LEAST CO_2 FOOTPRINT

JSL
JINDAL STAINLESS

Stainless Steel For Bridges, Tunnels & Roads

JINDAL INFINITY INFRA SOLUTIONS

A Partner For Safety & Sustainability

C M Y K

A LEGACY BUILT ON **SAFETY & TRUST**

India's leading stainless-steel manufacturer, Jindal Stainless, had a consolidated annual turnover of INR 38,562 crore (USD 4.7 billion) in FY24 and is ramping up its facilities to reach 4.2 million tonnes of annual melt capacity in FY27. It has 16 stainless steel manufacturing and processing facilities in India and abroad, including in Spain and Indonesia, and a worldwide network in 12 countries, as of March 2024. In India, there are ten sales offices and six service centres, as of March 2024. The company's product range includes stainless steel blooms, slabs, coils, plates, sheets, precision strips, wire rods, rebars, blade steel, and coin blanks.

Jindal Stainless relies on its integrated operations to enhance its cost competitiveness and operational efficiency. Founded in 1970, Jindal Stainless continues to be inspired by a vision for innovation and enriching lives and is committed to social responsibility.

Jindal Stainless remains focused on a greener, sustainable future, fuelled by environmental responsibility. The company manufactures stainless steel using scrap in an electric arc furnace, which involves lower greenhouse gas emissions and enables recyclability with no reduction in quality.

COMMITTED TO NET ZERO

- Net Zero emission by 2050 and 50% reduction in emissions by 2035
- Committed to taking Science Bases Target Initiative (SBTi) in our net zero journey in compliance with the Paris Agreement
- Responsible steel site certification: JSL is well underway towards achieving site certification from responsible steel

ENERGY EFFICIENCY

- Achieved ~3.1 lakh tCO_2e reduction over FY22–24through carbon-saving initiatives.
- Earned 30K+ E-Certificates by exceeding targets in PAT Cycles 1 & 2.
  - PAT Cycle 1: 12,687
  - PAT Cycle 2: 21,270

CAPTIVE RENEWABLE

- 7.3 MWp floating solar plant installed in Jajpur
- 4.2 MWp roof-top solar plant installed in Hisar
- 28 MWp rooftop solar plant being installed in Jajpur and Hisar
- Replaced fossil fuels with biofuels at Hisar Hot Rolling Mill, enabling 45,000+ tCO_2e abatement

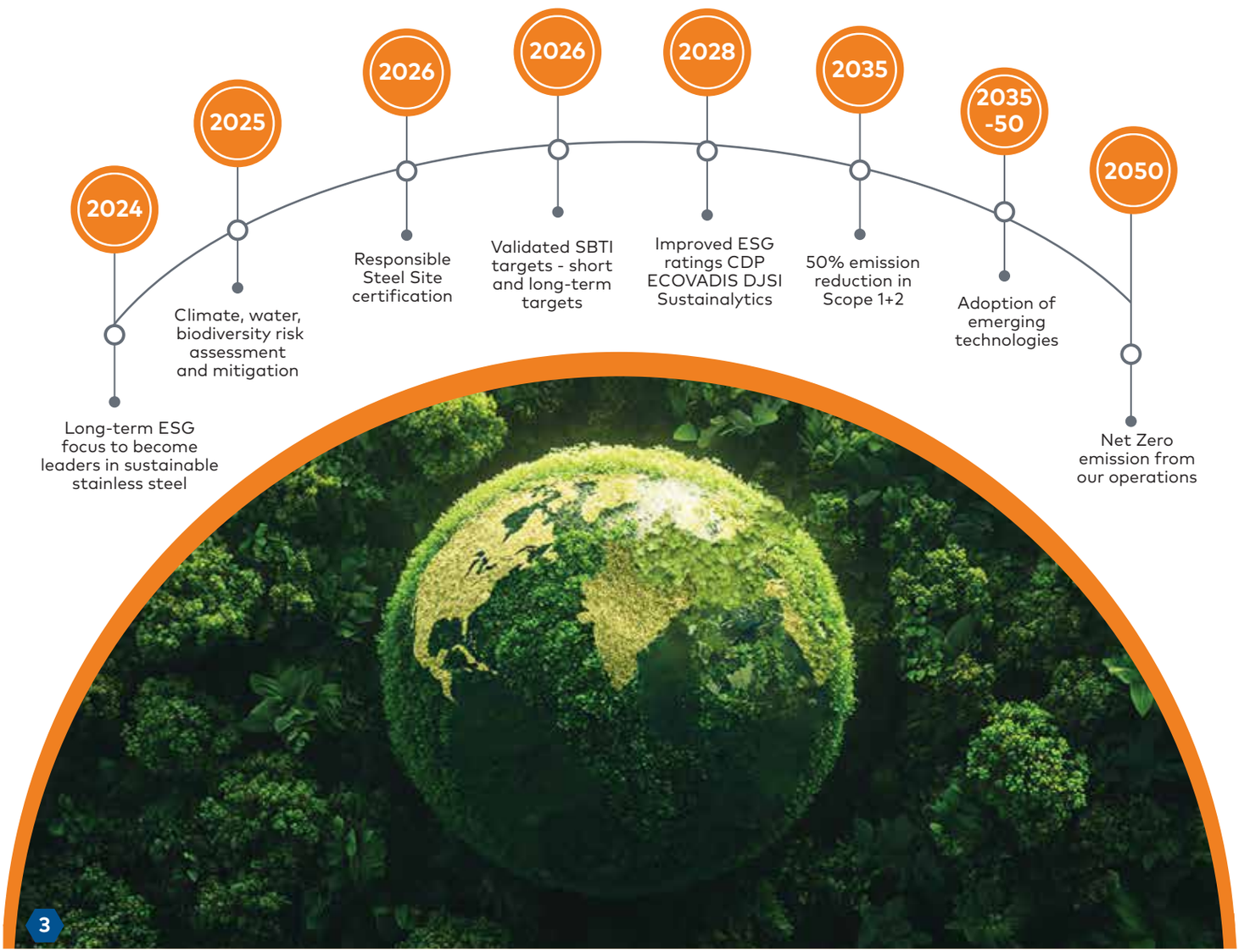
RENEWABLE RTC (ROUND THE CLOCK

- MoU with ReNew Power for 100 MW RTC renewable energy at Jajpur, cutting 4.35+ lakh tCO_2e annually
- Second MoU signed for 100 MW RTC renewable power at Hisar, with similar CO_2 abatement.
- All future power needs at JSL to be met with renewable sources.

GREEN HYDROGEN

- JSL commissions domestic stainless steel industry's first green hydrogen project for captive use.
  - Currently used in one HBA line, with plans for full rollout.
  - CO2 reduction potential of 2700 tCO2 annually
  - All existing HBA lines to move to Green Hydrogen by FY28

OUR SUSTAINABILITY ROAD MAP



STAINLESS STEEL

Stainless steel is a generic term for a group of corrosion resistant steels with a minimum of 10.5% chromium content. Other alloying elements are added to enhance their structure and properties such as formability, strength and cryogenic toughness.

These include metals such as:

- Nickel
- Molybdenum
- Titanium
- Copper
- Manganese

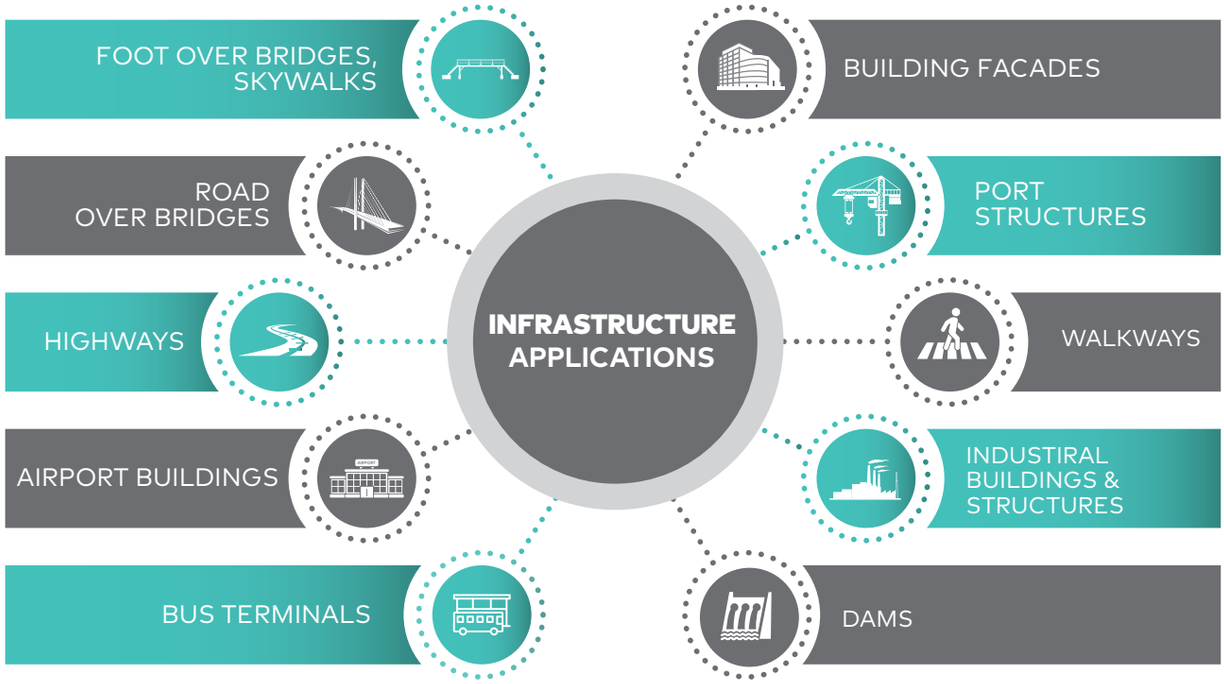
Non-metal additions are also made, and the main ones are:

- Carbon
- Nitrogen

The main requirement for stainless steels is that they should be corrosion resistant for a specified application or environment. The selection of a particular stainless steel "type" and "grade" must initially meet corrosion resistance requirements. Additional mechanical or physical properties may also need to be considered to achieve the overall service performance requirements.

ALL ABOUT STAINLESS STEEL:
GRADES & PROPERTIES

INFRASTRUCTURE APPLICATIONS OF STAINLESS STEEL OR VARIOUS APPLICATION OF STAINLESS STEEL IN INFRASTRUCTURE



HIGH-QUALITY STAINLESS STEEL FROM JINDAL STAINLESS LTD.

Stainless steel is available in a variety of grades, which are generally categorized into five main types:

AUSTENITIC – The most common type of steel, austenitic stainless steel contains nickel, manganese, nitrogen & sometimes molybdenum in addition to iron & chromium. These alloys cannot be hardened through heat treatments but can be work hardened.

MARTENSITIC – This stainless steel has carbon contents as high as 1%, which allows it to be hardened and tempered, similar to carbon and low-alloy steels.

FERRITIC – Ferritic steel features high chromium contents and low carbon contents (usually less than 0.10%). They cannot be work hardened and demonstrate less formability than austenitic steel. However, they offer magnetic properties, high corrosion resistance, and resistance to cracking due to corrosion.

DUPLEX – Duplex steel features a material structure that is half austenitic and half ferritic. This quality provides them with superior strength and corrosion resistance.

PRECIPITATION HARDENING (PH) – PH steels contain additional elements, such as aluminum, copper, or niobium, and undergo heat treatments, both of which enhance their material strength. As they are less likely to experience thermal distortion, they are suitable for the manufacturing of parts with intricate designs or that which require tight tolerances.

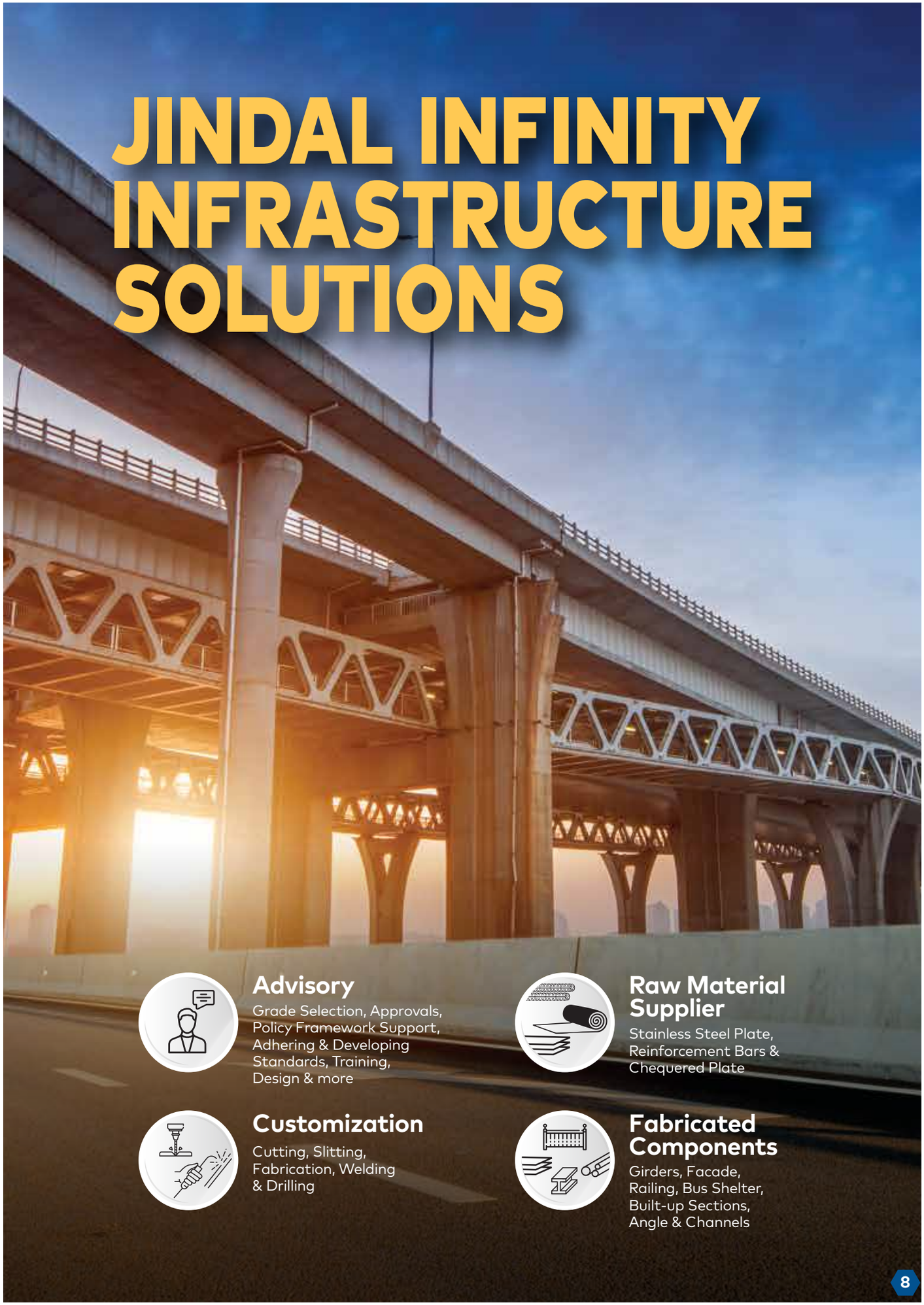
FERRITIC + MARTENSITIC - There are stainless steel grades that exhibit a dual-phase microstructure containing both ferritic and martensitic characteristics. This quality provides them with superior strength, high corrosion resistance and also offers magnetic properties.

STAINLESS STEEL
FOR YOUR BUSINESS NEEDS

Stainless steel offers several beneficial properties when used in infrastructure applications, making it a suitable choice for various construction and architectural elements. Some of the key properties of stainless steel in infrastructure include:

1. **CORROSION RESISTANCE:** Stainless steel is highly resistant to corrosion, making it a durable choice for infrastructure components exposed to harsh environmental conditions, such as bridges, coastal structures, and buildings in corrosive environments.
2. **HIGH STRENGTH TO WEIGHT RATIO:** Stainless steel helps in attaining optimized structural design using the least of material and without compromising on the strength criterion. It provides flexibility to the designers in being innovative while being simplistic in detailing connections, spans and their assemblies.
3. **LOW MAINTENANCE:** Due to its resistance to corrosion, stainless steel requires minimal maintenance, reducing long-term costs and the need for frequent inspections and repairs.
4. **LONGEVITY:** Stainless steel has a long service life, which is essential for critical infrastructure components like bridges and structural elements. It can withstand exposure to weather, moisture, and other environmental factors for many years without significant degradation or sectional loss.
5. **HIGH STRENGTH**: Stainless steel has excellent mechanical properties, including high tensile strength and the ability to withstand heavy loads. This makes it suitable for structural applications, such as supporting beams, columns, long span girders and shear connections.
6. **AESTHETIC APPEAL:** Stainless steel's sleek and modern appearance can enhance the visual appeal of infrastructure projects. It is often used in architectural elements, railings, facades, and decorative features to create an attractive and contemporary look.
7. **FIRE RESISTANCE:** Certain grades of stainless steel, have good fire-resistant properties, making them suitable for fire safety applications, including fire escapes and fire protection systems.
8. **DURABILITY IN EXTREME TEMPERATURES:** Stainless steel can maintain its structural integrity in a wide range of temperatures, making it suitable for infrastructure projects in both hot and cold climates.
9. **RESISTANCE TO CHEMICAL EXPOSURE:** Stainless steel is usually inert and definitely more resistant to varied chemical exposure conditions, making it an obvious choice for structures exposed to extreme chemical environments.
10. **HYGIENIC PROPERTIES:** Stainless steel is easy to clean and maintains a hygienic surface, which is important in infrastructure components like public restrooms, transportation hubs, and healthcare facilities.
11. **SUSTAINABILITY:** Stainless steel is recyclable, which aligns with sustainable building practices and green infrastructure initiatives. Its long life span and the ability to reuse and recycle it, reduce the environmental impact of infrastructure projects.

JINDAL INFINITY INFRASTRUCTURE SOLUTIONS



Advisory
Grade Selection, Approvals, Policy Framework Support, Adhering & Developing Standards, Training, Design & more

Raw Material Supplier
Stainless Steel Plate, Reinforcement Bars & Chequered Plate

Customization
Cutting, Slitting, Fabrication, Welding & Drilling

Fabricated Components
Girders, Facade, Railing, Bus Shelter, Built-up Sections, Angle & Channels

FERRITIC + MARTENSITIC
IRS 350CR, IRS 450CR

IRS 350CR & IRS 450CR grade stainless steel offers high strength coupled with corrosion resistance as compared to mild steel grades likes E250 and E350. These grades of stainless steel have a stable cost owing to low nickel and molybdenum content.

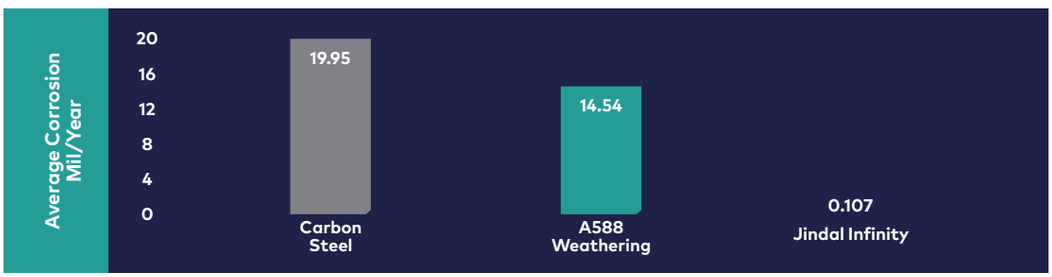
Mechanical Properties

Grade	YS (Mpa)	UTS (Mpa)	% Elongation
IRS 350CR	350 Min.	485 Min.	18 Min.
IRS 450CR (T<20 mm)	450 Min.	550 Min.	18 Min.
IRS 450CR (T= 20mm-40mm)	430 Min.	550 Min.	20 Min.
IRS 450CR (T>40mm)	420 Min.	550 Min.	20 Min.

Chemical Composition (As per ASTM A709 50CR, ASTM A1010 & RDSO Specifications BS-S-7.5.3.1-9)

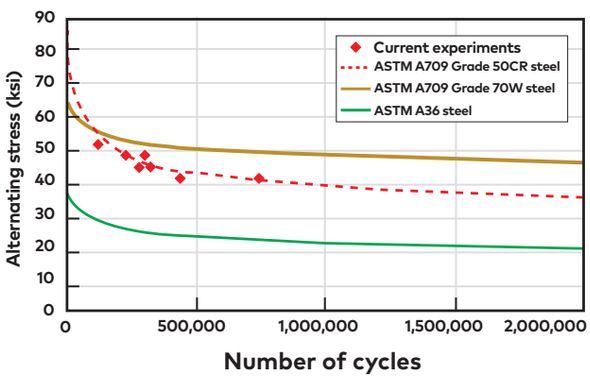
Grade	%C	%Mn	%P	%S	%Si	%Cr	%Ni	%Mo	%N
IRS 350 CR	≤0.03	1.00-1.5	≤0.04	≤0.01	≤1	10.50-12.50	≤1.5	0.10-0.75	≤0.03
IRS 450 CR	≤0.03	1.00-1.5	≤0.04	≤0.008	≤0.8	11.0-11.5	0.8-1.5	0.2-0.5	≤0.03

Upto 186x better corrosion resistance



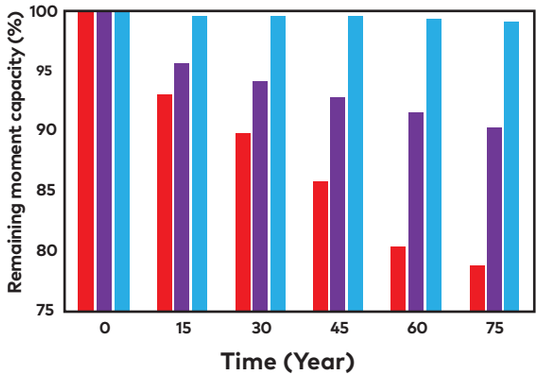
Corrosion performance as per SAE J2334 test consists of alternating wet/dry cycles with salt for 8 weeks, leads to low maintenance.

Fatigue Strength



Fatigue behavior ASTMA709 Grade 50CR steel in comparison to the other conventional structural steels (1 ksi = 6.9 MPa).

Moment Capacity Retention Vs Time



Percentage of drop in the moment capacity as a function of age.

WELDING OF IRS 350CR, IRS 450CR STAINLESS STEELS

Stainless Steel grades IRS 350CR and IRS 450CR are readily weldable via commonly used welding processes, both to itself as well as to carbon steel and other stainless steel grades, provided that appropriate consumable and fabrication procedures are utilized. The parts to be welded should be free of loose/thick scale, moisture, grease, and/or other foreign materials that could potentially influence weld quality. Qualification of the welding procedures per an appropriate code: eg. AWS D1.5, AWS D1.6 are recommended. As for welding any material, welder fume exposure should be minimized through use of ventilation, fume extractors, and/or respirators, as necessary for the given conditions. More specific welding related practices are described below:

- For thickness less than 0.5", weld heat input should be limited to a maximum of 25Kj/in to avoid diminished heat-affected zone (HAZ) toughness. For thicker plates, higher heat inputs to 70Kj/in. have been successfully used. Voltage and current should be set as the low to middle portion of the electrode manufacturer's range. Weld beads should be of the stronger type and of a size sufficient for the application without overwelding.
- The flux-cored arc (FCAW), gas metal arc (GMAW), shielded metal arc (SMAW) welding processes are generally suitable for IRS 350CR, IRS 450CR. Higher heat input processes like submerged arc (SAW) and the spray transfer modes of the other wire-fed processes should only be used after verification that the weld properties obtained are appropriate for the given application.
- ER309L T-1 is recommended for FCAW & for GMAW- ER 309L/ER309L Mo with gas mixture Ar-98% are recommended.
- Austenitic filler metals including 309L, 308L & 316L stainless are recommended for arc welding – IRS 350CR, IRS 450CR. Higher silicon versions of the fillers (309LSi, 308LSi, 316LSi) can be used, where necessary, to improve welding and/or weld appearance, albeit at some risk of increased weld metal crack sensitivity. Welding IRS 350CR and IRS 450CR to carbon steel should always be done employing 309L.

LIFE CYCLE COSTING (LCC):

A bridge represents a long-term, multi-year investment. Following its planning, design, and construction, a bridge requires periodic maintenance and possibly repair or rehabilitation actions to ensure its continued function and safety. It is logical to consider the whole life cost instead of the initial cost to evaluate a particular bridge option. Life cycle costing (LCC) presents a rational method for carrying out the same.

Eventually the owner has to decide when a bridge must be replaced, hence designating the end of its useful life. This end typically comes decades and sometimes even centuries after the initial construction was completed. In simplest terms, the time between a bridge's construction and its replacement or removal from service is its service life. The sequence of actions and events and their outcomes: e.g., construction, usage, aging, damage, repair, renewal–that lead to the end of the service life and the condition of the bridge during its life compose the life cycle. Owners and Engineers must decide about what management strategy to follow, what materials and designs to use, what repairs to make and when they should be made, based on their expectations about what the subsequent costs and outcomes will be. LCC is a set of economic principles and computational procedures for comparing initial and future costs to arrive at the most economical strategy for ensuring that a bridge will provide the services for which it was intended. While considering the option of Stainless Steel to carry out LCC, the following parameters would be important to consider:

A. Initial cost increase is 20-25% over carbon steel.

B. Low maintenance over carbon steel. However, only for aesthetic purposes, paint is recommended for utility Ferritic stainless steel.

C. Weight reduction of more than 25-30% can be achieved due to higher yield strength and light weight design.

D. Stainless steel is green material and helps in reducing carbon footprint.

E. Service life of stainless steel is double that of carbon steel.

APPROVED BY INDIAN RAILWAYS AND MUNICIPAL CORPORATION

Indian Railways and municipal bodies have approved the use of stainless steel in structural applications of bridges in line with global success stories of using modern technologies in construction.

RECOGNISED BY RDSO & INDIAN RAILWAYS

Stainless steel specification for structural applications in line with RDSO specification:

1. Material Specification: BS-S-7.5-3.1-9
2. Completed Project Drawings (FOB)
    - i. Span 33.55 x 3 mtr - Drawing No. - RC 5036
    - ii. Span 15.7 x 10 meter - Drawing No. - RC 5032
    - iii. Span 35.21 x 6 mtr - Drawing No. - UG-2203014-FOB-SG-001
    - iv. Span 43.86 x 3.5 mtr - RVNL/SCR/GRIL/KCK/FOB/SPF/440
3. RDSO standard stainless steel drawings
    - A. Foot Over Bridge (FOB)
        - i. Span 25-30m length x 6m wide; Drawing No. - RDSO/B-10424
        - ii. Span 20-25m length x 6m wide; Drawing No. - RDSO/B-10426
        - iii. Span 40 m x 3 m - Drawing No. - NRHQE P-390-FB/2022
        - iv. Span 20 x 3 m - Drawing No. - CBE/GM2/190/2023
        - v. Span 50 x 3 m - Drawing No. - 20352/05/KGP/23
    - B. Road Over Bridge (ROB)
        - i. Span 36m length x 11m wide; Drawing No. - CBS 0048
        - ii. Span 30m length x 11m wide; Drawing No. - CBS 0050

STRUCTURAL STAINLESS STEEL GIRDERS ALTERNATIVE TO PSC & RCC GIRDERS

Lighter, Modular and Project Time saving: A 40 m stainless steel Girder designed for special vehicle loading weighs around 30 MT whereas a 40-meter PSC Girder weighs around 120 T i.e. stainless steel girder can offer ~70% lighter superstructure weight.

For e.g. a typical 10 m wide bridge will use 5 girders overall weight of stainless steel girders per span will be 150 MT vs PSC Girders will weigh 600 MT.

The reduction is substantial weight results in following direct advantages of using stainless steel girders:

A. Optimised and leaner piers due to a substantial ~70% reduction in superstructure weight.

B. Faster Execution: Prefabricated lighter stainless girders result in execution benefits at the site as heavier cranes, PSC casting yard, and special manpower is not required.

C. Also, if compared to typically 27-30 m PSC girders weighing ~85 MT, span lengths can be increased to 40 m using stainless steel girders weighing only ~32 MT. Resulting in reductions in the number of piers and hence reduction in the project timeline.

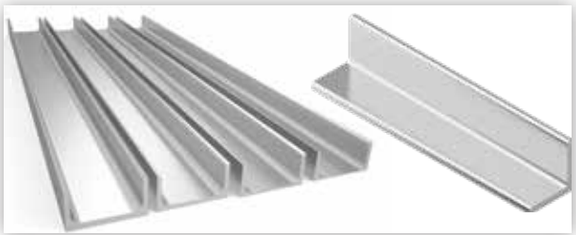
JINDAL INFINITY
INFRA SOLUTION : PRODUCT RANGE

A. Plates

i. Thickness - 3 mm - 70 mm
ii. Width - 1600 mm max
iii. Length - 12000 mm max

B. Fabricated Bridge Girders
and other structures, approved by RDSO

C. Fabricated Structural Sections
[Angles, Channels, H Beams, I Beams]

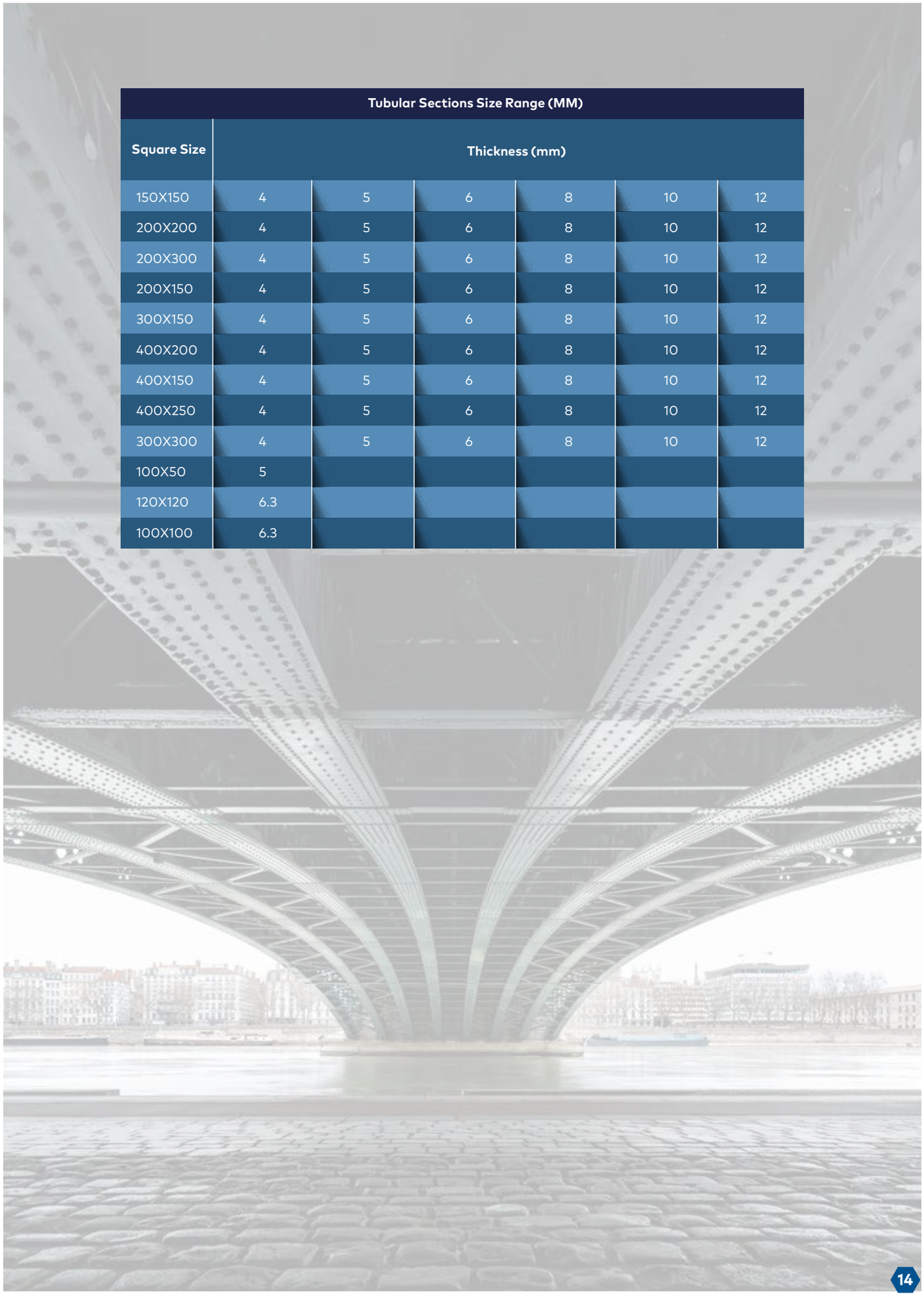


D. Welded Hollow Sections

E. Stainless Steel Chequered Plates

F. Stainless Steel Rebars
[SS 500, SS 550, SS 600 as per IS 16651:2017]

(Note: Any customized sizes can be catered as per mutual agreement)



Tubular Sections Size Range (MM)						
Square Size	Thickness (mm)					
150X150	4	5	6	8	10	12
200X200	4	5	6	8	10	12
200X300	4	5	6	8	10	12
200X150	4	5	6	8	10	12
300X150	4	5	6	8	10	12
400X200	4	5	6	8	10	12
400X150	4	5	6	8	10	12
400X250	4	5	6	8	10	12
300X300	4	5	6	8	10	12
100X50	5					
120X120	6.3					
100X100	6.3					

STAINLESS STEEL FOR VARIOUS BRIDGE DESIGNS

1. Steel-Concrete Composite Bridges

Combining the best of stainless steel and concrete, these bridges use built-up girders and concrete decks, often with shear connectors, to ensure the two materials work together efficiently. This type of bridge offers a highly efficient solution for clear spans ranging from **10m to 40m**. The **synergy between materials** enhances strength, reduces weight, and minimizes maintenance costs, making it an ideal choice for cost-effective and durable infrastructure.

2. Bowstring-Arch Bridges

Arch bridges use a curved structure that efficiently transfers loads, providing an elegant design and excellent strength. When designed with stainless steel, these bridges achieve enhanced **aesthetic appeal** and **structural integrity**. Stainless steel arch bridges are ideal for long spans ranging from **10m to 150m**, where the blend of beauty and performance is paramount. These bridges are not only functional but add to the **visual identity** of any area, with an emphasis on **long-lasting durability** and **minimal maintenance.**

3. Truss Bridges

Truss bridges feature a framework of stainless steel members arranged in triangles, converting loads into axial forces for maximum strength with minimal material. The **camelback truss** variant, with its distinctive arch, enhances load distribution and stability, making it ideal for longer spans. Stainless steel provides **superior fatigue resistance**, **corrosion resistance**, and **low maintenance**. Camelback truss bridges are well-suited for spans from **10m to 200m**, offering both **strength** and **aesthetic appeal**.

4. Open Web Girder Bridges

Open web girder bridges utilize steel girders with a "web" pattern, reducing material weight while maintaining high strength. They are commonly used for river and valley crossings, offering clear spans ranging from **30m to 200m**. The efficient use of **stainless steel** in this design allows for longer-lasting structures with **low maintenance** and **reduced need for frequent repairs**, contributing to **enhanced economic value** over time.

5. Cable-Stayed Bridges

Stainless steel cable-stayed bridges utilize **lighter pylons** made from stainless steel sections, which significantly reduce the **dead load** of the structure. This design allows for longer spans and lighter bridge structures, making them ideal for **spans of up to 1000m**. The **efficiency of stainless steel** results in **minimal maintenance** and **increased service life**, reducing the overall **cost of ownership**. With a sleek, modern appearance, cable-stayed bridges offer an **elegant and efficient solution** for large-scale infrastructure projects that demand strength, sustainability, and aesthetic appeal.

6. Stainless Steel Semi Through Girders Bridge - Potential Solution for water venting during heavy monsoon in cities:

a. During heavy monsoons, flooding has become a very common problem in the city's modern infrastructure. Timely water venting is very important for dewatering the cities during monsoon. The current design of concrete bridges over rivers, nallas crossing the cities have higher depths which creates hindrance for water venting. In this case, stainless steel semi through girder bridges can work as a potential solution.

b. Faster Execution: Prefabricated lighter stainless girders result in execution benefits at the site as heavier cranes, PSC casting yard, and special manpower is not required.

c. Also, if compared to typically 27-30 m PSC girders weighing ~85 MT, span lengths can be increased to 40 m using stainless steel girders weighing only ~32 MT. Resulting in reductions in the number of piers and hence reduction in the project timeline.

FASTENERS, BOLTS FOR
STAINLESS STEEL STRUCTURES

ITEM	CODE	GRADE
Bolts	ASTM A193	GR BB Class 2
Nuts	ASTM A194	GR 8
Washers	-	Type 303

All types of nuts & bolts including HSFG are domestically available.

Visit **www.jindalstainless.com** or contact at **infinity@jindalstainless.com** for suppliers of consumables, Fasteners & fabricated components.

STANDARDS AND CODES

Standard	Corresponding Design Code	Corresponding Construction / Fabrication Code
EN 10088 (Part 1 – List of stainless steel) (Part 2 – TDC for sheets/plates and strips of corrosion resisting steels for general purposes) (Part 3 - TDC for semi-finished products, bars, rods, wire, sections & bright products of corrosion resisting steels for general purposes) (Part 4 -TDC for sheet/plate and strip of corrosion resisting steels for construction purposes)	EN 1993-1-1(General Design Rules),EN 1993-2 (Steel Bridges) & EN 1993-1-4 (Supplementary Rules for Stainless Steel	EN 1090-2: Execution of steel structures (Technical Requirements for Steel Structures)
ASTM A1010/A1010M (standard specification for higher-strength martensitic stainless steel plate, sheet, and strip) ASTM A709/A709M (standard specification for structural steel for bridges) ASTM 240 (standard specification for chromium and chromium-nickel stainless steel plate, sheet, and strip for pressure vessels and for general applications)	AASTHO LRFD Bridge Design Specifications	AASTHO LRFD Bridge Construction Specifications
BS-S-7.5.3.1-9 (Specification for higher-strength martensitic stainless steel for bridge and associated structural applications IRS 350 CR)	AASTHO LRFD Bridge Design Specifications	AASTHO LRFD Bridge Construction Specifications

Jindal Infinity confirms to ASTM A1010 and RDSO specification BS-S-7.5.3.1-9

THE SCHEDULE OF RATES(SOR) FOR PLATES, FABRICATED SECTIONS, STAINLESS STEEL REBARS AND STAINLESS STEEL CHEQUERED PLATES ARE CURRENTLY AVAILABLE FROM THE FOLLOWING AGENCIES:

1. Municipal Corporation of Greater Mumbai (MCGM)
2. Public Works Department (PWD) Madhya Pradesh
3. Mumbai Metropolitan Region Development Authority (MMRDA)
4. Railways and All Zonal Railways

IRS 350CR STAINLESS STEEL

Bhayandar FOB, Western Railway

The Bhayandar foot over bridge in the Western Railways exemplifies a strategic shift towards employing stainless steel in infrastructure, specifically in bridge structures, showcasing distinct advantages over traditional carbon steel.

Primarily, IRS 350CR stainless steel provides superior corrosion resistance compared to carbon steel, a crucial factor in the coastal environment prevalent in many regions, including Maharashtra. This resistance ensures prolonged durability, reducing maintenance requirements and associated costs significantly.

Additionally, stainless steel's inherent strength and structural integrity enhance its reliability, ensuring the safety and longevity of the foot over bridge, a pivotal aspect for railway infrastructure.

Furthermore, stainless steel's resistance to rust and corrosion preserves the aesthetic appeal of the structure, maintaining its visual appeal over an extended period. The use of IRS 350CR stainless steel in the Bhayandar foot over bridge highlights its cost-effectiveness over a long term duration due to reduced maintenance needs and enhanced durability, ultimately contributing to a more sustainable and resilient infrastructure in the Railways network.

Himalaya FOB, CSTM - Mumbai

The Himalaya foot over bridge structure at Chhatrapati iShivaji Maharaj Terminus (CSTM) station in Mumbai is yet another landmark example of unparalleled advantages of stainless steel over conventional carbon steel.

Foremost, stainless steel's remarkable resistance to corrosion is pivotal in Mumbai's humid and coastal environment. This attribute ensures the extended durability of the structure, markedly reducing maintenance needs and associated costs over its lifecycle, making it a more sustainable and cost-effective choice compared to carbon steel.

Moreover, stainless steel's inherent strength and structural robustness provide superior load-bearing capabilities, ensuring the safety and reliability of the foot over bridge. This durability is crucial in supporting the substantial foot traffic typical of Mumbai's bustling transportation hubs.

NAUPADA & SRIKAKULAM FOB

Utilizing stainless steel in the Naupada and Srikakulam foot over bridges within Waltair Division near the coastline was a major fillip to prove the distinct advantages over carbon steel.

This choice demonstrates a cost-effective and resilient solution for constructing durable infrastructure in the coastal railway network of the Waltair Division.

LEAN DUPLEX
STAINLESS STEEL 2101, 2304

Lean duplex stainless steel is ideal for high-corrosion areas due to its excellent corrosion resistance, cost-effectiveness, durability, and low maintenance needs. It provides structural strength while resisting corrosion in harsh environments like marine or chemical settings, making it a reliable choice for various applications.

Mechanical Properties

Grade	YS (Mpa)	UTS (Mpa)
2101 (T>5 mm)	450 Min.	650 Min.
2101 (T<5 mm)	530 Min.	700 Min.
2304	400 Min.	600 Min.

Chemical Composition

Grade	%C	%Mn	%P	%S	%Si	%Cr	%Ni	%Mo	%N	%Cu
2101	≤0.04	4.00-6.00	≤0.04	≤0.030	≤1	21.0-22.0	1.35-1.70	0.10-0.80	0.20-0.25	0.10-0.80
2304	≤0.03	≤2.50	≤0.04	≤0.030	≤1	21.5-24.5	3.0-5.5	0.05-0.60	0.05-0.20	0.05-0.60

DUPLEX
STAINLESS STEEL 2205

Duplex stainless steel, also known as 2205, is one of the most commonly used grades of duplex stainless steel. Duplex stainless steel combines the strengths of austenitic and ferritic steels, offering superior corrosion resistance, higher strength, good weldability and better toughness than ferritic and lean duplex grades.

While Duplex 2205 may be more expensive than other grades upfront, however its superior corrosion resistance and strength can result in cost savings over time by reducing maintenance and replacement costs. It excels in harsh environments, providing a balanced blend of properties essential for various industries.

Mechanical Properties

Grade	YS (Mpa)	UTS (Mpa)	% Elongation
2205	450 Min.	650 Min.	25 Min.

Chemical Composition

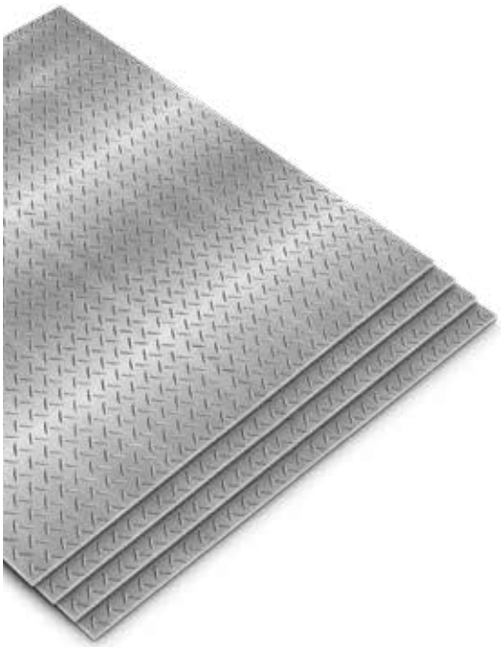
Grade	%C	%Mn	%P	%S	%Si	%Cr	%Ni	%Mo	%N
2205	≤0.03	≤2.00	≤0.03	≤0.020	≤1	22.0-23.0	4.50-6.50	3.0-3.50	0.14-0.20

MRINAL TAI GOREGAON MINOR BRIDGE

The slum peninsula of Mumbai has over 440 bridges to facilitate the connectivity of its 12.5 million citizens. The Mrinal Tai Goregaon Flyover is a massive infrastructure project aimed at easing congestion in India's most populous city. The project has been executed in several phases. Recently an extension to the flyover, the bridge over Walbert Nalla, at Oshiwara District Centre has been constructed to meet the long term needs of this rapidly developing suburb.

Brihan Mumbai Municipal Corporation (BMC), commissioned the project in 2021. The goal was to build a new bridge that could meet the demanding conditions for decades to come, including a combination of extreme weather, seawater and wastewater flowing below it. The new bridge demanded a material with high corrosion resistance and high strength. Duplex Stainless steel -2205 was an ideal candidate for the challenge.

All the girders and structural complements were made of duplex stainless steel 2205 (UNS S32205) manufactured and supplied by Jindal Stainless Ltd. The grade was chosen because of its high strength and its superior corrosion resistance provided by the nickel and molybdenum content.

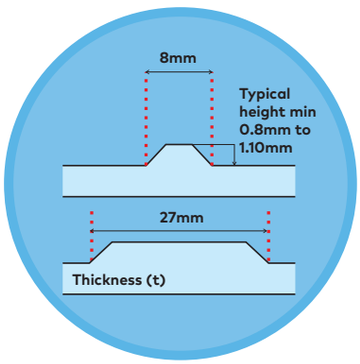


STAINLESS STEEL CHEQUERED PLATES

PRODUCT RANGE

- **Grade -** 409M
- **Thickness range -** 3mm to 8mm
- **Width Up to -** 1500mm
- **Finish -** Chequered

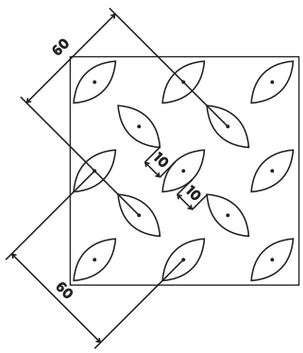
PATTERNED ALONG THE BEST GLOBAL STANDARDS



The pattern of this Stainless Steel Chequered Plate is in accordance with IS 3502 Pattern 1A.

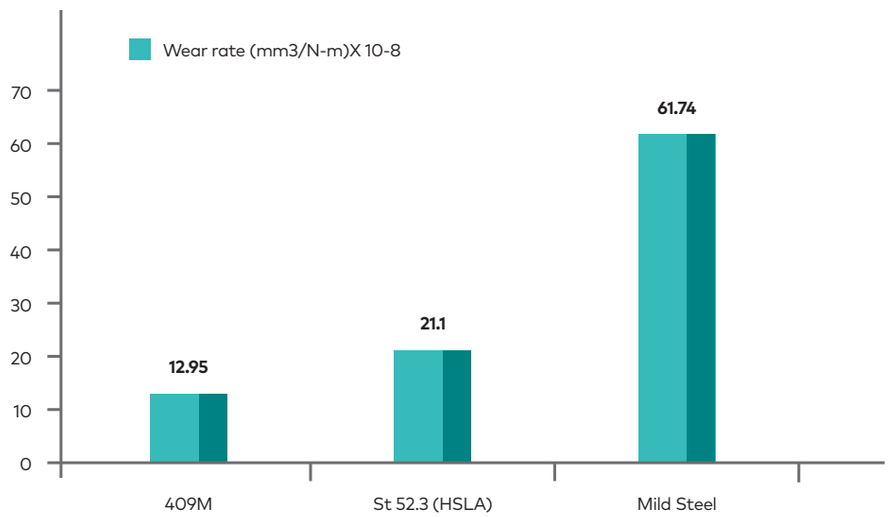
Dimensions of Bead*
Length – 27mm
Width – 8mm
Height – Min. 0.80mm

Number of Beads*
(100mm x 100mm):11
*Standard tolerance applies



UP TO 5 TIMES HIGHER WEAR RESISTANCE FOR HIGHER COST SAVINGS

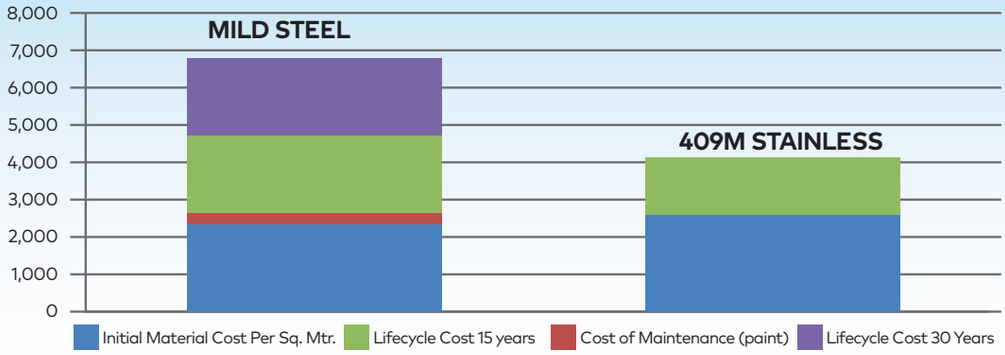
Grade 409M is known for its high wear resistance. Under the sliding wear test condition grade 409M is 1.6 times better than HSLA steel and 4.7 times better than normal mild steel.



C M Y K

LOWER LIFECYCLE COST FOR A LIFETIME OF GROWTH

LCC OF SS 409M HRAP CHEQUERED VS MILD STEEL HF CHEQUERED OVER 30 YEARS LIFE



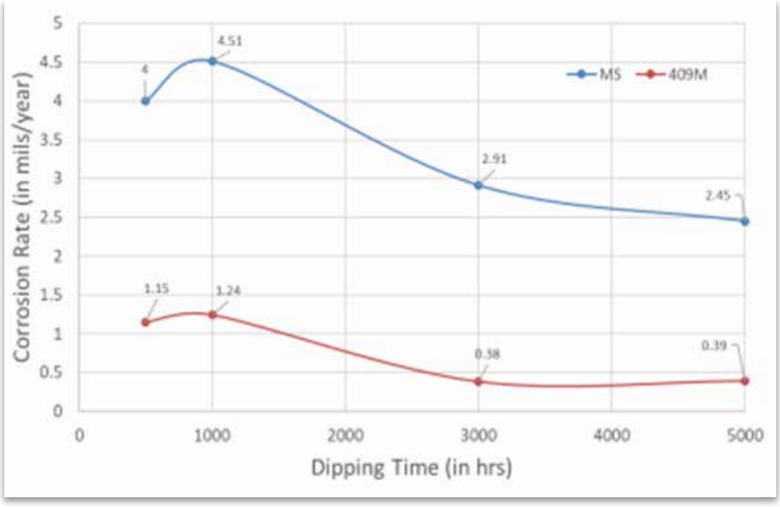
Supplying of anti-skid chequered plates for gangway, trolley refuge, man refuge, side pathway, etc. shall be confirming to latest IS 6911, ISS Symbol 409 M, minimum 6mm thick (excluding bead height) with flat bottom and top pattern confirming to IS 3502, 1A For, coastal/corrosive areas, thickness may be suitably increased depending upon severity of corrosion.

Appropriate matching stainless steel grade fasteners as recommended by manufacturer shall be used.

TEST MEDIUM	AVERAGE CORROSION RATE PER YEAR (Avg. Mils / year)					
	500 hours		1000 hours		5000 hours	
	MS	409M	MS	409M	MS	409M
1% NaCl	3.16	0.61	3.31	0.75	2.17	0.07
3% NaCl	4	1.15	4.51	1.24	2.45	0.39

TEST RESULT FOR 5000 HOURS

- In **1%NaCl** Corrosion rate of MS is **31 times** more.
- In **3%NaCl** Corrosion rate of MS is **5 times** more.



INDIAN RAILWAYS
GANGWAYS, PATHWAYS, TROLLY REFUGE, SIDE PATHWAYS

Recognizing the persistent maintenance challenges stemming from corrosion issues with the use of mild steel chequered plates along gangways and pathways, the Indian Railway took a decisive step towards enhancing durability and reducing upkeep expenses. After thorough observation and assessment, the decision was made to replace all mild steel plates with stainless steel chequered plates. This transition was underpinned by a strategic consideration of Life Cycle Cost (LCC) and various other factors. The shift to stainless steel not only mitigated the recurrent maintenance demands but also offered heightened resistance to corrosion, thereby ensuring prolonged longevity and structural integrity. This proactive measure embodies the Railway's commitment to improving infrastructure resilience while optimizing long-term operational efficiency.

Transformation at **Sampriti Setu, Eastern Railway – Howrah Division, West Bengal:** From Corroded Mild Steel to Resilient Stainless Steel Chequered Plates - A Bridge to Durability and Reliability

Revitalizing **Nalhati Bridge, Eastern Railway – Howrah Division, West Bengal:** Evolution from Corrosion-Prone Mild Steel to Enduring Stainless Steel Chequered Plates - Ensuring Longevity and Strength.

APPLICATIONS – 409M
Chequered Plates

SEWAGE TREATMENT PLANTS
PLATFORMS & WALKWAYS

INDUSTRIAL STAIRCASE

FOOT OVER BRIDGE - WALKWAYS

INDUSTRIAL PLATFORMS

INSPECTION PATHWAYS – RAILWAYS

THE PERFECT BLEND OF STRENGTH & DURABILITY TO COMPLEMENT PROGRESS

INTRODUCING JINDAL INFINITY REBARS

Chemical Composition of SS Rebar Grade G (410 L) as per IS 16651:2017:

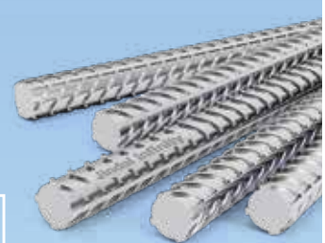
Chemical	C	Ni	Mn	Si	P	S	Cr	N
Min %							11	-
Max %	0.03	0.6	1	1	0.04	0.03	13.5	-

Mechanical Properties of High Strength Deformed Stainless Steel Bars and Wires as per IS 16651:2017:

S. No.	Properties	SS 500	SS 550	SS 600	SS 650
1	0.2 percent proof stress (Rp0.2), Min, N/mm2	500	550	600	650
2	Percentage elongation after fracture (A5), Min, on gauge length 5.65 √A, where A is the cross-sectional area of the test piece	16	14.5	10	10

Product Offering:

Diameter (mm)	8 mm to 32 mm
Standard Length	12 mtrs.



Policy from Ministry of Road Transport and Highways:
Use of stainless steel in bridges on National Highways and other centrally sponsored projects to be constructed in marine environment susceptible to severe corrosion.
Policy No. RW/NH-34049/03/2020-S&R (B)

NEED FOR STAINLESS STEEL REBARS

Stainless steel rebars play a pivotal role in modern construction owing to their exceptional corrosion resistance and durability. Unlike conventional carbon steel rebars, stainless steel rebars offer extended service life in structures exposed to corrosive environments such as marine settings, chemical plants, and infrastructure in coastal areas. Their resistance to rust and corrosion helps maintain the structural integrity of buildings and bridges over time, significantly reducing maintenance costs and the need for frequent repairs. These rebars contribute to enhanced safety and reliability in construction, ensuring structures remain robust and stable for longer periods while minimizing environmental impact through their recyclability, making them a sustainable choice for infrastructure development worldwide.

OTHER ADVANTAGES:

- It is highly resistant to corrosion from chloride ion
- It does not rely on the high alkalinity of concrete for protection
- Concrete cover can be reduced
- Concrete sealant, such as Silane, can be eliminated
- Concrete mix can be simplified to suit concrete design needs, not for rebar protection needs
- It improves durability
- It reduces maintenance and repair
- It can be used selectively for high risk elements cost-effectively
- It will eventually be recycled

WHAT TYPE OF STAINLESS STEEL CAN BE USED IN THE REINFORCEMENT OF CONCRETE?

There exists a diverse array of stainless steel alloy options for choosing rebars, designed to fulfil specific mechanical design requirements and anticipated environmental corrosiveness. Stainless steels encompass primarily five main groups: Austenitic, Ferritic, Duplex, Martensitic, and Precipitation-hardened steels. The selection of SS REBAR GRADE G Stainless Steel as a preferred material depends on various factors, including its corrosion resistance, expected longevity, and life cycle cost, ensuring it aligns well with the intended application and structural demands.

SS REBAR confirming to IS 16651: 2017 is currently used in various projects by different Govt. bodies in India including:

- **INDIAN RAILWAYS**
- **NHAI**
- **PWDs**
- **MMRDA**
- **MCGM**
- **MRIDCL**
- **Statue of Oneness (Adi Shankaracharya)**
- **RDSO – High Speed Rail Test Track**
- **Pamban Bridge**
- **Dr. Balasaheb Ambedkar Memorial and many more**

Extended Life

Excellent Durability

Exceptional Corrosion Resistance

Min. Maintenance Cost

Lower Environmental Footprint

Excellent Fire Resistant

Reduction in Life Cycle Cost

APPLICATIONS – STAINLESS STEEL REINFORCEMENT BARS

HIGHWAY INFRASTRUCTURE

Stainless steel reinforcement finds application in highway infrastructure where corrosion could lead to early degradation of the road system, potentially causing significant economic consequences for the local community. Utilizing stainless steel allows the builder to essentially complete the construction efficiently, avoid subsequent repairs, and ensure long-term durability. Employing stainless steel reinforcement substantially extends the useful lifespan of the infrastructure, minimizing the need for frequent repairs or replacements.

- **BRIDGE STRUCTURE ELEMENTS**
- **DECK PANELS**
- **BARRIER WALLS AND CURBS**
- **SIDEWALKS AND MEDIANS**
- **DECK JOINT BLOCKOUTS**
- **ABUTMENTS ROOF SLABS, APPROACH SLABS AND W**
- **BRIDGE PIERS AND PIER CAPS**
- **BARS PROJECTING FROM PRECAS**
- **ANCHORING SYSTEMS**
- **TUNNELS**
- **ALL OTHER CHLORIDE SPLASH ZONES**
- **HIGHWAY ELEMENTS**
- **LOAD TRANSFER DOWELS**
- **CONCRETE PAVEMENTS**

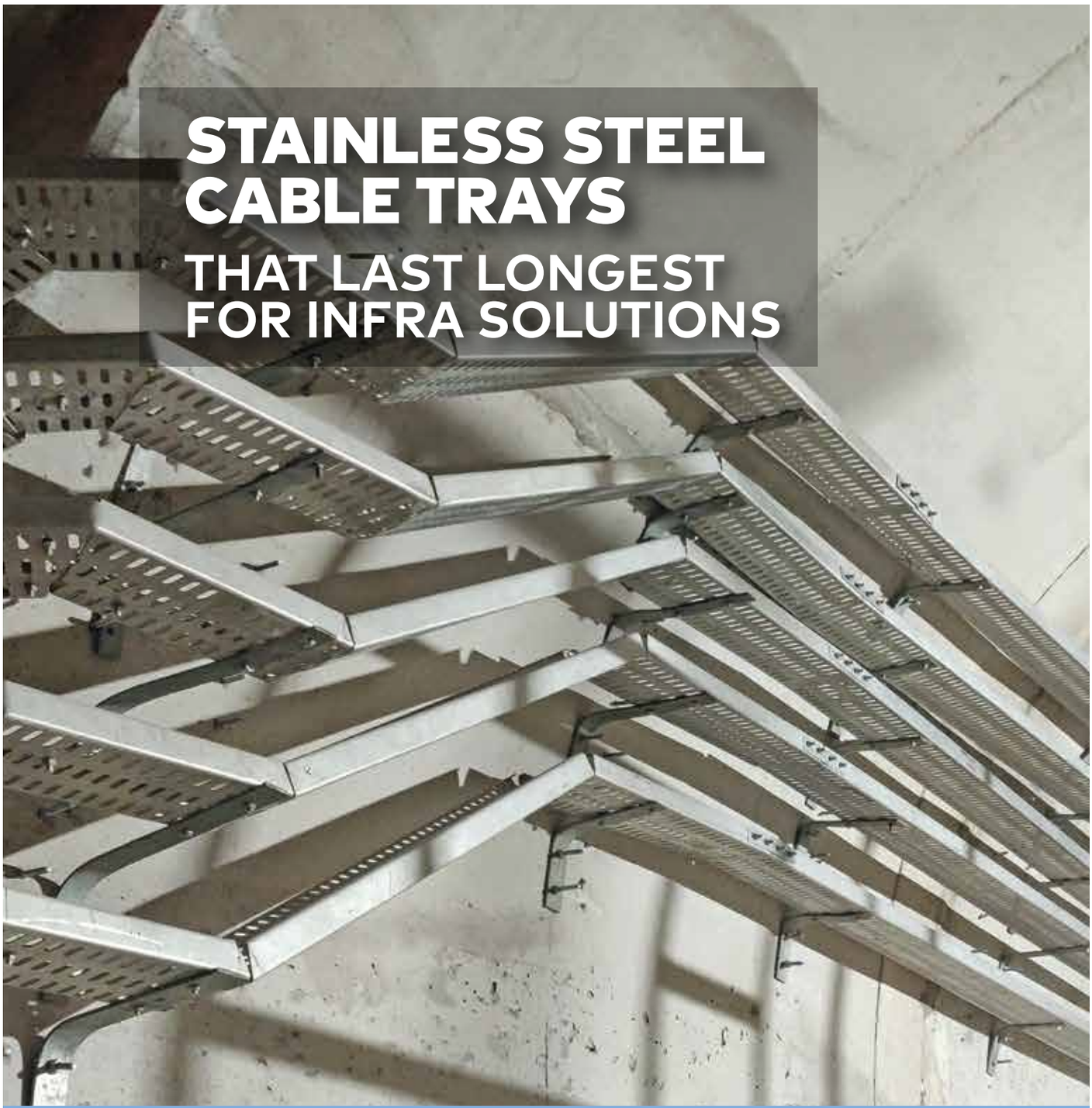
MARINE INFRASTRUCTURE

Stainless steel reinforcing is used for structures in a marine environment where corrosion could be an acute design challenge. By using stainless steel reinforcing, the useful life of a marine structures is dramatically increased.

- **MARINE STRUCTURES**
- **COASTAL BRIDGES**
- **PIERS**
- **WHARVES**
- **TUNNELS**

OTHER APPLICATIONS

BRIDGES	DAMS	RAILWAY WASHING LINES
SEA WALLS	NUCLEAR WASTE STORAGE TANKS	DOCKYARDS
WASTE WATER TANKS	HIGH RISE BUILDINGS	



STAINLESS STEEL CABLE TRAYS

THAT LAST LONGEST FOR INFRA SOLUTIONS

Grade:	EN 1.4404	EN 304	EN 204CU	EN 430	EN 316L
Width:	300mm	Thickness	1.2mm	Length	300mm

Corrosion Resistant

Lowest Maintenance

Long-Lasting Strength

*Load test certified by Govt. approved laboratory conforming to IEC 61537

STAINLESS STEEL USAGE IN ARCHITECTURE, BUILDING & CONSTRUCTION

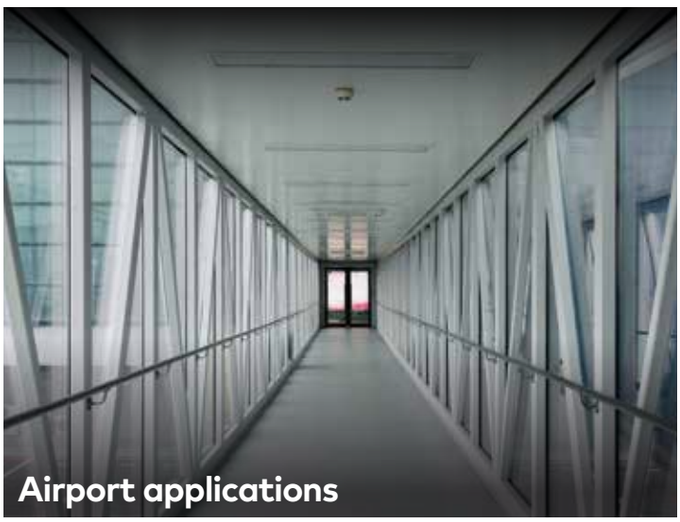

Claddings


Roof Sheets

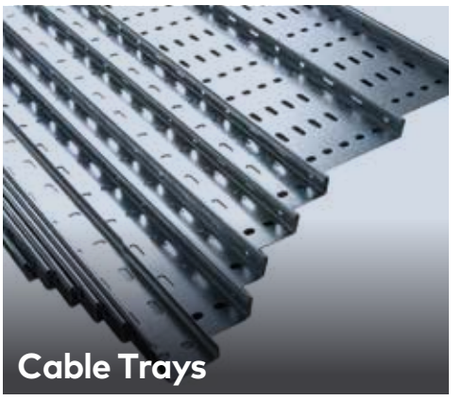

Facades


Gratings


Furniture


Airport applications

STAINLESS STEEL USAGE IN ARCHITECTURE, BUILDING & CONSTRUCTION

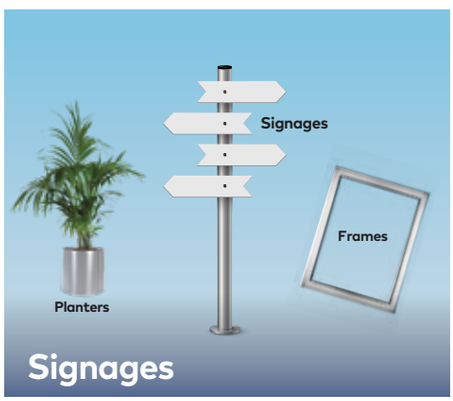

Cable Trays


Bollards


Benches


Bus Shelter

Dustbin



Signages


Elevators


Canopies


Art Applications

EDGE AHEAD WITH THE JSL EDGE

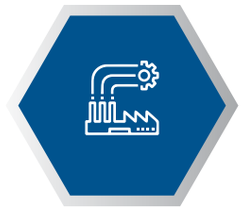
Regular Supplier to Railways

Approved by RDSO

Wide Manufacturing Range

State-of-the-art Technology

Largest SS Manufacturer



Fully Integrated Plant

Socially Responsible Company

Flexibility: 50 MT Heat

Wide Marketing Network

Environment Friendly Company

Indian Railways' Most Trusted Fabrication Partner

Chain of Service Centres

NOTES

JINDAL STAINLESS

Contact for Advisory
Mr. Nagarajan P. :- 8130757806

Contact for Events Participation &
Sponsorship Opportunities
Ms. Pranjali Singh :- 7488631417
pranjali.singh@jindalstainless.com

Email: infinity@jindalstainless.com
www.jindalstainless.com

Version 6

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