



JSPL RAILS

Jindal Steel & Power Ltd., Plot No. 2, Near Exit-10, Gurgaon-122001.  
Tel: +91 124 6612000 (Board) Fax: +91 124 6616202  
e-mail: [marketing@jindalsteel.com](mailto:marketing@jindalsteel.com) | Website: [www.jindalsteelpower.com](http://www.jindalsteelpower.com)

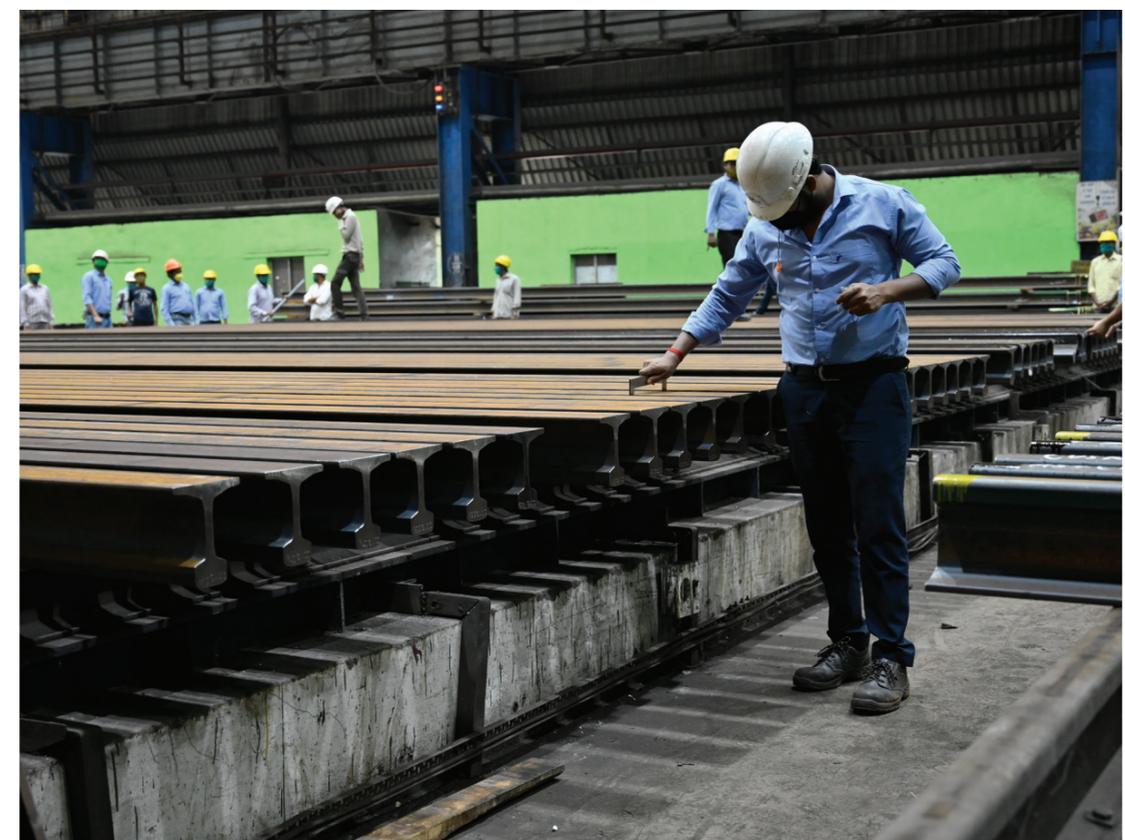
LONG RAILS | HEAD HARDENED RAILS  
WELDED PANELS | CRANE RAILS

# ABOUT JINDAL STEEL & POWER LIMITED

---

JSPL is an industrial powerhouse with a dominant presence in steel, power, mining & infrastructure sectors. Part of the US \$ 22 billion OP Jindal Group, the Company is continuously scaling its capacity utilizations & efficiencies to capture opportunities for building “A Nation of Our Dreams”.

Led by Mr Naveen Jindal, the youngest son of the legendary Shri O.P. Jindal, the company produces economical and efficient steel and power through backward and forward integration.



## JSPL – PROUD FLAGBEARER OF INDIAN INDUSTRY

---

New India is going places with an unprecedented drive to make things happen. Also, rapid urbanization in major cities across India has reaffirmed the significance of a rapid intra-city transportation system.

To keep pace, Indian Railways finds itself actively entrenched in transformation mode, with ambitious plans to upgrade infrastructure & operate rails at avg. 160kmph. Key focus areas include upgradation of tracks and signalling, new infrastructure development, higher axle loads, improvements in safety and passenger experience.

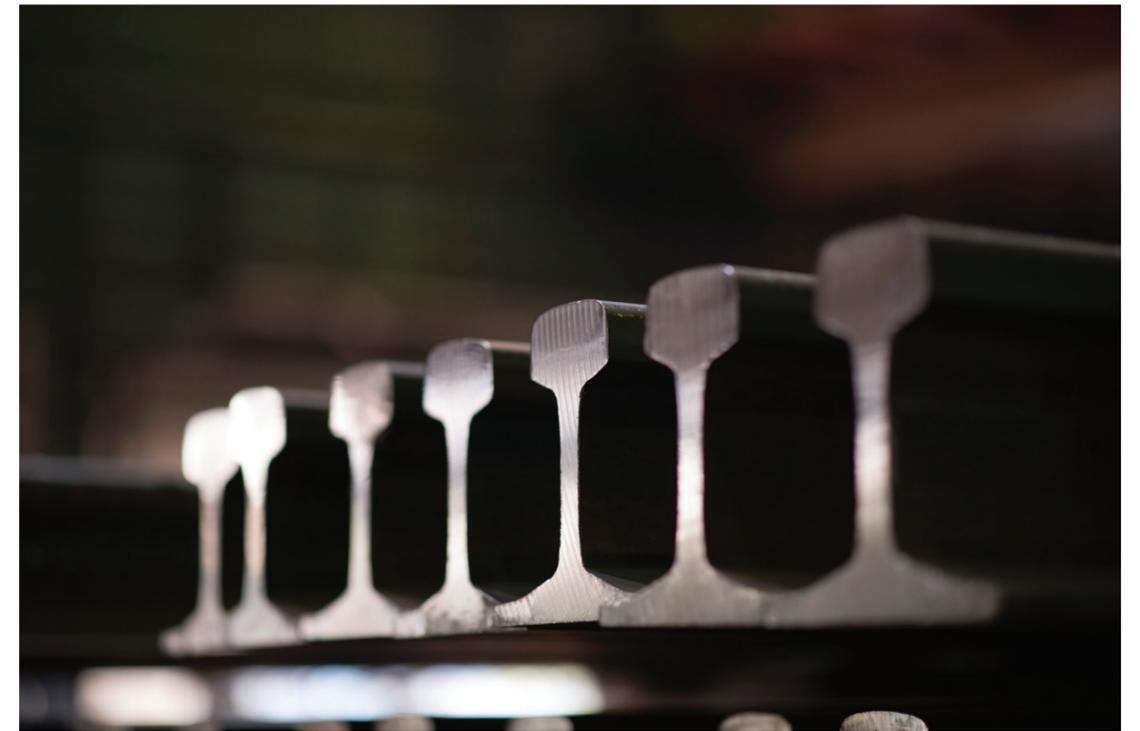
The company endeavours to strengthen India’s industrial base by aiding infrastructural development, through sustainable development approaches and inclusive growth. It deploys its resources to improve infrastructure, education, health, water, sanitation, environment et al in the areas it operates in.

# INDIAN RAILWAYS & BEYOND

---

Indian Railways is in transformation mode. Indian Railways is implementing various development projects to upgrade infrastructure & operate Rails at Avg 160kmph and High speed of over 300kmph. Upgradation of track and signaling, Infrastructure development, Higher Axle Load, Improvements in Safety and Passenger Experience are key focus areas of Indian Railways.

Also, Urbanization and Rapid development in cities like Delhi- NCR, Kolkata, Mumbai, Chennai, Bangalore, Hyderabad, Jaipur, Kochi and Ahmedabad etc. have showcased the importance of a rapid intra-City Transportation system. The upcoming Metro Rail Projects in various cities with more than 2000 Km route would just be a beginning.



## JSPL: COMPLETE RAIL SOLUTION PROVIDER

---

JSPL's drive for innovation and market leadership is clearly manifested in its Rail Manufacturing operations. Building on its 25 Years of steel making Expertise and its world Class Rail making facility, the company works closely with Rail Customers to develop products that address their needs.

JSPL operates one million tonne per annum (mtpa) capacity Rail Mill at its 3.6 mtpa integrated steel plant at Raigarh in Chhattisgarh. As a diversified steel manufacturer, JSPL supplies high performance Rail Products in various specifications like UIC, IRS, EN and other international Specifications. JSPL has the capability to supply long Rails- Rolled up to 121m and from its long Rail Welding Plant up to 484m. JSPL can provide Rails in both Normal and Head Hardened Grades.

Other products line of JSPL includes wide range of Plates, Coils, Structural, Wire Rods, TMT Rebar's and extensive Fabrication Facilities to Support all Rail Sector Constructions and Engineering Projects.

# “MAKE IN INDIA”: ATMANIRBHAR INDIAN RAILWAYS

JSPL in pursuit of supporting vision of Atmanirbhar Bharat through “Make in India” policy are building futuristic Infrastructure and adopt latest & efficient technology to help the Rail industry rise to the challenges of speedy expansions, higher traffic volumes, heavier axial loads and faster train speeds.

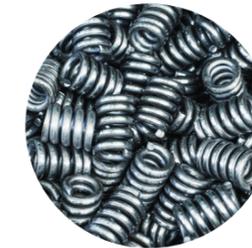


## PRODUCT RANGE:



### TMT Rebars

(Capacity- 2.4MTPA) - in Gr Fe500D , 500S, 550D, 600 & Dia-6 to 40mm Plates - (2.5MTPA) - in Gr E250 to E450 Br, Bo & C, IRS M41- Corten, ASTM A588, Normalized Grade Steel



### SPRING STEEL ROUNDS

in Gr 55Si7 & 60 Si7 (Dia-20 to 36mm), Approved By RDSO



### STRUCTURAL SECTIONS

(Angles, Channels, H Beam Sleepers, Beam Columns) Approved by CORE & RDSO (Capacity- 0.6 MTPA)



### FABRICATED BRIDGE GIRDERS

and other structures, Approved by RDSO (Capacity-0.18 MTPA)



### RAILS

60E1/UIC 60 GR 880/R260 & GR 1080HH/1175HT & ZU-1-60/60E1A1 as per EN13674/ IR T-12 (Capacity - 1.0MTPA)

## PROVEN PERFORMANCE:

India is the 4th largest Rail network in the world and has varied topography. JSPL Rails have proven its performance on various geographies, Curves, gradients, speed, short distances with frequent braking and acceleration in India. JSPL is the first private manufacturer to earn status of Regular Supplier of Rails to Indian Railways.

JSPL has supplied over 1.1 Mn MT Rails to prestigious projects of INDIAN RAILWAYS, Rail Vikas Nigam Ltd, IRCON, Dedicated Freight Corridors and others in India and International Projects such as Sri Lanka Railways, Bangladesh Railways.

# MANUFACTURING PROCESS: CONTROLLED CHEMISTRY

The importance of the Rail steel can be known from the fact that even after years of service and high stress, Age, traffic and weather Rails are supposed to maintain its basic properties. Rail Steel selection has to guarantee Weldability along with High Mechanical properties

JSPL steel products are produced from virgin Iron ore through Integrated Steel Making Process (BF /DRI-NOF/EAF- LRF-Degasser (RH)-CCM –Rolling Mill—HT Process)- route

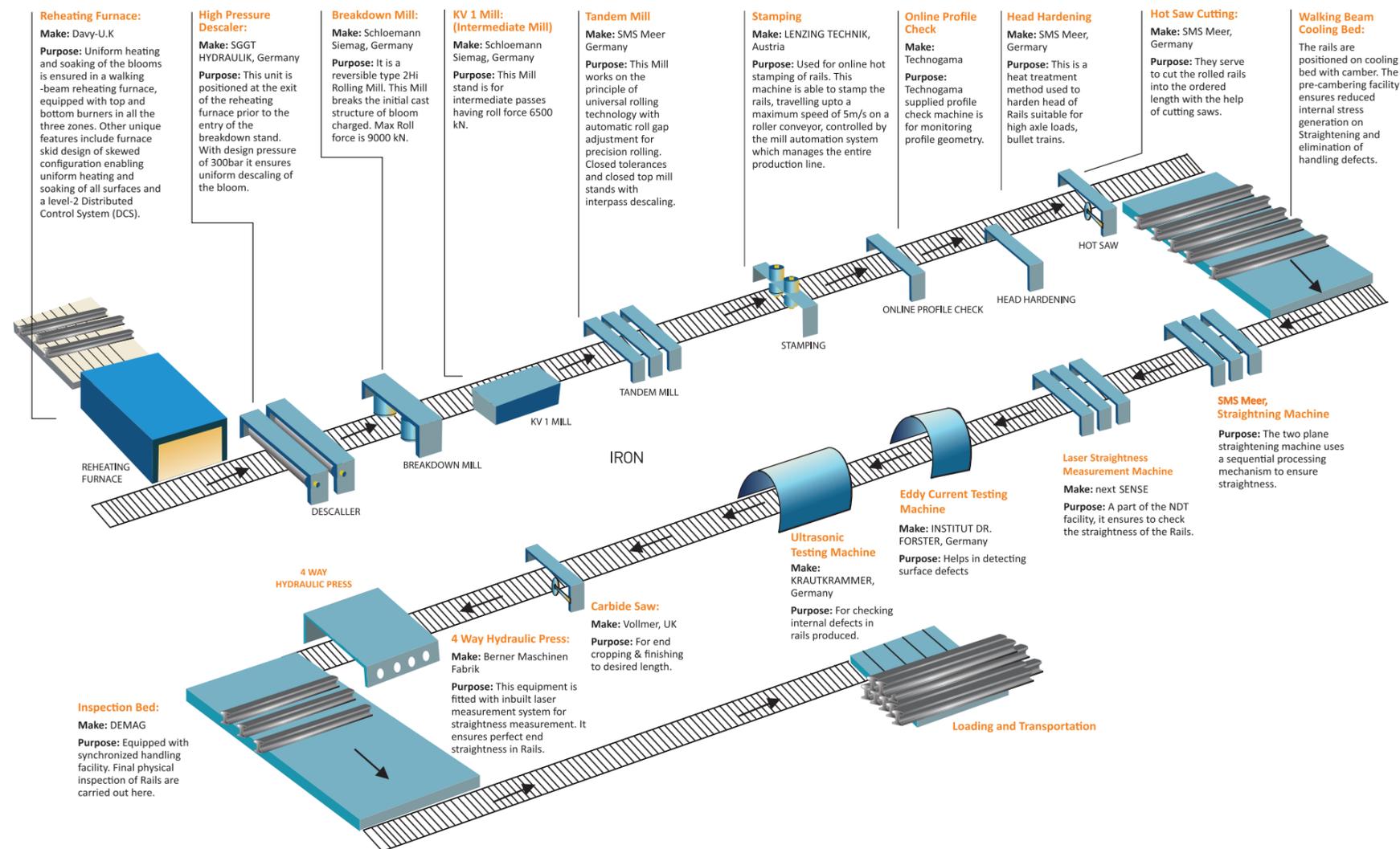
JSPL steel conforms to the international quality standards of rail steel. With Integrated iron making & steel making facility and in-house power generation facilities, the Raigarh plant is capable of producing single length 121m long finished Rail Conforming to Indian and International Specification.

# LOWER LEVELS OF DISSOLVED GASES:

Gases dissolved in steel may have high detrimental effects like shatter-cracks during usage and must be controlled in very close limits. At JSPL, Ruhrstahl Heraeus (RH) Degasser is used for Cleaning Steel From dissolved gases like Hydrogen, Oxygen and Nitrogen.

The Ruhrstahl Heraeus (RH) degasser is lowered in the Ladle of Liquid Steel and the pressure inside is reduced to less than 1 mbar. Argon is injected through tuyeres in one of the snorkels, forcing the steel up into the unit and out again through the other snorkel exposing it through Vacuum inside the Ruhrstahl Heraeus (RH) Degasser. The Clean steel from Ruhrstahl Heraeus (RH) Degasser has Hydrogen content less than 1.6 ppm specified in IRS T-12.

## Process Route for Rail Production



## CLEAN STEEL:

---

One of the most important requirements for rail steel is its cleanliness. Inclusion free, homogenous and sound steel is vital for safe durable rails. Inclusions in the finished rail, can cause cracks which might grow and cause the rail to fracture. With JSPL's advanced steelmaking and continuous casting practices helps us ensure cleanest steel. The effectiveness of steel making process is affirmed with modern non-destructive testing techniques capable of finding defects/inclusions in 100% Rail length.



## RAIL ROLLING:

---

JSPL's Rail Mill produces superior quality, one of the world's longest 121 meter long finished Rails in various specification including IRS-T-12- 2009 Certified by Rites.

From the Walking Beam Type reheating Furnace (250MT/hr), the uniformly heated blooms are immediately passed through the high pressure primary de-scaler to achieve scale free surface with design pressure of 300 Bar. The Rolling process includes Breakdown Stand (BD), Intermediate Stand (KV1), Universal Tandem Mill. After Rolling, the Rails are stamped and cut into the required lengths. JSPL has a walking Beam Type Cooling Bed of 123 meter to supply rolled Rail panels of up to 121 meter with automatic concerns.



# R&D FACILITY AND LABORATORY:

At JSPL, we have established a multidisciplinary R&D department that is sufficiently agile to adapt to evolving requirements and continual improvement. JSPL has a dedicated R&D team who have succeeded in developing cost effective and energy efficient processes and superior quality advanced steel products.

R&D at JSPL is supported by an equipped and NABL certified laboratory which also helps us to ensure quality of finished product. Rail steel undergoes a series of Tests to ascertain the quality of finished product as well as consistency of processes. Broadly classified as Acceptance Tests and Qualifying criteria tests:

## A. QUALIFYING CRITERIA TESTS

- Residual Stress Measuring instrument is used to measure the residual stresses developed in the Rails

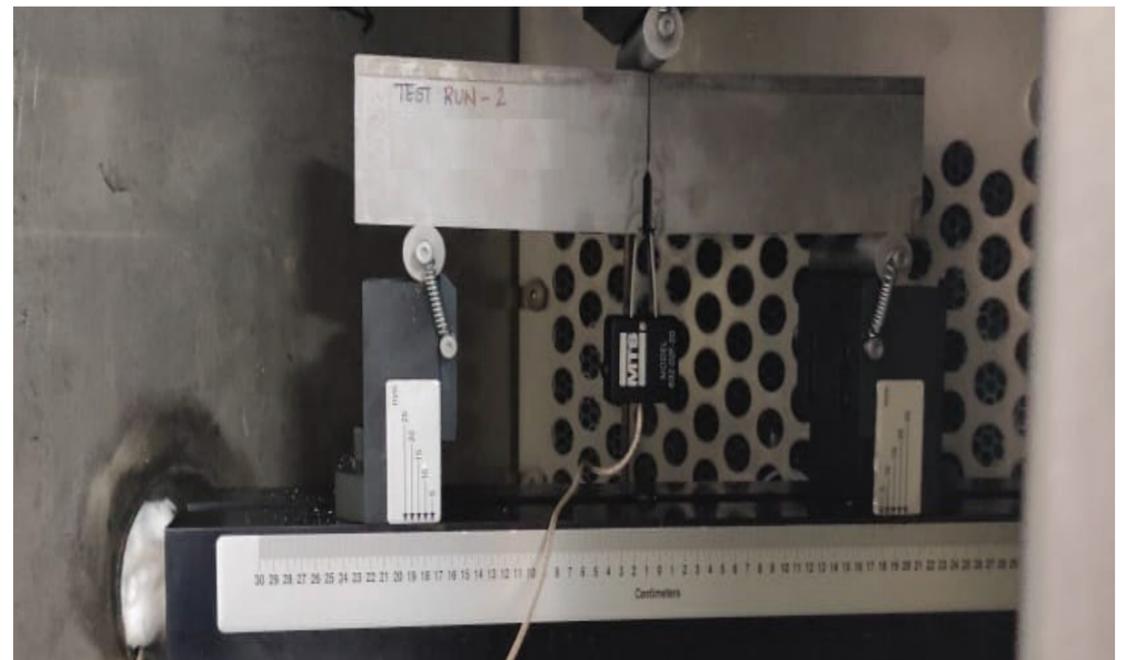


Fig: Typical Residual Stress Testing Technique used

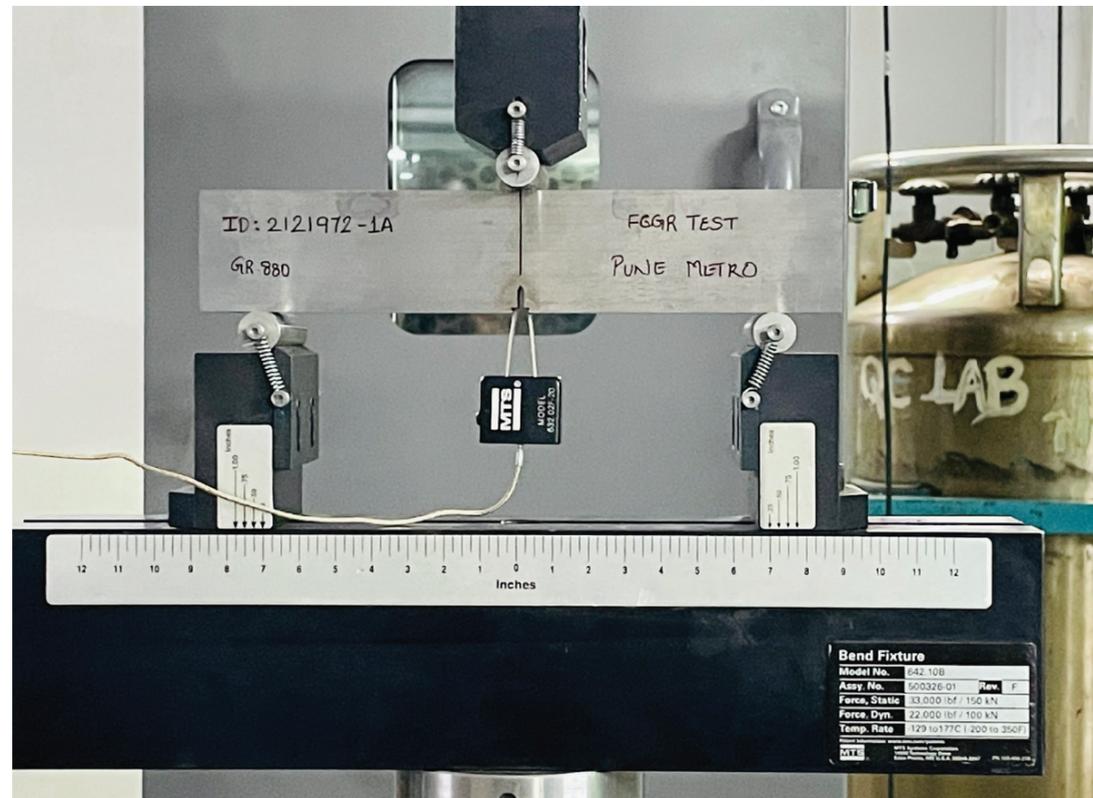
- Fatigue Test is used to measure ability of rails to resist multiple load cycles.



- Fracture Toughness Measurement is used to evaluate ability of rails to resist fracture propagating through pre-existing internal flaws.



- Fatigue Crack growth Rate FCGR tests require use of standard specimen geometries which include compact tension, single edge notch bend, single edge notch tension and centre crack tension specimens. To achieve this, pre-cracking is conducted at a stress ratio lower than that used in the subsequent FCGR test.



## B. ACCEPTANCE TESTS

These tests are carried out on each and every heat.

### Product Chemical Analysis:

Spectrometer is used to measure the chemical composition of the product samples.

### Tensile Test for YS, UTS, % Elongation (Universal Testing Machine):

UTM serves to evaluate the Yield Strength (YS), Ultimate Tensile Strength (UTS) and elongation of the rail samples.

**Hardness Test:** Brinell hardness machine is used to measure hardness of rail steel

**Inclusion Rating:** This test is carried out to assess the number and size of inclusions present

**Hardness Distribution:** This test shall be carried out as per Clause 19.2.3 of IRS-T-12:2009 with latest amendment on heat treated Rails by transversely cut rail sections, Hardness value at any point shall not exceed 390 BHN.

**Micro Structure Test:** Test piece for microstructure should be taken from the top of rail head. Test piece should be polished, etched and viewed under microscope X100 and X500 magnification. The microstructure shall be fine pearlite without formation of any martensite and Bainite.

**Sulphur Print:** It employs macrograph method for evaluating homogeneity of a steel product. It reveals distribution of sulphide in steel. The sections cleaned on one surface in order to eliminate completely all machining marks and to obtain a sharp impression.

A Baumann-type impression is obtained by the application of bromide paper, previously impregnated with a solution of Sulphuric acid, to the clean rail sections drawn from a location within the cast at the discretion of the Inspecting Agency.

**Falling Weight Test:** This test is carried out Used to determine the ability of Rail to resist cracking when a heavy load falls from a certain height. It gives an idea about material toughness

**Hydrogen content:** Gases Dissolved in steel may have high detrimental effects like shatter-Cracks during Usage for the same, it is important to control the same in very close limits at JSPL Ruhrstahl Heraeus Degasser is used for Cleaning steel from dissolved gases like Hydrogen, Oxygen and Nitrogen.

**Macro Structure Test:** Due to specific process of heat treatment being adopted by the manufacturer Macro-structure of heat affected zone may not show distinct zones. Supplier should advise about the same to the purchaser in advance.

# LONG RAILS

---

Rails of 13 Meter & 12 Meter are quite common nowadays. Importance of reducing welded Joints has been felt by railways worldwide, both on economic and technical considerations. Welded Joints have a detrimental effect on the harmonious interplay between wheel and Rail Running Surface. This not only disrupts the dynamics of vehicle movement but is also a potential weak point from safety considerations particularly with increased wear at welded joints on account of train speeds and axle loads going up.

On account of multitude problems with fish plated joints and improper thermite welding at the track site like fractures, high maintenance costs, etc, the requirement of superior quality welding in Factory conditions has been on the rise. These long rails would minimize welding at site thereby reducing wear and tear and provide extended lifespan. It would also allow faster laying of tracks.



# LONG RAIL WELDING PLANT

---

Inspired to innovate new products to provide solutions and improvements, JSPL has installed an integrated flash butt welding plant to produce long welded Rails up to 484 Meter with only 3 Welds using Rolled up to 121 Meter Long.

The welding plant by Railtech SCHLATTER – France Comprises state-of-the-art automatic brushing, automatic welding machine (with built-in Stripping Unit) post straightening and finish grinding followed by on line ultrasonic testing of Welded Joints.

# LONG RAIL HANDLING & TRANSPORTATION

---



# HEAD HARDENED RAILS

As a lifeline for mass transportation, Railways have to continually innovate and steel play a Pivotal role in providing choice for Heavy Haul applications by meeting the demanding conditions of the mass transit and freight networks in becoming faster and further, Head Hardened Rail offers greater efficiencies through its ability to handle higher axle loads with low deformation and wear. These Rails are also used in Tracks where higher acceleration and Deceleration are inevitable.

JSPL pioneered in setting up Online Head Hardened Rails Facility (SMS Meer Germany) in India. The Head Hardened Rails manufacturing process and product of JSPL is approved by RDSO and TUV-Nord, Luxembourg.

Head Hardening Process at JSPL Rail Mill: The Rolled rails are heated through induction coils for uniform heating of rail heads. The uniformly heated rails are passed through a cooling chamber. Mist cooling of Rails through "Selective Cooling" technology of SMS-Meer ensure uniform cooling across the section.

## MECHANICAL PROPERTIES OF HH RAILS VIS-À-VIS NORMAL RAILS:

Specification	Grade	Hardness [BHN]	Ultimate Tensile Strength (MPa)
IRS T-12 2009	880 Grade	Min 260	880
	1080 HH	340-390	1080
	1175 HT	350-390	1175
EN 13674-2011	R260	260-300	880
	R350HT	350-390	1175

# ADVANTAGES OF HEAD HARDENED RAILS

JSPL took the lead by setting up a state of the Art Technology for Online Rail Head Hardening. Head hardened Rails with Enhanced wear resistance required for High Speed Track Metro Rail and Heavy Haul applications with Very High strength & Low residual Stress allowing improved lifecycle and thereby making it cost efficient.

- Lower Rail Wear
- Higher Strength
- Lower Residual Stresses
- Enhanced Safety
- Cost Efficient with High Lifecycle

# APPLICATIONS:

---

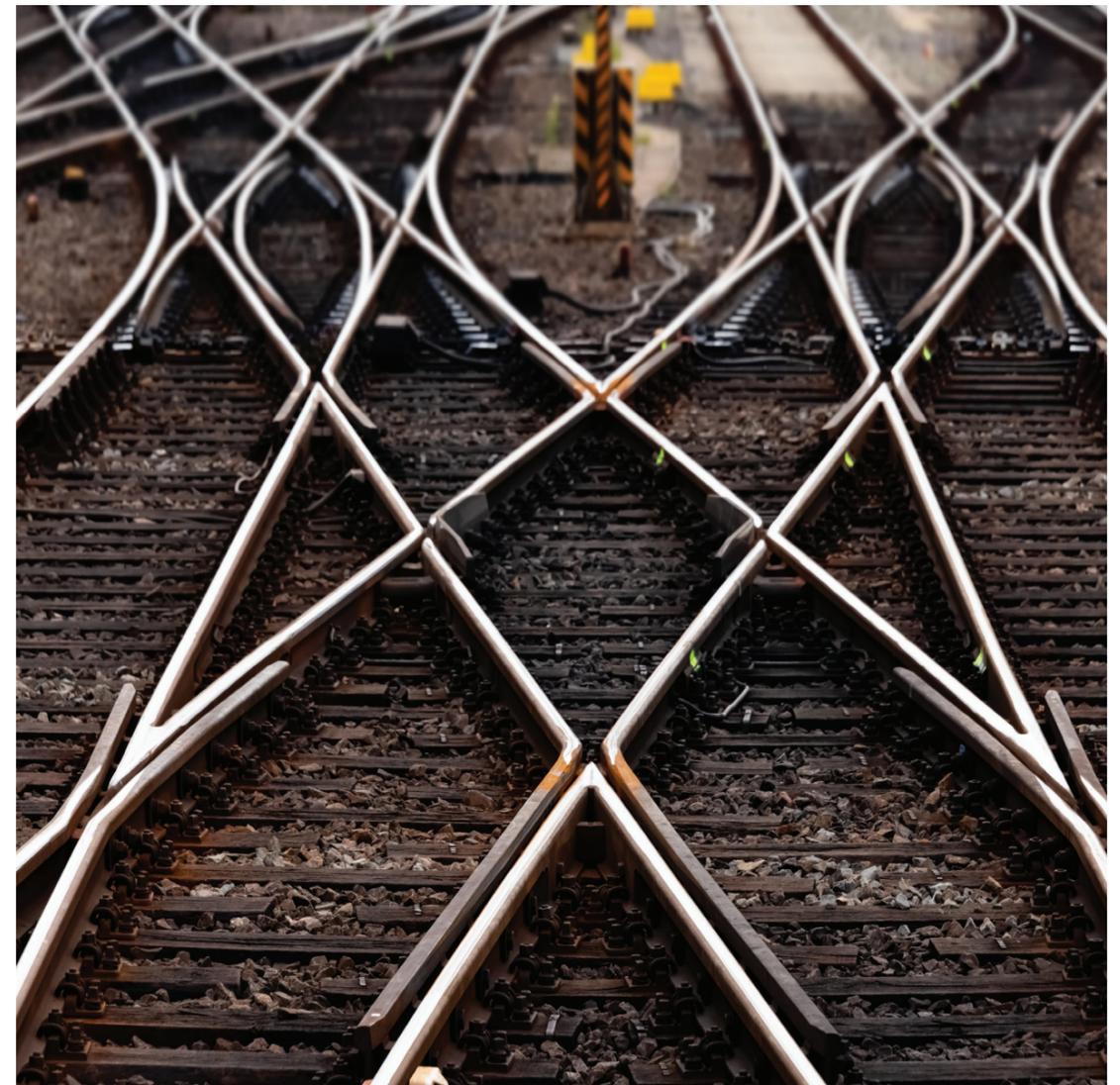
- **Mixed Traffic System:** Rails supplied are suitable for use in Traditional Mixed –traffic systems. The Rails are used in different weather conditions, different geographies, frequent braking, and varied load conditions.



- **Heavy Haul Applications:** High axle loads and longer trains, growing demand for transport capacity to keep pace with economic growth have resulted in need to upscale existing Rail tracks with High Strength Rails which offers high resistance to wear, longer life and reduced maintenance. JSPL is the first Indian manufacturer to develop High Strength Heat treated Rails suitable for Heavy Haul application.



- **Switches and Turnouts:** To meet the requirement of sturdier switches for handling higher speed and Higher Axle Loads, Thick web switches made up of ZU-1- 60 Asymmetric Rails are now used. JSPL offers Rail Profile ZU-1-60 as per IRS-T-12 and 60E1A1 as per EN-13674 for Switches and Turnout applications.

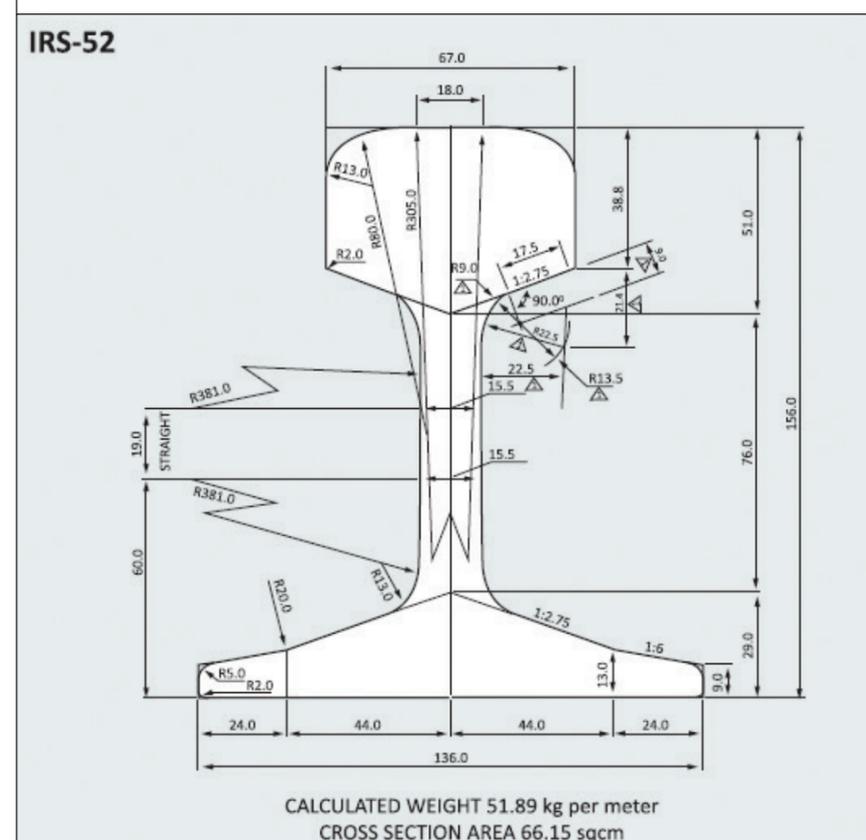
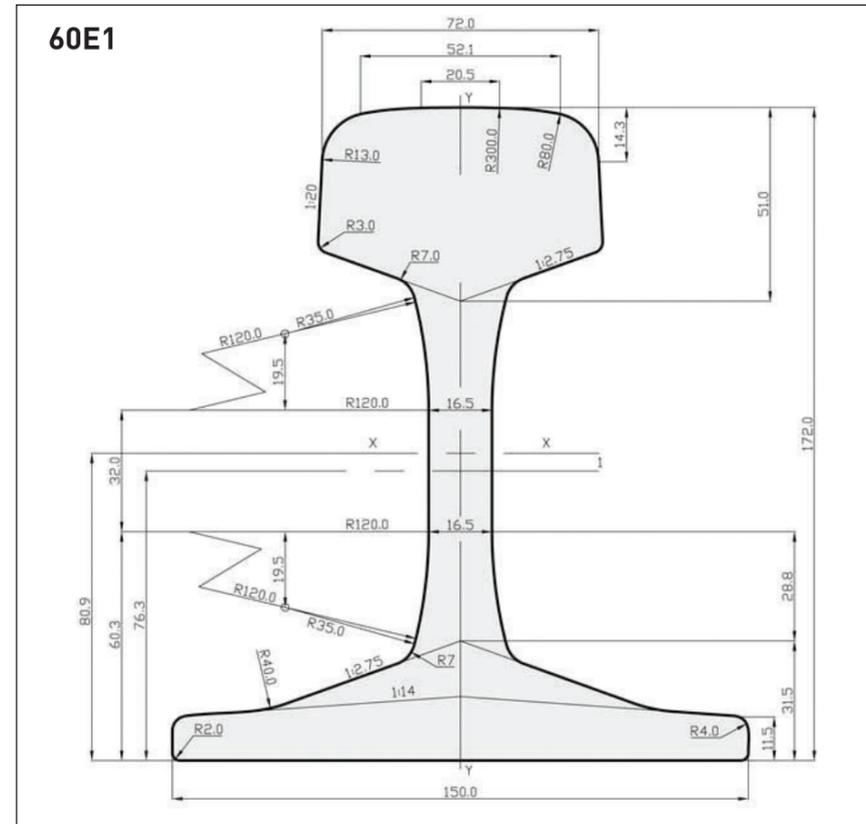
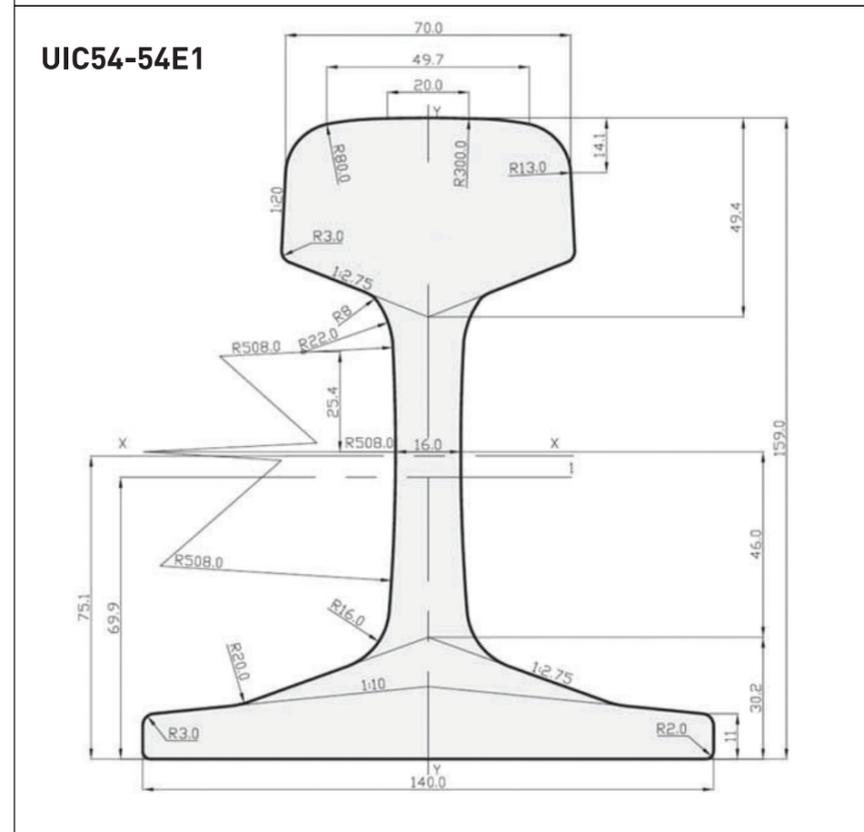
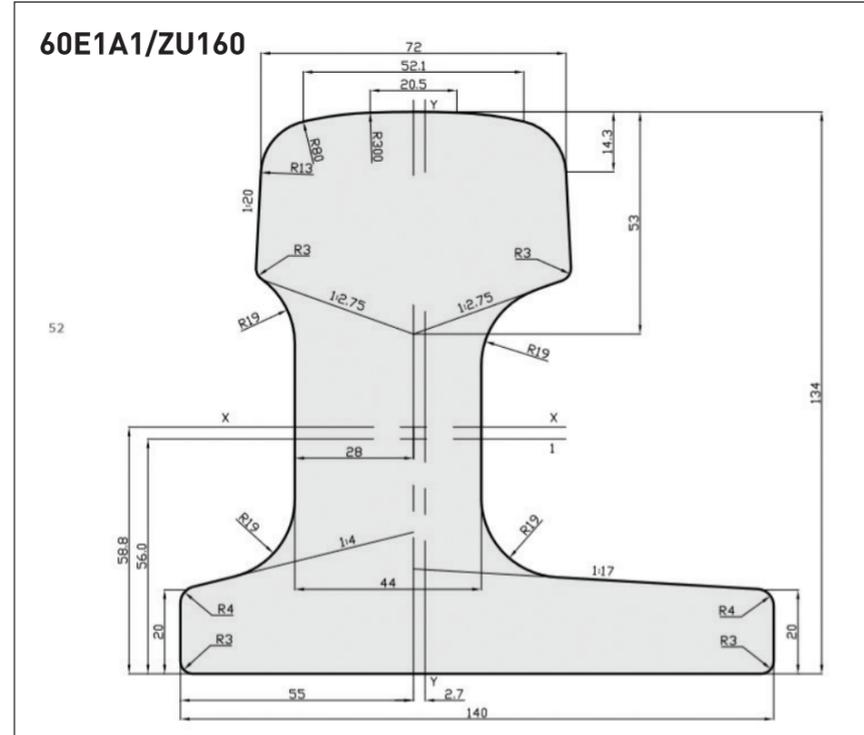


# JSPL PRODUCT RANGE:

## GRADES- CHEMICAL COMPOSITION AND MECHANICAL PROPERTIES

Steel grade	% by mass								% by mass				Tensile strength [MPa]	Elongation A min[%]	Hardness of the rail running surface, centre line HBW
	C	Si	Mn	P[Max]	S[Max]	Cr	Al [Max]	V [Max]	N [Max]	O2 [ppm]	H2 [ppm]				
880	0.60 to 0.80	0.10 to 0.50	0.80 to 1.30	0.030*	0.030*	–	0.015	–	–	–	1.6	880	10	Min 260	
R260	0.60 to 0.82	0.13 to 0.60	1.65 to 1.25	0.030	0.030	≤0.15	0.004	0.030	0.010	20	2.5	880	10	260-300	
1080 HH	0.60 to 0.80	0.10 to 0.50	0.80 to 1.30	0.030*	0.030*	–	0.015	–	–	–	1.6	1080	10	340-390	
1175HT	0.70 to 0.82	0.13 to 0.60	0.65 to 1.25	0.030	0.030	0.15	0.004	0.030	0.010	20	1.6	1175	9	350-390	
R350 HT	0.70 to 0.82	0.13 to 0.60	0.65 to 1.25	0.025	0.030	≤0.15	0.004	0.030	0.010	20	2.5	1175	9	350-390	

RAIL SECTIONS BY JSPL: 60E1, IRS 52, UIC 54 & ZU160



# NEW PRODUCTS FOR THE NEW INDIA

---

JSPL is keen to contribute to the government's 'Make In India' initiative. After the successful development of 260m Long Rails and Head Hardened Rails, we are committed to further pursuing this mission with the development of the following new products:

- **Asymmetric Rails (ZU-1-60/60E1A1)** : JSPL has developed thick web 60E1A1/ ZU-1-60 Rails profile. These Rails are used for making Turnouts. JSPL has been approved by RDSO for ZU-1-60 Asymmetric Rails.
- **60E1, Grade R260 Non Heat Treated Rails:** Indian Railways is amending Rail specification along the lines of International Standards. We have developed 60E1, R260 Grade Rails (As per RDSO Specification) to meet new requirement of IR.
- **Grade 1175HT Rails:** These Rails are developed for High Speed and High Axle Load requirement of Indian Railways. It is equivalent to Rail Grade R350HT (EN-13674).
- **Zn Coated Corrosion Resistant Rails:** Premature rail fractures occur in track on account of corrosion. To improve the life of rail against the corrosion, methodology and technical specification for zinc metallization were issued by RDSO. JSPL is also working on this new development with IR & RDSO.
- **Crane Rails:** JSPL offers a range of Crane Rail sections for use with overhead crane and floor-mounted cranes. These include CR 80, CR 100, CR 120 and CR150.

