

**TATA STEEL**

**TATA**  
**ASTRUM**  
HR SHEETS AND COILS



**TATA STEEL**

**Tata Steel Limited**

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# Tata Steel Legacy of Trust

Tata Steel is amongst the top-ten global steel companies with a crude steel production capacity of 26.5 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 in nearly 50 countries.

The Group's Vision is to be the world steel industry benchmark in "Value Creation" and "Corporate Citizenship" through the excellence of its people, its innovative approach and overall conduct. The Tata Steel Group recorded a turnover of US \$ 26.13 bn in the year ended March 31, 2012.

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**TATA**  
**ASTRUM**  
HR SHEETS AND COILS

Tata Astrum, HR sheets & coils from Tata Steel, is the new star in the manufacturing industry that will redefine the norms of the market by virtue of its impeccable quality and best-in-class service offerings.

Hot rolled coils and sheets have been the backbone of the infrastructure and manufacturing sector for years now. Tata Astrum shall strive to support the growth in these sectors by addressing the unmet needs of customers and providing end to end solutions. With its wide range of products, Tata Astrum can serve customers from different segments viz. Automotive, Railways, Yellow Goods, Agriculture, Fabrication, etc.



# The Basket of Offerings

- Wide Range of grades for a host of applications
- Pan-India network of distributors to serve you at your convenience
- Steady availability in various thickness & width combinations
- Cut-to-length sheets/slit coils from certified service centers
- Product Marking to ensure source authenticity
- Product Application Engineer Support to recommend the correct grade and usage
- Test certificates with mechanical properties
- Customer Engagement & Knowledge Sharing Programs

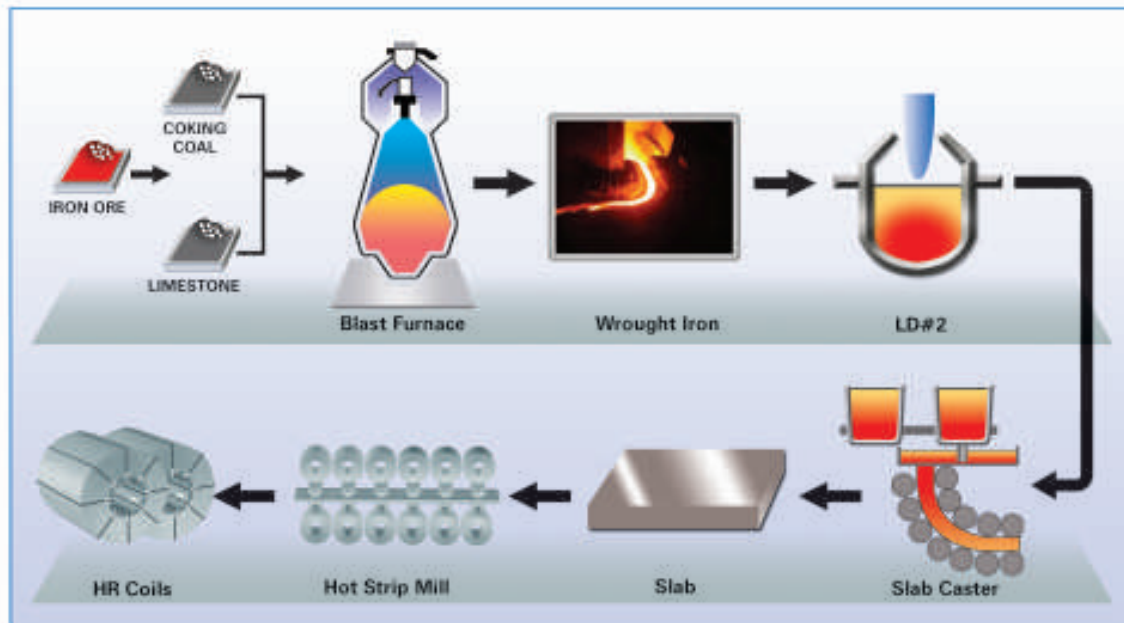




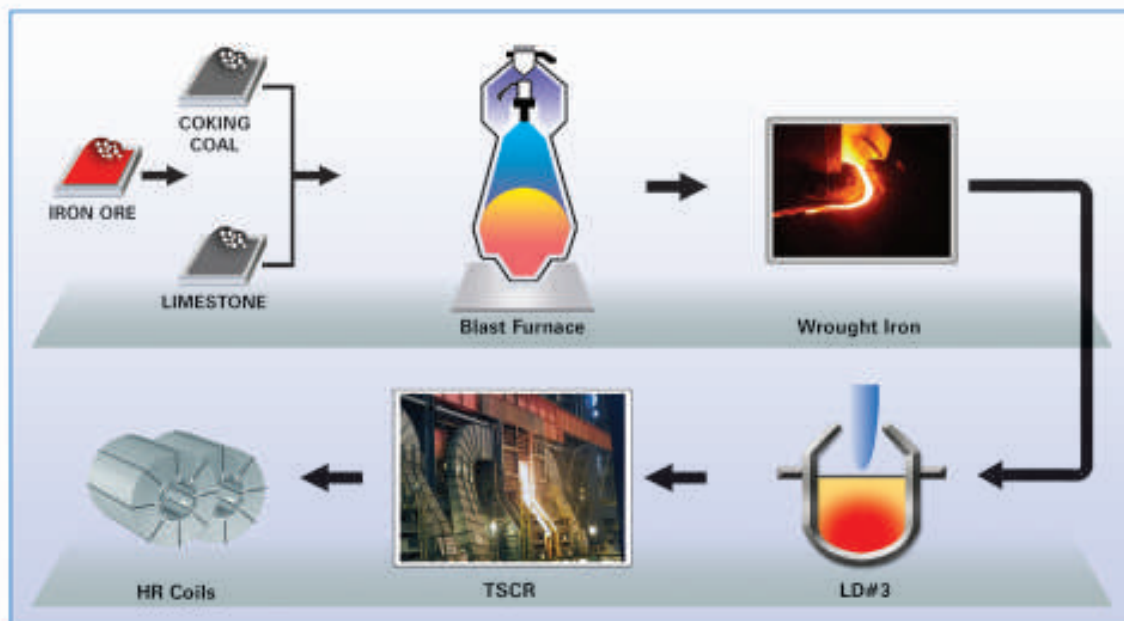
# PROCESS FLOW

## RAW MATERIAL TO END PRODUCT

HSM\* Route



LD#3 & TSCR\* Route



\* HSM - Hot Strip Mill    \* TSCR - Thin Slab Caster & Rolling Mill



# Leading Edge Technologies

From steel making to final finishing, the entire production line incorporates state-of-the-art technologies and processes that make Tata Astrum a best-in-class product.



# Steel making

The first level of differentiation takes place in the steel making shop is to meet the variety of customer requirements through appropriate grade chemistry.

Our steel is made and cast to the requisite parameters in LD2 & Slab Caster (Steel-Making & Casting Shop). The shop is equipped with all modern facilities to be able to produce the best quality steel adhering to stringent quality parameters.

It has the following facilities:

- Desulphurization stations for low-sulphur steel
- Argon stirring and alloy additions at ladle furnace
- Degassing facility (RH) for low residuals and gas levels, required for IF grade steels
- One vertical bending (improved cleanliness) and two curved casters
- A semi-automatic scarfing machine for inspecting surface level defects

LD#2 & Slab Caster is capable of producing a very wide range of steels – from low carbon steels to special alloy and high carbon steels.



LD#2



Slab Caster



Hot Strip Mill

## Hot Strip Mill

After the steel is cast into slabs, it is transferred to the Hot Strip Mill (HSM) where it is rolled to the desired thickness & width. The rolling and subsequent cooling is done in a manner so as to ensure that the final product (HR coil) attains its requisite mechanical properties (as per design parameters).

In order to meet the quality and volume requirements the HSM is equipped with 3 Re-heating Furnaces, 1 Reversing Mill and 1 six-stand finishing mill (4-Hi).

The unit is equipped with:

- Automatic controls to ensure proper heating of slabs
- Automatic Width Control (AWC) facilitates width control and adjustments based on online inputs with the help of activated hydraulic cylinders
- Coil-box for temperature homogenization leading to uniformity in properties along the length
- Profile Contour & Flatness Control (PCFC) helps in maintaining perfect flatness through online monitoring & adjustment
- Automatic Gauge Control (AGC) ensures consistent thickness by hydraulic gap and gauge control
- Continuous Variable Crown (CVC) ensures minimal & uniform crown throughout the length of the coil



# Pickling and Skin Passing

## PICKLING & OILING

Hot Rolled coils have an oxide film or scales on their surface. Pickling cleans these scales to give the hot rolled coil surface a better look and finish.

Through a continuous process, the HR coil is uncoiled and sent through a series of inorganic acid bath (hydrochloric or sulphuric acid) that removes the oxides/scales (rust) from the surface (top & bottom). Post the pickling process, the strip is properly rinsed and then oiled. Pickling and oiling process enhances the surface finish and improves the shelf life of steel. Pickled and oiled steel sheets and coils are ideal for applications that require an even finish.

## PICKLING, OILING & SKIN PASSING

Skin-passing of the coils is done post the pickling & oiling process. Skin passing is a light cold rolling operation which suppresses the appearance of stretcher strain and minimizes coil break during uncoiling and subsequent processing. It produces a smooth surface, makes the thickness of the coil uniform and does minor corrections in mechanical properties.

The skin-passing process involves passing the coil through a set of rolls. The rolls induce a predefined amount of force on the HR surface which makes the surface smoother and corrects the yield point phenomenon.

Tata Steel supplies HRPO & HRSPO steel from its in-house facilities in CRM Bara as well as from its EPAs.

### CRM, Bara Specifications for HRPO:

Parameters	Values
Strip Thickness	1.2mm to 6mm
Strip Width	700mm to 1650mm
Weight	30 T (max)
Coil I/D	762mm
Coil O/D	1000mm to 2150mm

### BMW, Gamharia Specifications for HRPO:

Parameters	Values
Strip Thickness	1.2mm to 5mm
Strip Width	900mm to 1500mm
Weight	30 T (max)
Coil I/D	610 mm

### CRM, Bara Specifications for HRSPO:

Parameters	Values
Strip Thickness	1.2mm to 3.2mm
Strip Width	800mm to 1270mm
Weight	28 T (max)
Coil I/D	610 mm
Coil O/D	2150mm (max)



Run out Table at TSCR

# LD#3 & TSCR Mill

## Thin Slab Caster & Rolling Mill

The Thin Slab Caster & Rolling Mill (TSCR) is the newest addition to the Flat Products Complex. The mill was commissioned on the 14th of February '12 and is equipped with all the latest technologies to cater to different requirements of the customers.

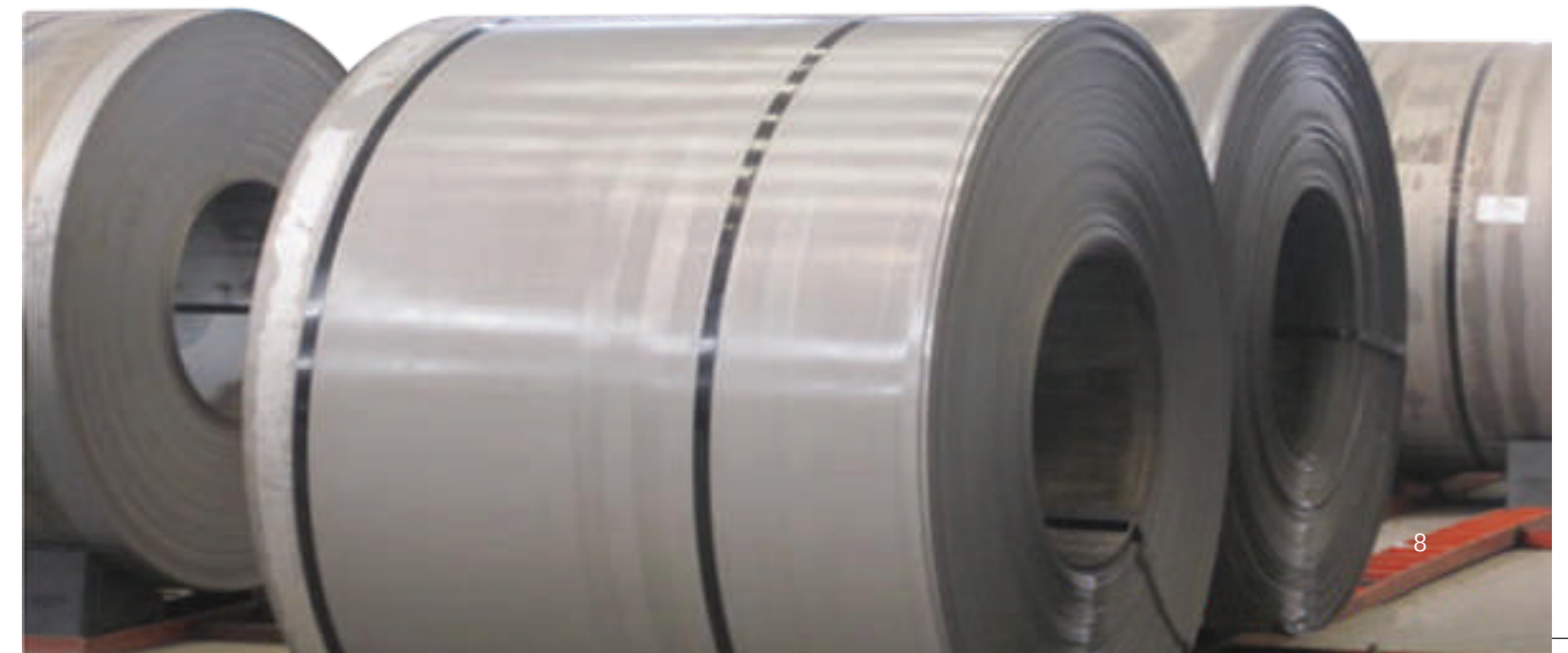
It is an integrated shop where steel is made in the steel making shop (LD#3), then cast and rolled continuously. Unlike the HSM, there is no slab stage in this mill and thus it reduces the time lag.

LD#3 & TSCR has the following facilities:

- 2 De-sulphurization Stations, 2 BOF Converters, 2 Online Purging (OLP) Stations & 2 Single Strand Casters
- Two tunnel furnaces and one emergency crop shear
- One 4 Hi 6 (+1) stand finishing mill with laminar cooling facility followed by 2 down-coilers

## Unique Features to ensure best-in-class product:

- Vertical Caster equipped with Liquid Core Reduction and Dynamic Soft Reduction for better segregation control
- Calcium treatment for higher steel cleanliness
- Mill capable of rolling thinner (1 mm min) and wider (1680 mm max) sections
- Dynamic Continuous Variable Crown (CVC) and Work Roll Bending (WRB) technology for better control of profile, flatness and contour of rolled strip
- Dynamic Disturbance Compensators (DDC) for improved thickness tolerances
- Hydraulic Gap Control (HGC) for roll gap adjustment & Automatic Gauge Control (AGC)
- Edge masking on the run-out table for homogeneous mechanical properties





# Shearing Line

The Shearing Line at the Hot Strip Mill enables Tata Steel to serve customers who require Hot Rolled Sheets and Plates of various grades.

The Shearing Line is about 100 metres long with the following facilities : uncoiler, 5 roll flattener, 9 & 17 roll levellers, flying shear, conveyor belts, stackers, discharge table and weigh bridge in a continuous line. The line is controlled by a highly automated system employing control desks, sensors and transducers, programmable logic controllers and man-machine interfaces which are integrated with level-3 control systems.

Automated systems ensure proper dimension of the product. The line is equipped with a manual inspection provision where trained inspectors screen the product for any abnormality. Other features of the Shearing Line include automatic production recording of plates and bundles.

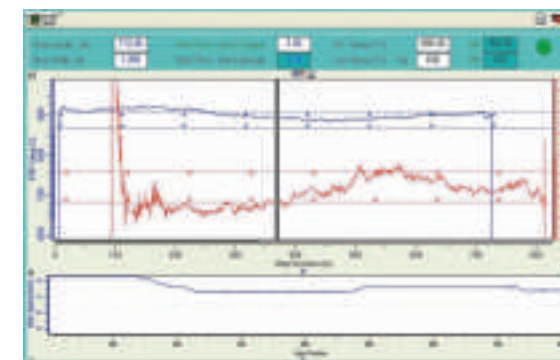


# Quality & Process Control



All the production lines are equipped with the latest technologies and have robust quality control mechanisms to check any abnormality in the process which might hamper the product quality.

Continuous Variable Crown, Thickness Control, Profile Control and Flatness Control (PCFC) and Automatic Width Control (AWC) are some of the features which enable us to ensure that the material produced meets customer needs.

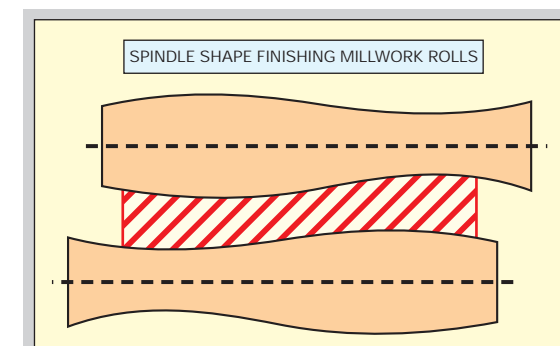


Process Control Chart Online

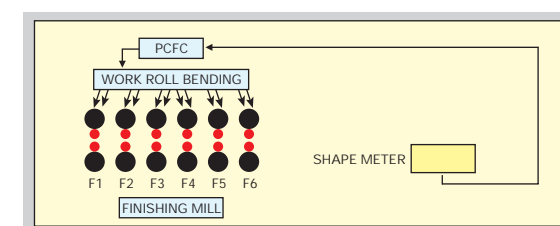
Inspection:

Since the surface of the hot rolled steel is critical to any application, we have dedicated surface inspection systems to ensure top quality. These include :

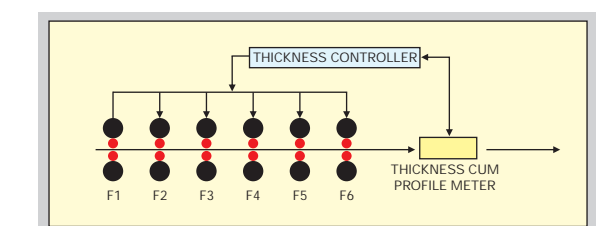
- Online Surface Inspection System (SIS): The system inspects coils during processing and helps detect the surface quality correctly. This improves accuracy and reduces decision-making time.
- Manual Inspection – Certain grades of coils which are used for specialised operations and have extreme critical surface requirements are uncoiled and manually inspected for any defects.\*



C V C System

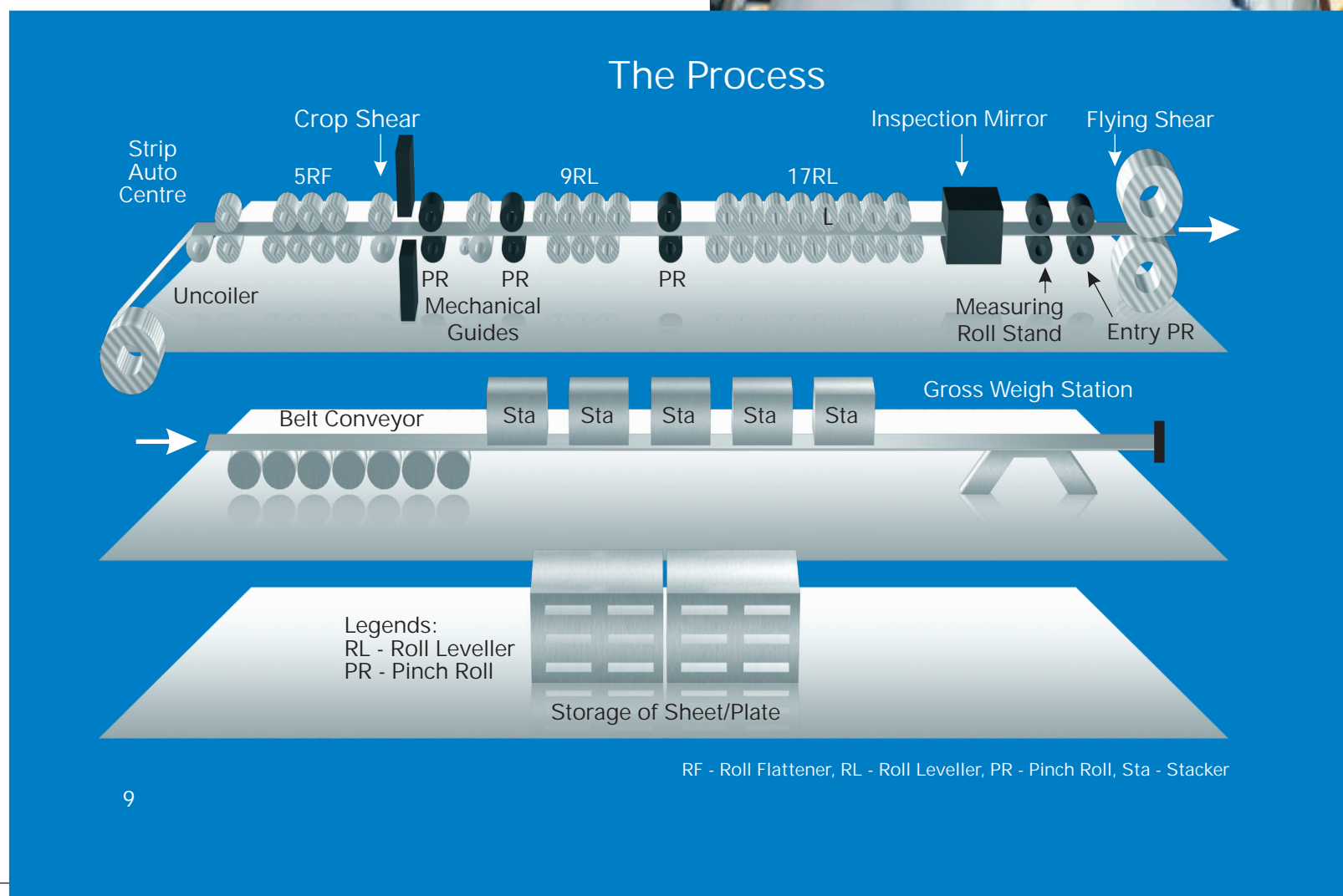


PCFC System



Thickness Control

\* Only coils of certain grades and meant for certain applications are checked manually.







Bend testing



Impact Testing

# Testing Parameters



Tensile Testing



Wichsen-cupping testing



Hardness testing

## Chemical Composition:

The chemical composition of the steel is tested at the steel making stage and the results are mentioned in the test certificate.

## Elongation:

The elongation of a material is basically the percentage change in the length of the material when tension is applied along the length. All our materials are tested for their elongation and the value is mentioned in the test certificate.

## Tensile Testing :

Tensile testing helps in finding out the maximum tensile load that the material can bear. It helps in specifying the UTS<sup>(1)</sup> as well as YS<sup>(2)</sup> of the material.

## Impact Testing:

It helps in establishing the impact load bearing capability of the material, that is, the force required to fracture it. It is a measure of the toughness of the material.

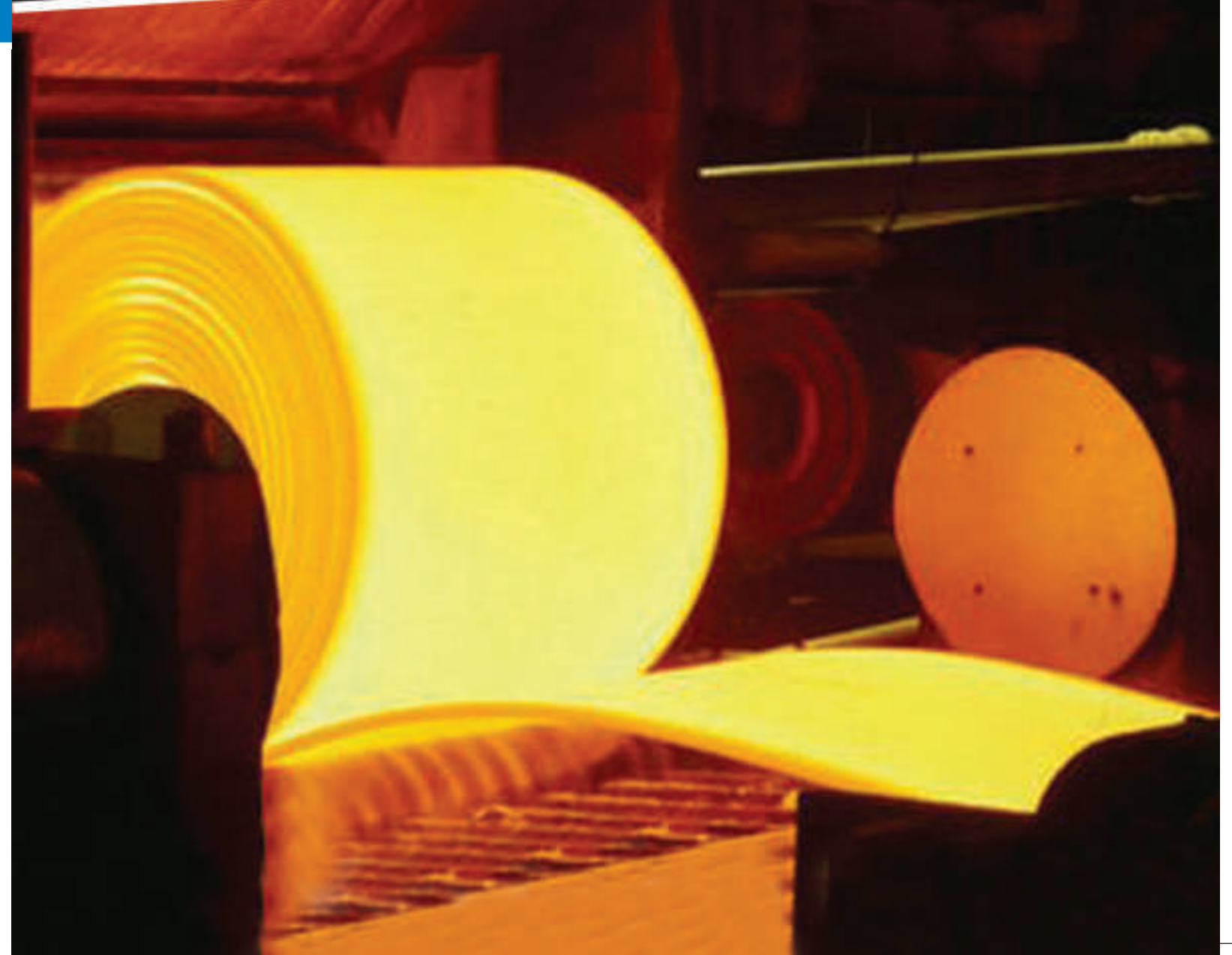
## Bend Test:

The bend test essentially measures a metal's ductility. Ductility defines how easily a metal can bend without breaking. The higher the ductility of a metal, the more it can bend without breaking or becoming deformed from its original shape. Our labs are equipped with the machinery to carry out the bend test and provide the tested value on the Test Certificate.

<sup>(1)</sup>Ultimate Tensile Strength

<sup>(2)</sup>Yield Strength

# A Multitude of Segments





# Automotive Industry



Tata Steel has been a preferred steel supplier to almost all the major automobile manufacturers and their vendors in the country for over a decade. From our years of serving auto customers we have developed competencies that are important for the industry. Be it customized size requirement or prudent stock management, we are capable of partnering our customers in their progress. Tata Astrum can be used for manufacture of LM/CM, axles, wheel components, brackets, mountings etc. Ashok Leyland, Tata Motors, Toyota are some of our major HR customers.

Tata Astrum is supplied along with a test certificate which carries the details of all the mechanical properties of the supply lot, to make work easier for our customers.



## Lifting & Excavation



We believe that Hot Rolled Products forms the building blocks of lifting and excavation equipment. Be it the cabin of a tipper or the bucket of the excavator, each has to be made from the right grade of steel to ensure style and durability. Our range of hi-tensile steel suits the requirements of load bearing components and our formable grades of steel can be used to manufacture the smaller engine/cabin components.





# Projects & Fabrication

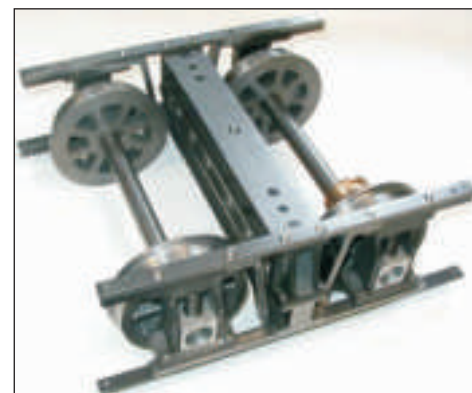


As India treads its growth trajectory, infrastructure is an area which will grow at breakneck speed. Industrial projects and fabrication jobwork will aid this growth. Tata Astrum's structural and hi-tensile grade steels are available in a wide range of thicknesses and widths. In order to authenticate the material as Tata Astrum, the logo of the brand will be imprinted on the surface \*(will be available in some time). Our water-marked test certificates further help in differentiating our material.

\*HR sheets, can be made available to our customers in the sizes that they require, if suitably packed.



## Railways



Railways is a segment where Tata Steel's products have found ample use for over a decade now. Tata Astrum complies to BIS and IRS standards which are mandatory requirements of Directorate of Railways. Tata Astrum finds its uses in a host of applications like engine / coach components, spring planks, axles etc.





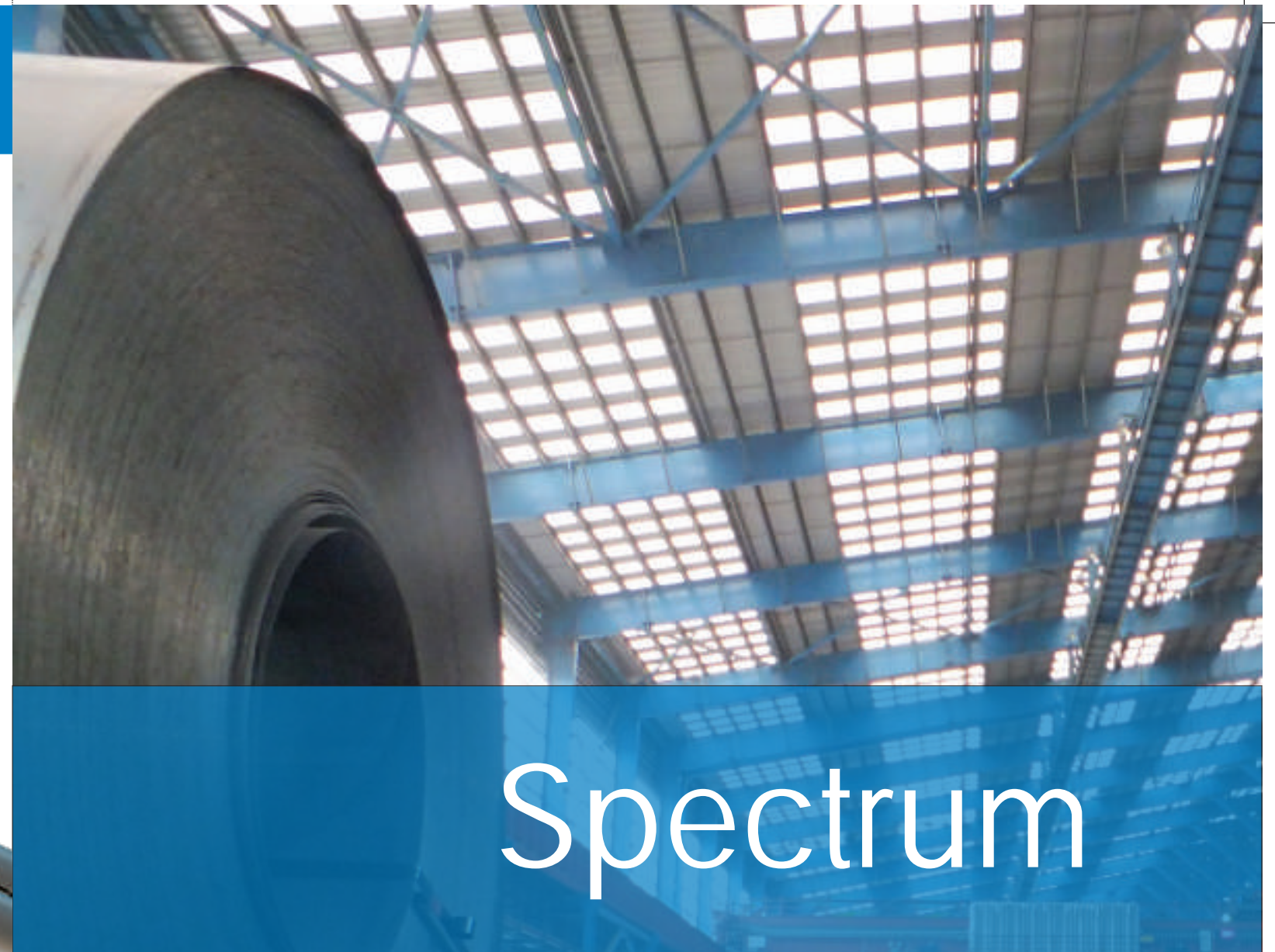
# Tube Manufacturing



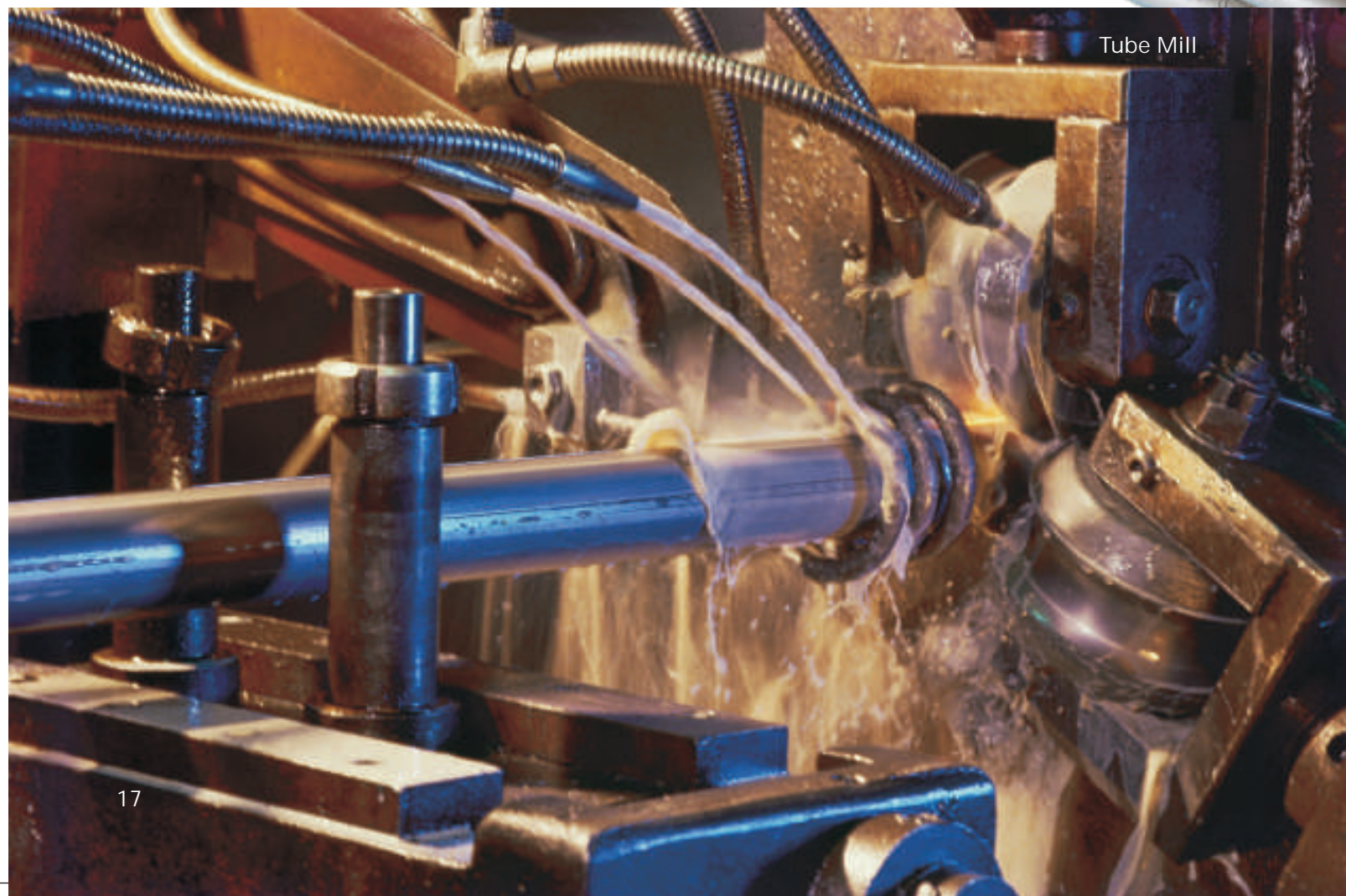
Tubes are used for a wide array of applications, which include water/liquid conveying, gas conveying, structural framework, automotive/bi-cycle components, etc. Tata Astrum can cater to these needs of the tube manufacturers with appropriate products.

Tata Astrum can be offered in different thickness & width combinations, slit to the requisite sizes. Tata Astrum owing to its better tolerances and optimal widths can help you reduce your wastage.

Tata Tubes, our in-house tube manufacturing facility has been using our steel to produce tubes and pipes for different applications.



## Spectrum





# Product Range

Tata Astrum comes in different forms to suit a variety of requirements. It is dispatched either directly from the mills or from one of the many authorized service centers, depending on customer requirements. No matter from where it is dispatched, it conforms to Tata Steel's impeccable product quality standards.

**The product range includes :**

- Hot Rolled Coils (HRC)
- Cut to length (CTL) Sheets
- Slit Coils
- SPO (Skin Pass Pickled & Oiled)
- Pickled & Oiled (PO)

TDC or Technical Delivery Condition consists of a set of specifications which is guaranteed in the product.

TDC	Ref Grade	State of the material	Thickness Range (mm)	Segment
HR01	IS 10748 Gr-1	HR Dry	1.6 – 4.99	Tube manufacturing
HR02	IS 1079 DD	HR Dry	1.6 – 12	Sheet metal components
HR03	SAPH 440/E34	HR Dry	2.5 – 12	Automotive structural components
HR04	BSK 46	HR Dry	3.5 – 8	Automotive structural components
HR05	IS 2062 Gr-A	HR Dry	2 – 4.99	Structurals for construction, machinery, projects
HR06	IRS M41	HR Dry	5 – 12	Railway wagon and engine components
HR07	IS 2062 Gr-A	HR Dry	2.51 – 4.99	Structurals for construction, machinery, projects requiring drilling, punching
HR08	IS 2062 Gr-A	HR Dry	5 – 12	Structurals for construction, machinery, projects
HR09	IS 10748 Gr-1	HRSP0	1.6 – 4.5	Tube manufacturing
HR10	IS 10748 Gr-2	HRSP0	1.6 – 4.5	Tube manufacturing, bicycle components
HR11	Tata PT(H)	HR Dry	1.6 – 8	Tube manufacturing (Precision Tubes)
HR12	ASTM 622M	HRSP0	1.6 – 4.5	Compressor shells
HR13	IS 11513 DD	HR Dry	1.6 – 12	Cold Rolling
HR14	IS 5986 Fe 410	HR Dry	2 – 4.99	Automotive structural components
HR15	IS 5986 Fe 360	HR Dry	1.6 – 4.99	Retail Sheets, Structurals
HR16	IS 10748 Gr-1	HR Dry	5 – 12	Tube manufacturing
HR17	IS 1079 EDD	HR Dry	1.6 – 6.5	Sheet metal components (Requiring extra draw)
HR18	IS 2062 Gr-B-R	HR Dry	2 – 4.99	Structurals for construction, machinery, projects
HR19	IS 2062 Gr-B-R	HR Dry	5 – 12	Structurals for construction, machinery, projects
HR20	IS 2062 Gr-A	HR Dry	5 – 12	Structurals for construction, machinery, projects requiring drilling, punching
HR21	DIN 17100 St52.3	HR Dry	5 – 12	Prefabricated structures, earth moving equipments
HR22	DIN 17100 St52.3	HR Dry	2 – 4.99	Prefabricated structures, earth moving equipments
HR23	IS 2062 Gr-A (for Galv)	HR Dry	5 – 12	Structurals for projects (requiring galvanizing)
HR24	Gr-A CFS	HR Dry	2 – 4.99	Brake shoe and web components
HR25	IS 2062 Gr-B-0	HR Dry	5 – 12	Structurals for construction, machinery, projects
HR26	IS 2062 Gr-A	HR Dry	12.01 – 16	Structurals for construction, machinery, projects

We can also supply grades other than the ones mentioned in the table, subject to Minimum Order Quantity (MOQ) and Width-Thickness combination. HR PO material for the above grades can be supplied on order.

# A World of Benefits

## Packaging & Material Identification:

*Making it easy for you*

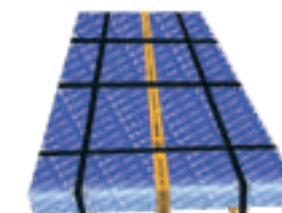
Tata Steel's stringent packaging standards have been developed to ensure failsafe packing. Each coil/bundle has a label carrying the consignment & material details. It ensures proper identification and traceability.



Dry HR Packaging



Coil Packaging



PO & SPO Packaging



## Guarantee of Authenticity

Tata Astrum is supplied along with test certificates mentioning the chemical composition, mechanical properties and coil ID of the material.





# More for You

At Tata Steel, customer service infrastructure has been fine-tuned into a system to ensure customer satisfaction at every stage. The components of this infrastructure include:

**Technical Delivery Conditions (TDCs)**  
Based on consultations with customers, specifications are made to ensure that the delivered product is exactly what they need. These TDCs subsequently translate into our process charts at the plant.

**Technical Processing Requirement (TPR)**  
The Technical Processing Requirement (TPR) is a set of guidelines which enable the EPA/service centre to serve the customers with their exact requirements. The TPRs are based on the end application of the materials, hence each application of the material will have a separate TPR.

It includes the sheet dimensions, flatness requirements, packaging details etc.



### Quality Assurance at EPA/SC\*

In order to ensure that the quality standards set by Tata Steel are adhered to at the EPA/SC, Quality Assurance Personnel are deployed. Care is taken to ensure that the final processed material that reaches the customer is free from any defects.

### Complete & Accurate Documentation

We ensure that documentation is accurate and complete. Each consignment is dispatched with the relevant invoice, challans and certificates.

### Timely & Convenient Delivery

We offer convenient delivery from our countrywide network of distributors at your doorstep; the way you wish.

### Local Sales Offices

Tata Steel's local sales offices are easy to approach and are staffed with officers who are fully geared to understand your requirements.

### Regional Technical Experts/Application Engineers (AEs)

Our technical experts visit customer premises to understand usage and to facilitate and resolve any difficulties they might face while using our material.

### IT-based Complaint Handling

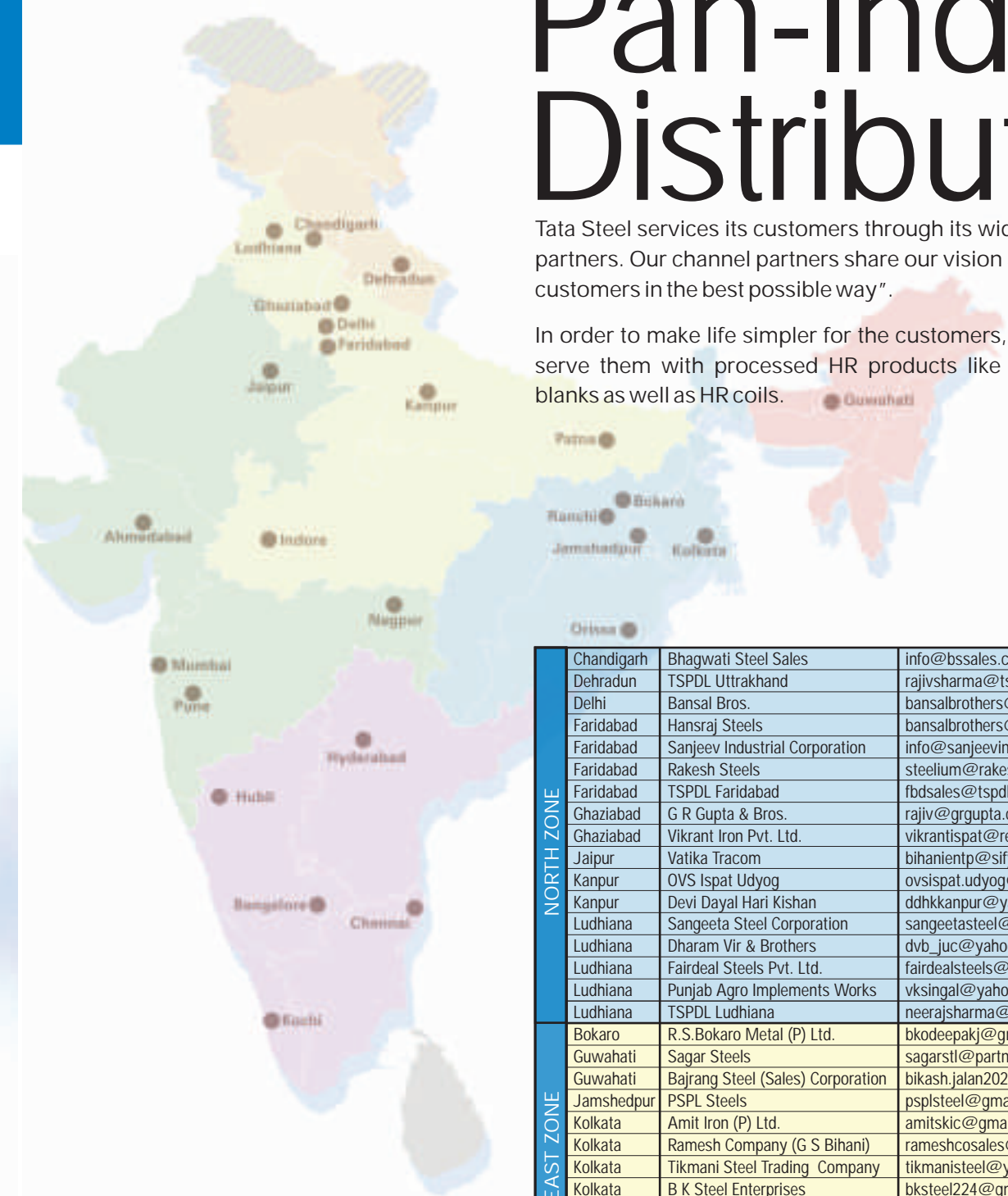
Although we do not leave any stone unturned to ensure that you do not have a complaint, still we have a comprehensive IT-based complaint handling system to resolve any concern in the shortest possible time.

EPA - External Processing Agent, SC - Service Centre

# Pan-India Distribution

Tata Steel services its customers through its wide network of channel partners. Our channel partners share our vision and mission "to serve customers in the best possible way".

In order to make life simpler for the customers, our channel partners serve them with processed HR products like HR sheets, slit coils, blanks as well as HR coils.



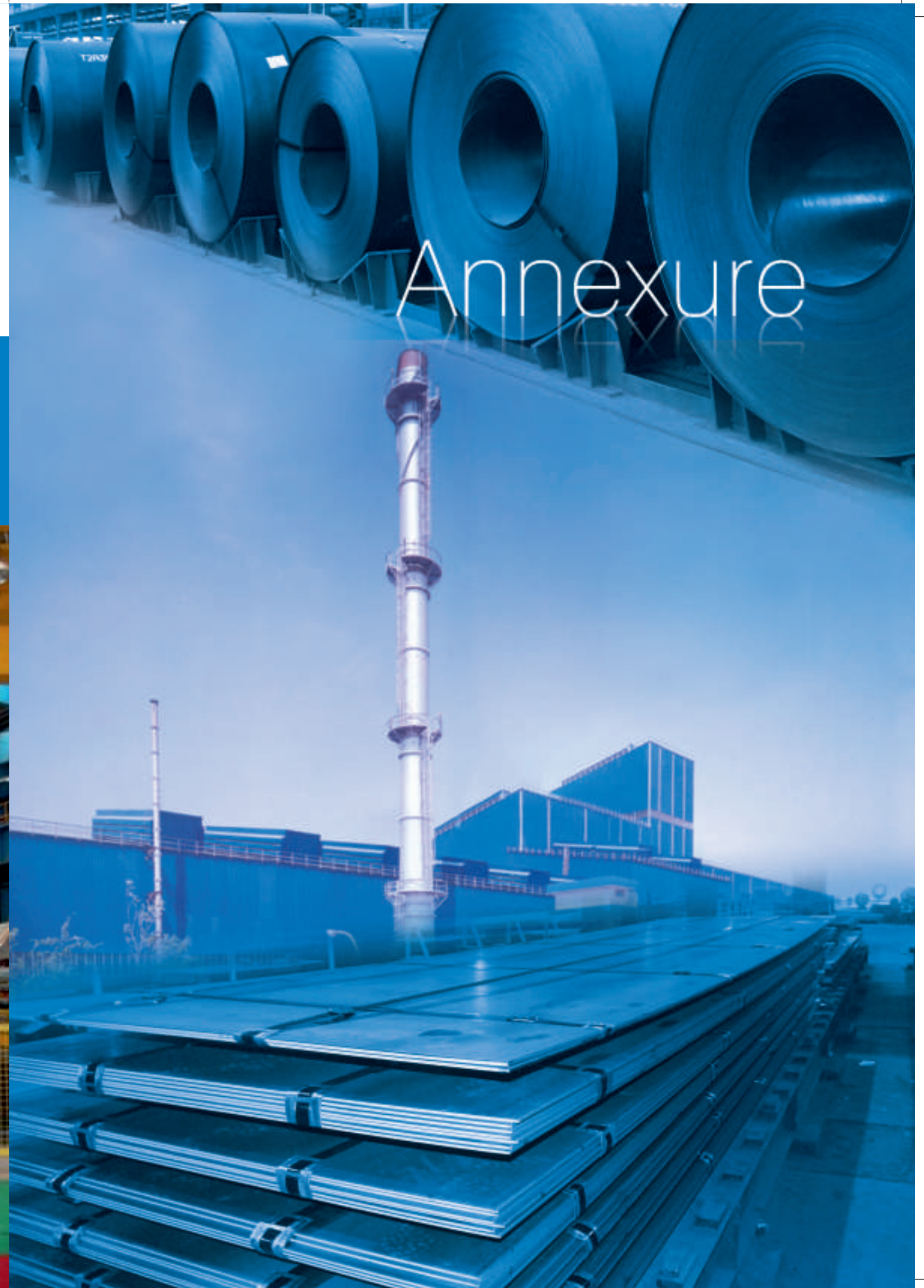
NORTH ZONE	Chandigarh	Bhagwati Steel Sales	info@bssales.com
	Dehradun	TSPDL Ultrakhand	rajivsharma@tspd.com
	Delhi	Bansal Bros.	bansalbrothers@yahoo.com
	Faridabad	Hansraj Steels	bansalbrothers@yahoo.com
	Faridabad	Sanjeev Industrial Corporation	info@sanjeevindustrial.com
	Faridabad	Rakesh Steels	steelium@rakeshsteels.in
	Faridabad	TSPDL Faridabad	fbdsales@tspd.com
	Ghaziabad	G R Gupta & Bros.	rajiv@grgupta.com
	Ghaziabad	Vikrant Iron Pvt. Ltd.	vikrantisp@rediffmail.com
	Jaipur	Vatika Tracom	bihanientp@sify.com
	Kanpur	OVS Ispat Udyog	ovsispat.udyog@partners.tatasteel.com
	Kanpur	Devi Dayal Hari Kishan	ddhkkanpur@yahoo.com
	Ludhiana	Sangeeta Steel Corporation	sangeetasteel@gmail.com
	Ludhiana	Dharam Vir & Brothers	dvb_juc@yahoo.co.in
	Ludhiana	Fairdeal Steels Pvt. Ltd.	fairdealsteels@gmail.com
	Ludhiana	Punjab Agro Implements Works	vsingal@yahoo.com
	Ludhiana	TSPDL Ludhiana	neerajsharma@tspd.com
	EAST ZONE	Bokaro	R.S Bokaro Metal (P) Ltd.
Guwahati		Sagar Steels	sagarstl@partners.tatasteel.com
Guwahati		Bajrang Steel (Sales) Corporation	bikash.jalan2020@gmail.com
Jamshedpur		PSPL Steels	psplsteel@gmail.com
Kolkata		Amit Iron (P) Ltd.	amitskic@gmail.com
Kolkata		Ramesh Company (G S Bihani)	rameshcosales@gmail.com
Kolkata		Tikmani Steel Trading Company	tikmanisteel@yahoo.co.in
Kolkata		B K Steel Enterprises	bksteel224@gmail.com
WEST ZONE	Odisha	Bhartia Distributors Pvt. Ltd.	bdpl@bhartiagroup.com
	Patna	BMW Ventures Ltd.	nitin@bmventures.com
	Ranchi	Birma Industrial	sunilgreat@yahoo.co.in
	Ahmedabad	Rohit & Company	sales@rohitandco.com
	Indore	SKM Indore	amitabh@abcomin.com
SOUTH ZONE	Mumbai	Rohit & Company	sales@rohitandco.com
	Mumbai	SKM Steels Limited.	kirtishah@skmsteels.com
	Mumbai	Nareesh Steel Industries Pvt. Ltd.	info@nareeshsteel.com
	Nagpur	Tejram Ramniwas Agrawal	trasteel@yahoo.com
	Pune	TSPDL Pune	vivekyadav@tspd.com
	Pune	B Odhavji & Company	sales@bodhavji.com
SOUTH ZONE	Bengaluru	Ramsaroop & Sons	steelium@hotmail.com
	Bengaluru	G K Steels	fp@gksteels.com
	Chennai	Sri Balaji Steel Traders	sbst@airtelmail.in
	Chennai	Thirupathy Steels	tschennai@yahoo.in
	Chennai	Govindaraja Mudaliar Sons (P) Ltd.	karthik@gmspl.net
	Chennai	VNC Steel Distributors	info@vncgroup.com
	Hubli	S C Shettar & Sons	scshettar@airtelmail.in
	Hyderabad	G K Steels	fp@gksteels.com
	Hyderabad	Indicor Steel Pvt. Ltd.	sales@indicorsteel.com
	Kochi	Kummenchery Steels	mahin@kummencherysteels.com



# Service Centres

Processing is done through certified service centres or EPAs who adhere to the quality standards specified by Tata Steel.

Tata Steel conducts regular workshops and audits to ensure that the EPAs/SC supply the right material to the customer in the right form.



# Annexure



### TECHNICAL DELIVERY CONDITION FOR HR01

Grade Specifications		
Grade Equivalent	IS 10748 Gr 1	
Tata Steel TDC	HR01	
End Application	Bearing housings, Tubes, Liner Plates	
Section Details		
Thickness range (mm)	2 to 4.99	
Width range (mm)	900 to 1680	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	2.0 < thk < 4.99	+/- 0.075
Width tol - Coils (mm)	All widths	+ 20/-0 (untrimmed)
	All widths	+ 20/-0 (untrimmed)
	Width < 1250	+ 4/-0 (if trimmed)
Width tol - Plates (mm)	Width > 1250	+ 5/-0 (if trimmed)
	Length tol - Plate (mm)	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	170.0	-	
U.T.S.	Mpa	290.0	-	
% Elongation	%	30.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.1	
Mn	%	-	0.5	
N	ppm	-	120	
P	%	-	0.04	
S	%	-	0.04	
Si	%	-	-	NGAV
Al	%	-	-	NGAV
Cu	%	-	-	NGAV
Cr	%	-	-	NGAV
Ni	%	-	-	NGAV
Mo	%	-	-	NGAV
CE		-	-	
V	%	-	-	
Nb	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR03

Grade Specifications		
Grade Equivalent	SAPH 440	
Tata Steel TDC	HR03	
End Application	Auto-Structurals	
Section Details		
Thickness range (mm)	2.5 to 12	
Width range (mm)	900 to 1680	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	2.5 < thk < 6.0	+/- 0.075
	thk > 6.0	+/- 1% of thk subject to max +/-0.1
Width tol - Coils (mm)	All widths	+ 20/-0 (untrimmed)
	All widths	+ 20/-0 (untrimmed)
Width tol - Plates (mm)	Width < 1250	+ 4/-0 (if trimmed)
	Width > 1250	+ 5/-0 (if trimmed)
Length tol - Plate (mm)		+ 10/-0

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	305.0	-	
U.T.S.	Mpa	440.0	-	
% Elongation	%	34.0	-	
Bend Test (180 Degree)	Close	-		NGAV

Chemistry	Unit	Min	Max	Remarks
C	%	-	-	NGAV
Mn	%	-	-	NGAV
N	ppm	-	-	
P	%	-	0.04	
S	%	-	0.04	
Si	%	-	-	NGAV
Al	%	0.02	-	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	-	
V	%	-	-	
Nb	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR02

Grade Specifications		
Grade Equivalent	IS 1079 Gr DD	
Tata Steel TDC	HR02	
End Application	Auto- Sheet Metal components involving draw	
Section Details		
Thickness range (mm)	1.6 to 12	
Width range (mm)	900 to 1680	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	1.6 < t < 6.0	+/- 0.075
	t > 6.0	+/- 1.25% of t subject to max +/-0.1
Width tol - Coils (mm)	All widths	+ 20/-0 (untrimmed)
	All widths	+ 20/-0 (untrimmed)
Width tol - Plates (mm)	Width < 1250	+ 4/-0 (if trimmed)
	Width > 1250	+ 5/-0 (if trimmed)
Length tol - Plate (mm)		+ 10/-0

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	-	-	NGAV
U.T.S.	Mpa	260.0	390.0	
% Elongation	%	28.0	-	
Bend Test (180 Degree)	Close	-		NGAV

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.1	
Mn	%	-	0.4	
N	ppm	-	120	
P	%	-	0.035	
S	%	-	0.035	
Si	%	-	0.05	
Al	%	0.02	-	
Cu	%	-	-	NGAV
Cr	%	-	-	NGAV
Ni	%	-	-	NGAV
Mo	%	-	-	NGAV
CE		-	-	
V	%	-	-	
Nb	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR04

Grade Specifications		
Grade Equivalent	BSK 46	
Tata Steel TDC	HR04	
End Application	Auto-Structurals	
Section Details		
Thickness range (mm)	3.5 to 8.0	
Width range (mm)	1000 to 1540	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	3.5 < thk < 8.0	+/- 0.1
	thk > 8.0	N.A.
Width tol - Coils (mm)	All widths	+ 20/-0 (untrimmed)
	All widths	+ 20/-0 (untrimmed)
Width tol - Plates (mm)	Width < 1250	+ 4/-0 (if trimmed)
	Width > 1250	+ 5/-0 (if trimmed)
Length tol - Plate (mm)		+ 10/-0

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	460.0	-	
U.T.S.	Mpa	500.0	640.0	
% Elongation	%	21.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.12	
Mn	%	-	1	
N	ppm	-	-	
P	%	-	0.025	
S	%	-	0.025	
Si	%	-	0.1	
Al	%	0.02	-	
Cu	%	-	-	NGAV
Cr	%	-	-	NGAV
Ni	%	-	-	NGAV
Mo	%	-	-	NGAV
CE		-	-	
Ti	%	-	-	NGAV
Nb	%	-	0.08	



### TECHNICAL DELIVERY CONDITION FOR HR05

Grade Specifications		
Grade Equivalent	IS 2062 Gr A	
Tata Steel TDC	HR05	
End Application	Fabrication/Auto Structrals/Railways	
Section Details		
Thickness range (mm)	2.0 to 4.99	
Width range (mm)	900 to 1680	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	2.5 < t < 2.8	+/- 0.05
	2.8 < t < 4.99	+/- 0.075 (except for few point values may go upto +/- 0.08)
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250	+4/-0 (if trimmed)
	Width > 1250	+5/-0 (if trimmed)
Length tol - Plate (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	255.0	-	
U.T.S.	Mpa	410.0	-	
% Elongation	%	23.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.23	
Mn	%	-	1.5	
N	ppm	-	100	
P	%	-	0.045	
S	%	-	0.045	
Si	%	-	0.4	
Al	%	-	-	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	0.42	
V	%	-	-	
Nb	%	-	0.02	

### TECHNICAL DELIVERY CONDITION FOR HR08

Grade Specifications		
Grade Equivalent	IS 2062 Gr A	
Tata Steel TDC	HR08	
End Application	Fabrication/Auto Structrals/Railways	
Section Details		
Thickness range (mm)	5.0 to 12.0	
Width range (mm)	900 mm to 1680 mm	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	5.0 < thk < 6.0	+/- 0.075
	thk > 6.0	+/- 1.25% of thickness subject to max +/-0.1
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250	+4/-0 (if trimmed)
	Width > 1250	+5/-0 (if trimmed)
Length tol - Plate (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	255.0	-	
U.T.S.	Mpa	410.0	600.0	
% Elongation	%	23.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.23	
Mn	%	-	1.5	
N	ppm	-	120	
P	%	-	0.045	
S	%	-	0.045	
Si		-	0.4	
Al	%	-	-	NGAV
Cu	%	-	-	NGAV
Cr	%	-	-	NGAV
Ni	%	-	-	NGAV
Mo		-	-	NGAV
CE		-	0.42	
V		-	-	
Nb		-	-	

### TECHNICAL DELIVERY CONDITION FOR HR06

Grade Specifications		
Grade Equivalent	IRS M41-97 Corten Steel	
Tata Steel TDC	HR06	
End Application	Railways- Engine Components	
Section Details		
Thickness range (mm)	5.0 to 12.0	
Width range (mm)	1100 to 1500	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	5.0 < t < 6.0	+/- 0.075
	t > 6.0	+/- 1.25% of thickness subject to max +/-0.1
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1200	+3/-0 (if trimmed)
	Width > 1200	+5/-0 (if trimmed)
Length tol - Plate (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	340.0	-	
U.T.S.	Mpa	480.0	-	
% Elongation	%	22.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.1	
Mn	%	0.25	0.45	
N	ppm	-	-	
P	%	0.075	0.14	
S	%	-	0.03	
Si	%	0.28	0.72	
Al	%	-	0.08	
Cu	%	0.3	0.6	
Cr	%	0.35	0.6	
Ni	%	0.2	0.47	
Mo	%	-	0.05	
CE		-	-	
V	%	-	0.05	
Nb	%	-	0.04	

### TECHNICAL DELIVERY CONDITION FOR HR09

Grade Specifications		
Grade Equivalent	IS 10748 Gr 1 (HRSP0)	
Tata Steel TDC	HR09	
End Application	Farm Equipment- Harvester Combine, Panels	
Section Details		
Thickness range (mm)	1.6 to 4.5	
Width range (mm)	1000 to 1270	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	1.6 < thk < 4.5	+/- 0.075
	thk > 6.0	N.A.
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Sheets (mm)	All widths	-
	Width < 1250	-
	Width > 1250	-
Length tol - Sheets (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	170.0	-	
U.T.S.	Mpa	290.0	-	
% Elongation	%	30.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.1	
Mn	%	-	0.5	
N	ppm	-	120	
P	%	-	0.04	
S	%	-	0.04	
Si	%	-	-	
Al	%	-	-	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	-	
V	%	-	-	
Nb	%	-	-	



### TECHNICAL DELIVERY CONDITION FOR HR10

Grade Specifications		
Grade Equivalent	IS 10748 Gr 2 (HRSP0)	
Tata Steel TDC	HR10	
End Application	Cycle Industry, Bottom Bracket, Cycle frames	
Section Details		
Thickness range (mm)	1.6 to 4.5	
Width range (mm)	1000 to 1270	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	1.6 < thk < 4.5	+/- 0.75
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Sheets (mm)	All widths	-
	Width < 1250	-
	Width > 1250	-
Length tol - Sheets (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	230.0	-	
U.T.S.	Mpa	350.0	-	
% Elongation	%	28.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.12	
Mn	%	-	0.6	
N	ppm	-	120	
P	%	-	0.04	
S	%	-	0.04	
Si	%	-	-	NGAV
Al	%	-	-	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	-	
V	%	-	-	
Nb	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR12

Grade Specifications		
Grade Equivalent	ASTM 622M (HRSP0)	
Tata Steel TDC	HR12	
End Application	Compressor Shells	
Section Details		
Thickness range (mm)	1.6 to 4.5	
Width range (mm)	1000 to 1250	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	1.6 < thk < 4.5	+/- 0.150
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Sheets (mm)	All widths	-
	Width < 1250	-
	Width > 1250	-
Length tol - Sheets (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	-	250.0	
U.T.S.	Mpa	-	350.0	
% Elongation	%	32.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	0.02	0.06	
Mn	%	0.1	0.25	
N	ppm	-	60	
P	%	-	0.025	
S	%	-	0.015	
Si	%	-	0.03	
Al	%	-	0.06	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	-	
B	%	0.002	0.0045	
Nb	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR11

Grade Specifications		
Grade Equivalent	Tata PT(H)	
Tata Steel TDC	HR11	
End Application	Cycle Industry BB Shell, BB Cup, Fork Bracket	
Section Details		
Thickness range (mm)	2.0 to 8.0	
Width range (mm)	900 to 1680	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	2.0 < thk < 6.0	+/- 0.075
	thk > 6.0	+/- 1.25% of thickness subject to max +/-0.1
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Sheets/Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250	+4/-0 (if trimmed)
	Width > 1250	+5/-0 (if trimmed)
Length tol - Sheets/Plates (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	195.0	-	
U.T.S.	Mpa	320.0	480.0	
% Elongation	%	25.0	-	
Bend Test (180 Degree)	Close	-		NGAV
Hardness	HRB	-	72.0	

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.12	
Mn	%	-	0.7	
N	ppm	-	90	
P	%	-	0.03	
S	%	-	0.02	
Si	%	-	0.35	
Al	%	-	-	NGAV
Cu	%	-	-	NGAV
Cr	%	-	-	NGAV
Ni	%	-	-	NGAV
Mo	%	-	-	NGAV
CE		-	-	
V	%	-	-	
Nb	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR13

Grade Specifications		
Grade Equivalent	IS 11513 DD	
Tata Steel TDC	HR13	
End Application	Cold Rolling	
Section Details		
Thickness range (mm)	1.6 to 12.0	
Width range (mm)	900 to 1540	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	1.6 < thk < 6.0	+/- 0.075
	thk > 6.0	+/- 1.25% of thickness subject to max +/-0.1
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Sheets/Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250	+4/-0 (if trimmed)
	Width > 1250	+5/-0 (if trimmed)
Length tol - Sheets/Plates (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	-	-	NGAV
U.T.S.	Mpa	-	-	NGAV
% Elongation	%	-	-	NGAV
Bend Test (180 Degree)	Close	-		NGAV
Hardness	HRB	-	70.0	

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.05	
Mn	%	-	0.25	
N	ppm	-	90	
P	%	-	0.025	
S	%	-	0.02	
Si	%	-	0.05	
Al	%	0.02	-	
Cu	%	-	-	NGAV
Cr	%	-	-	NGAV
Ni	%	-	-	NGAV
Mo	%	-	-	NGAV
CE		-	-	
V	%	-	-	
Nb	%	-	-	



### TECHNICAL DELIVERY CONDITION FOR HR14

Grade Specifications		
Grade Equivalent	Fe 410	
Tata Steel TDC	HR14	
End Application	Auto Structural	
Section Details		
Thickness range (mm)	2.00 to 4.99	
Width range (mm)	900 to 1680	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	2.5 < thk < 2.8	+/- 0.05
	2.8 < thk < 4.99	+/- 0.075 (except for few point values going upto +/- 0.08)
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Sheets/Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250	+4/-0 (if trimmed)
	Width > 1250	+5/-0 (if trimmed)
Length tol - Sheets/Plates (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	255.0	-	
U.T.S.	Mpa	410.0	520.0	
% Elongation	%	24.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.2	
Mn	%	-	1.2	
N	ppm	-	100	
P	%	-	0.04	
S	%	-	0.04	
Si	%	-	-	NGAV
Al	%	0.02	-	
Cu	%	-	-	NGAV
Cr	%	-	-	NGAV
Ni	%	-	-	NGAV
Mo	%	-	-	NGAV
CE		-	0.42	
V	%	-	-	
Nb	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR16

Grade Specifications		
Grade Equivalent	IS 10748 Gr 1	
Tata Steel TDC	HR16	
End Application	Liner Plates, Tubes	
Section Details		
Thickness range (mm)	5 to 12	
Width range (mm)	1000 to 1540	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	5.0 < thk < 6.0	+/- 0.075
	6.0 < thk < = 12	+/-1.25% of nominal thickness subject to max +/-0.1
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250	+4/-0 (if trimmed)
	Width > 1250	+5/-0 (if trimmed)
Length tol - Plate (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	170.0	-	
U.T.S.	Mpa	290.0	-	
% Elongation	%	30.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.1	
Mn	%	-	0.5	
N	ppm	-	120	
P	%	-	0.04	
S	%	-	0.04	
Si	%	-	-	NGAV
Al	%	-	-	NGAV
Cu	%	-	-	NGAV
Cr	%	-	-	NGAV
Ni	%	-	-	NGAV
Mo	%	-	-	NGAV
CE	-	-	-	
V	%	-	-	
Nb	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR15

Grade Specifications		
Grade Equivalent	Fe 360	
Tata Steel TDC	HR15	
End Application	Sheet metal component	
Section Details		
Thickness range (mm)	1.6 mm to 4.99	
Width range (mm)	900 to 1680	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	1.6 < t < 2.8	+/- 0.05
	2.8 < t < 4.99	+/- 0.075 (except for few point values may go upto +/- 0.08)
Width tol (mm)	All widths	+20/-0
Length tol (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	230.0	-	
U.T.S.	Mpa	370.0	-	
% Elongation	%	33.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.17	
Mn	%	-	1	
Si	%	-	-	
S	%	-	0.045	
P	%	-	0.045	
Cu	%	-	-	NGAV
Cr	%	-	-	NGAV
Ni	%	-	-	NGAV
Mo	%	-	-	NGAV
N	ppm	-	90	
Al	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR17

Grade Specifications		
Grade Equivalent	IS 1079 EDD	
Tata Steel TDC	HR17	
End Application	Sheet Metal components requiring deep draw	
Section Details		
Thickness range (mm)	1.6 to 6.5	
Width range (mm)	900 to 1500	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	Thick Range (t)	Tolerance
	1.6 < t < 2.8	+/- 0.05
	2.8 < t < 6.5	+/- 0.075 (except for few point values may go upto +/- 0.08)
Width tol (mm)	All widths	+20/-0
Length tol (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa			
U.T.S.	Mpa		380.0	
% Elongation	%	37.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.08	
Mn	%	-	0.5	
Si	%	-	0.06	
S	%	-	0.025	
P	%	-	0.025	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
N	ppm	-	90	
Al	%	-	-	



### TECHNICAL DELIVERY CONDITION FOR HR18

Grade Specifications		
Grade Equivalent	IS 2062 E 250 Gr B	
Tata Steel TDC	HR18	
End Application	Farbrication/Auto Structrals/Construction	
Section Details		
Thickness range (mm)	2.5 to 4.99	
Width range (mm)	900 to 1540	
Coil ID (mm) / OD (mm)	760 / 2100	
Dimension Tolerance		
Thickness tol (mm)	2.5 < t < 2.8	+/- 0.05
	2.8 < t < 4.99	+/- 0.075 (except for few point values may go upto +/-0.08)
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250	+4/-0 (if trimmed)
	Width > 1250	+5/-0 (if trimmed)
Length tol - Plate (mm)	+10/-0	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	255.0	-	
U.T.S.	Mpa	410.0	-	
% Elongation	%	23.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.23	
Mn	%	-	1.5	
N	ppm	-	100	
P	%	-	0.045	
S	%	-	0.045	
Si	%	-	0.4	
Al	%	-	-	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	0.42	
V	%	-	-	
Nb	%	-	0.02	

### TECHNICAL DELIVERY CONDITION FOR HR20

Grade Specifications		
Grade Equivalent	IS 2062 Gr A	
Tata Steel TDC	HR20	
End Application	Structrals requiring drilling/hole punching	
Section Details		
Thickness range (mm)	5.0 mm to 12.0 mm	
Width range (mm)	900 mm to 1540 mm	
Coil ID (mm) / OD (mm)	760 mm / 2100 mm	
Dimension Tolerance		
Thickness tol (mm)	5.0 < t < 6.0mm	+/- 0.075 mm
	t > 6.0mm	1.25% of thickness subject to max. of 0.1mm
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250 mm	+4/-0 (trimmed)
	Width > 1250 mm	+5/-0 (trimmed)
Length tol - Plate (mm)	+10/-0 mm	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	255.0	370.0	
U.T.S.	Mpa	410.0	600.0	
% Elongation	%	23.0	-	
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.23	
Mn	%	-	1.5	
N	ppm	-	100	
P	%	-	0.045	
S	%	-	0.045	
Si	%	-	0.4	
Al	%	0.02	-	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	0.42	
V	%	-	-	
Nb	%	-	0.02	

### TECHNICAL DELIVERY CONDITION FOR HR19

Grade Specifications		
Grade Equivalent	IS 2062 E 250 Gr B	
Tata Steel TDC	HR19	
End Application	Farbrication/Structrals/Construction	
Section Details		
Thickness range (mm)	5.0 mm to 12.0 mm	
Width range (mm)	900 mm to 1680 mm	
Coil ID (mm) / OD (mm)	760 mm / 2100 mm	
Dimension Tolerance		
Thickness tol (mm)	5.0 < thk < 6.0 mm	+/- 0.075 mm
	thk > 6.0 mm	+/- 1.25% of thickness subject to max +/-0.1 mm
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250 mm	+4/-0 (trimmed)
	Width > 1250 mm	+5/-0 (trimmed)
Length tol - Plate (mm)	+10/-0 mm	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	255.0	-	
U.T.S.	Mpa	410.0	-	
% Elongation	%	23.0	-	
Impact Test				

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.22	
Mn	%	-	1.5	
N	ppm	-	120	
P	%	-	0.045	
S	%	-	0.045	
Si	%	-	0.4	
Al	%	-	-	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	0.41	
V	%	-	-	
Nb	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR21

Grade Specifications		
Grade Equivalent	DIN 17100 ST52.3	
Tata Steel TDC	HR21	
End Application	Lifting/Excavation Equipments, Pre-fabricated structures	
Section Details		
Thickness range (mm)	5.0 mm to 12.0 mm	
Width range (mm)	900 mm to 1680 mm	
Coil ID (mm) / OD (mm)	760 mm / 2100 mm	
Dimension Tolerance		
Thickness tol (mm)	5.0 < t < 6.0mm	+/- 0.075 mm
	t > 6.0mm	1.25% of thickness subject to max. of 0.1mm
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250 mm	+4/-0 (trimmed)
	Width > 1250 mm	+5/-0 (trimmed)
Length tol - Plate (mm)	+10/-0 mm	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	355.0		
U.T.S.	Mpa	490.0		
% Elongation	%	22.0		
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%		0.2	
Mn	%		1.4	
N	ppm			
P	%		0.03	
S	%		0.03	
Si	%		0.1	
Al	%	0.02		
Cu	%			
Cr	%			
Ni	%			
Mo	%			
CE				
V	%			
Nb	%			



### TECHNICAL DELIVERY CONDITION FOR HR22

Grade Specifications		
Grade Equivalent	DIN 17100 ST52.3	
Tata Steel TDC	HR22	
End Application	Lifting/Excavation Equipments, Pre-fabricated structures	
Section Details		
Thickness range (mm)	2.0 mm to 4.99 mm	
Width range (mm)	900 mm to 1680 mm	
Coil ID (mm) / OD (mm)	760 mm / 2100 mm	
Dimension Tolerance		
Thickness tol (mm)	2.0 < t < 2.8 mm	+/- 0.05 mm
	2.8 < t < 4.99 mm	+/- 0.075 mm (except for few point values may go upto +/- 0.08 mm)
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250 mm	+4/-0 (trimmed)
	Width > 1250 mm	+5/-0 (trimmed)
Length tol - Plate (mm)	+10/-0 mm	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	355.0		
U.T.S.	Mpa	490.0		
% Elongation	%	22.0		
Bend Test (180 Degree)	Close	-		

Chemistry	Unit	Min	Max	Remarks
C	%		0.2	
Mn	%		1.4	
N	ppm			
P	%		0.03	
S	%		0.03	
Si	%		0.1	
Al	%	0.02		
Cu	%			
Cr	%			
Ni	%			
Mo	%			
CE				
V	%			
Nb	%			

### TECHNICAL DELIVERY CONDITION FOR HR24

Grade Specifications		
Grade Equivalent	IS 2062 E 250 Gr A (CFS)	
Tata Steel TDC	HR24	
End Application	Brake Shoe Components	
Section Details		
Thickness range (mm)	2.0 mm to 4.99 mm	
Width range (mm)	900 mm to 1540 mm	
Coil ID (mm) / OD (mm)	760 mm / 2100 mm	
Dimension Tolerance		
Thickness tol (mm)	2.0 < t <= 2.8 mm	+/- 0.05 mm
	2.8 < t <= 4.99 mm	+/- 0.075 mm (except for few point values may go upto +/- 0.08 mm)
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250 mm	+4/-0 (trimmed)
	Width > 1250 mm	+5/-0 (trimmed)
Length tol - Plate (mm)	+10/-0 mm	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	255.0		
U.T.S.	Mpa	410.0		
% Elongation	%	23.0	-	
Impact Test				

Chemistry	Unit	Min	Max	Remarks
C	%	0.16	0.25	
Mn	%	0.6	1.5	
N	ppm	-	120	
P	%	-	0.05	
S	%	-	0.05	
Si	%	-	0.4	
Al	%	-	-	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	0.42	
V	%	-	-	
Nb	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR23

Grade Specifications		
Grade Equivalent	IS 2062 E 250 Gr A (Used for Galvanizing)	
Tata Steel TDC	HR23	
End Application	Structrals/Construction	
Section Details		
Thickness range (mm)	5.0 mm to 12.0 mm	
Width range (mm)	900 mm to 1540 mm	
Coil ID (mm) / OD (mm)	760 mm / 2100 mm	
Dimension Tolerance		
Thickness tol (mm)	5.0 < thk < 6.0 mm	+/- 0.075 mm
	thk > 6.0 mm	+/- 1.25% of thickness subject to max +/-0.1 mm
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250 mm	+4/-0 (trimmed)
	Width > 1250 mm	+5/-0 (trimmed)
Length tol - Plate (mm)	+10/-0 mm	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	255.0	370.0	
U.T.S.	Mpa	410.0	600.0	
% Elongation	%	23.0	-	
Impact Test				

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.23	
Mn	%	-	1.5	
N	ppm	-	120	
P	%	-	0.045	
S	%	-	0.045	
Si	%	-	0.4	
Al	%	-	-	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	0.42	
V	%	-	-	
Nb	%	-	-	

### TECHNICAL DELIVERY CONDITION FOR HR25

Grade Specifications		
Grade Equivalent	IS 2062 E 250 Gr B(0)	
Tata Steel TDC	HR25	
End Application	Structurals	
Section Details		
Thickness range (mm)	5.0 mm to 12.0 mm	
Width range (mm)	900 mm to 1540 mm	
Coil ID (mm) / OD (mm)	760 mm / 2100 mm	
Dimension Tolerance		
Thickness tol (mm)	5.0 < t < 6.0mm	+/- 0.075 mm
	t > 6.0mm	1.25% of thickness subject to max. of 0.1mm
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250 mm	+4/-0 (trimmed)
	Width > 1250 mm	+5/-0 (trimmed)
Length tol - Plate (mm)	+10/-0 mm	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S. Mpa	250.0			
U.T.S.	Mpa	410.0		
% Elongation	%	23.0	-	
Impact Test	J	27	-	

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.22	
Mn	%	-	1.5	
N	ppm	-	120	
P	%	-	0.045	
S	%	-	0.045	
Si	%	-	0.2	
Al	%	0.02	-	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	0.41	
V	%	-	-	
Nb	%	-	-	



## TECHNICAL DELIVERY CONDITION FOR HR26

Grade Specifications		
Grade Equivalent	IS 2062 E 250 Gr A	
Tata Steel TDC	HR26	
End Application	Fabrication/Construction/Structurals	
Section Details		
Thickness range (mm)	12.01 mm to 16.0 mm	
Width range (mm)	900 mm to 1680 mm	
Coil ID (mm) / OD (mm)	760 mm / 2100 mm	
Dimension Tolerance		
Thickness tol (mm)	12.0<t<16.0mm	1.25% of thickness subject to max. of 0.1mm
Width tol - Coils (mm)	All widths	+20/-0 (untrimmed)
Width tol - Plates (mm)	All widths	+20/-0 (untrimmed)
	Width < 1250 mm	+4/-0 (trimmed)
	Width > 1250 mm	+5/-0 (trimmed)
Length tol - Plate (mm)	+10/-0 mm	

Mechanical Properties	Unit	Min	Max	Remarks
Y.S.	Mpa	250.0		
U.T.S.	Mpa	410.0		
% Elongation	%	23.0	-	
			-	

Chemistry	Unit	Min	Max	Remarks
C	%	-	0.23	
Mn	%	-	1.5	
N	ppm	-	120	
P	%	-	0.045	
S	%	-	0.045	
Si	%	-	0.4	
Al	%		-	
Cu	%	-	-	
Cr	%	-	-	
Ni	%	-	-	
Mo	%	-	-	
CE		-	0.42	
V	%	-	-	
Nb	%	-	-	

- Details mentioned in the TDC are as on date. Liable to change in future.
- For complete details of the TDC, please contact your nearest Tata Steel Sales Office or Distributor.

## Equivalent Specifications for Reference

TDC	TSL Grade	IS	JIS	DIN/EN
HR 01/HR 16	IS 10748 GR.1	IS 10748 GR.1	JIS G3132 SPHT-1	-
HR 02	IS 1079 GR.DD	IS 1079 GR.DD/ IS 11513 Gr.DD	JIS G3131 SPHD	DIN 1614 STW22/24
HR 03	IS G3113 SAPH440	-	JIS G3113 SAPH440	DIN OSTE 340 TM
HR 04	BSK 46			DIN OST 460 TM/ EN 10149-2 S460 MC
HR 05/HR 08	IS:2062 E250A (Fe410W)	IS:2062 E250A (Fe410W)	JIS G3101 SS400 / JIS 3113 G SAPH400	DIN 17100 St44.2/ EN10025 S275
HR 06	IRSM-41		JIS G3125 SAPH	EN 10155 S355 JOWP
HR 13	IS 11513 Gr. D	IS 11513 Gr. D	JIS G3131 SPHC	EN10111-DD11
HR 14	IS 5986 Fe 410	IS 5986 Fe 410	JIS G3101 SS400 / JIS 3113 G SAPH400	DIN 17100 St44.2/ EN10025 S275
HR 15	IS 5986 Fe 360	IS 5986 Fe 360		DIN 17100 St37.2/ BS EN 10025 S235
HR 17	IS 1079 GR.EDD	IS 1079 GR.EDD/ IS 11513 Gr.EDD	JIS G3131 SPHE	

## Equivalent Specifications for Reference

TDC	TSL Grade	ASTM	Others (BS/SAE)
HR 01/HR 16	IS 10748 GR.1	-	SAE 1006/1008/1010/1020
HR 02	IS 1079 GR.DD	ASTM A 1011 DS Type B	SAE 1006/1008/1010/1020; BS 1449 HR1/HR2/HR3/HR4
HR 03	IS G3113 SAPH440	ASTM A1011/1018 HSLA Gr. 50 Class 2	SAE J1392 050XLF
HR 04	BSK 46	ASTM A1011/1018 HSLA Grade 60	
HR 05/HR 08	IS:2062 E250A (Fe410W)	ASTM A1011 SS36	BS 4360 Gr.43A
HR 06	IRSM-41		BS 4360 WR50A
HR 13	IS 11513 Gr. DD	ASTM A1011 CS Type B	SAE 1006/1008/1010
HR 14	IS 5986 Fe 410	ASTM A1011 SS36	BS 4360 Gr.43A
HR 15	IS 5986 Fe 360	ASTM A1011/1018 SS33	BS1449:1991 HR37/23
HR 17	IS 1079 GR.EDD	ASTM A 1011 DS Type B	SAE 1006/1008/1010/1020; BS 1449 HR1/HR2/HR3/HR4



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<b>Delhi</b> :	Tata Steel Limited 1st Floor, Jeevan Tara Building 5 Sansad Marg, New Delhi 110 001 Phone: 91 11-66248500, Fax: 91 11 2334 3196	<b>Chennai</b> :	Tata Steel Limited 8th Floor, Chettinad Sigapi Achi Building, 18/3- Rukmini Lakshmi pathy Road, Egmore Chennai- 600008
<b>Ghaziabad</b> :	Tata Steel Limited Plot No. 1227-1229, GT Road Lalkuan, Ghaziabad 201 001	<b>Bangalore</b> :	Tata Steel Limited A Wing, 2nd Floor, Jubilee Building 45 Museum Road, Bangalore 560 025 Phone: 91 80 669 50033 Fax: 91 80 669 50038
<b>Faridabad</b> :	Tata Steel Limited 2nd Floor, Business Centre, 33-B NIT, Faridabad Haryana - 121001, Phone: 91 129-4098321	<b>Secunderabad</b> :	Tata Steel Limited 6th Floor, Surya Towers 104 Sardar Patel Road Secunderabad 500 003 Phone: 91 40 5526 1020 / 1030 Fax: 91 40 2781 2418
<b>Chandigarh</b> :	Tata Steel Limited SCO-16 1st Floor, Sector 26 Madhya Marg, Chandigarh - 160 019 Phone: 91 172 2791047, 2790932 Fax: 91 172 279 2426	<b>Coimbatore</b> :	Tata Steel Limited No:6, New Damunagar, Puliakulam Coimbatore - 641036
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