JSW Steel

PARTNERING INDIA'S INFRASTRUCTURE GROWTH STORY

LRPC Strands - From the House of JSW

Neotrex Steel Private Limited (A subsidiary of **JSW Steel**)

JSW Steel - STRENGTH IN THE STRANDS

The technologically advanced LRPC Strands are brought to you by **Neotrex Steel Private Limited**, a subsidiary of JSW Steel Ltd., which is part of the JSW Group – a $13 billion leading conglomerate in India. Known as a strategic first mover, the group has a strong presence in Steel, Energy, Infrastructure, Cement, Paints, Venture Capital, Sports and plays a significant role in spurring India's economic growth.

The group strives for excellence by leveraging its strengths & capabilities and has a successful track record of executing large capital-intensive and technically complex projects. It has a wide product mix, state-of-the-art manufacturing facilities and a committed focus to sustainable growth. With a culturally diverse workforce spread across India, the USA, Europe, and Africa, the JSW Group directly employs nearly 40,000 people.

LRPC STRANDS – CATALYSING GROWTH OF INFRASTRUCTURE

At JSW, the focus is on propelling the nation's growth by actively and consistently delivering world-class products. In this direction, it has introduced the all-new technologically advanced **Low Relaxation Prestressed Concrete Strands** (LRPC). These strands are highly reliable and are designed to reinforce and accelerate the ongoing and upcoming construction and infrastructure projects across India, and globally.

These strands are highly dependable and engineered to take the load and function optimally in challenging situations and environments, across different sectors. They adhere to Indian as well as international standards, for years and years of powerful performance.

LRPC STRANDS
FOR A BETTER TOMORROW

Over the last couple of decades, LRPC strands have been widely used in India, and have gathered momentum in the construction segment. However, the addition of advanced technology and capacity remained stagnant for a long period. With **Neotrex Steel Private Ltd.**, the construction segment will now get best-in-class LRPC strands.

WHAT IS MEANT BY LOW RELAXATION?

Stress relaxation means a gradual reduction in stress with time at constant strain. It occurs in steel when it is in a strained condition for an extended period and is a property of steel itself. This plays an important role while designing prestressed concrete structures, i.e., lower relaxation loss is better for the prestressed concrete structures.

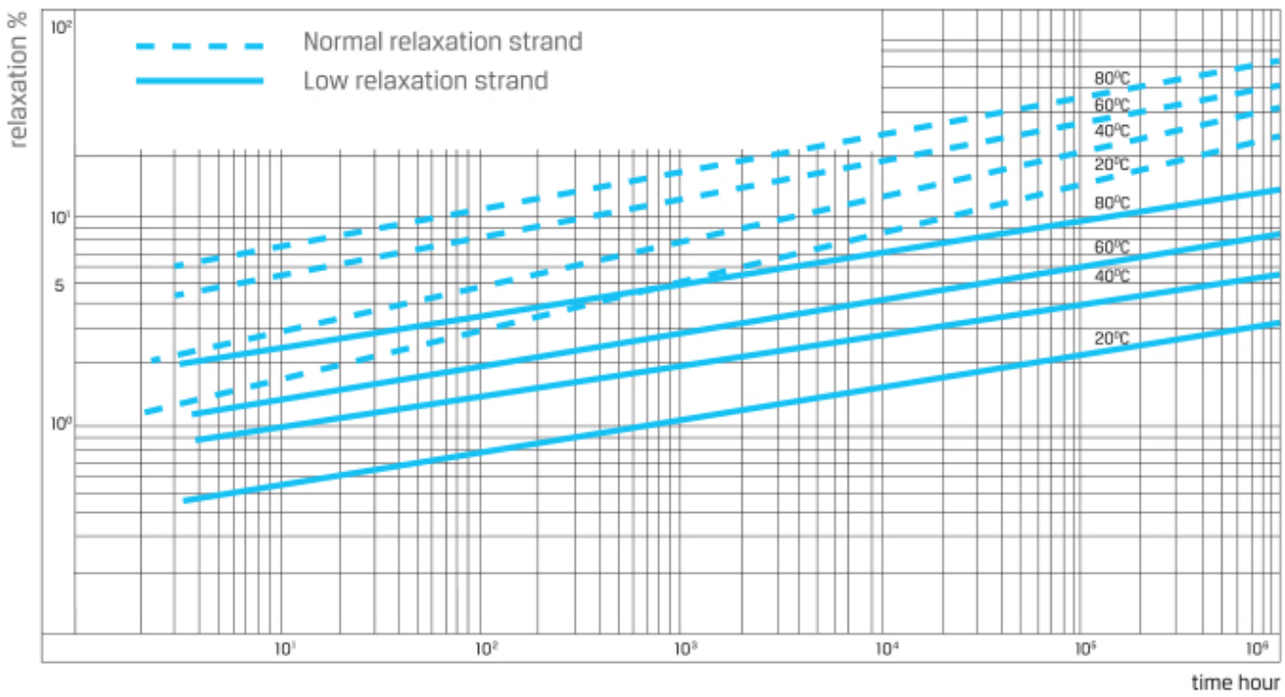
The relaxation loss is checked at a controlled temperature of 20°C and 70% of the specified breaking load. In LRPC Strands, the relaxation loss is less than 2.5% after 1000 Hrs., as against 5% in Normal Relaxation Prestressed Concrete Strands (NRPC).

WHY LRPC STRANDS?

Some key properties of LRPC stands that make it an ideal choice.

- Compared to normal steels, it has low-stress relaxation loss at normal and higher temperatures
- Cost reduction: ~ 10-12% saving in overall construction cost of the project, which comes out through reduction in steel requirement, cement consumption, number of pillars, shuttering work, labour cost, etc.
- Larger spans up to 25-30 meters can be constructed with the use of prestressed concrete strands
- Speed of construction: With the use of LRPC strands, the speed of construction increases significantly
- High reliability: The thermomechanical forces applied during manufacturing of the strands ensure that breakages if any, happen at the plant itself and there are no strand failures at the construction sites
- 'Hot Stretching' of the strands give necessarily straight strands, which eliminates post straightening activity
- Higher fatigue resistance
- Lighter structures can be built with high reliability

RELAXATION CURVE



Relaxation values for Normal & Low Relaxation strand at different temperatures.
(Initial stress = 70% of specified characteristic strength).

PRODUCT QUALITY AND APPROVALS

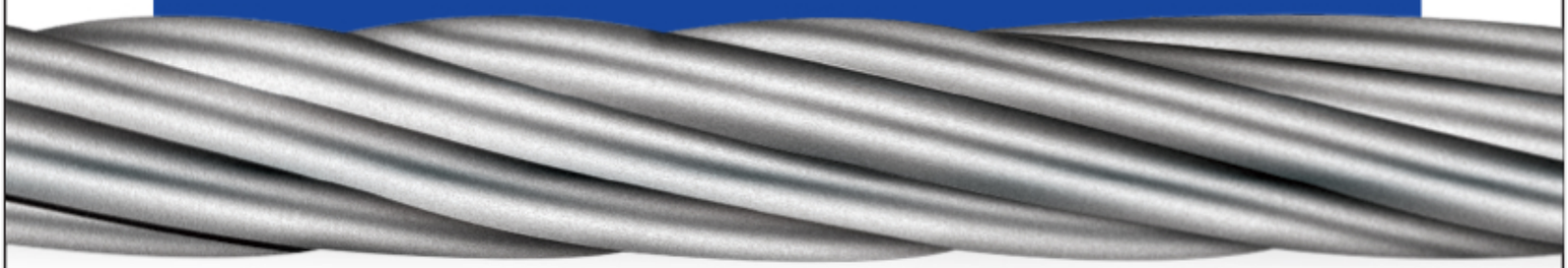
At JSW, we deploy advanced technologies in steelmaking, modern plant and machinery, sophisticated test equipment and best process controls. We have a production capacity of approximately 1.8 million MT per annum of high-quality wire rods, suitable for critical and high-end applications.

We manufacture LRPC strands with the latest technology. Our wire rod mills are the best-in-class and way ahead of the competition and are among the few-of-its-kind in the world. These superior quality wire rods lead to production of exceptional LRPC strands, which in turn deliver consistent performance to our construction sector customers.

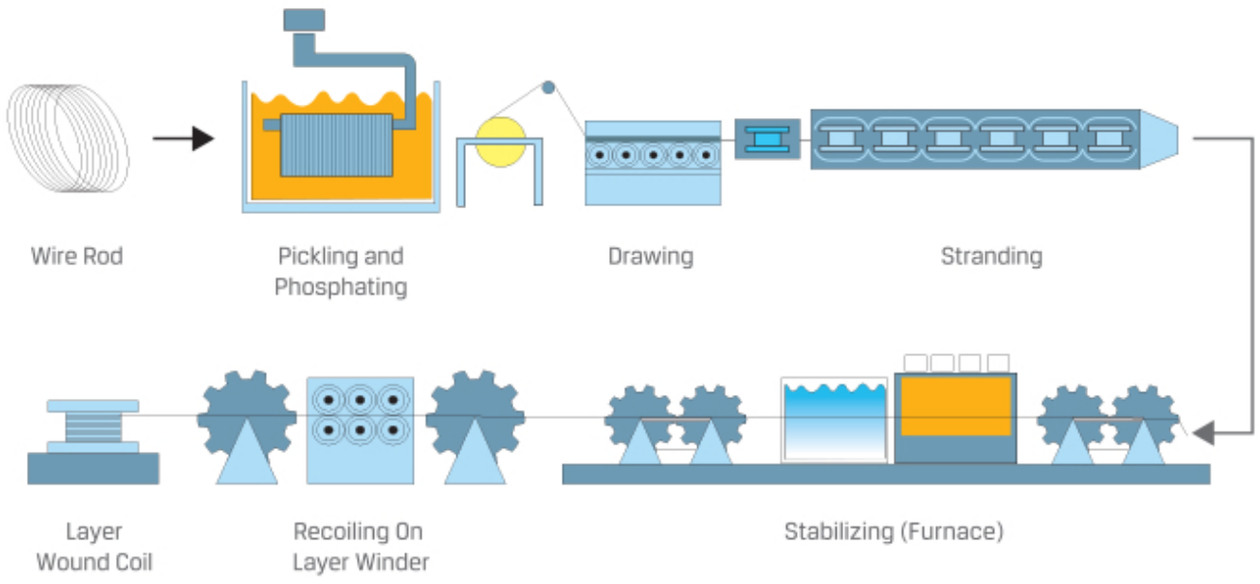
We have BIS, ISO certificate, and NABL accredited test laboratory for our wires plant. We manufacture LRPC strands in sizes 3/8-inch, 1/2-inch and 5/8-inch diameter for our domestic and overseas customers as per IS14268: 2017, BS5896, EN10138, ASTM A 416/A, 416 M, AS/ NZS 4672 etc.

CUTTING EDGE MANUFACTURING FACILITIES

- Latest technology for manufacturing LRPC strands
- High-end wire rods from **integrated steel** facilities give almost zero defects related to wire rods in the end product.
- Stringent process and quality controls at all the stages of manufacturing
- Latest electrical and electronic controls for better identification and removal of deviations, if any.
- Strands conform to cryogenic test, fatigue test and deflected tensile test at independent global laboratories.



LRPC MANUFACTURING PROCESS FLOW



MANUFACTURING LINE FEATURES

Advanced and automatic pickling line, multi-block wire drawing and stranding

Latest version of SCADA for process control at various stages

NABL accredited test lab

Built-in feature of supplying material on length basis to reduce wastage

NATIONAL AND INTERNATIONAL STANDARDS

INDIAN STANDARDS

Standard	Class	Nominal Diameter	Diameter tolerance	Nominal area of strand	Nominal weight (approx.)	Pitch	Straightness	Minimum Breaking Load		Minimum Yield Load (1%)		Minimum Elongation GL=600mm	1000 hr. Relaxation Loss	MOE
		mm	mm	mm^2	Kg/1000m	Times of diameter		Kg	KN	Kg	KN	%	(% Max.)	GP_a Or KN/mm^2
IS14268: 2017	Class I	9.5	+/- 0.4	51.6	405	12-16	Arc height should be less than 25 mm for gauge length of 1000 mm	9075	89	8168	80.1	3.5	2.5	185-205
		11.1		69.7	548			12247	120.1	11023	108.1			
		12.7		92.9	730			16325	160.1	14694	144.1			
		15.2		139.4	1094			24493	240.2	22046	216.2			
	Class II	9.5		54.8	432			10432	102.3	9391	92.1			
		11.1		74.2	582			14062	137.9	12654	124.1			
		12.7		98.7	775			18732	183.7	16856	165.3			
		15.2		140	1102			26584	260.7	23912	234.5			

AUSTRALIAN AND NEWZELAND STANDARDS

Standard	Grade	Nominal Diameter	Diameter tolerance	Nominal area of strand	Nominal weight (approx.)	Weight Tolerance	Pitch	Straightness	Minimum Breaking Load		Minimum Yield Load		Minimum Elongation (GL=600 mm)	1000 hr. Relaxation Loss (% Max)		MOE
		mm	mm	mm^2	Kg/1000 m	%	Times of diameter		Kg	KN	KN		%	70%	80%	GP_a Or KN/mm^2
											0.1%	0.2%				
AS/ NZS 4672-2007	1720	9.30	-	51.6	405	+4/-2	12-18	Arc height should be less than 25 mm for gauge length of 1000 mm	9055	88.8	72.8	75.4	3.5	-	3.5 (B)	185-205
	1850	9.50	-	55	432				10401	102	83.6	86.6				
	1870	11.10	-	73.9	580				14072	138	113	117				
	1720	12.40	-	92.9	729				16315	160	131	136				
	1870	12.70	-	98.7	774				18762	184	151	156				
	1840	12.90	-	100	785				18966	186	158	165				
	1750	15.20	-	143	1122				25493	250	205	212				
	1830	15.20	-	143	1122				26614	261	214	222				
	1780	18.00	-	190	1492				34466	338	277	287				
	1830	18.00	-	190	1492				35995	353	289	300				
AS 1311-1987	Super	9.30	+/- 0.4	55	430	-	12-16		10401	102	-	86.7	2.5	-		
		10.90		75	590				14072	138		117.3				
		12.70		100	785				18762	184		156.4				
		15.20		143	1125				25493	250		212.5				

AMERICAN STANDARDS

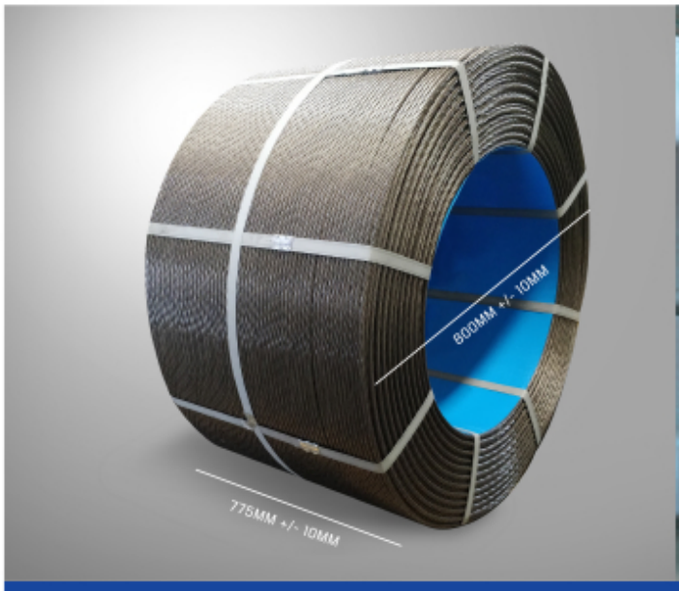
Standard	Grade	Nominal Diameter of strand	Diameter tolerance (approx.)	Nominal area	Nominal weight	Pitch	Minimum Breaking Load		Minimum Yield Load	Minimum Elongation	1000 hr. Relaxation Loss (% Max)
		mm	mm	(mm^2)	Kg/1000 m	Times of diameter	Kg	KN	KN 1.0%	%	80%
ASTMA416-2018	1725	9.50	+/- 0.4	51.6	405	12-16	9075	89	80.1	3.5	3.5(B)
		11.10		69.7	548		12247	120.1	108.1		
		12.70		92.9	730		16325	160.1	144.1		
		15.20		139.4	1094		24493	240.2	216.2		
	1860	9.53	+0.65/-0.15	54.8	432		10432	102.3	92.1		
		11.11		74.2	582		14062	137.9	124.1		
		12.70		98.7	775		18732	183.7	165.3		
		15.24		140	1102		26584	260.7	234.6		
		15.75		149.2	1173		28286	277.4	249.7		

BRITISH STANDARDS

Standard		Grade	Nominal Diameter	Diameter tolerance	Nominal area of strand	Nominal weight (approx.)	Weight Tolerance	Pitch	Straightness	Minimum Breaking Load	Minimum Yield Load		Minimum Elongation (GL=600 mm)	1000 hr. Relaxation Loss (% Max)		MOE
			mm	mm	mm^2	Kg/1000 m	%	Times of diameter		KN	KN		%	70%	80%	GP_a Or KN/mm^2
											0.1%	1.0%				
BS5896-1980	Standard	1770	9.30	+0.3/-0.15	52	408	+4/-2	12-18	Arc height should be less than 25mm for gauge length of 1000 mm	92	78	81	-		4.5 (A)	185-205
		1860	9.30		52	408				97	82	85				
		1770	11.00		71	557				125	106	110				
		1770	12.50	+0.4/-0.2	93	730				164	139	144				
		1860	12.50		93	730				173	147	152				
		1670	15.20		139	1090				232	197	204				
	Super	1860	15.20	+0.4/-0.2	139	1090	+4/-2	12-18		259	220	228				
		1670	15.20		139	1090				232	197	204				
		1860	9.60	+0.3/-0.15	55	432				102	87	90				
		1860	11.30		75	590				139	118	122				
		1860	12.90	+0.4/-0.2	100	785				186	158	163				
		1770	15.70		150	1180				265	225	233				
		1860	15.70		150	1180				279	237	246				
BS5896-2012		Y1670S7	15.20	-	139	1086	+2/-2	14-18		232-267	204	-	3.5		4.5 (A) 2.5(A)	195
		Y1700S7G	18.00		223	1742				379-436	334					
		Y1770S7	9.30		52	406.1				92-106	81					
		Y1770S7	11.00		70	546.7				124-143	109					
		Y1770S7	12.50		93	726.3				165-190	145					
		Y1770S7	15.70		150	1172				266-306	234					
		Y1820S7G	15.20		165	1289				300-345	264					
		Y1860S7	8.00		38	296.8				70.7-81.3	62.2					
		Y1860S7	9.30		52	406.1				96.7-111	85.1					
		Y1860S7	9.60		55	429.6				102-117	89.8					
		Y1860S7	11.30		75	585.8				140-161	123					
		Y1860S7	12.50		93	726.3				173-199	152					
		Y1860S7	12.90		100	781				186-214	164					
		Y1860S7	15.20		139	1086				259-298	228					
		Y1860S7	15.70		150	1172				279-321	246					
		Y1860S7G	12.70		112	874.7				208-239	183					

EUROPEAN STANDARDS

Standard	Grade	Nominal Diameter	Nominal area	Nominal weight (approx.)	Weight Tolerance	Pitch	Straightness	Minimum Breaking Load	Minimum Yield Load	Minimum Elongation (GL=600 mm)	1000 hr. Relaxation Loss (% Max)		MOE
		mm	mm^2	Kg/1000 m	%	Times of diameter		KN	KN	%	70%	80%	GP_a Or KN/mm^2
									0.1%				
prEN 10138-2009	Y1770S7	9.30	52	406.1	+2/-2	14-18	Arc height should be less than 25 mm for gauge length 1000 mm	92-106	81	3.5	-	4.5 (A), 2.5 (A)	195
		11.00	70	546.7				124-143	109				
		12.50	93	726.3				165-190	145				
		15.20	139	1086				246-283	216				
	Y1860S7	15.70	150	1172				266-306	234				
		9.30	52	406.1				96.7-111	85.1				
		9.60	55	429.6				102-117	89.8				
		11.30	75	585.8				140-161	123				
		12.50	93	726.3				173-199	152				
		12.90	100	781				186-214	164				
		15.20	139	1086				259-298	228				
		15.70	150	1172				279-321	246				
	Y1860S7G	12.70	112	874.7				208-239	183				
		15.20	165	1289				307-353	270				
	Y1820S7G	15.20	165	1289				300-345	264				



— FINISH COIL DIMENSIONS AND SUPPLY CONDITIONS —

The LRPC strands can be supplied in both oiled and unoiled conditions. The oil used is water-soluble and can be washed at the site before it is used. The coils are available in a weight of 0.50 MT to 3.50 MT. However, 5 MT coils can also be supplied that will save time and minimize wastage at the site. The coils supplied are in reeless, palletised form with appropriate strapping for easy and safe handling at various places. The end of the strand protrudes out of the coil and has proper identification.

"Unoiled coils" are packed with corrosion protective paper and then polythene/HDPE packed.

DO'S AND DON'TS

Handling and Storage of coils at site

- Coils are to be stored in a closed, dry shed and on some elevated platform so that it doesn't come in direct contact with soil or water. This is very important if the coils are stored for a longer period at the site. In such cases, vapour phase inhibitors should be used. Remember that the pit holes formed due to excessive corrosion may lead to premature failure during prestressing, making the coils unusable.
- Coils to be unloaded safely with the help of a crane or similar arrangement and should not be dropped off the vehicle.
- For strand cutting, abrasive disc cutter or shear cutter is to be used. The strands should not be cut with flame or welding operation as it changes the microstructure of the steel and in turn the properties.
- The strands and the coil straps are to be cut with caution with necessary anchoring or holding so that it doesn't bounce. Please note that the straps are tied and the strands are coiled under tension and may cause serious injuries if not handled with care.
- Failure to follow necessary precautions against damage and corrosion can result in severe repercussions later.

Metros

Bridges & Flyovers

Slabs in High Rise Buildings

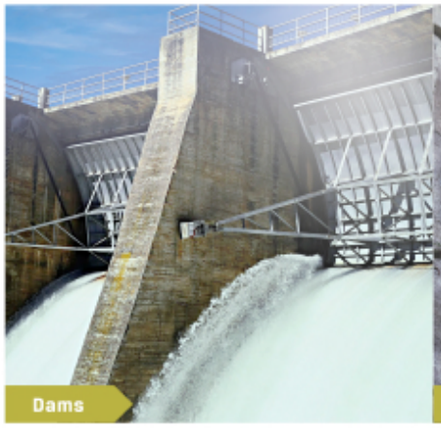
LRPC STRAND APPLICATIONS

LRPC strands are used in pre-stressed concrete girders for Roads, Bridges & Flyovers, Metros, Nuclear Reactors, LNG Tanks, Slabs in Skyscrapers, Dams, Aqueducts, Jetties, Rock Anchoring & Soil Stabilization, Cement Silos and Hangars.

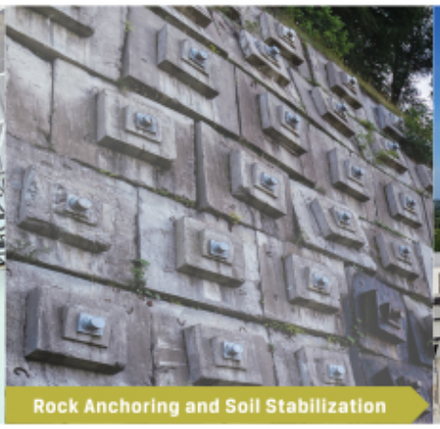
Nuclear Reactors

LNG Tanks

Windmills



Dams



Rock Anchoring and Soil Stabilization

Cement Silos

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