TATA STEEL

TATA TISCON SD

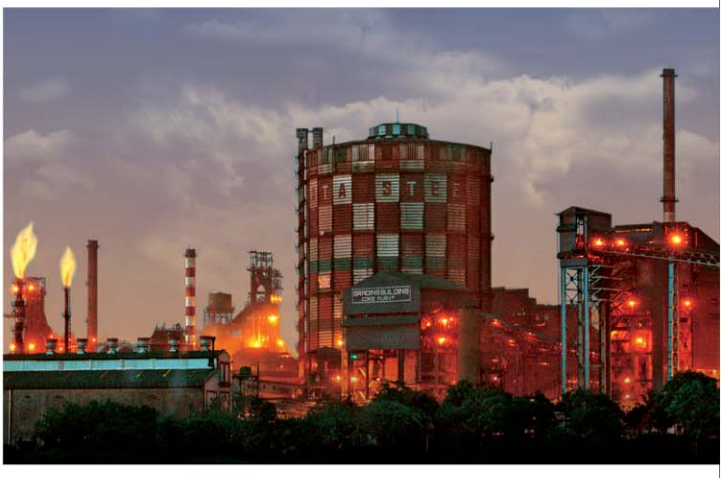
TATA TISCON SUPER DUCTILE REBARS

The new standard in earthquake resistant construction

TATA

Credentials of a pacesetter

Tata Steel is the largest private sector steel company in India and the very first steel company in Asia. Since its inception it has been at the cutting edge of steel technology, backed by its captive mines, state-of-the-art processes and R&D. Tata Steel takes pride in having created a wealth of brands such as Tata Steelium (India's first branded cold rolled steel), Tata Shaktee (galvanised corrugated sheets), Tata Pipes, Tata Wiron (galvanised wire products) and a premium range of reinforcement bars under the brand names TATA TISCON, TISCON 500, TISCON CRS and now TATA TISCON Super Ductile rebars.

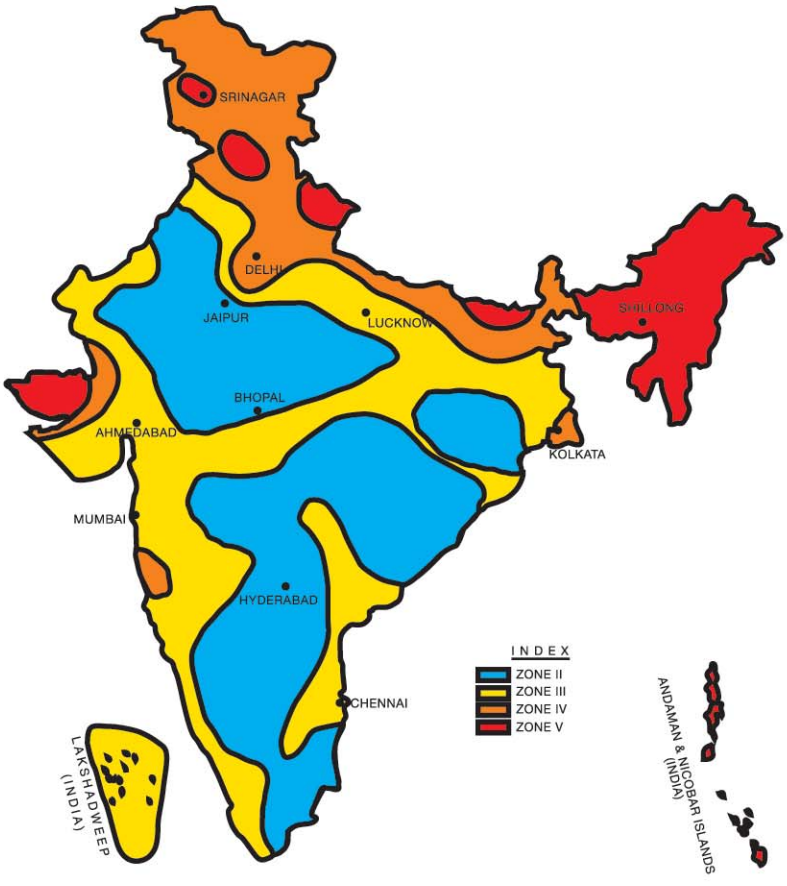


TATA TISCON rebars

TATA TISCON rebars are manufactured in the world's most advanced steel plant. Made from pure steel, with controlled chemistry and minimum impurities, every rebar incorporates the most advanced TMT technology from Tempcore, Belgium and has a perfect combination of strength and ductility. Different grades of TATA TISCON rebars are used for different construction needs. While Fe 415 is used for small structures, heavy duty construction like high-rises and flyovers use Fe 500. In addition, TATA TISCON has introduced Super Ductile rebars as per the latest international standards, for use in earthquake prone zones.

Minimising the impact of earthquakes

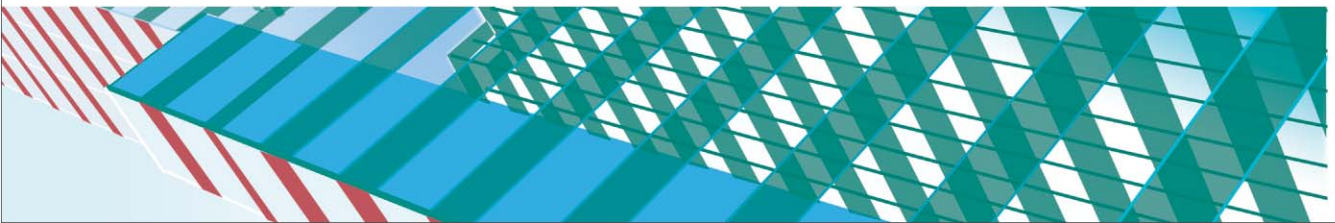
54% of India sits on the highly active Himalayan and Eurasian plates making her susceptible to earthquakes of varying intensity. Earthquakes in Bhuj, Latur, Uttarkashi, Kashmir and Sikkim have all caused enormous damage and loss of life. Since earthquakes cannot be prevented or even predicted, India must learn to prevent damages caused by earthquakes more effectively.



Some earthquake prone countries like Japan, New Zealand, Australia, Mexico and parts of the U.S.A., have learnt to design and construct their buildings in a manner that minimises the damage caused by earthquakes. While the design is important, the quality of the construction material used, particularly the rebars, which hold together the entire structure, is of vital importance. In these countries, Super Ductile rebars have been developed and institutionalised for zones vulnerable to earthquakes. The distinguishing feature of Super Ductile rebars is their capacity to absorb large amounts of energy released during earthquakes without catastrophic failures which might happen in case of ordinary rebars.

For the first time in India, Tata Steel has developed Super Ductile rebars, ideally suited for use in earthquake prone areas (zones 3, 4 and 5 as indicated in the map).

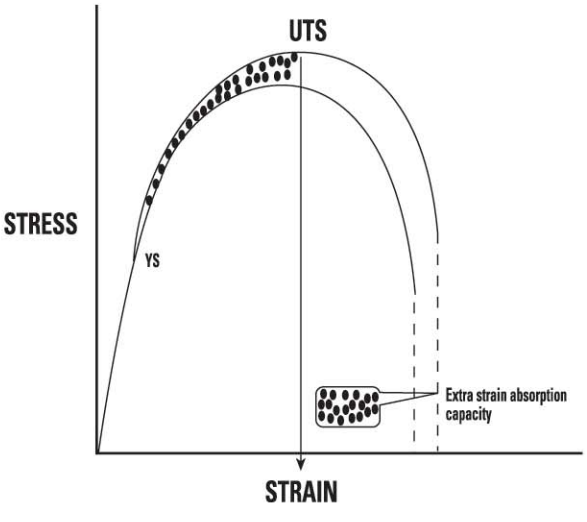
The boundaries of India as depicted are neither authentic nor an accurate depiction of the actual borders.



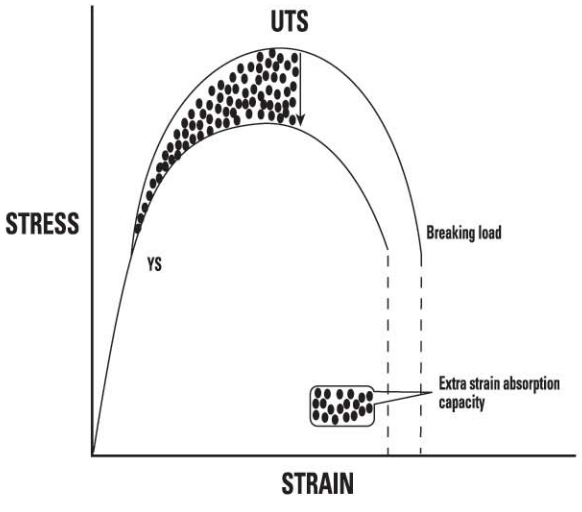
Need for Super Ductile rebars

An essential characteristic for earthquake zone construction is that the rebars should be able to bend without breaking. Structural designs take into account yield strength of rebars, factoring in all dead, live loads and safety limits.

Frequent shaking of the ground and its amplitude may generate stresses that exceed the rebars' yield strength. To prevent the collapse of buildings, it is necessary that even when the stress exceeds the yield strength, it should not exceed the tensile strength. This has been made possible with TATA TISCON Super Ductile rebars, designed to have a much higher UTS/YS ratio compared to ordinary rebars. In other words, they can be plastically deformed to a much larger extent without crossing their ultimate tensile strength.

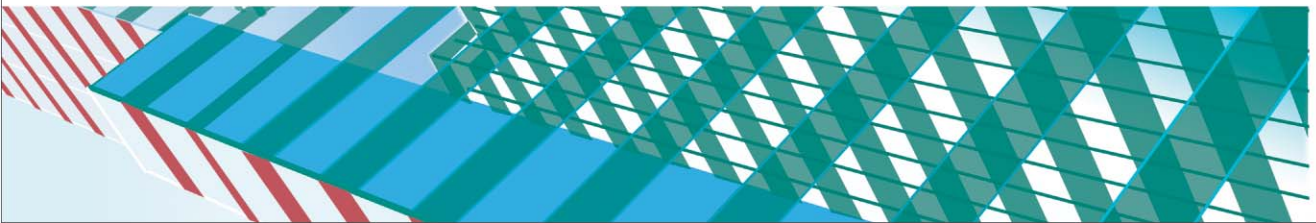


ROLE OF TOTAL ELONGATION



ROLE OF UTS / YS RATIO

Higher UTS/YS ratio ensures greater energy absorption capacity compared to higher total elongation.

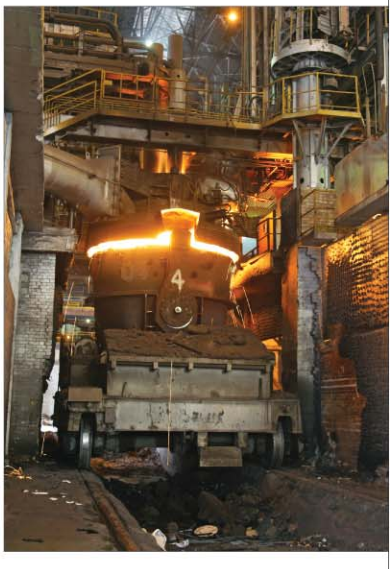


TATA TISCON Super Ductile rebars

TATA TISCON Super Ductile rebars are of Fe 500 grade. They are made more ductile through a special chemistry and post rolling treatment. This enhances the gap between the yield strength and the ultimate tensile strength.

BIS-13920, with the amendment in 2002, has incorporated usage of Fe 500 in ductile detailing of structures subjected to seismic forces. This is provided the rebars possess higher ductility and are manufactured through the TMT route. In fact, our newly developed product TATA TISCON Super Ductile rebars ensure properties that exceed the given standards.

TATA TISCON Super Ductile rebars guarantee more than the basic characteristic strength as per BIS-1786. They offer superior properties with respect to percentage elongation and UTS/YS ratio compared to the specifications and in line with the international standards of 'high ductile' specialty rebars. The high 'uniform elongation' ensures that even after large plastic deformation, the rebars do not start 'necking'- a phenomenon which initiates ultimate failure.



Moreover, they restrict and certify nitrogen levels as per the latest international norms for high quality rebars which in turn improve the critical torsional properties.

Thus, TATA TISCON Super Ductile rebars possess a tremendous capacity to absorb energy beyond the yield limits and resist collapse of buildings during earthquakes.

TATA TISCON Super Ductile rebar Properties

Mechanical Properties	BIS - 1786	U.K. B.S. 4449/2005		AUSTRALIA/NEW ZEALAND AS NZS 4671/2001		TATA TISCON SUPER DUCTILE
YS Min. MPa	Fe - 500	500 B *	500 C *	500 N	500 E	Fe - 500 SD *
	500	500	500	500	500	500
YS Max. MPa	N.S.	650	650	650	600	650
UTS Min.	8% Higher than YS	8% Higher than YS	15% Higher than YS	8% Higher than YS	15% Higher than YS	15% Higher than YS
UTS Max.	N.S.	N.S.	N.S.	N.S.	40% Higher than YS	30% Higher than YS
UTS/YS Min.	1.08	1.08	1.15	1.08	1.15	1.15
% Total Elongation	12.0 Min.	N.S.	N.S.	N.S.	N.S.	16.0 Min.
% Elongation upto UTS	N.S.	5.0 Min.	7.5 Min.	5.0 Min.	10.0 Min.	8.0 Min.
Application	General	General	E.Q. Zone	General	E.Q. Zone	E.Q. Zone

E.Q. ZONE : EARTHQUAKE ZONE N.S. : NOT SPECIFIED * N_2 : 120 PPM MAX.

Manufacturing of TATA TISCON Super Ductile rebars

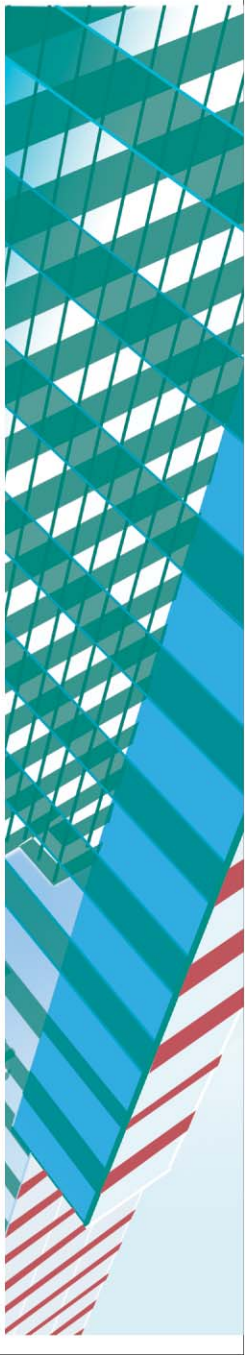
TATA TISCON Super Ductile rebars are manufactured through Iron Ore - Blast Furnace - Basic Oxygen Furnace - Billet Casting route with precise control over several parameters:

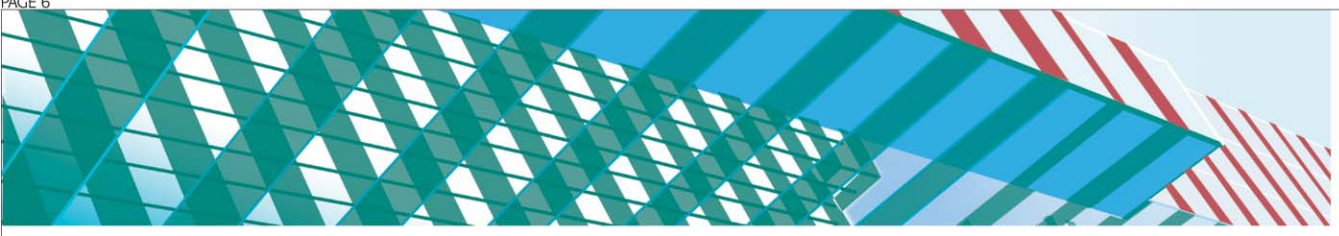
Chemistry - TATA TISCON Super Ductile rebars are made with a unique chemistry with critical control over carbon, sulphur, phosphorus and other alloying elements. Carbon equivalent is maintained at a lower range to facilitate good weldability. Billets are cast with electromagnetic stirring to eliminate harmful segregation.

Rolling - The billets are rolled in most advanced mills with all PLC drives for maintaining very narrow range of temperatures and other rolling parameters which are critical for making rebars super ductile. The rebars also have very close dimensions, prominent rib pattern and surface finish.

For certain sections, tungsten carbide rolls are used in place of conventional steel rolls to enhance the surface quality and bond strength with concrete.

Thermo Mechanical Treatment - The Tempcore TMT online quenching process is adopted after rolling, with automated control of water pressure, nozzle angle and the rate of water flow. For Super Ductile rebars, it is very important to have a critical balance between chemistry and quenching parameters, essential in developing the desired properties.





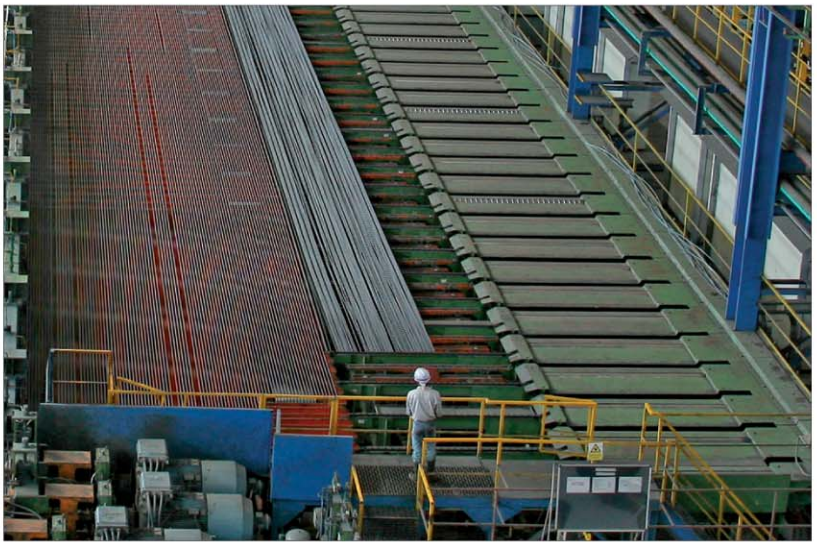
Characteristics of TATA TISCON Super Ductile rebars

Superior Mechanical Properties - TATA TISCON Super Ductile rebars are available in Fe 500 grade with a minimum characteristic yield strength of 500 MPa as specified in BIS-1786 which means, structural designing need not incorporate any deviation from the standard characteristic strength assumptions. In fact, the UTS and ductility being greater than specified in the Standard, the rebars ensure enhanced safety during earthquakes. Due to higher UTS but same characteristic yield strength, rebars acquire more bendability resulting in ease of work at sites. Moreover, the bent portion retains higher residual ductility.

Better Bond Strength - The rib pattern of TATA TISCON Super Ductile rebars are specially designed to bond best with concrete.
The carefully designed ribs and uniform replication of the same during rolling through the length of the rebar is ensured through cutting roll passes made with CNC machines only.

High Energy Absorption Capacity - While the current BIS-1786 specifies for conventional Fe 500 grade the minimum UTS/YS ratio of 1.08, for the new super ductile variety, this is maintained at a minimum of 1.15. This ensures that rebars when stressed beyond yeild strength, as it may happen during an earthquake, will absorb the stress easily and to a much higher extent without any danger of sudden and catastrophic rupture.

Super Ductility - Internationally, the concept of rebar ductility has changed. It is now expressed as uniform elongation up to ultimate tensile strength rather than total elongation which stands for elongation till breakage. Breakage cannot be allowed in any case and therefore measure of total elongation is not so relevant. In the TATA TISCON Super Ductile variety, the uniform elongation is more focussed on and maintained at a very high value compared to some of the international specifications. Thus Super Ductile rebars can undergo plastic deformations to a large extent without necking and thus resist ultimate breakage.

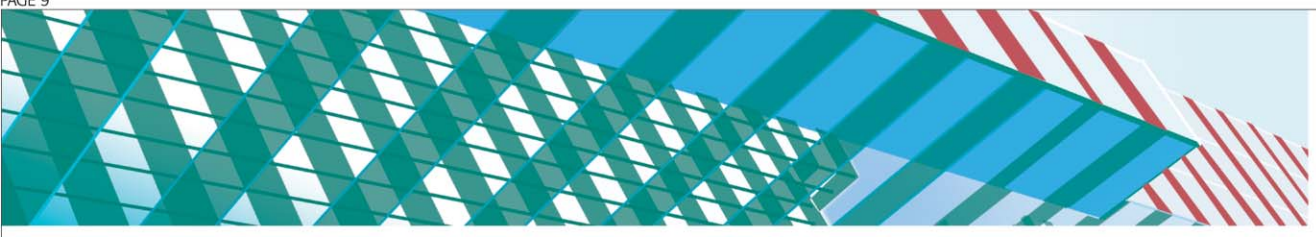


Important information

Availability - TATA TISCON Super Ductile rebars are available in various sizes ranging from 8 mm to 40 mm rounds. They can be easily identified by the embossed SD mark on them. TATA TISCON Super Ductile rebars are supplied in standard lengths of 12 metres. However, lengths may be customised as per the site requirements.

Application - TATA TISCON Super Ductile rebars are recommended for all reinforced concrete constructions, particularly in seismic zones 3, 4 and 5 in the country. They are a must in regions that are densely populated. Structures like houses, residential complexes, schools, offices, commercial complexes, hospitals, high-rises, auditoriums, stadiums and utility buildings should be made with TATA TISCON Super Ductile rebars. It is imperative to prevent devastating damages and loss of lives.

Cost - Often there is a misconception that while designing an earthquake resistant structure the cost of reinforcement increases substantially. High-strength TATA TISCON Super Ductile rebars which come at a nominal incremental cost, result in lower consumption of steel, compared to lower-strength rebars. They can be gainfully utilised for construction which is high on safety at a nominal increase in cost.



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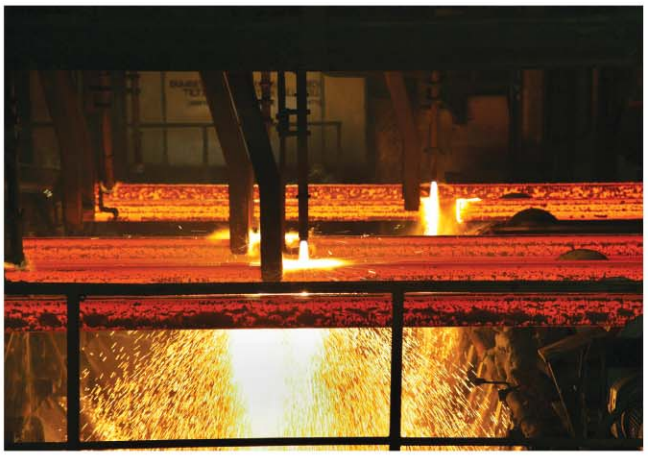

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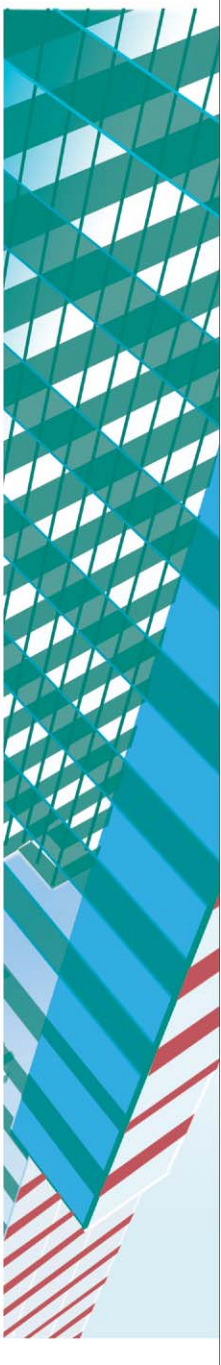

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