



INDIAN OFFICES

MUMBAI (HO)

Tata Steel Limited
Wire Division
16th Floor,
R Tech Park Nirlon Complex
Western Express Highway Goregaon
East, Mumbai 400063
Tel: +91 22 66425200

BANGALORE

Tata Steel Limited
Wire Division
Jubilee Bldg, A Wing,
2nd Floor, 45 Museum Road,
Bangalore 560025
Tel: 080 66950000

BHUBANESHWAR

Tata Steel Limited
2/B, Fortune Tower
Chandrasekharpur
Bhubaneswar-751023
Tel: 09040093374

INDORE

Tata Steel Limited
3rd Floor, NRK Business Park,
B -1, Scheme No. 54, Vijayanagar
Square, Indore 452010
Tel: 073 16450191

KOLKATA

Tata Steel Limited
Wire Division
52 Jawaharlal Nehru Road
2nd Floor, Kolkata 700071
Tel: +91 033 22825069

NEW DELHI

Tata Steel Limited
Hindustan Times House, 15th Floor,
10-20, Kasturba, Gandhi Marg,
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Tel: 011 23327072 / 73 / 74
011 65544000

AHMEDABAD

Tata Steel Limited
172/2, Premchand House Annexe,
Ashram Road,
Ahmedabad, 380009
Tel: 079 66612600

PUNE

Tata Steel Limited
Office no. 6 & 7, Second Floor
Wing B, Great Eastern plaza
Old Airport road, Yerwada,
Pune - 411 006
Tel: 020 65600554

CHENNAI

Tata Steel Limited
Wire Division
8th Floor, Sigapi Achi Building 1819,
Rukmini Lakshmiipathi Road Egmore,
Chennai 600008
Tel: 044 66960026 / 27

HYDERABAD

Tata Steel Limited
6th Floor, Gummidielli Towers,
1-10-39-To-44, Begumpet,
Hyderabad-500016
Tel: 040 66261020

JAIPUR

Tata Steel Limited
G-Business Park, 6th Floor, D-34,
Near Agrasen Circle, C-Scheme,
Subhash Marg, Jaipur - 302001
Tel: 0141 6518572

COIMBATORE

Tata Steel Limited
New No. 97, Race Course Road,
Opp. K G Theatre
Coimbatore 641018
Tel: 042 22309028 / 58

OVERSEAS OFFICES

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Clo Tata Consultancy Services
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New Jersey 08837, USA
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Mr. Anil Bhandari
Email: anil.bhandari@tatasteel.com

USA

Tata Sales International Americas
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Mr. Rajiv Ranjan
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Mr. Shuja Haque
Email: shuja.haque@tatasteel.com

MANUFACTURING PLANTS

INDIA

Tata Steel Limited
Tarapur Complex
MIDC Tarapur Industrial Area
Thane 401 506
Tel: 91 (2525) 295000

THAILAND

TSN Wires Co. Ltd.
Rasa Tower 1, 14th Floor 555
Phaholyothin Road Chatuchak
Bangkok 10900
Tel: (+66) 2937 0060
Fax: (+66) 2937 0068 2937 0069
Email: tsn_sale@tsnwires.co.th
Website: www.tsnwires.co.th

THAILAND

The Siam Industrial Wire Co. Ltd.
555 Rasa Tower, 14th Floor,
Phaholyothin Road,
Chatuchak, Bangkok 10900
Tel: (66-2) 9370068 / (66-2) 9370069

TATA STEEL GLOBAL WIRES BUSINESS



STRANDS FOR PRE-STRESSING OF CONCRETE



TATA STEEL GLOBAL WIRES BUSINESS

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E-mail: wiresforinfra@wires.tatasteel.com www.tatawire.com

TATA STEEL

Established in 1907, Tata Steel is among the top ten global steel companies with a crude steel production capacity of over 28 million tonnes per annum (mtpa). A Fortune 500 company, the Tata Steel Group is the world's second most geographically diversified steel producer, employing over 80,000 people across five continents in nearly 50 countries. The Group's vision is to be the world's steel industry benchmark in Value Creation and Corporate Citizenship through the excellence of its people, its innovative approach and overall conduct. Underpinning the vision is a performance culture committed to aspirational targets, safety and social responsibility, continuous improvement, openness and transparency.

TATA STEEL GLOBAL WIRES BUSINESS

With manufacturing facilities in India and Thailand and a global sales network, this Group is among the top Wire Manufacturers in the world. It manufactures a variety of wires for the Automobile, Construction, Power and General Engineering industries, in single and stranded forms.

Highlights

- Fully integrated manufacturing facilities from Iron Ore Mining to Steel Wires
- A wealth of expertise and experience in wire drawing, with the latest manufacturing facilities
- Equipped to meet exacting specifications of customers
- Established products across India, Thailand, China, Sri Lanka, USA, Europe, Australia and Middle East
- Backed by a strong R&D set-up.



STORAGE AND HANDLING AT SITE

It is important to emphasize that proper care be taken during storage and use of strands at site.

Failure to observe simple precautions against damage and corrosion can cause severe repercussions at later stages

Tata Wiron strands are available in both dry and oiled conditions.

Oiled Condition: Water soluble oil is used to protect the strand during storage, which can be easily washed away with water during use.

Dry Condition: VCI paper (Rust Preventive) and polyethylene are used to protect the strands. However, if the strands are stored onsite for a long period, then precautions should be taken through some form of external protection to avoid the risk of corrosion or localised pitting.

Recommended procedure for proper storage and handling at site

- Strands should be unloaded under a shed or cover as far as possible.
- For short term storage outdoors, coils should be stacked on timber support and covered with a waterproof sheet. Care should be taken to ensure air circulation to avoid condensation. For long term storage outside, in addition to the above precautions, it is advisable to keep a small bag of vapour phase inhibitor.
- Steel cutting should be effected with abrasive disc cutters or shears. Using flame cutters or exposing steel to sources of heat can alter the micro structure and change the properties/ characteristics of steel.

Pull Direction

Place the strand pack in a strand cage so that the arrow pull direction faces the opening.

Space Considerations

- There should be NO SPACE between the strand pack and the frame of the strand cage prior to cutting the steel straps.
- When there is space, insert spacers (such as wooden boards) prior to cutting banding straps.

Note: Excessive expansion of the pack may cause entangling of strands.



PC Strand Wire is coiled under high tension. Ensure adequate safety measures while uncoiling.

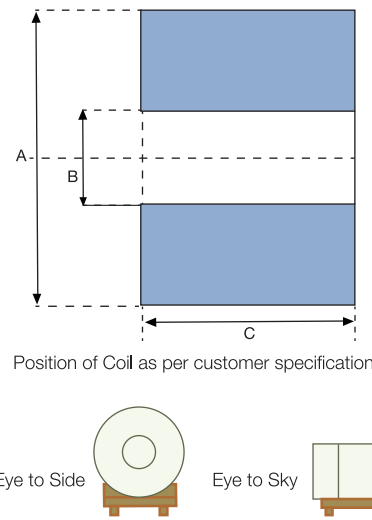
Tata Steel Global Wires Division is committed to protecting the environment. Any suggestions from our customers to help us do so are welcome.

DIMENSIONS OF REELESS COIL

Tata Wiron Low Relaxation PC Strand can be supplied in dry or oiled condition as per the customer's requirement. Oil used can be easily washed away with plain water at site before stressing and grouting operations.

PC strands are supplied in cheese coils from 1MT to 3.5 MT as per the customer's need. These coils are suitably strapped for compactness and depending on the customer's requirement, are packed or palletised.

The starting end of the strand is separately identified and can be easily located in the coil.



Nominal Diameter Strand (inches)	A	B	C	Approximate Length per pack (feet) of (Corresponding to coil weight of 2.5 to 3.5 MT)
	Outside Diameter (inches)	Inside Diameter (inches)	Width (inches)	
3/8	59 max	31 min	30 max	22,000
7/16				16,000
1/2				12,000
0.6				8,600



TATA STEEL GLOBAL WIRES - INDIA

Tata Steel Global Wires - India is the country's leading producer of Steel Wires and one of the largest in Asia. It is also a leader in the international wire industry, well-established in Europe, USA, Middle East, and Australia. The Company has fully integrated manufacturing cycles, from sourcing of raw materials to in-house steel making and wire rod rolling facilities. This has led to a comprehensive extension of technology support to all the wire units in its fold at Tarapur, Indore and Jamshedpur. All the units of operation adhere to strict quality parameters and are ISO certified. It manufactures a wide range of wires catering to the needs of various industry segments such as automobile, infrastructure, power and general engineering.

Low Relaxation Pre-stressed Concrete (LRPC) Strands and Pre-stressed Concrete (PC) Wires cater to the infrastructure segment requirements for building bridges, dams and many other large structures. The products are well-established in the entire country in the construction, fencing and farming sectors, and the brand TATA WIRON is well-accepted by consumers.

In India, the unit has set up a world-class manufacturing facility at Tarapur and has also been the sole supplier of pre-stressed concrete strands used in the construction of pre-cast segments for the 4.7 kms, 8-lane-cable-stayed Bandra-Worli Sea Link in Mumbai, India, as well as many other flagship infrastructure projects across the world.



PC Strand Applications

Low Relaxation PC Stranded Wires are used in pre-stressed concrete girders for road, river & railway bridges, flyovers, pre-stressed atomic reactor domes, slabs, silos, hangars, aqueducts, LNG terminals, high-rise buildings, rock anchoring, windmills, port connectivity, viaducts and railway sleepers.



MEGA PROJECTS



Bandra-Worli Sea Link



Mumbai Monorail



Dubai Metro Rail

- **Atomic Power Plants:** Kota, Kaiga and Tarapur
- **Metro Rail Projects:** Delhi, Bangalore, Mumbai, Kolkata, Hyderabad, Chennai and Jaipur
- **LNG Tanks:** Dabhol, Dahej and Kochi
- **Cable Stay Bridges:** Bandra-Worli Sea Link - Mumbai, Naini - UP
- **IT Parks:** TCS - Nagpur, Hyderabad, Pune, Chennai, Kochi, Bangalore and Infosys - Pune
- **Flyovers:** JJ Flyover - Mumbai, Hebbal Flyover - Bangalore and PV Narasimha Rao Expressway - Hyderabad
- **Bridges:** Godavari Bridge, Sone Bridge and Ganga Bridge
- **Monorail:** Mumbai
- **Shopping Malls:** Dubai City Center, Mall of the Emirates, Midriff City Center - Dubai, Mall of Qatar, Qatar Foundation, Al Ain School - UAE, Windsor Manor Building - Dubai and Al Badar Warehouses, Industrial Area
- **Hotels:** Al Raha Beach Residential - Abu Dhabi
- **Housing Complexes:** Cultural Village Phase-I - Dubai, Motor City Dubai, The Villa Phase-II & The Villa Phase-III, Dubai Land - Dubai, The Views, Emirates Golf Club and Al Falah Community Development - Abu Dhabi
- **Flyovers/Highways:** Dubai Airport Tunnel, LRT Project - Dubai, North Road Corridor Project
- **Towers:** Atlantis Royal Tower - Dubai, Emirates Crown Tower - Dubai, Al Mazaya Icon Tower - Dubai and Business Central Towers - Dubai



IT Park



Mall of the Emirates



Al Raha Beach Residential, Abu Dhabi



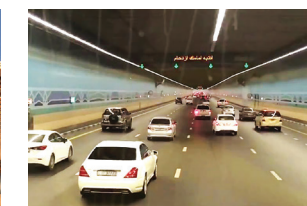
ANZ Arena, Melbourne



Emirates Golf Club, Dubai



Atlantis Royal Tower, Dubai



Dubai Airport Tunnel



LNG Tank at Dahej Port

MULTIPLE APPLICATIONS

PC strands are used in pre-stressed concrete girders for road, river & railway bridges, flyovers, pre-stressed atomic reactor domes, slabs, silos, hangars, aqueducts, high-rise buildings, viaducts and railway sleepers.



Windmill



Flyover



Bridge



Atomic Reactor



Metro Bridge



LNG Tank



Building & Rock Anchoring



Cement Silo

Advantages :

- Up to 10% reduction in steel requirement is possible
- Less number of anchorages, sheathings, wedges and labour, resulting in reduction of project cost
- Reduction in concrete requirement due to reduced size of structural members
- Thermo-mechanical processing, elimination of extra post straightening treatment

What is meant by 'Low Relaxation'?

Pre-stressed steel strand when stressed and embedded in concrete, loses the applied stress exponentially as time passes. This loss of stress is called 'Stress Relaxation' and is one of the important factors in the design of pre-stressed concrete structures . If the assumed relaxation in stress can be reduced, then many advantages can be expected.

'Low Relaxation' wire and strand exhibits a relaxation loss not greater than 2.5% after 1,000 hrs at 20°C (68°F) when initially loaded to 70% of the specified minimum breaking strength, as compared with 5% for 'Normal Relaxation' of stress-relieved wire and strand. TATA Wiron Low Relaxation Strands are treated by the 'stabilizing' process, which is the most widely accepted method throughout the world. This is also known as 'hot stretching' because the steel is subjected to a stress-relieving temperature while it is under tension.

The use of Low Relaxation Strand is well-established in developed countries, However, its use in India was restricted until the 1990's due to the restricted availability of strands. With this world-class technology now available in India, design and construction engineers can reap the benefits of this critical material, on a wider scale.

Advantages of Low Relaxation Strand

- Less stress loss at ambient and elevated temperatures.
- Increased limit of proportionality and close tolerances on unit mass to length ratio.
- Uniform stress-strain relationship, higher breaking loads and proof stress loads.
- Higher effective force in the tendon, due to lower relaxation losses of the pre-stressing steel. Saving in the number of anchorages, ducts, sheaths, wedges, as well as labour costs, etc.
- Saving in concrete, due to possible reduction in the size of the structure, which in turn, results in lighter structures.
- Failure of strand, on site is substantially mitigated as each point of strand is tested online during manufacturing. Quality problems, if any, are detected during the manufacturing process itself, thereby offering a highly reliable product.
- The hot-stretching process during manufacturing ensures that the strand is nearly straight. Thus, extra post-straightening treatment is not required.
- Lower relaxation property of wire allows saving in steel as a lesser quantity is used. Consistency of physical properties and coil characteristics with uniform winding .
- Higher fatigue and corrosion resistance.
- Selection of wire rods of specified chemistry and quality.

QUALITY ASSURANCE

Adhering to our philosophy of making and bringing quality products to customers, we at Tata Steel take care of our products right from sourcing the iron ore. We select raw material from our own mines and steel-making facilities to ensure integrity and quality of the products. Our pre-stressing strand producing plants are certified with ISO 9001:2015 for our quality management systems and our testing laboratory is NABL-accredited for ISO/IEC 17025. BIS has granted us IS 14268:2005 for producing pre-stressing strands. We manufacture pre-stressing strands as per BS 5896, ASTM A 416/A 416 M, AS/NZS 4672 and EN 10138-3. The standard sizes we produce are 3/8 inch, 1/2 inch and 0.5 inch.

- Own steel making & wire rod rolling to meet specific chemistry and quality requirements
- Selection of wire rods of specified chemistry and quality
- Quality checks at every stage of production
- In-house relaxation testing facility
- Strands have been successfully tested at independent laboratories for fatigue under dynamic loads and for tensile properties at sub-zero temperatures

APPROVALS

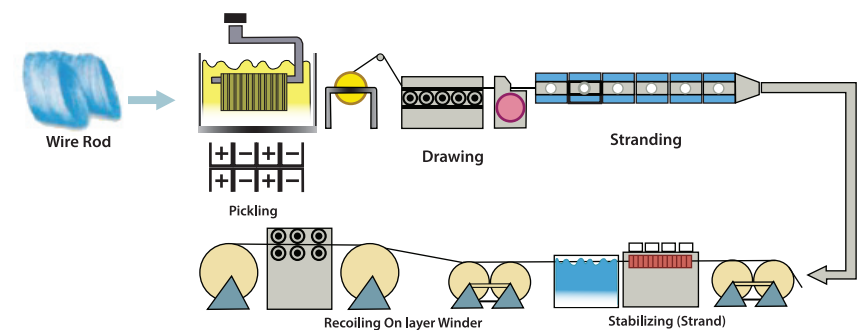
Our PC strands undergo the following tests at EMPA Switzerland:

- Cryogenic tensile test at -165°C
- Fatigue Test
- One-Pin test.

Accreditation of lab testing facilities by NABL India, which is recognised by NATA of Australia. Certified to ISO 9001:2015 standards.

Tata Steel Wire Division operates multiple plants for the manufacture of Pre-stressed Concrete Strand, using the latest technology.

MANUFACTURING PROCESS



Technological Features of Manufacturing Process

- State-of-the-art, fully automated pickling plant equipped with German technology
- Latest generation vertical rod welding manufacture
- SCADA controlled stabilizing line



Certificates

We manufacture strands under the most stringent process controls. Measuring the strand properties accurately needs strict adherence to the test procedures. We have adopted the ISO 17025 standard of Laboratory Quality Management system and our test lab has been accredited by NABL since 2005.



STANDARDS

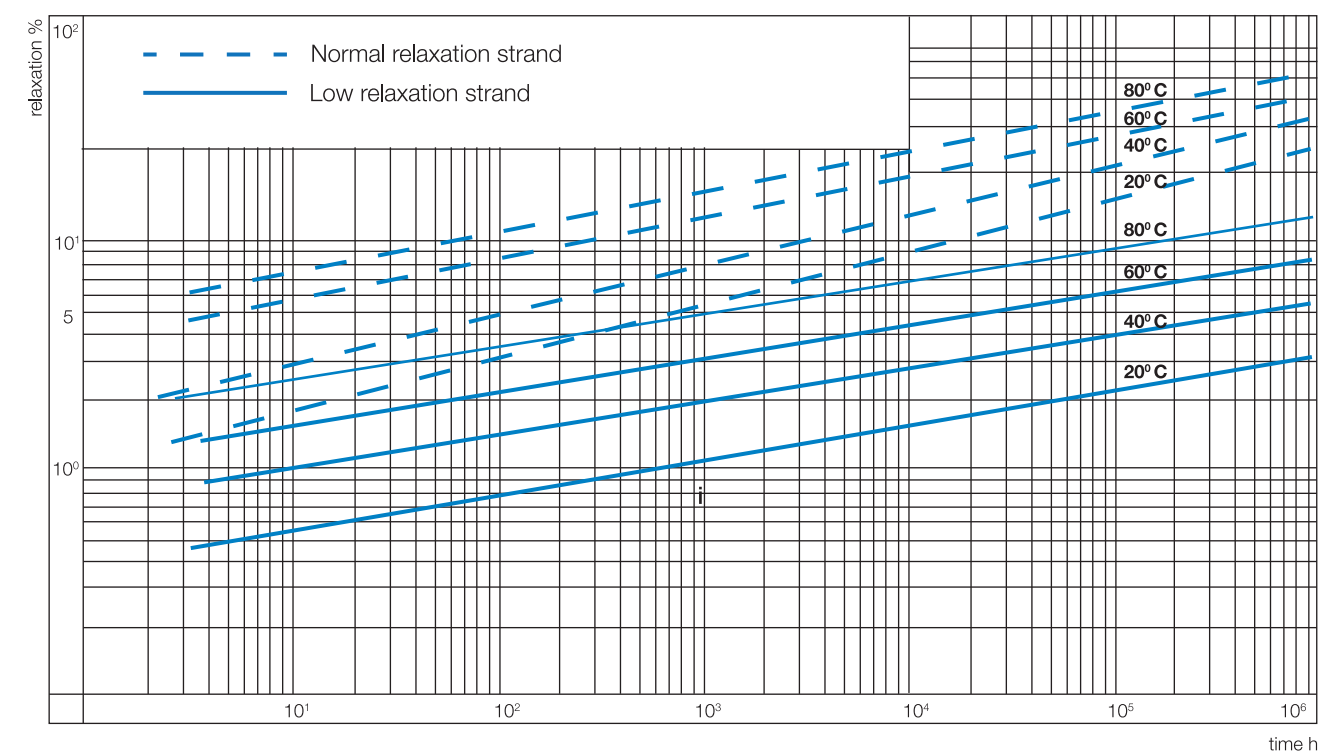
International Specification	Indian Specification
ASTM A 416	IS 14268 (Low Relaxation Strand)
BS 5896	IS 6006 (Normal Relaxation Strand)
JIS 3536	
AS 1311	
EN 10138:3:2000	

Any other International Specifications and as per customer requirements

Strand sizes most commonly made

9.3mm	12.5mm	15.24mm
9.6mm	12.7mm	15.7mm
11.3mm	12.9mm	16mm

TYPICAL RELAXATION CURVE



Relaxation Values for Normal & Low Relaxation Strand at different temperatures
(Initial stress = 0.70 x Specified Characteristic Strength)



INTERNATIONAL STANDARDS

INDIAN STANDARDS

Standard	Grade	Nominal Diameter	Diameter Tolerance	Nominal Area	Unit Weight	Weight Tolerance	Pitch	Minimum Breaking Load	Minimum Yield Load			Minimum Elongation	Straightness	1,000-hr. Relaxation (% Max.)		MOE		
									kN	kN				%	70%		80%	Gpa or kN/mm2
										0.1%	0.2%							
IS 14268:1995	Class 1	9.5	+/-0.4	51.6	405	-	12-16	89	-	-	80.1	3.5	Arc height shall be no greater than 25 mm for gauge length 1 m	2.5	-	185-205		
		11.1	+/-0.4	69.7	548	-	12-16	120.1	-	-	108.1	3.5		2.5	-			
		12.7	+/-0.4	92.9	730	-	12-16	160.1	-	-	144.1	3.5		2.5	-			
		15.2	+/-0.4	139.4	1094	-	12-16	240.2	-	-	216.2	3.5		2.5	-			
	Class 2	9.5	+/-0.4	54.8	432	-	12-16	102.3	-	-	92.1	3.5		2.5	-			
		11.1	+/-0.4	74.2	582	-	12-16	137.9	-	-	124.1	3.5		2.5	-			
		12.7	+/-0.4	98.7	775	-	12-16	183.7	-	-	165.3	3.5		2.5	-			
		15.2	+/-0.4	140	1102	-	12-16	260.7	-	-	234.5	3.5		2.5	-			

AUSTRALIAN / NEW ZEALAND STANDARDS

Standard	Grade	Nominal Diameter	Diameter Tolerance	Nominal Area	Unit Weight	Weight Tolerance	Pitch	Minimum Breaking Load	Minimum Yield Load			Minimum Elongation	Straightness	1,000-hr. Relaxation (% Max.)		MOE		
									kN	kN				%	70%		80%	Gpa or kN/mm2
										0.1%	0.2%							
AS/NZS 4672:2007	Super	1720	9.30	-	51.60	405.00	+4/-2	12-18	88.8	72.8	75.4	-	3.5	-	3.5 (B)	185-205		
		1850	9.50	-	55.00	432.00	+4/-2	12-18	102.0	83.6	86.6	-	3.5	-	3.5 (B)			
		1870	11.10	-	73.90	580.00	+4/-2	12-18	138.0	113.0	117.0	-	3.5	-	3.5 (B)			
		1720	12.40	-	92.90	729.00	+4/-2	12-18	160.0	131.0	136.0	-	3.5	-	3.5 (B)			
		1870	12.70	-	98.70	774.00	+4/-2	12-18	184.0	151.0	156.0	-	3.5	-	3.5 (B)			
		1840	12.90	-	100.00	785.00	+4/-2	12-18	186.0	158.0	165.0	-	3.5	-	3.5 (B)			
		1750	15.20	-	143.00	1122.00	+4/-2	12-18	250.0	205.0	212.0	-	3.5	-	3.5 (B)			
		1830	15.20	-	143.00	1122.00	+4/-2	12-18	261.0	214.0	222.0	-	3.5	-	3.5 (B)			
		1780	18.00	-	190.00	1492.00	+4/-2	12-18	338.0	277.0	287.0	-	3.5	-	3.5 (B)			
		1830	18.00	-	190.00	1492.00	+4/-2	12-18	353.0	289.0	300.0	-	3.5	-	3.5 (B)			
		AS 1311:1987	Super	9.30	+/-0.4	55	430	-	12-16	102	-	86.7	-	3.5	2.5		-	185-205
				10.9	+/-0.4	75	590	-	12-16	138	-	117.3	-	3.5	2.5		-	
12.7	+/-0.4			100	785	-	12-16	184	-	156.4	-	3.5	2.5	-				

AMERICAN SPECIFICATIONS

Standard	Grade	Nominal Diameter	Diameter Tolerance	Nominal Area	Unit Weight	Weight Tolerance	Pitch	Minimum Breaking Load	Minimum Yield Load			Minimum Elongation	Straightness	1,000-hr. Relaxation (% Max.)		MOE		
									kN	kN				%	70%		80%	Gpa or kN/mm2
										0.1%	0.2%							
ASTM A416-2010 (Round Strand)	1725	9.50	+/-0.4	51.60	405.0	-	12-16	89.0	-	-	80.1	3.5	-	3.5 (B)	185-205			
		11.10	+/-0.4	69.70	548.0	-	12-16	120.1	-	-	108.1	3.5	-	3.5 (B)				
		12.70	+/-0.4	92.90	730.0	-	12-16	160.1	-	-	144.1	3.5	-	3.5 (B)				
		15.20	+/-0.4	139.40	1094.0	-	12-16	240.2	-	-	216.2	3.5	-	3.5 (B)				
		1860	9.53	+0.65/-0.15	54.80	432.0	-	12-16	102.3	-	-	92.1	3.5	-		3.5 (B)		
	11.11		+0.65/-0.15	74.20	582.0	-	12-16	137.9	-	-	124.1	3.5	-	3.5 (B)				
	12.70		+0.65/-0.15	98.70	775.0	-	12-16	183.7	-	-	165.3	3.5	-	3.5 (B)				
	15.24		+0.65/-0.15	140.00	1102.0	-	12-16	260.7	-	-	234.6	3.5	-	3.5 (B)				
	15.75		+0.65/-0.15	149.20	1173.0	-	12-16	277.4	-	-	249.7	3.5	-	3.5 (B)				

BRITISH SPECIFICATIONS

Standard	Grade	Nominal Diameter	Diameter Tolerance	Nominal Area	Unit Weight	Weight Tolerance	Pitch	Minimum Breaking Load	Minimum Yield Load			Minimum Elongation	Straightness	1,000-hr. Relaxation (% Max.)		MOE		
									kN	kN				%	70%		80%	Gpa or kN/mm2
										0.1%	0.2%							
BS 5896 -1980	Standard	1 770	+0.3/-0.15	52.00	408.0	+4/-2	12-18	92.0	78.0	-	81.0	3.5	-	4.5 (A)	185-205			
		1 860	+0.3/-0.15	52.00	408.0	+4/-2	12-18	97.0	82.0	-	85.0	3.5	-	4.5 (A)				
		1 770	+0.3/-0.15	71.00	557.0	+4/-2	12-18	125.0	106.0	-	110.0	3.5	-	4.5 (A)				
		1 770	+0.4/-0.2	93.00	730.0	+4/-2	12-18	164.0	139.0	-	144.0	3.5	-	4.5 (A)				
		1 860	+0.4/-0.2	93.00	730.0	+4/-2	12-18	173.0	147.0	-	152.0	3.5	-	4.5 (A)				
	Super	1 670	+0.4/-0.2	139.00	1090.0	+4/-2	12-18	232	197.0	-	204.0	3.5	-	4.5 (A)				
		1 860	+0.4/-0.2	139.00	1090.0	+4/-2	12-18	259.0	220.0	-	228.0	3.5	-	4.5 (A)				
		1 670	+0.4/-0.2	139.00	1090.0	+4/-2	12-18	232.0	197.0	-	204.0	3.5	-	4.5 (A)				
		1 860	+0.3/-0.15	55.00	432.0	+4/-2	12-18	102.0	87.0	-	90.0	3.5	-	4.5 (A)				
		1 860	+0.3/-0.15	75.00	590.0	+4/-2	12-18	139.0	118.0	-	122.0	3.5	-	4.5 (A)				
BS 5896 -2012	Super	Y1670S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	232-267	204.0	-	-	3.5	-	4.5(A), 2.5(A)	195			
		Y1700S7G	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	379-436	334.0	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1770S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	92-106	81.0	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1770S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	124-143	109.0	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1770S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	165-190	145.0	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1770S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	266-306	234.0	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1820S7G	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	300-345	264.0	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1860S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	70.7-81.3	62.2	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1860S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	96.7-111	85.1	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1860S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	102-117	89.8	-	-	3.5	-	4.5(A), 2.5(A)				
BS 5896 -2012	Super	Y1860S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	140-161	123.0	-	-	3.5	-	4.5(A), 2.5(A)	195			
		Y1860S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	173-199	152.0	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1860S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	186-214	164.0	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1860S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	259-298	228.0	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1860S7	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	279-321	246.0	-	-	3.5	-	4.5(A), 2.5(A)				
		Y1860S7G	+0.4/-0.2	139.00	1090.0	+4/-2	14-18	208-239	183.0	-	-	3.5	-	4.5(A), 2.5(A)				

EUROPEAN STANDARDS

Standard	Grade	Nominal Diameter	Diameter Tolerance	Nominal Area	Unit Weight	Weight Tolerance	Pitch	Minimum Breaking Load	Minimum Yield Load			Minimum Elongation	Straightness	1,000-hr. Relaxation (% Max.)		MOE		
									kN	kN				%	70%		80%	Gpa or kN/mm2
										0.1%	0.2%							
prEn 10138 -2009	Y1770S7	9.30	-	52.0	406.1	+2/-2	14-18	92.0-106.0	81.0	-	-	3.5	Arc height shall be no greater than 25 mm for gauge length 1 m	-	4.5(A), 2.5(A)	May be taken to be 195 GPa (kN/mm2)		
		11.00	-	70.0	546.7	+2/-2	14-18	124.0-143.0	109.0	-	-	3.5		-	4.5(A), 2.5(A)			
		12.50	-	93.0	726.3	+2/-2	14-18	165.0-190.0	145.0	-	-	3.5		-	4.5(A), 2.5(A)			
		15.20	-	139.0	1,086.0	+2/-2	14-18	246.0-283.0	216.0	-	-	3.5		-	4.5(A), 2.5(A)			
		15.70	-	150.0	1,172.0	+2/-2	14-18	266.0-306.0	234.0	-	-	3.5		-	4.5(A), 2.5(A)			
	Y1860S7	9.30	-	52.0	406.1	+2/-2	14-18	96.7-111.0	85.1	-	-	3.5		-	4.5(A), 2.5(A)			
		9.60	-	55.0	429.6	+2/-2	14-18	102.0-117.0	89.8	-	-	3.5		-	4.5(A), 2.5(A)			
		11.30	-	75.0	585.8	+2/-2	14-18	140.0-161.0	123.0	-	-	3.5		-	4.5(A), 2.5(A)			
		12.50	-	93.0	726.3	+2/-2	14-18	173.0-199.0	152.0	-	-	3.5		-	4.5(A), 2.5(A)			
		12.90	-	100.0	781.0	+2/-2	14-18	186.0-214.0	164.0	-	-	3.5		-	4.5(A), 2.5(A)			
Y1860S7G	12.70	-	112.0	874.7	+2/-2	14-18	208.0-239.0	183.0	-	-	3.5	-	4.5(A), 2.5(A)					
	15.20	-	165.0	1,289.0	+2/-2	14-18	307.0-353.0	270.0	-	-	3.5	-	4.5(A), 2.5(A)					
	15.20	-	165.0	1,289.0	+2/-2	14-18	300.0-345.0	264.0	-	-	3.5	-	4.5(A), 2.5(A)					