office

USHA MARTIN LIMITED

Plot No. L9 (1), Phase-II
Sipcot Industrial Park, Sriperumbudur
Kancheepuram - 602105
Chennai, Tamilnadu
Phone: +91 44 3717 5100 (24 Lines)
Fax: +91 44 3717 5200
Email: marketing-south@ushamartin.com

North Regional Office

USHA MARTIN LIMITED

701, 'Surya Kiran'
19, Kasturba Gandhi Marg
New Delhi - 100 001
Phone: +91 11 2331 5156 / 5157 / 5158
2371 1232 / 2371 5220
Fax: +91 11 2332 0723 / 5586
Email: marketing-north@ushamartin.com

West Regional Office

USHA MARTIN LIMITED

168, CST Road,
Agarwal Industrial Estate
Kalina, Santa Cruz (E)
Mumbai - 400 098
Phone: +91 22 3064 5400
Fax: +91 22 2652 6774
Email: marketing-west@ushamartin.com

Overseas Offices

USHA MARTIN UK LIMITED

Tasman House, Mariner Court
Clydebank, Glasgow, UK G81 2NR, UK
Tel: + 44 (0)141 951 8801
Fax: + 44 (0) 141 951 8802
Email: marketing-uk@ushamartin.com

EUROPEAN MANAGEMENT & MARINE CORP.

Howe Moss Place, Kirhill Industrial Estate
Dyce, Aberdeen AB 21 OGS, Scotland, U.K
Ph: +44 1224 77 5151
Fax: +44 1224 775252
Email: info@emmcorp.com

BRUNTON SHAW UK

(A Division of Usha Martin UK Limited)
Sandy Lane, Workshop, S80 3ES, UK
Tel: + 44 1909 537 600
Fax: + 44 1909 500 199
Email: info@brunton-shaw.co.uk

DE RUITER STAALKABEL B.V.

Ringerstraat 7, 3164 BA, Slidrecht
Holland
Tel: + 31 (0)184 49 9999
Fax: +31 (0) 184 41 8351
Email: sales@drstk.nl

USHA MARTIN AMERICAS, INC

701 Plastics Avenue, Houston
Texas 77020, USA
Ph: +1 713 676 1800
Fax: +1 713 676 1166
Email: marketing-us@ushamartin.com

USHA MARTIN AUSTRALIA PTY LTD

Unit 2/ 468-470, Victoria Street
St.Wetherill Park, NSW 2164, Australia
Ph: +61 296 094971
Fax: +61 297 566516
Email: marketing-australia@ushamartin.com

USHA MARTIN SINGAPORE PTE LIMITED

91 Tuas Bay Drive, Usha Martin Building,
Singapore - 637307
Ph: +65 6265 7756
Fax: +65 6265 7226
Email: marketing-singapore@ushamartin.com

USHA MARTIN VIETNAM CO. LTD

823 Huynh Tan Phat, Hamlet 6
Phu Xuan Commune Nha Be District
Ho Chi Minh City, S.R Vietnam
Tel: +84 8 3781 8196
Fax: +84 8 3781 8171
HP: +84 903702469
Email : marketing-vietnam@ushamartin.com

PT. USHA MARTIN INDONESIA

Konica Building 3A Fl
Jl. Gunung Sahari Raya 78
Jakarta 10610 - Indonesia
Ph: +62 21 42870794
Fax: +62 21 42870795
Email: marketing-indonesia@ushamartin.com

BRUNTON WOLF WIRE ROPES FZCO

P.O. Box. 17491, M00301
Jebel Ali Free Zone, Dubai, U.A.E
Tel: + 971 04 8838151
Fax: + 971 04 8838152
Email: marketing-bsme@ushamartin.com

USHA SIAM STEEL INDUSTRIES PUBLIC CO. LTD

209 K-Tower-B, 22nd Floor, Unit 3/1
Sukhumvit 21 Road (Asok)
Bangkok - 10110, Thailand
Tel: +662 261 7361 to 64
Fax: +662 640 8227
Email: marketing-thailand@ushamartin.com

USHA MARTIN EUROPE B.V.

Leerlooierstraat 3
2984 BK Ridderkerk
Holland
Phone: +31 (0)180 74 50 99
Mobile: +31 (0)635 11 29 31
E-mail: d.gelton@ushamartineurope.com

USHA MARTIN CHINA CO. LTD.

No. 122, East FuTe No. 1 Rd. Wai Gao Qiao Free Trade Zone,
Shanghai, P.R. China (Shanghi) Pilot Free Trade Zone,
Postal Code: 200131
Tel: +86 21 6858 8699
Fax: +86 21 6858 8711
Email: yhw@umchina.com.cn