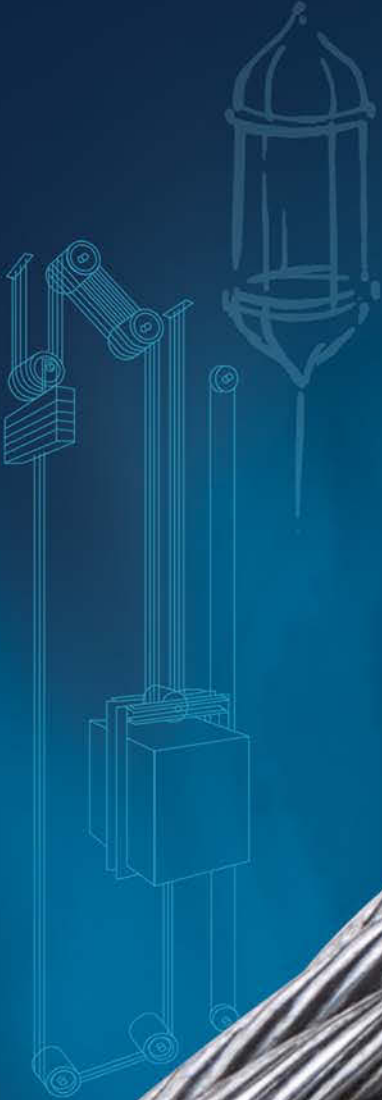




ELEVATOR ROPES

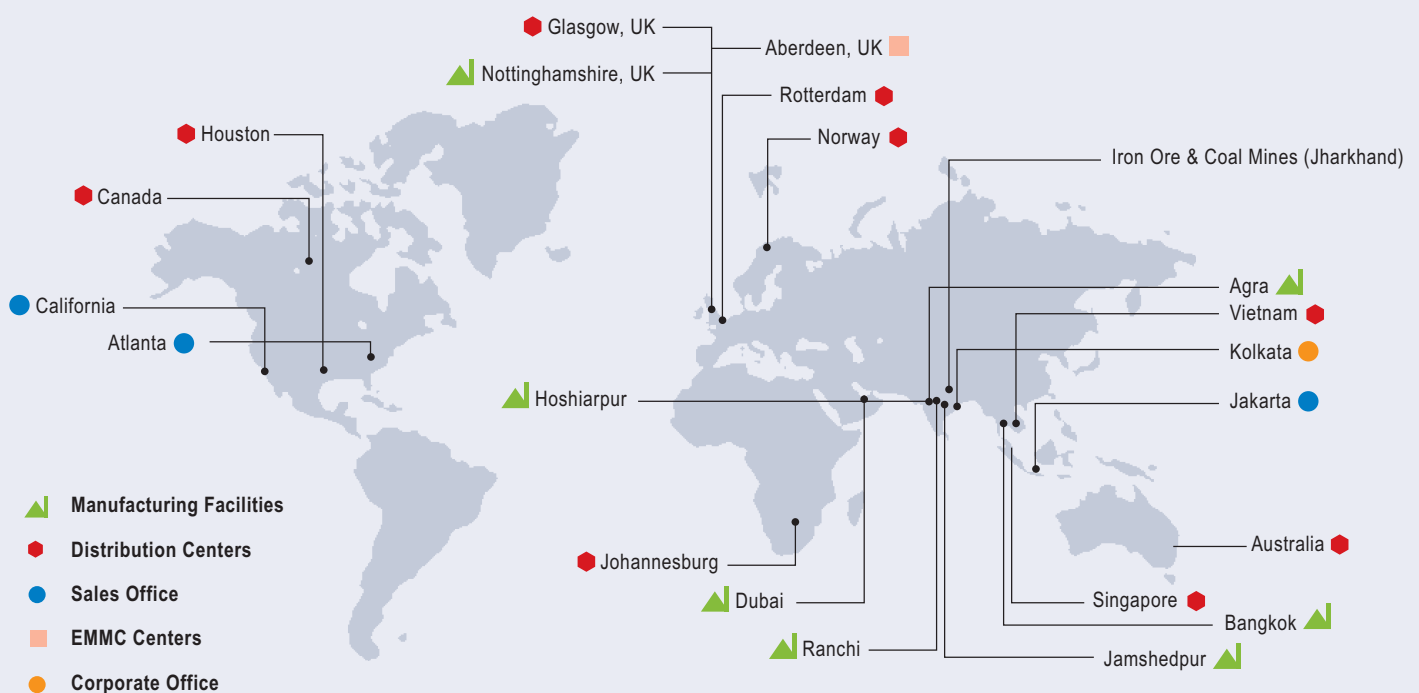


usha martin

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.



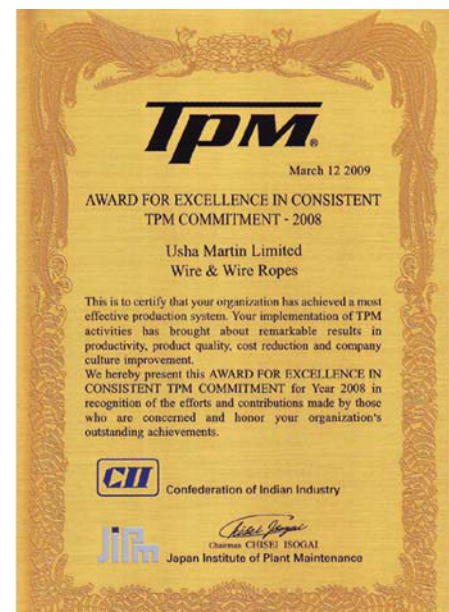
CERTIFICATIONS

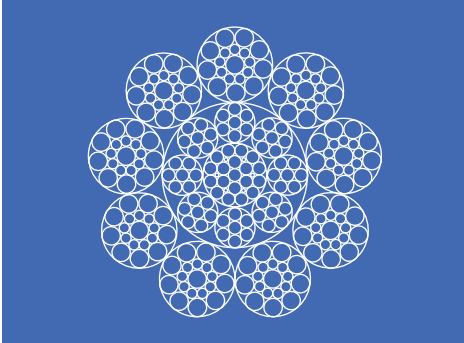
Accreditation

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**.

MANUFACTURING PROCESS

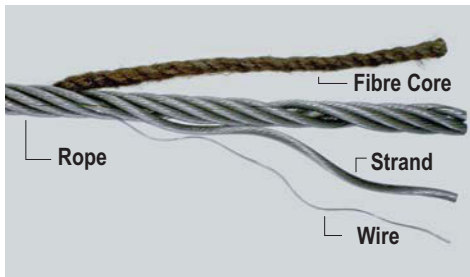
Manufacturing Machines

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

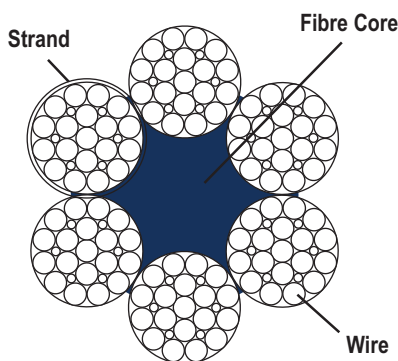


Wire Rope is an intricate device, a composite structure, made up of a number of individual units, called wires, which are designed and produced in such a manner that they always exist and work in some precise relationship with one another. This precise relationship of individual wires, which possess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

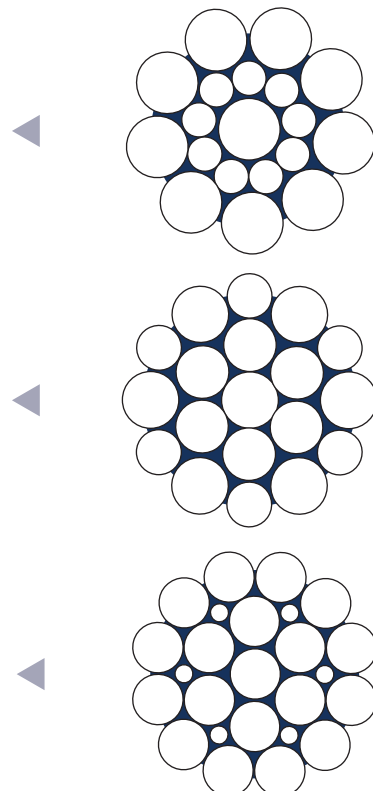
Seale has larger diameter of wires on the outer layer to resist abrasion and has an equal number of smaller wires on the inner layer to provide flexibility.

Warrington

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

Filler (Filler Wire)

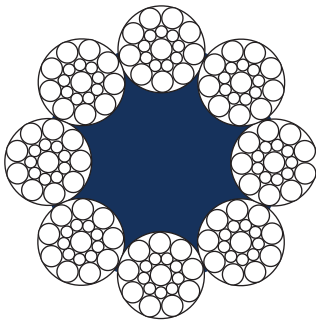
Filler Wire has smaller wires filling the empty spaces between the outer and inner wire layer and offers better fatigue properties along with good abrasion resistance.



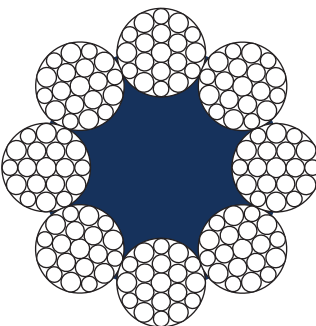
Core

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.

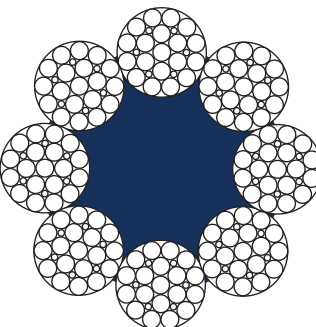
The **fibre core** provides increased flexibility to the wire rope and in some cases act as a reservoir of lubricant. An **independent wire rope** core is wire rope in itself, which is used to strengthen the rope and provide resistance to crushing. Its flexibility is however less than a wire rope with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



8 x 19S FC



8 x 19W FC



8 x 25F FC

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.

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.

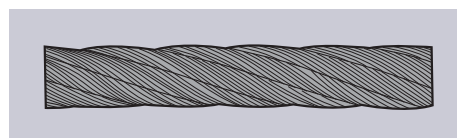
The nominal diameter of the wire rope is used to identify the product in any given table/chart of any product standard and at the same time it is used to calculate the applicable tolerances of rope diameter.

Lay Direction

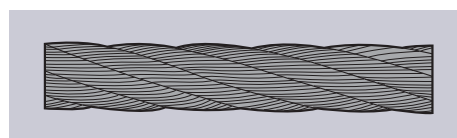
Lay Direction denotes the direction of helical laying of strands around the core.

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.



RIGHT LANG LAY



RIGHT REGULAR LAY

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 9x19 Class with Steel Core	0.30–0.60%	0.45–0.85%
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 9x19 Class with Steel Core	0.10–0.30%	0.25–0.60%

- 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.**

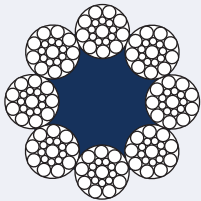


Rope Class 8x19 with Fibre Core

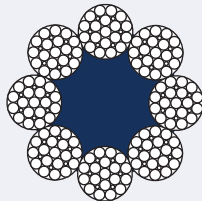
Preferred Rope Construction

8-strand wire rope with

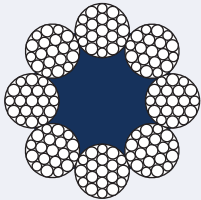
- Seale
- Filler or
- Warrington strand construction and a Fibre Core at the centre
 - Most frequently used world-wide
 - Good Bend Fatigue due to smaller wires
 - Good Elongation properties
 - Better Contact on drum and sheaves



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	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	Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force		
			Rope Grade		
			Dual Tensile		Single Tensile
			1180/1770	1370/1770	1570
As per EN 12385-5	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	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
US Customary Units Wire Rope conforms to the applicable sections of ISO 4344	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

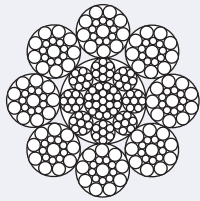


Rope Class 8x19 With Steel Core

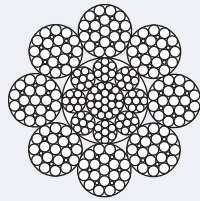
Preferred Rope Construction

8-strand wire rope with

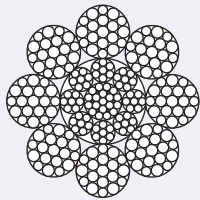
- Seale
- Filler or
- Warrington strand construction and a Steel Core (IWRC) at the centre
 - Very Good Bend Fatigue values
 - Very Good Elongation properties
 - Better Crushing resistance
 - Better Contact on drum and sheaves



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	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

As per
ISO 4344

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	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
As per EN 12385-5	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	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.
US Customary Units Wire Rope conforms to the applicable sections of ISO 4344	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

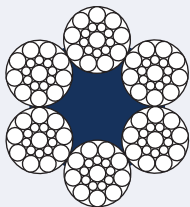


Rope Class 6x19 with Fibre Core

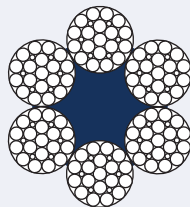
Preferred Rope Construction

6-strand wire rope with

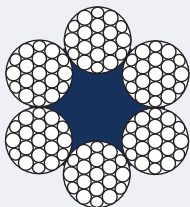
- Seale
- Filler or
- Warrington strand construction and a Fibre Core at the centre
 - 6x19 is mostly used as Governor Rope
 - Good Bend Fatigue values
 - Good Elongation properties



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	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

As per
ISO 4344

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	Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force			
			Rope Grade			
			Dual Tensile		Single Tensile	
			1180/1770	1370/1770	1570	1770
As per EN 12385-5	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.

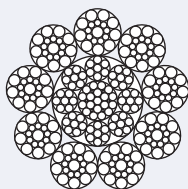
TABLE 9	Nominal Rope Diameter	#Equiv. Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force			
				Rope Grade			
				Dual Tensile		Single Tensile	
				*1180/1770	1370/1770	1570	**1770
US Customary Units Wire Rope conforms to the applicable sections of ISO 4344	in.	mm	lb./ft.	lbs.	lbs.	lbs.	lbs.
	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.

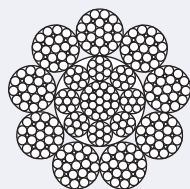
Equivalent Nominal Rope Diameter ('inch') is for reference only

* 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



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



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

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

TABLE 10	Nominal Rope Diameter	#Equiv. Nominal Rope Diameter	Approx. Mass	Minimum Breaking Force			
				Rope Grade			
				Dual Tensile		Single Tensile	
				1370/1770	*1570/1770	1570	1770
SI Units Wire Rope conforms to the applicable sections of ISO 4344 & EN 12385	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	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.
US Customary Units	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
Wire Rope conforms to the applicable sections of ISO 4344	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.



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