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TATA TISCON
JOY OF BUILDING

TATA TISCON
Solutions for your Business


TATA TISCON
500D
SD
TATA TISCON
TATA TISCON
600
CRSD
TATA TISCON
500D
SD

Profile of a trail-blazer: TATA Steel

A panoramic view of the TATA Steel Plant, Jamshedpur

Established in 1907 as Asia's first integrated private sector steel company, TATA Steel Group is among the top-ten global steel companies with an annual crude steel capacity of over 29 million tonnes per annum (MTPA). It is now the world's second-most geographically-diversified steel producer, with operations in 26 countries and a commercial presence in over 50 countries. The TATA Steel Group, with a turnover of US$ 24.82 billion in FY 13, has over 80,000 employees across five continents and is a Fortune 500 company. 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 this vision is a performance culture committed to aspirational targets, safety and social responsibility, continuous improvement, openness and transparency.

TATA Steel Long Products – Ride on excellence

A panoramic view of the New Bar Mill

TATA Steel offers a bouquet of world-class products covering rebars designed for different geographies and needs and carbon and alloy steel wire rods for a host of engineering applications. The rebars are made in the Merchant Mill and the New Bar Mill, while the wire rods are produced in the Wire Rod Mill. All the Mills draw their feedstock from the basic oxygen steel making unit which produces continuously cast billets. The Long Products Technology Group – a critical support service of the business – ensures seamless co-ordination among production, marketing and planning units. The sales and marketing wing has its pulse on the market and provides valuable consumer insight for product diversification, strategic planning and specific sales programmes.

With its best-in-class products, value added services and delivery commitments, TATA Steel is the one partner for all your long product needs.

In 2008, TATA Steel India became the first integrated steel plant in the world, outside Japan, to be awarded the Deming Application Prize for excellence in Total Quality Management.

In 2012, TATA Steel became the first integrated steel company in the world to win the Deming Grand Prize instituted by the Japanese Union of Scientists and Engineers.

TATA Tiscon – the reliable rebar

TATA Tiscon rebars are available in several categories: TATA Tiscon Fe 500D, TATA Tiscon Fe 600, TATA Tiscon CRSD and TATA Tiscon Super Ductile. Together, they comprehensively cover all applications for reinforcing steel bars. All TATA Tiscon rebars adhere to all the mandatory requirements of the Bureau of Indian Standards IS 1786. They are made in accordance with the TMT process.

Product Category	Special Qualities	Applications
TATA Tiscon 500D	Excellent bendability, good weldability and high fatigue resistance on dynamic loading	General concrete reinforcements in highrise buildings bridges and other concrete structures
TATA Tiscon CRSD	High corrosion resistance properties	Suited to RCC structure exposed to extreme coastal and underground environments
TATA Tiscon SD	Superior Ductility (better UTS:YS ratio and elongation)	Construction in earthquake prone zone
TATA Tiscon 600	High strength rebars - leading to less congestion	Highrise buildings' foundation

The manufacturing process: TMT

TATA Steel was the first in India to develop Thermo Mechanically Treated (TMT) rebars, using the latest technology from Tempcore, Belgium. The rebars are produced in state-of-the-art plants under the close supervision of high-calibre metallurgists and engineers. The basic steel is made from virgin iron ore through the blast furnace – basic steel making – secondary refining – billet casting route, with minimum impurities. They are rolled in fully automated mills from world renowned suppliers.

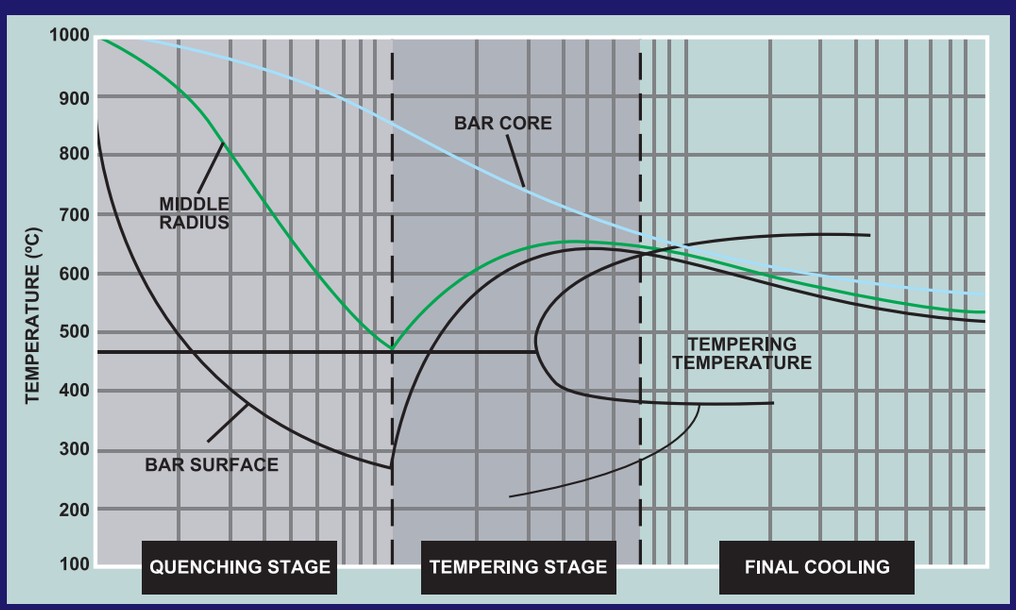
In 2013, TATA Tiscon was recognized as Asia's most promising brand.

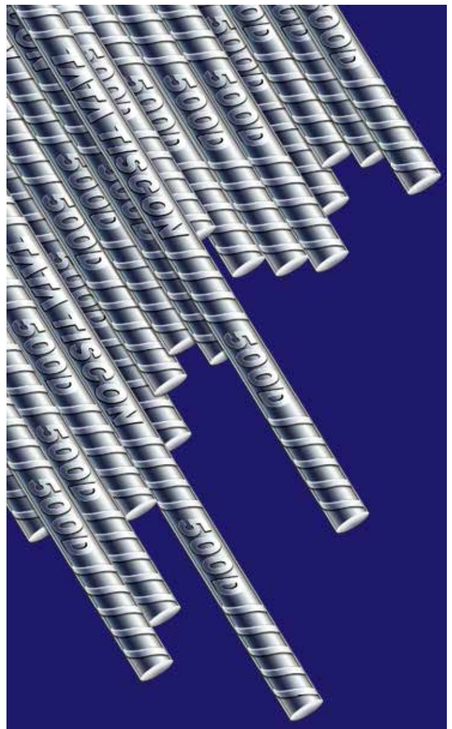
QUENCHING: The hot rolled bar leaving the final mill stand is rapidly quenched by a special water spray system. This hardens the surface of the bar to a depth, optimized for each section through formation of martensitic rim while the core remains hot and austenitic.

SELF-TEMPERING: When the bar leaves the quenching box, the core remains hot compared to the surface, allowing heat to flow from the core to the surface, causing tempering of the outer martensitic layer into a structure called 'tempered martensite'. The core still remains austenitic at this stage.

ATMOSPHERIC COOLING: This takes place on the cooling bed where the austenitic core is transformed into ductile ferrite-pearlite structure. Thus the final structure consists of an optimum combination of a strong outer layer (tempered martensite) with a ductile core (ferrite-pearlite). This gives TATA Tiscon its unique combination of higher strength and ductility.

Quenching and self tempering temperature profile





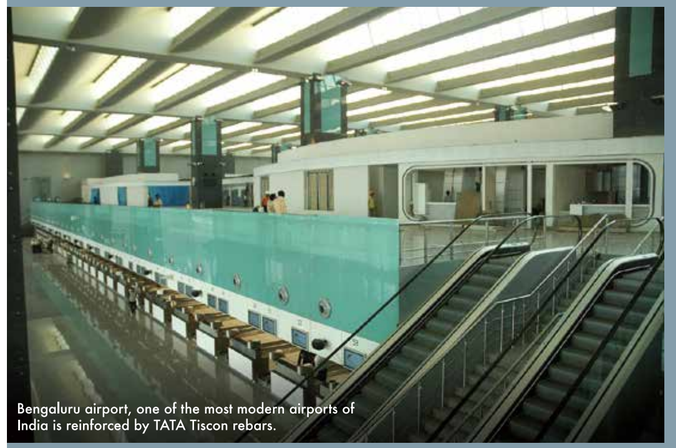
	IS : 1786 Fe500D	TATA Tiscon Fe500D*
Chemical Composition (Weight %)		
Carbon (max.)	**0.250**	**0.250**
Sulphur (S) (max.)	**0.040**	**0.035**
Phosphorus (P) (max.)	**0.040**	**0.035**
S&P (max.)	**0.075**	**0.070**
Mechanical Properties		
Yield Stress-YS (N/mm^2) (min.)	**500**	**520**
% Elongation (min.)	**16**	**18**
Ultimate Tensile Stress-UTS (N/mm^2) (min.)	**565**	**580**

Normal range: 18-25%* Elongation ▶ High Ductility

*(Typical values for 90% supplies)

All typical values are indicative only and not guaranteed

Advantages of TATA Tiscon Fe500D



Bengaluru airport, one of the most modern airports of India is reinforced by TATA Tiscon rebars.

Nuclear power plants at Kalpakkam, Kota and Trombay. 50,000 metric tonnes of TATA Tiscon rebars have gone into reinforcing the buildings.

HIGHER BOND STRENGTH: Higher bond strength is developed between the rebar and the surrounding concrete. The design and profile of the rib and its replication throughout the length of the rebar by using automated milling machines, result in uniform and precise ribs, leading to uniform strength.

MORE ECONOMY: TATA Tiscon Fe500D rebars are higher in strength and elongation. This helps you economise on steel consumption without sacrificing on safety.

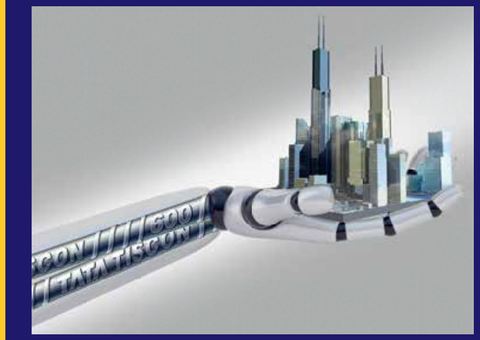
EXCELLENT BENDABILITY: Due to the controlled process of manufacturing rebars under TMT technology, the tempered outer surface and the tough core of TATA Tiscon Fe500D result in a rebar with excellent values of bendability. As a result, TATA Tiscon rebars can withstand harsher bends than that stipulated in IS:1786, which has an obvious advantage in the construction sites.

SUPERIOR WELDABILITY: TATA Tiscon Fe500D has an inherent low carbon and carbon equivalent. TATA Tiscon rebars can be butt-welded or lap-welded using simple welding practices with ordinary rutile coated electrodes of matching strength. Generally, no pre and post welding treatment is required.

CLOSE DIMENSIONAL TOLERANCES: TATA Tiscon Fe500D follow mass/metre philosophy. This is on the negative side of the specified tolerance on a weighted average basis in accordance with BI standards. This ensure an extra length during usage that results in the reduction of rebar consumption.

Also available is TATA Tiscon Fe600 which is the new name for SUPER STRENGTH. For details, please refer to the page folded alongside.

High strength rebars



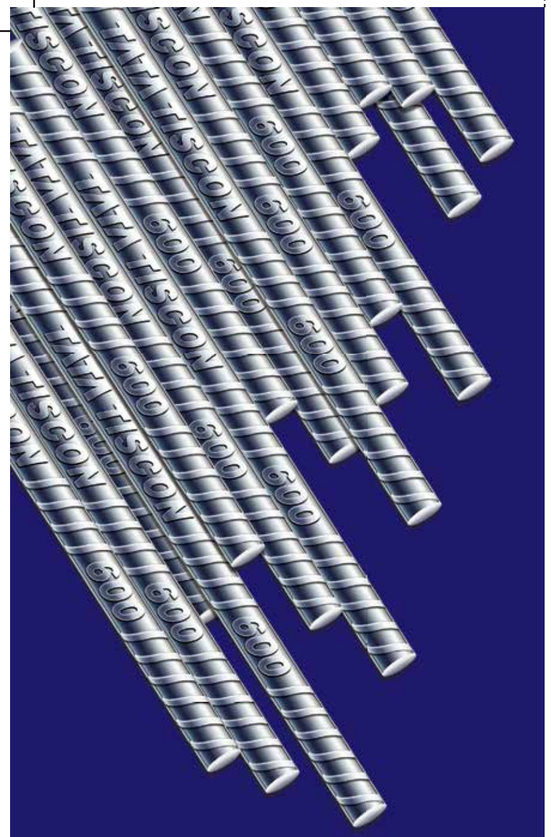
TATA Tiscon Fe600

Reinforced concrete, these days, is synonymous with construction globally. Be it the world's highest building, biggest metro viaduct or longest bridge, they are all built using reinforced concrete. Improvement in concrete technology has resulted in higher grade of concrete (up to M80) thereby making the structural member leaner. Constrained by land availability and enabled by enhancement in design capabilities engineers are opting for leaner structures with higher load-carrying capabilities.

Such improvements in technology have been coherent with this requirement. However, with high-strength carbon alloyed steel reinforcing bars the biggest challenge has been managing the **compatible ductility** together with **enhanced strength.** TATA Tiscon Fe600 rebars are envisaged to provide the best of both worlds. These reinforcement bars are suitably micro-alloyed to achieve better ductility along with higher strength. TATA Tiscon Fe600 can be used in buildings, bridges, and marine facilities etc. to create leaner structures with lesser steel congestion improving construction quality and saving cost.

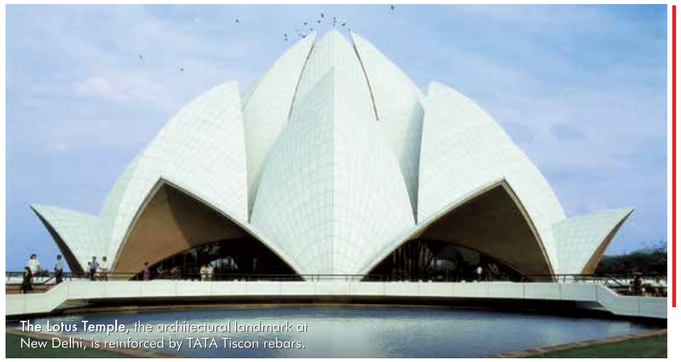
	IS : 1786 Fe600	TATA Tiscon Fe600*
Chemical Composition (Weight %)		
Carbon (max.)	**0.300**	**0.300**
Sulphur (S) (max.)	**0.040**	**0.035**
Phosphorus (P) (max.)	**0.040**	**0.035**
S&P (max.)	**0.075**	**0.075**
Mechanical Properties		
Yield Stress-YS (N/mm^2) (min.)	**600**	**620**
% Elongation (min.)	**10**	**16**
Ultimate Tensile Stress-UTS (N/mm^2) (min.)	**660**	**700**

*(Typical values for 90%)



Super strength has a new name – TATA Tiscon Fe600

The Corrosion Fighter: CRSD



The Lotus Temple, the architectural landmark at New Delhi, is reinforced by TATA Tiscon rebars.

TATA Tiscon CRSD (Corrosion Resistance Steel) rebar is a breakthrough innovation by TATA Steel to help builders fight the deadly menace of corrosion. Wherever there is salinity in the air, along the coastline, in sea water, in ground water or where there are acid particles in the air, corrosion strikes like a virus. It eats into RCC structures like buildings, bridges, dams, industrial plants and more.

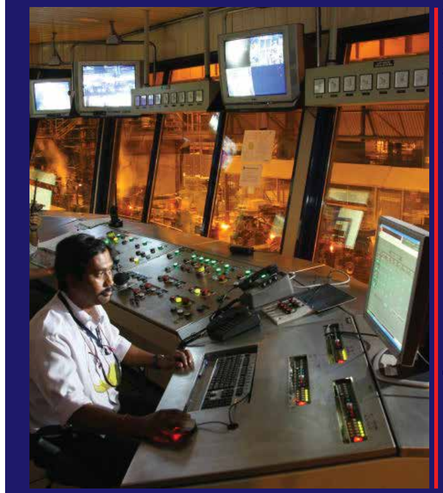
TATA Tiscon CRSD rebars with their unique protective chemistry, keep corrosion at bay and protect the life of concrete structures. It is available in the following diameters: 8, 10, 12, 16, 20, 22, 25, 28, 32, 36 and 40 mm, in grade IS:1786, Fe 500D.

TATA Tiscon CRSD – mechanical properties

	IS:1786 Fe500D	TATA Tiscon Fe500 CRSD* (Typical values)
Mechanical Properties (min.)		
Yield Stress-YS (N/mm^2)	**500**	**500**
% Elongation	**16**	**16**
Ultimate Tensile Stress-UTS (N/mm^2) (min.)	**565**	**580**

*(Typical values for 90% of batches)

TATA Tiscon CRSD process technology



TATA Tiscon CRSD rebars are produced, using a judicious selection of corrosion resistant elements (Cu, P and Cr) complemented by a special Thermo Mechanical Treatment (TMT) route.

The microstructure resulting from the TMT process, leads to higher corrosion resistance on account of:

- being free from torsional stresses
- presence of self-tempered lathe martensitic layer on surface known to inhibit corrosion attack
- homogeneous distribution of corrosion resistant elements from core to surface

Chemical composition and CRI of TATA Tiscon CRSD

C (max.)	S (max.)	P (max.)	Cu (min.)	CRI
0.25	0.04	0.04	0.40	1.30

CRI is measured using Electrochemical Impedance Spectroscopy (EIS) at National Metallurgical Laboratory, Jamshedpur. It is measured as ratio of Impedance of steel under test to the Impedance of Fe500D rebar.

CRSD rebars have the lowest levels of Phosphorus content in steel. This makes them compliant to the chemical composition of Fe 500D grade.

In this test, rebar samples are exposed to Carbonated Concrete Pore Chloride (pH:9, Chloride 0.6M) for 20 days to form passive film. The impedance studies are then performed after interval of 24 hours. This procedure of testing simulates exposure of rebar to conditions similar to marine atmosphere with carbonation and chloride contamination (i.e. worst condition).

Advantages of TATA Tiscon CRSD

- Longer life due to superior corrosion resistance
- High yield strength, coupled with good ductility and bendability
- No extra precaution required in material handling and transportation
- No maintenance during fabrication
- Ideally suited to poor working conditions at site
- No extra precaution during welding
- Can be bent and rebent around very small mandrels

The Thyagaraja Indoor Stadium, New Delhi. TATA Tiscon has been used in various structures that have been built for the 2010 Commonwealth Games.

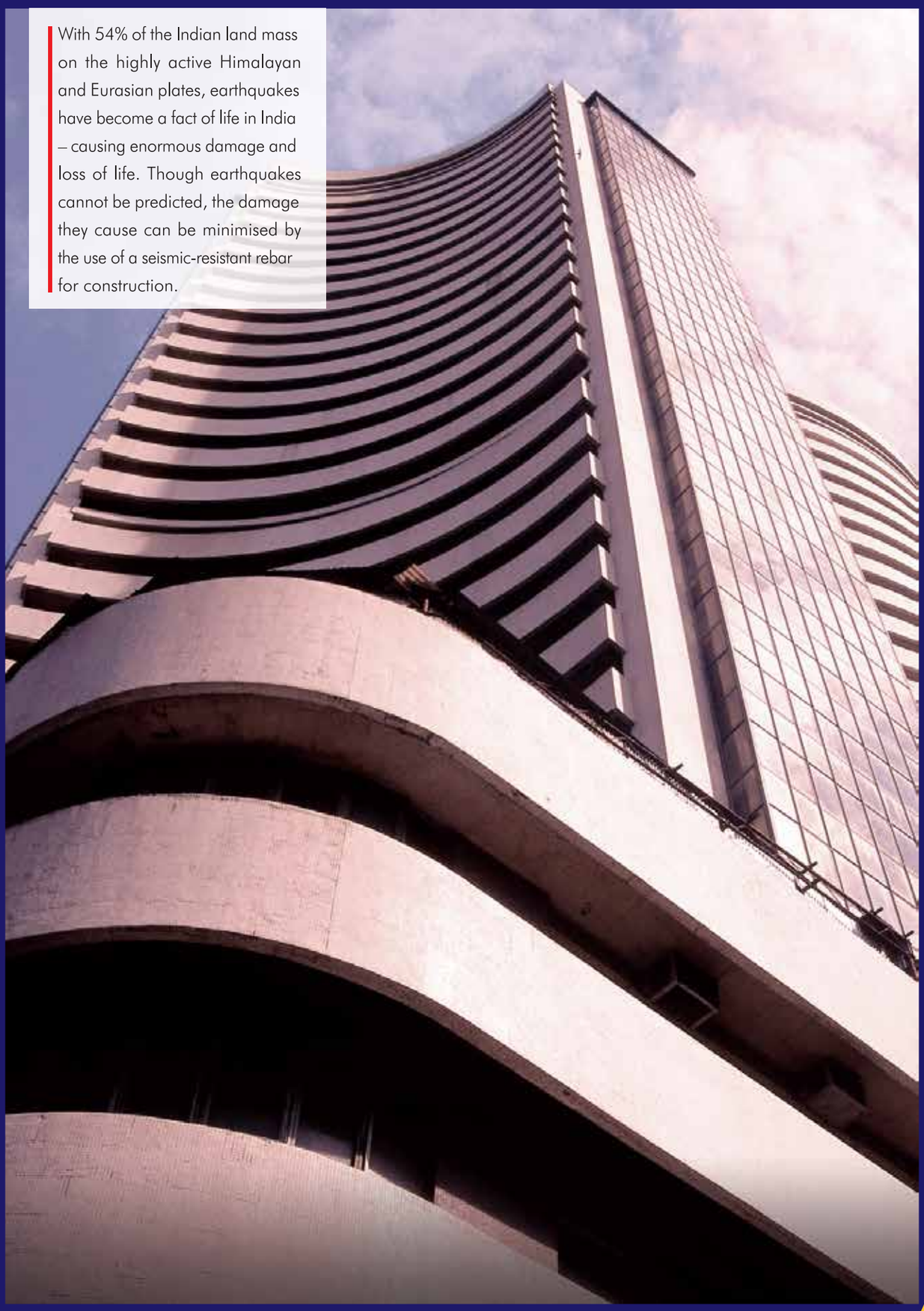
CRSD vis-a-vis Epoxy Coated Rebar and Inhibitor Solution

Parameters	TATA Tiscon CRSD	Cement Polymer Composite Coating (CPCC)	Epoxy Coated Rebar
Corrosion Resistance Technology	Enhanced inherent immunity with special alloying addition	External coating that behaves more like a blanket cover	External coating that behaves more like a blanket cover/plant
Surface preparation	Not required	Surface cleaning efficiency is a critical factor	Not required
Coating holiday effect	No coating holiday effect due to inherent corrosion resistance	Detection and elimination of all coating holidays under suspicion. Pits and discontinuities can lead to severe pitting and corrosion at the uncoated site	Pits and discontinuities in the epoxy film can lead to accelerated corrosion at the uncoated site
Bond strength with concrete	Better bond strength with concrete	Bond strength may not be high due to external coating	Lesser bond strength compared to CRS due to external coating
Welding	No special care is required	Coating gets damaged during welding	Not advisable for welding as coating gets damaged during welding
Fabrication (cutting)	Normal practice as conventional rebar	Chances of cracking/flaking of coating while cutting	Chances of cracking/flaking of coating while cutting
			Special tools needed for cutting to avoid damage in the vicinity of cut end
	No protection required at bear cut end due to inherent immunity	Exposed cut end does not have any coating from where corrosion can initiate	Exposed cut end does not have any coating from where corrosion can initiate
Bending	Normal practice just as for conventional rebar	There are chances of the coating getting removed during bending. Bending to be completed prior to coating	There is a chance that the coating may get disbonded during bending if quality of coating is not proper
Handling	No special handling required	Extensive special handling required	Special handling required at site to avoid coating damages
Final inspection and repair at site	Not required	Quality control is difficult. Final inspection is required to repair all the visible damages. Labour intensive and needs close monitoring	Inspection at site Recommended to detect and repair all the visible coating damages
Usage of tie wire, couplers	Uncoated tie wire/couplers can be used at site	Pre-coated tie wire/couplers to be used	Pre-coated tie wire/couplers to be used

TATA Tiscon Super Ductile rebars – innovation in seismic damage control

TATA TISCON SD

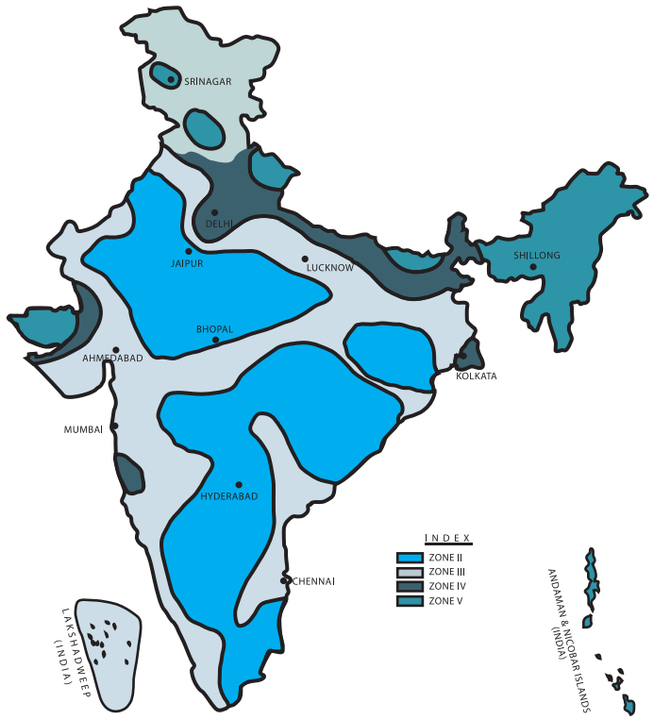
With 54% of the Indian land mass on the highly active Himalayan and Eurasian plates, earthquakes have become a fact of life in India – causing enormous damage and loss of life. Though earthquakes cannot be predicted, the damage they cause can be minimised by the use of a seismic-resistant rebar for construction.



For the first time in India, TATA Steel has developed TATA Tiscon Super Ductile rebars, ideally suited for use in earthquake prone areas (zones II, III, IV and V indicated in the map). The distinguishing feature of TATA Tiscon Super Ductile rebars is its capacity to absorb large amounts of energy released during earthquakes, without catastrophic failure which might happen in case of ordinary rebars.

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

Frequent tremors on the ground and its amplitude may generate stresses that exceed the yield strength of the rebars. 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.



TATA Tiscon Super Ductile rebar properties

PROPERTIES	BIS 1786	BIS 1786	(UK) B.S. 4449 / 2005		AUS/NEW ZEALAND AS NZS 4671 / 2001		TATA TISCON SD
	Fe500	Fe500D	500B	500C	500N	500E	Fe500SD
YS min.	500	500	500	500	500	500	520
YS max.	NS	NS	650	650	650	650	650
UTS min.	8% higher to YS	10% higher to YS	8% higher to YS	15% higher to YS	8% higher to YS	15% higher to YS	15% higher to YS
UTS max.	NS	NS	NS	35% higher to YS	NS	40% higher to YS	40% higher to YS
UTS:YS min.	1.08	1.10	1.08	1.15	1.08	1.15	1.15
% Total elongation	12.0 min.	16.0 min.	NS	NS	NS	NS	18
% Elongation upto max. stress	NS	5	5	7.5	5	10	6

E.Q. Zone: Earthquake Zone NS: Not Specified N2: 120 PPM max.

Precision-manufactured 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.

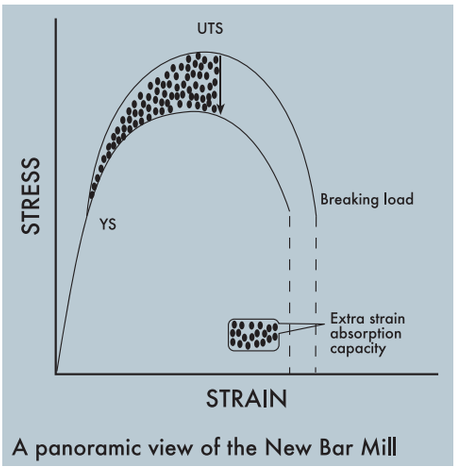
CHEMISTRY: TATA Tiscon Super Ductile rebars are made to a unique chemistry with critical control over Carbon, Sulphur, Phosphorus and other alloying elements. Carbon equivalent is maintained at a lower range to facilitate good weldability. Billets are cast with electromagnetic stirring to eliminate harmful segregation.

ROLLING: The billets are rolled in the most advanced mills 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.

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 TATA Tiscon Super Ductile rebars, it is very important to have a critical balance between chemistry and quenching parameters, essential in developing the desired properties.

Advantages of TATA Tiscon Super Ductile rebars

A panoramic view of the New Bar Mill



SUPERIOR MECHANICAL PROPERTIES: TATA Tiscon Super Ductile rebars are available in Fe500D 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.

HIGH ENERGY ABSORPTION CAPACITY: TATA Tiscon Super Ductile rebars have a higher UTS/YS ratio. This ensures that rebars when stressed beyond yield 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: In TATA Tiscon Super Ductile rebars, the uniform elongation is more focused on high value, and maintained at a very high value, compared to some of the international specifications. Hence TATA Tiscon Super Ductile rebars can undergo plastic deformations to a large extent without necking and thus resist ultimate breakage.

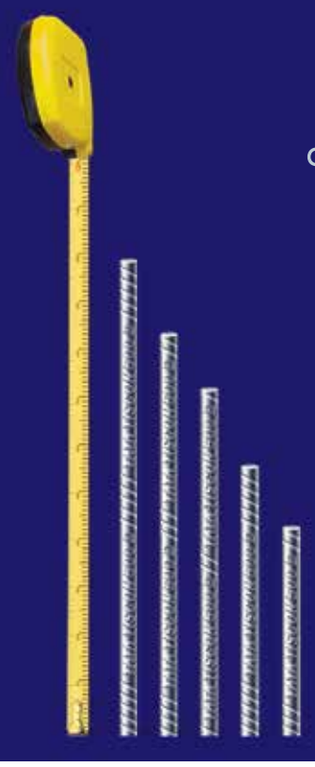
Introducing TATA Tiscon rebars in 36 mm, 40 mm and 50 mm* diameters.

TATA Tiscon now brings you rebars in 36 mm, 40 mm and 50 mm diameters.

For years TATA Tiscon has offered rebars in diameters of 8 mm, 10 mm, 12 mm, 16 mm, 20 mm, 22 mm, 25 mm, 28 mm and 32 mm to cater to varied construction needs.

Now with 36 mm, 40 mm and 50 mm rebars, it will be possible to create bigger, stronger and taller structures with stronger foundation. Structures which truly reflect an imagination that has been set free.

** Available on request.*



Introducing customised lengths from TATA Tiscon

Now TATA Tiscon rebars are also available in 7.5 m, 8 m, 8.5 m, 9 m, 9.5 m, 10 m, 10.5 m and 11 m, besides 12 m length.

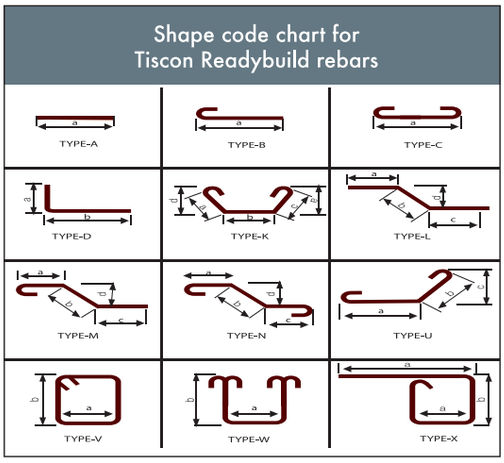
Any other size, apart from the standard ones (mentioned above), can be supplied subject to MOQ.

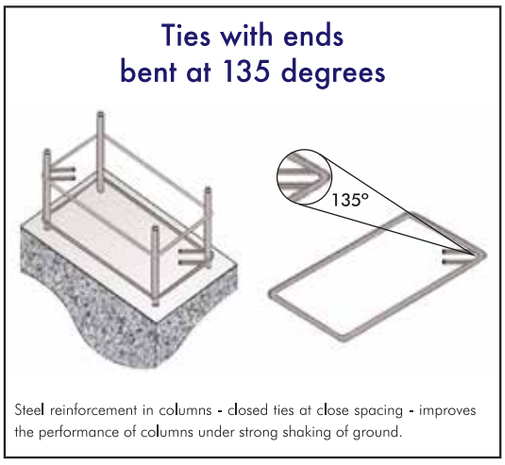
TISCON READYBUILD
CUSTOMISED REBAR SOLUTIONS

A Service Innovation

The Tiscon Readybuild Customised Rebar Solution customises the lengths of the rebars and bends them at required angles, in accordance with the given project's specifications. The fast and efficient service caters to every kind of reinforcement requirement, redefines concepts of time and inventory management, and reduces material wastage.

Tiscon Readybuild: Cut & Bend service





Steel reinforcement in columns - closed ties at close spacing - improves the performance of columns under strong shaking of ground.

Advantages of the Tiscon Readybuild Customised Rebar Solution

RELIABILITY OF STEEL AND SUPPLY: TATA Tiscon rebars from the Tiscon Readybuild Customised Rebar Solutions are made from 100% virgin steel. The supply of raw materials, according to a given schedule is guaranteed. There is no question of delay due to non-availability of steel.

BETTER SITE PRODUCTIVITY: There is a reduced involvement of labour, used for handling, cutting and bending. This makes site management much easier. Projects get a competitive edge due to the enhanced speed of construction.

BETTER QUALITY CONSTRUCTION: The Tiscon Readybuild Customised Rebar Solution is fully automated and rebars are fabricated to IS standards. The machines guarantee a precision that is impossible to achieve manually. The accuracy with which the rebars are cut and bent leads to easier fabrication on-site.

REDUCED WASTAGE: Wastage of materials is averted as human error is done away with because of the machines at the plant. As a result, the cost of disposing waste material on-site is also reduced.

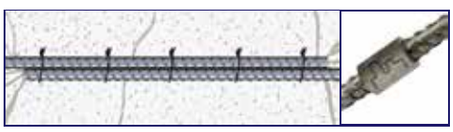
LESS TIME TAKEN: The time taken to complete the project is reduced as the entire process is comparatively error-free, being mostly automated.

REDUCED PROJECT COST:

1. Inventory and storage cost is negligible due to just-in-time delivery system.
2. Labour cost is reduced as the entire cut and bend process is limited to ordering the material according to specification.
3. Wastage of materials is averted as human error is done away with to a large extent. Thus the cost of disposing waste material on site is also reduced.

Tiscon Readybuild: Cut & Bend with Couplers

One of the most common methods for reinforcement of joints for rebars are when two bars are laid parallel to one another over a certain lap length and tied together with the help of binding wire. This results in a lot of wastage of the rebars and congestion at the point of lapping of the two members.



To alleviate this problem, TATA Tiscon has introduced hollow mechanical members called COUPLERS. They are threaded inside and screwed on the two rebars which need to be joined.

TATA Tiscon service edge

Reliable Steel Programme

TATA Steel's Reliable Steel Programme removes even the slightest delay in the delivery of steel, negating completely the chances of project overrun. The entire supply chain has been re-arranged so that On-Time and In-Full (OTIF) supply of material is guaranteed.

TATA Steel, known for its superior product quality and continuous improvement, will become one of the best service providers in the steel business with its Reliable Steel Programme.

Advantages of the Reliable Steel Programme

- On-Time and In-Full (OTIF) delivery
- Manages sudden changes in steel requirements
- Reduces inventory levels at sites

TATA STEEL SALES OFFICES (LONG PRODUCTS)

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CHANDIGARH:
SCO 16, 1st Floor
Sector 26 C, Madhya Marg
Chandigarh - 160 019
Phone: 0172 279 1047/0932
Fax: 0172 279 2426

KANPUR:
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The Mall
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Phone: 0512 237 5679
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191 Burma Road
Burma Mines
Jamshedpur - 831 007
Phone: 0657 227 0901/0995
Fax: 0657 227 0685

GUWAHATI:
4th floor, Subham Velocity,
Honuram Boro Path,
Opp. Wallford, G.S. Road
Guwahati - 781 005
Phone: 09085988500

PATNA:
Boring Canal Road
Patna - 800 001
Phone: 0612 222 5624
Fax: 0612 223 2044

WEST ZONE

MUMBAI:
Tata Steel Ltd.
One Forbes, 3rd floor
1 Dr. V B Gandhi Marg,
Fort, Mumbai - 400 001
Phone: 961935509

INDORE:
3rd Floor, N.R.K.Business Park,
B1 Scheme No. 54,
A.B. Road, Vijay Nagar
Indore - 452 010, MP
Phone: 0731 645 0690

NAGPUR:
Museum Road
Civil Lines
Nagpur - 440 001
Phone: 0712 253 3209
252 2209, 561 1812
Fax: 0712 253 7078

AHMEDABAD:
2nd Floor
Premchand House Annexe
Ashram Road
Ahmedabad - 380 009
Phone: 079 6661 2605/
2600/2603
Fax: 079 6661 2604

PUNE:
Tata Steel Ltd,
Office No 6 & 7,
2nd Floor, Wing-B,
Great Eastern Plaza,
Airport Road,
Pune-411001

SOUTH ZONE

CHENNAI:
Chettinad "Sigapi Achi Building"
18/3, Rukmini Lakshmipathy
Road, Egmore
Chennai - 600 008
Phone: 044-66960097

BENGALURU:
2nd Floor, 'A' Wing
Jubilee Building
45 Museum Road
Bangalore - 560 025
Phone: 080 2532 5517/18/19
Fax: 080 2532 5527

SECUNDERABAD:
6th Floor, Surya Towers
104 Sardar Patel Road
Secunderabad - 500 003
Phone: 040 5526 1050
Fax: 040 2781 2418