



**JINDAL STAINLESS STEEL**  
FORGING THE BACKBONE OF RAILWAYS,  
THE LIFELINE OF THE NATION.

An efficient choice for Coaches, Wagons, Metros and  
Railway's Structural Applications

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# THE TALE OF TRIUMPH

Founded by Shri O. P. Jindal in 1970, Jindal Stainless is one of the largest stainless steel conglomerates in India and ranks amongst the top 10 stainless steel conglomerates in the world. The group's credibility and name is determined by the magnitude of its operations which is inspired by a vision for innovation and enriching lives. Jindal Stainless group has an annual crude steel capacity of 1.8 MTPA and an annual turnover of USD 3 Billion.

## JINDAL STAINLESS LIMITED

Jindal Stainless Limited is one of the largest manufacturers of stainless steel in India with a capacity of 1.9 million tons per annum. A leader and a name synonymous with 'Enterprise', 'Excellence' and 'Success' - the company's ethos mirrors most characteristics similar to the metal it produces. Akin to stainless steel, Jindal Stainless Limited is innovative and versatile in its thought process; strong and unrelenting in its operations.

The company is focusing on strengthening Internal Process & Systems and Customer Serviceability. Further, special plans are being made for market development of niche grades and expanding the portfolio of high value products of steel. Stainless steel is a material par excellence, which now seeks to permeate through Indian architecture. The Architecture Division launched by Jindal Stainless has taken the initiative to promote Stainless Steel products and technology solutions to cater to the emerging markets of Stainless Steel for Architecture, Building and Construction (ABC) in India.

## DESIGNING THE FUTURE WITH STEEL

Throughout history, humans have been hungry for improvement. From cars to homes to public utilities, everything if it is aesthetic and efficient. This ever-rising public aspiration in all spheres of life is the inflection point that the stainless steel industry has been looking forward to. Because stainless steel is a metal that can cater to varied future needs.

Unlike other alternatives including carbon steel, cement, plastics, glass, and aluminium composites, stainless steel is non-corrosive and self-repairing by its inherent nature. This validates why there has been a major transformation in the end-use profile of stainless steel, over the last few decades.

## HERE'S HOW THE COMPANY CAN HELP YOU

The Architecture Division of Jindal Stainless is capable of providing a full range of technical support services including design, engineering work, fabrication of quality material, finishes and job site supervision by trained personnel. The division has completed many projects, especially those pertaining to street furniture, cafeteria furniture, modular-kitchens, lighting and signage, apart from other architectural requirements.

Be inspired by some of the finest ideas, born out of stainless steel, on the following pages and work with 'the experts at Jindal Stainless' us to create a tomorrow as resplendent and pure as stainless steel.







# A LEGACY OF ENDURING QUALITIES

Jindal Stainless has come to establish itself as a brand that's synonymous with trustworthiness. It makes perfect business sense to partner with the company as it believes "A promise should always be kept!"



Jindal Stainless offers extensive consultancy from discovery to recommendation and to implementation.

## Consultancy



Being aware of the crucial significance of timelines, the company spares no effort to meet the deadline of every business project.

## On Time



Count on the experts to have the right stainless steel grade that is a perfect fit for your business requirements. The company's R&D spends a lot of time in developing custom grades to resolve specific problems.

## Right Grade



Business is conducted in a very transparent way at Jindal Stainless. Right from the right material recommendations, proposals, right supplies, to grades and honest communication at all stages.

## Transparency



At Jindal Stainless, a job is not considered 'done' even at solution implementation; the company's expertise is at your disposal whenever you need it thereafter.

## After Sales Promise







# STAINLESS STEEL: A BETTER FIT FOR RAILWAYS



## CRASH RESISTANCE

Coaches made of Stainless Steel offer maximum safety to its passengers during crash and accidents as they are resistant to higher impact



## FIRE RESISTANCE

Stainless Steel can withstand temperatures in excess of 900°C, which makes it a suitable metal for fabricating coaches



## CORROSION RESISTANCE

Superior corrosion resistance in diverse environments makes Stainless Steel coaches more durable as compared to others



## WEAR RESISTANCE

Stainless Steel has higher resistance to wear as compared to HSLA Steel, which makes it an ideal material for fabricating all the components that comes in direct contact with coal/iron ore/other corrosive materials



## IMPACT RESISTANCE

Operating conditions of wagons involve significant impact loading where Stainless Steel scores over HSLA Steel for fabrication of wagons because of its resistance to high impact

## FATIGUE RESISTANCE

Stainless Steel, by the virtue of higher strength, showcases double fatigue resistance



## ABRASION RESISTANCE

Lower maintenance cost and high hardness of Stainless Steel along with their superior resistance to scratch, dent and abrasion, makes it an ideal metal for Indian Railway's network, which is spread across 64,600 KM



## HIGHER STRENGTH & LIGHTER CAR BODY

Stainless Steel exhibits higher strength to weight ratio and enables reduction in thickness of the components, which makes the car body lighter and translates to less consumption of energy per travelled kilometer



## WELDABILITY & REPAIRABILITY

Metro Coaches made of Stainless Steel have the finest weld quality at optimal cost and time as Stainless Steel is easier to weld and fabricate than other materials



## GREEN METAL

Stainless Steel, is 100% recyclable, that makes it a complete "green metal"

# EDGE AHEAD WITH THE JSL EDGE







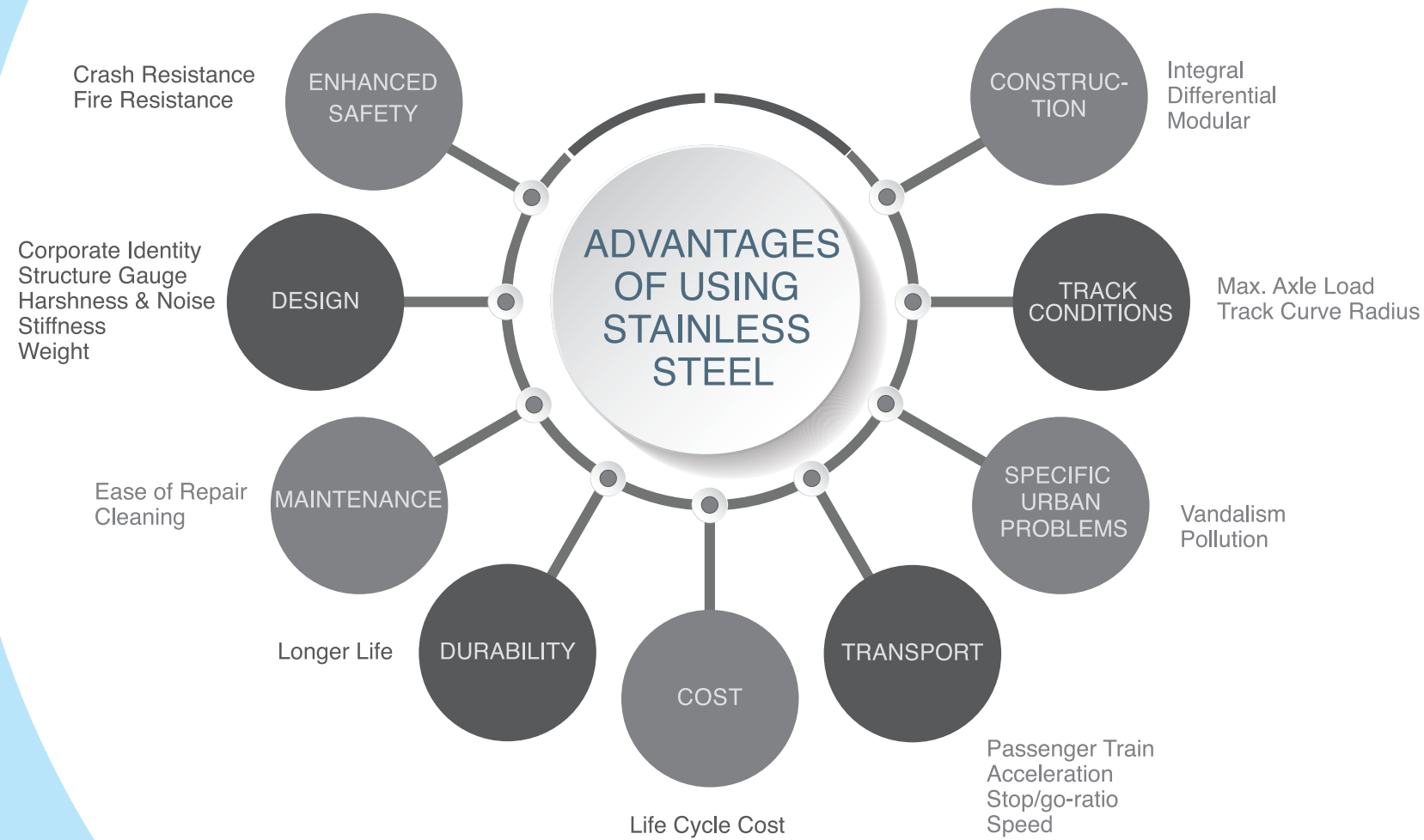
# COACHES



*Unparalleled safety for passengers  
made possible by Jindal Stainless*



# THE STAINLESS STEEL EDGE



# COMPARATIVE PROPERTIES OF STAINLESS STEEL, MILD STEEL & ALUMINIUM

Material Property	409M/IRSM 44	304L/301L	IRSM 41	T-6061 Alloy
Yield Strength (Mpa)	320 min.	235 min./350	340 min.	240 min.
Impact Resistance (J)	67	92	27	26
Fire Resistance Temp. (degC)	789	940	500	160
Corrosion Resistance	Very Good	Excellent	Poor	Good

# TESTIMONY OF ABSOLUTE BRILLIANCE

Impact Resistant

Corrosion Resistant

Fire Resistant

High Strength To Weight Ratio

Energy Efficient

Lower Lifecycle Cost

Sustainable Green Material

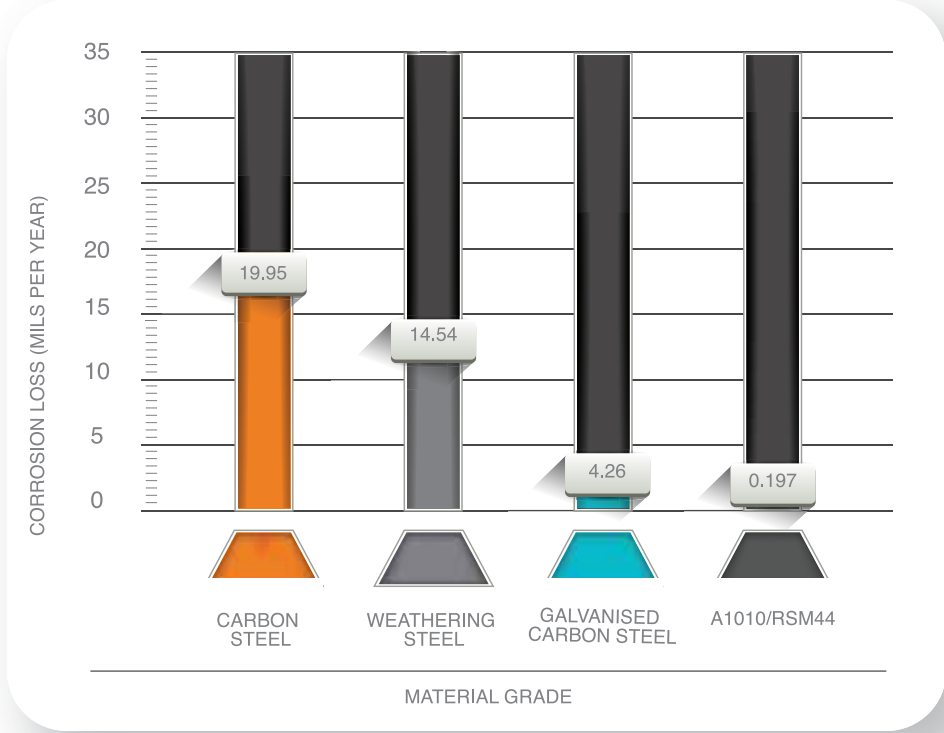




# DURABILITY THAT REDEFINES BENCHMARKS

CORROSION RESISTANCE UNDER WET/DRY SALT WATER ENVIRONMENTS

MATERIAL GRADE	Corrosion Loss (Mils per year)
CARBON STEEL	19.95
CORTEN STEEL	14.54
GALVANIZED CARBON STEEL	4.26
X2CRNI12(409M)	0.197



CORROSION PERFORMANCE IN SAE J2334 TEST CONSISTING OF ALTERNATIVE WET/DRY CYCLES WITH SALT FOR 8 WEEK.

CORROSION PERFORMANCE IN SAE J2334 TEST CONSISTING OF ALTERNATIVE WET/DRY CYCLES WITH SALT FOR 8 WEEK.

# TYPES OF PRODUCTS AND GRADES

Railway Specification	Type of Stainless	Grades	ASTM / IS Equivalent Grades	Chemical Composition								
				C%	Mn % max	Si % max	S % max	P % max	Cr %	Mo %	Ni %	Others
IRSM44-97	Ferritic	IRS-M44	409M	0.03	0.8-1.5	1.0	0.03	0.03	10.8 to 12.5		1.5 max	Ti 0.75 max
Ck 201	Ferritic	X2 Cr Ti 12	409	0.03	1.0	1.0	0.03	0.04	10.5 to 12.5			Ti 6X %C min upto 1 max
Ck 201	Ferritic	X2 Cr Ni 12	409M	0.03	0.5-1.5	1.0	0.03	0.04	10.5 to 12.5		0.3-1.0	N-0.03 max
Ck 201	Ferritic	X6 Cr 17	430	0.08	1.0	1.0	0.03	0.04	16-18			
Ck 201	Austenitic	X5 Cr Ni 18 10	304	0.07	2.0	1.0	0.03	0.045	17-19		8.5-10.5	
Ck 201	Austenitic	X2 Cr Ni N 18 7	301	0.08	2.0	1.0	0.03	0.045	16-18		6-8	
Ck 201	Austenitic	X6 Cr Ni Ti 18 10	321	0.08	2.0	1.0	0.03	0.045	17-19		9-12	Ti 5X %C min upto 0.8 max
Ck 201	Austenitic	X5 Cr Ni Mo 17 12 2	316L	0.03	2.0	1.0	0.03	0.045	16-18	2-2.5	10.5-13.5	



Railway Specification	Type of Stainless	Grades	ASTM / IS Equivalent Grades	Mechanical Properties		
				0.2% proof Stress (N/mm2)	Tensile Strength (N/mm2)	Elongation (%)
IRSM 44-97	Ferritic	IRS-M44	409M	350-450	500 min	25
Ck 201	Ferritic	X2 Cr Ti 12	409	220	390-560	20
Ck 201	Ferritic	X2 Cr Ni 12	409M	320	450-650	20
Ck 201	Ferritic	X6 Cr 17	430	270	450-600	20
Ck 201	Austenitic	X5 Cr Ni 18 10	304	235	550-750	40
Ck 201	Austenitic	X2 Cr Ni N 18 7	301	350	600-900	40
Ck 201	Austenitic	X6 Cr Ni Ti 18 10	321	245	540-740	40
Ck 201	Austenitic	X5 Cr Ni Mo 17 12 2	316L	255	550-700	40





# CURRENT APPLICATIONS OF STAINLESS STEEL IN COACHES

ROOF	TROUGH FLOOR	WATER TANKS	UNDER FRAME
FOOT STEPS	WASTE BINS	SUPPORT HANDLES	LUGGAGE RACKS
PARTITON FRAMES	AC UNITS / AIR DUCTS	BIODIGESTER TANKS	PANTRY
WATER TANKS	GRAB POLES	OUTER SHELL	MODULAR TOILETS
DOOR FRAME	SINKS		



Fresh Air Grill  
Grade – X5CrNi1810



Modular Toilets  
Grade – 316L



Connecting Door  
Grade 304

Outer Shell – Outside View  
Grade – X2CrNi12

# NEW POSSIBILITIES: STAINLESS STEEL UNDERFRAME

## ADVANTAGES



Corrosion  
Resistant

BETTER CORROSION RESISTANCE AND LIFE FOR 30-40 YEARS



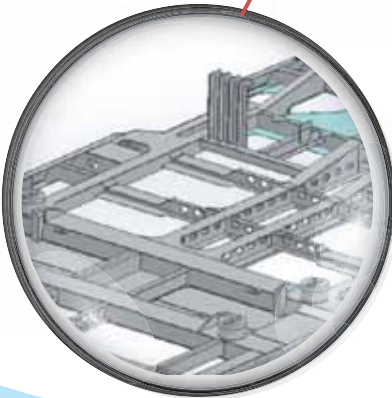
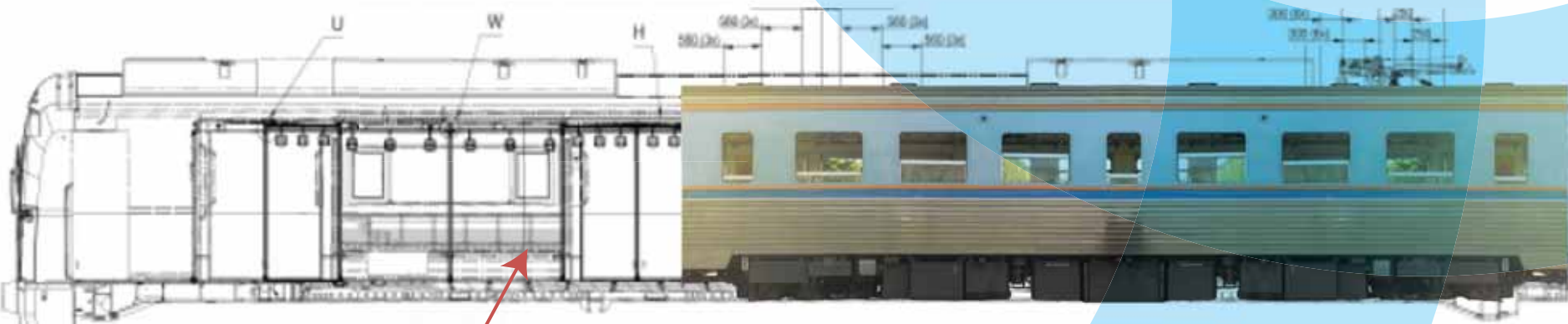
Proposed SS  
Grades

- UNPAINTED - 201LN
- PAINTED - SS201LN, X2 CRNI12/409M/IRSM-44

# CHEMICAL COMPOSITION OF PROPOSED SS GRADES:

Grades	%C (max.)	%Mn (max.)	%Si (max.)	%S (max.)	%P (max.)	%Cr (max.)	%Ni (max.)	%N (max.)	Others
201ln	0.03	6.4-75	1	0.015	0.045	16.0-18.0	4.0-5.0	0.1-0.25	Cu=1.0 max
X2Crni12	0.03	0.5-1.5	1	0.03	0.04	10.5-12.5	0.3-1.0	0.03	

Higher Cr content provides more resistance to corrosion leading to enhanced life for 30-40 years.



UNDER FRAMES PRODUCT

MCF - Tender for 100 numbers of Hamsafar Shell kit has been published having SS under frame which is going to be opened on Nov first week. Tender details are as below: Tender no.-11195013 dated 5th Oct 2029 MCF





# SUCCESS STORIES\*

## MAKE IN INDIA EMU

First Indian EMU made with Jindal Stainless Steel.  
Grade – **X2CrNi12**

## ICF TRAIN 18

(Side wall, end wall, roof, trough floor, door, foot steps, water tanks, air reservoir and gang ways, AC units and retention tanks) Jindal stainless supplied stainless steel for the prestigious ICF Train 18 project - Semi high-speed trains designed and built entirely in India.  
Grade – **X2CrNi12i**



## SRI LANKA COACHES

ICF goes International using Jindal Stainless Steel  
Grade – **301L-ST**

## FIRST MEMU COACHES

(Side wall, end wall, roof, trough floor, door, foot steps, water tanks, air reservoir and gang ways, AC units, SS modular toilet and retention tanks)  
Made with Jindal Stainless Steel  
Grade – **X2CrNi12**





# GLOBAL TRENDS ON STAINLESS STEEL COACHES\*

Strassenbahn Forcity Classic Chemnitz tram car manufactured by Skoda is made completely out of Stainless Steel.



Stadler has made duplex Stainless Steel coaches including underframes for the services in snow areas. The vehicle is designed for an ambient temperature range of - 40 to + 40 degrees celsius; the vehicle can cope perfectly with continental conditions.



\*Inspirational case study with JSL having no role

## MEMU

### SPECIFIC ADVANTAGES

- LOW WEIGHT IN COMPARISON TO EXISTING UNDERFRAMES BY 15-20%
- CORROSION RESISTANCE AND LIFE FOR 25-30 YEARS







# WAGONS



*Long lasting and least maintenance freight cars  
made with Jindal Stainless Steel*





# ADDING YEARS TO THE WAGONS

IRS : M44 is the cost effective Stainless Steel for fabrication of wagons because of its following characteristics:



**Corrosion Resistant**

It has superior corrosion resistance as compared to HSLA Steel



**Wear Resistant**

Wear resistance of Stainless Steel is also significantly higher as compared to HSLA Steel. Hence, all components in direct contact with coal/iron ore/other corrosive media should be fabricated in Stainless Steel.



**Impact Resistant**

Impact resistance of Stainless Steel is significantly higher as compared to HSLA Steel. Since operating conditions of wagons involve significant impact loading, therefore Stainless Steel is more suited for fabrication of wagons.





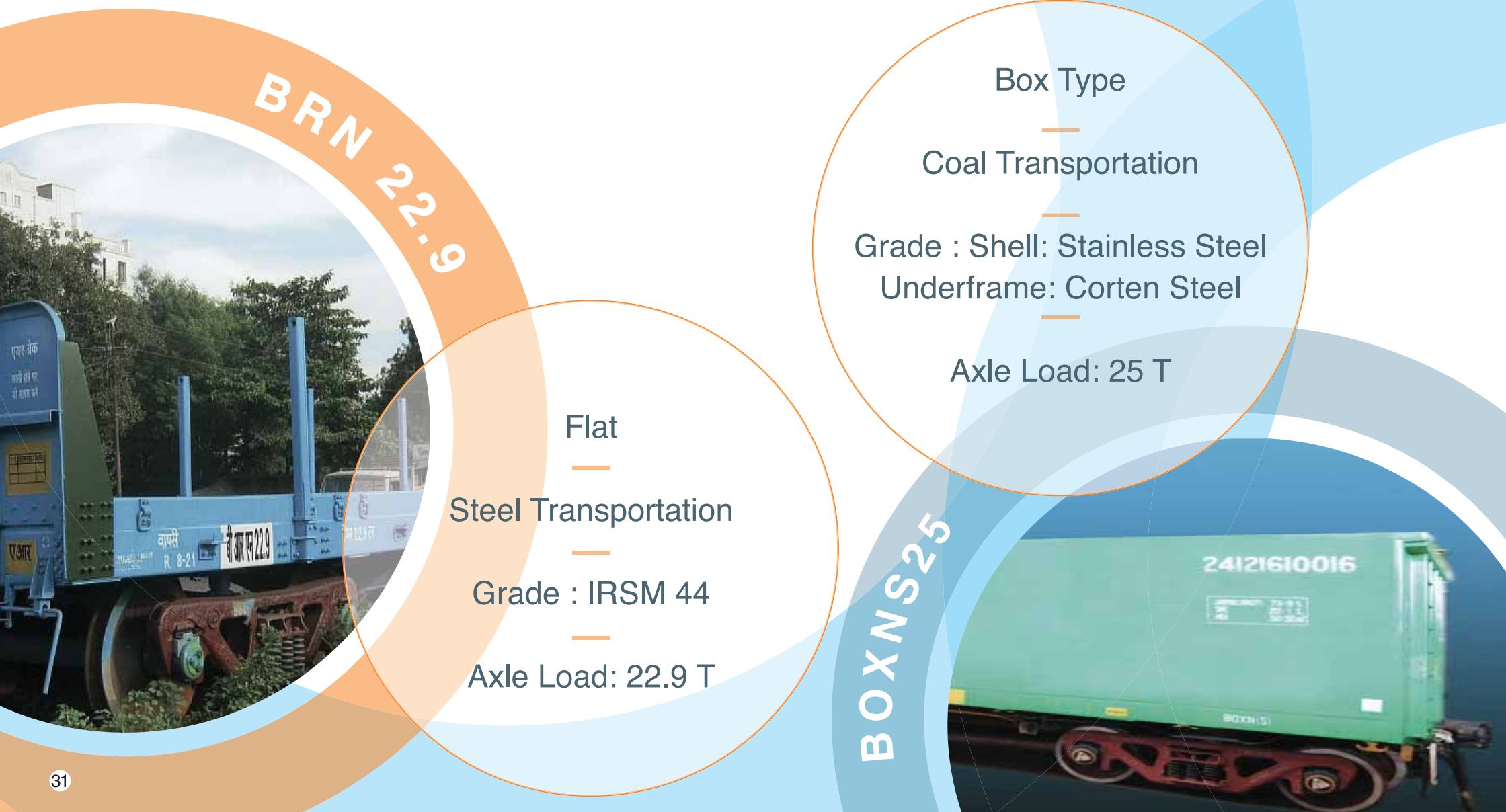
# STAINLESS STEEL WAGONS IN INDIAN RAILWAYS



Open Box Type  
—  
Coal / Cement Transportation  
—  
Grade: IRSM 44  
—  
Axle Load: 22.9 T

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# STAINLESS STEEL WAGONS IN INDIAN RAILWAYS



# STAINLESS STEEL WAGONS IN INDIAN RAILWAYS





JINDAL STAINLESS  
STEEL SCORES 10/10  
WHEN COMPARED  
TO CARBON STEEL

COMPARISON –  
E450 & IRSM 44

Sl. No.	Material Property	E450	Score	IRSM 44	Score
1	Yield Strength	484 MPa. Within specification but on higher side.	✓	365 MPa	✓
2	Tensile Strength	582 MPa. YS/UTS ratio is higher than 0.8	✓	515 MPa. YS/UTS ratio is 0.7 (<0.8> which confers it with higher impact strength than E450 material	✓
3	% Elongation	25%. Within spefication but on lower side.	✓	33%. Good ductility	✓
4	Corrosion Resistance	Poor corrosion resistance. To compensate, higher corrosion allowance & thereby higher thickness of component needs to be used, which increases the weight of the wagon body and reduces payload/tare wt ratio.	✗	Higher Corrosion resistance due to high Cr content (11%Cr.)	✓
5	Impact Resistance	Relatively less impact resistance	✗	14% more energy absorption on impact at room temperature	✓
6	Weldability	Welding issues due to high C content (0.22% max)	✗	Good Weldability due to low C content (0.03% max)	✓
7	Formability	Formability relatively difficult	✗	Easier due to high quality	✓
8	Wear Resistance	Less wear resistance	✗	High wear resistance due to 6% high surface hardness	✓
9	Fatigue	Good fatigue performace up to 3 lakh cycles	✓	Good fatigue performance up to 3 lakh cycles	✓
10	Thickness various between straight and bent portion	6.26%. Falls within the tolerance levels	✓	4.0%-Falls within the tolerance levels	✓

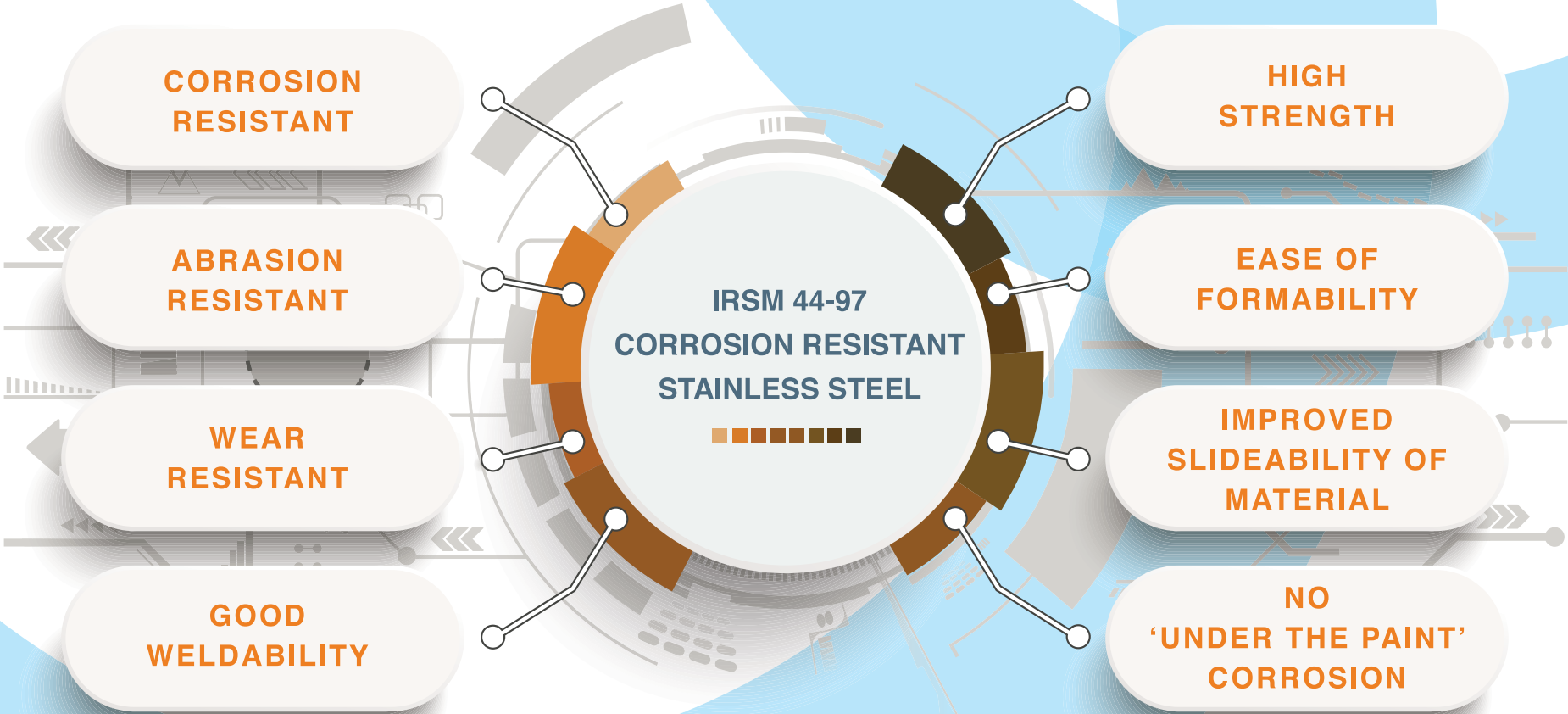
Symbol nomenclature/interpretation is as below

✓ - Good

✓ - Marginal

✗ - Not Good

CLASS THAT  
TRANSCENDS DURABILITY



# MATERIAL CHARACTERISTICS

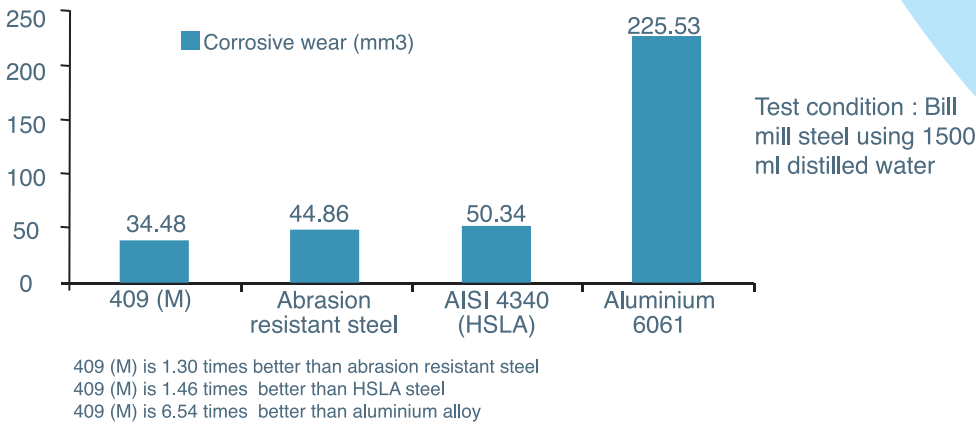
## MECHANICAL PROPERTIES

PROPERTY	IRSM44
YIELD STRENGTH (MPA)	350
TENSILE STRENGTH (MPA)	550 - 750
PERCENTAGE ELONGATION	25

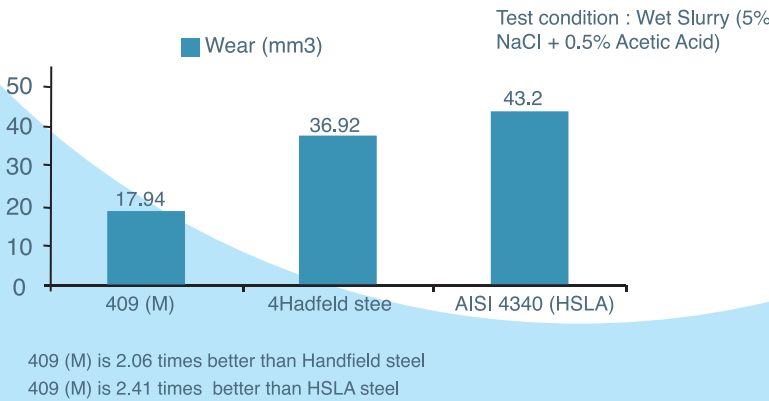
# WHY IRSM44 ?

## 1. CORROSION RESISTANCE

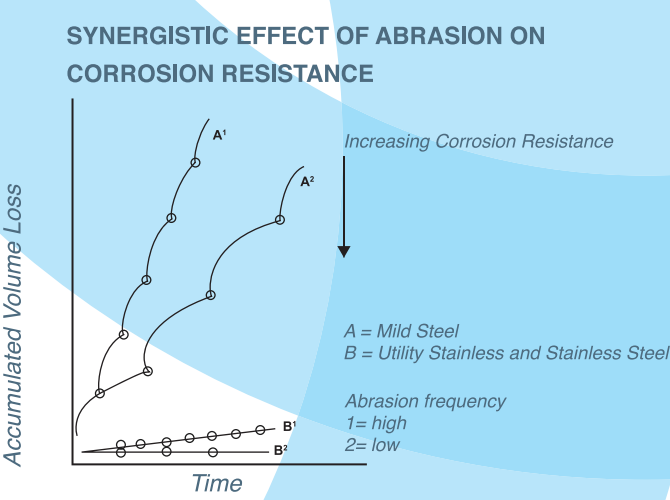
CORROSIVE WEAR RESISTANCE IN WET CONDITION



ABRASIVE WEAR RESISTANCE IN WET CONDITION



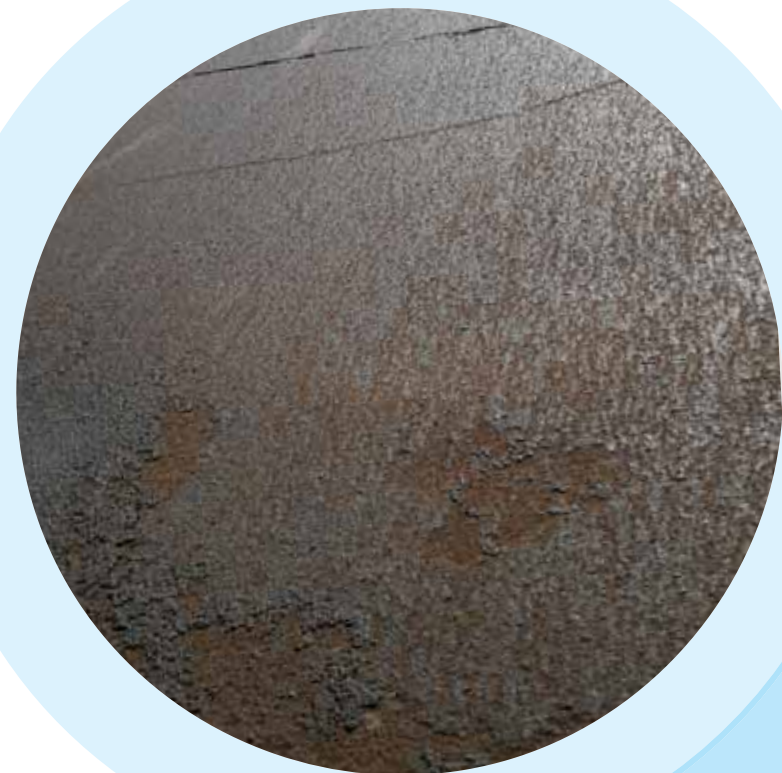
## 2. ABRASION RESISTANCE





# NEW POSSIBILITIES

## CONVERSION OF BOBRN WAGONS INTO STAINLESS STEEL



- *Currently used material : E250*
- *There is abrasion and wear on the side and end walls*
- *POH done after 6 years*
- *POH cost for BOBRN wagons : Rs 2.57 lakh*
- *Use of SS will enable reduction in weight and minimise the periodic overhauling (POH) cost.*

## CONVERSION OF BOBRN WAGONS INTO STAINLESS STEEL



- *Stainless Steel cladding of end wall and side wall, longitudinal ridge, cross ridge & cross ridge stay by NTPC to increase the flowability of material and enhance the wagon life*
- *Railways workshop preferred conversion into complete Stainless Steel, since it would reduce the weight of the wagons substantially*



## CONVERSION OF BOST WAGONS INTO STAINLESS STEEL



- *Currently BOST wagons are made out of E 250*
- *Used for carrying steel plates, bars, but in eastern region, they are also used for carrying coal*
- *Significant amount of corrosion and abrasion observed in BOST wagons during POH*
- *Complete floor and cross members are changed during POH.*



## CONVERSION OF BOST WAGONS INTO STAINLESS STEEL



- *The entire wagon has to be stripped and completely rehabilitated*
- *Cost of complete rehabilitation during POH is around ₹7.0 lakhs*
- *Benefits with Stainless Steel: Weight reduction & decrease in POH cost*





# GLOBAL EXAMPLE ON STAINLESS STEEL WAGONS\*

Stainless Steel Hopper wagons are designed and manufactured by Taravagonka, Slovakia for climatic conditions with temperatures T1 (from -25 C to +40 C) according to TSI-WAG

\*Inspirational case study with JSL having no role



# STRUCTURAL APPLICATIONS



*Robust infrastructure  
that withstands the test of time*







# THE UNMATCHED ADVANTAGES

In areas where a bridge is subject to high time-of-wetness or high chloride exposures (i.e., coastal areas or areas where large quantities of deicing salt are used), carbon steels are not effective as they have a high corrosion rate. In these conditions, Structural Stainless Steel IRS-M44/ASTM 1010 (UNS S41003) provides sufficient corrosion protection with lower maintenance during its design life.

## Advantages of Stainless Steel IRS-M44/ASTM 1010 (UNS S41003) FOB over currently used IS 2062 material are:

- *Strength & durability*
- *Resistant to corrosion and thus very low maintenance*
- *Design flexibility*
- *Sustainable- helps in reducing carbon foot print*
- *Significant reduction in weight*

Bridge structure weight can be reduced by approximately 30% as compared to RDSO approved FOOT OVER BRIDGE Design Diagrams specifications RDSO/B-10401-7.

Jindal Stainless Limited & Jindal Stainless (Hisar) Limited are approved sources for supplying Stainless Steel Plates, Coils and Sheets to Indian Railways. IRSM 44 grade is a corrosion resistant utility high strength Stainless Steel widely used by Indian railways for its suitability in manufacturing rail cars.



# STAINLESS STEEL: INIMITABLY AHEAD



## CHEMICAL PROPERTIES

Grade	% C	% MN	% Si	% S	% P	% Ni	% Mo	% Cr	Others
IRSM 44/97(M)	0.03 max	0.8 - 1.5	1.0 max	0.03 max	0.03 max	1.5 max	0.1minm	10.8 - 12.5	Ti - 0.75 max
409M	0.03 max	0.8 - 1.5	1.0 max	0.03 max	0.03 max	1.5 max	-	10.8 - 12.5	Ti - 0.75 max
ASTM A1010	0.03 max	1.5 max	1.5 max	0.01 max	0.04 max	1.5 max	-	10.5 - 12.5	N - 0.03 max
IS 2062	0.23	1.5	0.04	0.045	0.045	-	-	-	-

## MECHANICAL PROPERTIES

Grade	Yield Strength	Tensile Strength	% Elongation
IRSM 44/97(M)	350 MPa	490 MPA min	20 min
409M	275 MPA min	450 MPA min	20 min
ASTM A1010	350 MPA min	485 MPA min	18 min
IS 2062	240 MPA min	410 MPA min	23 min

\*Stainless Steel has higher strength resulting in weight reduction

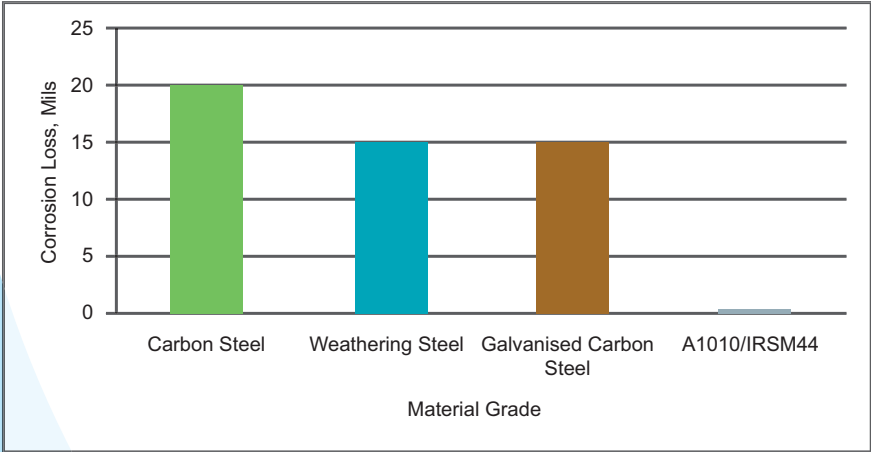




# CORROSION PERFORMANCE

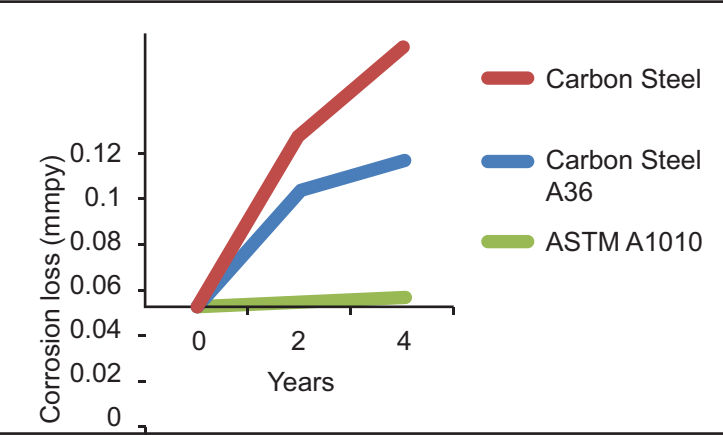
## 1. Corrosion Resistance Under Wet/Dry Salt Water Environments

Material Grade	Corrosion Loss (Mils per year)
Carbon Steel	19.95
Weathering Steel	14.54
Galvanized Carbon Steel	4.26
A1010/IRSM44	0.197



## 2. Atmospheric Corrosion Test at Kure Beach, USA [1]

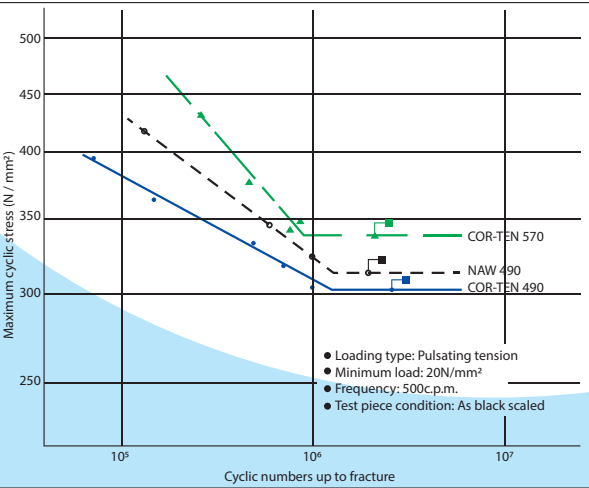
Samples of Carbon Steel A36, Corten Steel and ASTM A1010 (Equivalent to IRSM 44 97) have been tested in marine atmospheric exposure at Kure beach, 25m location from coastline for 4 years. As shown in Fig 2, after 4 years of exposure, samples of ASTM A1010 (Equivalent IRSM 44-97 & UNS S41003) exhibited better corrosion resistance than Carbon Steel A36 and Corten Steel.



Again the results show negligible corrosion loss of ASTM A1010 (Equivalent IRSM 44-97) even under marine corrosive environment.

## 3. Fatigue Strength

The Fatigue Strength of the COR-TEN 490 is also around 310Mpa similar to grade 3Cr12 (EquivalentIRSM44-97) under pulsating tension (Stress Ratio R=0, i.e., zero to tensile loading) as shown in figure.



# WEIGHT COMPARATIVE CHART

FOR 25MX6M WIDE SPAN

S. No.	Description	IRS-M44 Module Weight	IS 2062 Module Weight
1	Girder	29X	54X
2	Top Section (Flooring)	18X	19X
3	Columns-Main		
4	Trustle	2X	3X
5	Staircase	12X	18X
6	Staircase Columns - 1	4X	4X
7	Staircase Columns - 2	2X	2X
	Total	67X	100X
Weight Reduction = 33%			

# LIFE CYCLE COST ANALYSIS

Life cycle costs take account of:

- Initial costs
- Maintenance costs
- Diversion from landfills and recycled content
- Service life and environment

The excellent corrosion resistance of stainless steel offers reduced inspection frequency and costs, reduced maintenance costs and long service life. Also, stainless steel has a high residual scrap value.

Material	Qty (kg)	Conversion (₹/MT)	Total cost (₹)	Maintenance Cost	Scrap Recovery	LCC (60 years)	Savings (%) of Stainless Steel
IS 2062	Y	2.05X	2.05XY	2XY	0.23XY	3.82XY	
2101	0.6Y	6X	3.6XY		0.97XY	2.63XY	31.15%
A1010/IRSM 44	0.6Y	4X	2.4XY	3.6XY	0.54XY	2.22XY	41.88%

(A) FOB Fabrication & Installation Cost (₹/MT)				
Material	Description	Mild Steel	2101	A1010/IRSM44
1	Material Cost	X	4X	2.2X
2	Fabrication Cost	0.5X	1.5X	1.25X
3	Erection Cost	0.5X	0.5X	0.5X
4	Painting Cost per cycle	0.1X	0	0.1X
	Total Fabrication & Installation Cost	2.05X	6X	4X

(A) FOB Fabrication & Installation cost (₹/MT)				
	(B) Maintenance Cost	No. of Cycles	Paint cost (₹/MT)	Total Cost (₹/MT)
Mild Steel	Paint life 3 years	20	0.1X	2XY
2101	No Paint required			0
A1010/IRSM 44	Paint life of 10 years	6	0.1X	0.36XY

(C) Scrap Recovery			
Material	% Corrosion Rate (mm/year)	Material Loss % in 60 years	Scrap Recovery (%)
Mild Steel	0.023	15%	60%
2101	Marine	0	90%
A1010/IRSM 44	0.00008	0	90%

\*Qty - Weight of Columns, Girders, Staircase, Roof

\*\* Conversion - Fabrication, Supply and Installation

\*\*\* Scrap value - Recovery after Design Life for IS 2062 is 60% and IRSM44 is 90%

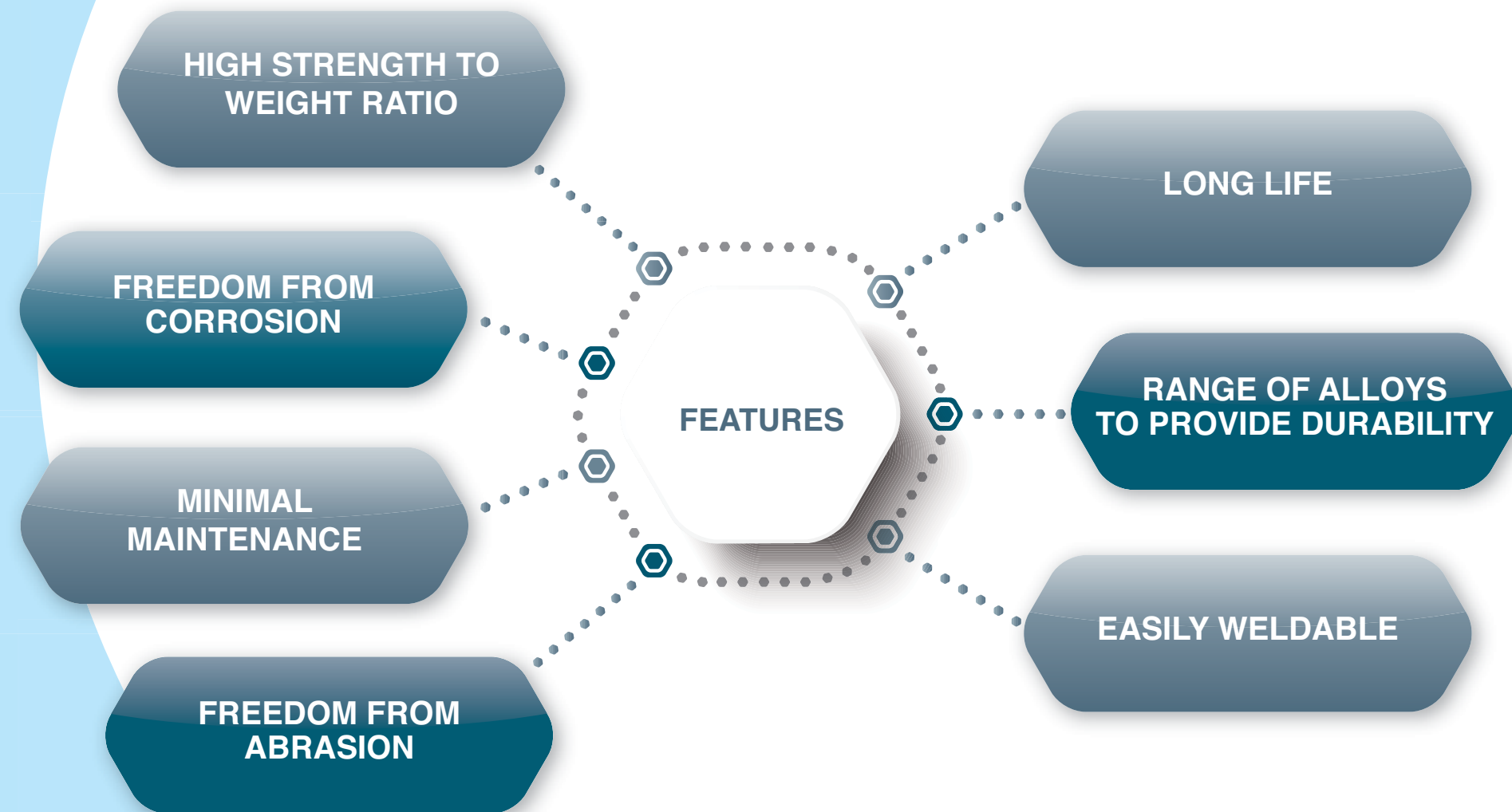
\*\*\*\* Paint Life of IS 2062 is 3 years and IRSM 44 is 10 years or more.

JSL recommends A1010/IRSM 44 grade stainless steel for the Structural Members of FOB. Initial cost increase is 15-20% over existing PEB carbon steel, However, savings over service life of 60 years is 40-45% Recommended with Painting with low maintenance with increased paint life of 10 years over carbon steel with painting life of 3 years Weight Reduction of 30% achieved due to higher Yield Strength Stainless steel is green material and increase in reducing Carbon Foot Print.





# THE BEDROCK OF MATCHLESS STANDARD



# BRIDGING THE GAP BETWEEN ENDURANCE AND EXCELLENCE

STAINLESS STEEL BRIDGE: ICONIC EXAMPLES\*

CHARVAUX FOOTBRIDGE,  
ANDRESY, FRANCE



MARINA BAY  
PEDESTRIAN BRIDGE,  
SINGAPORE



FOOTBRIDGE,  
LA DEFENSE,  
FRANCE



PEDRO ARUPPE  
FOOTBRIDGE,  
BILBAO, SPAIN



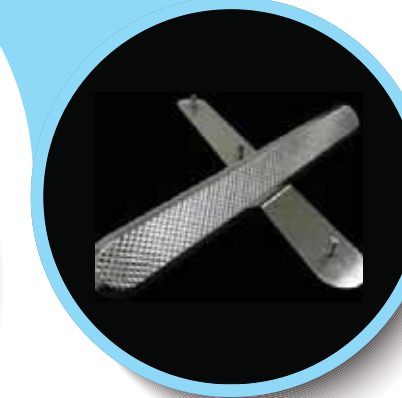
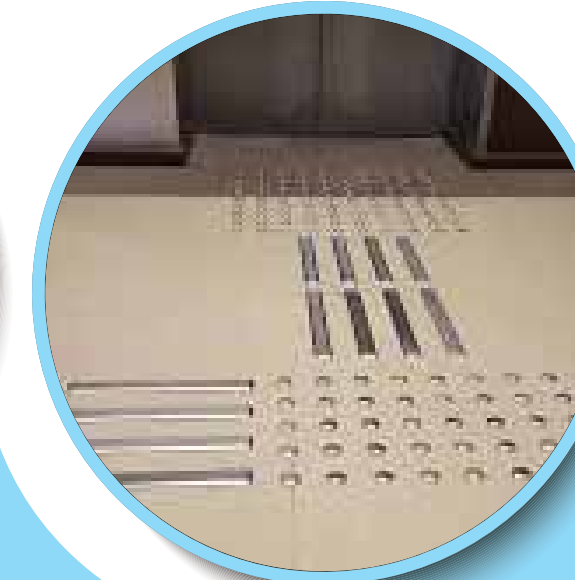
\*Inspirational case study with JSL having no role



## SPECIFIC — APPLICATIONS —



## STAINLESS STEEL TACTILE



Tactile is used for visually handicapped people as guiding instructions at public transport places (Offices, Airports and Metro etc).

The Stainless Steel studs or strips are commonly used indoors. Due to its high quality finish, luminance and aesthetic appeal, many architects prefer the use of stainless steel studs/strips for indoor applications.

Stainless Steel ensures ultra-high sheer strength and excellent durability with virtually no maintenance.

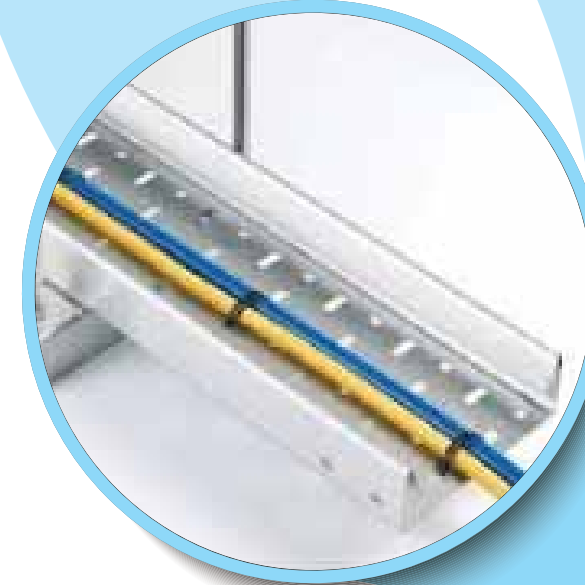


# NEW PRODUCT — DEVELOPMENT — APPLICATIONS

## STAINLESS STEEL FOR CABLE TRAY

Gaseous emissions from the textile industries are the second biggest cause of pollution in the world. The major cause of air pollution in textile operations are because of releasing carbon dioxide, aerosol fumes, poisonous gases and VOC's (volatile organic compounds) in form of visible and invisible smoke and above all, the intolerable smell. The drying operation emits hydrocarbon, where as formaldehyde, acids, softeners, and other explosive mixtures are given out from mineral oil drying and curing at high temperature process. The two main harmful emissions are acetic acid and formaldehyde in textile operations. These poisonous gases cause harm to humans as well as animals and damage the natural atmosphere.

Stainless Steel Cable tray will be used by Aditya Birla Group for their Textile Plant. Stainless Steel is preferred choice of material because of high corrosion resistance property and better aesthetics.



## STAINLESS STEEL TRENCH COVER

Mostly used in open environment.

Stainless Steel trench cover has greater life than MS Trench / Cemented slab cover with no maintenance like painting. It is also lighter in weight which reduces manpower while cleaning the trench. It has been used in the new building for Supreme Court of India in New Delhi.

304 Grade Stainless Steel Chequered has been used at the top surface and Stainless Steel Flat bar is used as support structure.



# REBARS — RAILWAYS

## THE SMARTER CHOICE TO BUILD ON



Design of  
C-steel



Impact  
Resistant



Ultimate  
Tensile Strength



Mixed  
C-steel



Corrosion  
Resistant



Easy to  
Install



Fire  
Resistant



Allows Thinner  
Concrete Layer



Highly  
Insensitive



100%  
Recycled



No Life  
Limit



No  
Maintenance



Tolerant to Poor  
Workmanship



# COMPARISON WITH OTHER MATERIALS

S. No.	Particular	Normal Carbon Steel Rebar	Stainless Steel Rebar	Remark
1	Corrosion Resistance	PREN - 0.192	PREN 1. 410S = 11.5 2. 316L = 27 3. S32101 = 27 4. S32205 = 34	Superior corrosion resistance of Stainless Steel makes it suitable to be used in alkaline and acidic environment
2	Strength (Mpa)	500 min. Typical :- 500 -510	500 min. Typical :- 500 - 660 (Duplex)	Stainless Steel comes with higher strength
3	Impact Resistance (J)	60 min.	60 min. Typical 100-130	Higher impact resistance makes it suitable for seismic zones
4	Life (Yrs)	30-35	Ferritic:- 60-80 Austenitic:- 120-150 Duplex:- >=200	Increased life reduces the life cycle cost of the structure

## APPLICATIONS OF STAINLESS STEEL REBARS



BRIDGES



TUNNELS



JETTIES



OFFSHORE PLATFORMS



RAILWAYS AND METRO STATIONS



BUILDINGS



# METROS



*World-class  
Safety & strength*





# THE SHEEN OF SUPERIORITY



## SAFETY AGAINST OVERCROWDING

Metro trains have higher “Super-dense Crush Load” i.e., 14 to 16 standing passengers per square meter of floor space. Under these overloading conditions, higher resistance to buckling plays a major role in selection of the material of construction. The buckling resistance of stainless steel is almost 3 times as compared to other materials, making it a metal of choice for constructing metro coaches.



## CRASH RESISTANCE

Stainless Steel has a significantly higher impact resistance. Thus, during crash and accidents, coaches made of Stainless Steel offer maximum safety to passengers.



## FIRE RESISTANCE

Stainless Steel can withstand temperatures in excess of 900°C. This fire resistance property makes Stainless Steel a suitable metal for fabricating metro coaches.



## CORROSION RESISTANCE

Stainless Steel has superior corrosion resistance than other materials, in diverse environments. Thus, the durability of Stainless Steel coaches is significantly higher as compared to other materials.



## HIGHER STRENGTH & LIGHTER CAR BODY

Stainless Steel, owing to its higher strength-to-weight ratio, enables reduction in thickness of the components and makes the car body lighter, which translates to lesser energy consumption in propelling the train.



## FATIGUE RESISTANCE

Stainless Steel, by virtue of higher strength, showcases double the fatigue resistance.



## ABRASION RESISTANCE

Stainless steel has higher hardness, which exhibits superior scratch, dent and abrasion resistance. For instance, coaches fabricated of stainless steel will incur lower maintenance cost in terms of dents & scratches for Indian Railways, which has a huge network of 64,600 KM spread over the country.



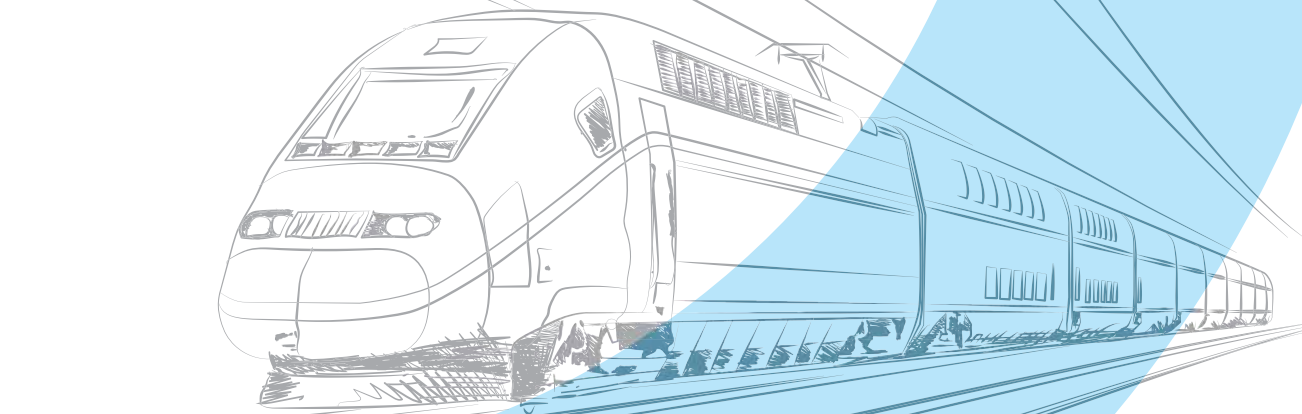
## WELDABILITY & REPAIRABILITY

Stainless steel is easier to weld and fabricate as compared to other materials. With the usage of optimum welding electrode, gas mixture and process parameters, metro coaches made of stainless steel have the finest weld quality at optimal cost.



# GRADES

Grade	Temper	Standard	Finish	Standard	Reference
201L, 201LN, 301L, 301LN, 304, 304L, 304LN, SUS, 301L, 301LN, Duplex, SS (32101, 32205)	DLT, LT, ST, MT, HT	ASTM A480, ASTM A666, JIS G 4305	Sheets- No. 2B, No. 4, TR, N1, 2B, 2BP, 2J	ASTM A480	EN ISO 9445-2:2009 EN ISO 9442-2:2010,





# STAINLESS STEEL SOLUTIONS FOR METRO



STATION ROOFS



OVERHEAD BRIDGES



METRO COACH BODY



COACH INTERIORS



LIFT/ELEVATORS



METRO COACH FLOORS



TICKET COUNTERS



RAILINGS





# FIBRE REINFORCED POLYMER



*Advancing the Use of  
Fibre Reinforced Polymer*

# JINDAL ADVANCE MATERIALS PVT. LTD.

Jindal Advance Materials Pvt. Ltd. (JAM) is proud to be a part of Jindal Stainless, one of the largest stainless steel conglomerates in India and amongst the top 10 in the world.

Inspired by the innovative world of fibreglass reinforced composites, JAM set up a fully equipped composite manufacturing facility to serve major industrial sectors like Mass Transportation, Automotive, Railways & Defence.

Implementation of Quality Management System ISO 9001:2015 helps us to achieve customer satisfaction by delivering desired quality.

As a professionally managed company backed by a team of experienced and technically skilled engineers and technicians, we have excelled in manufacturing and developing FRP products of the highest quality to meet the exact specifications and requirements of customers.



## What we do:

Design, Structural Analysis, Prototype, Production and Installation of FRP Composites

## Facilities available:

- Dedicated Design team
- Pattern and Tool Development
- Dedicated Paint Booth, Trimming Area, Gelcoat Spray Booth
- Heating Oven & Room for part curing
- Fully equipped lab to test incoming raw material
- Air conditioned storage for material having temperature oriented shelf life
- Skilled and experienced team of engineers, supervisors and laminators
- In-house R&D facility with leading industry experts

## Manufacturing Technologies:

- Vacuum Infusion
- Light RTM
- Vacuum Infusion with Reusable silicon membrane
- Hand Lay up

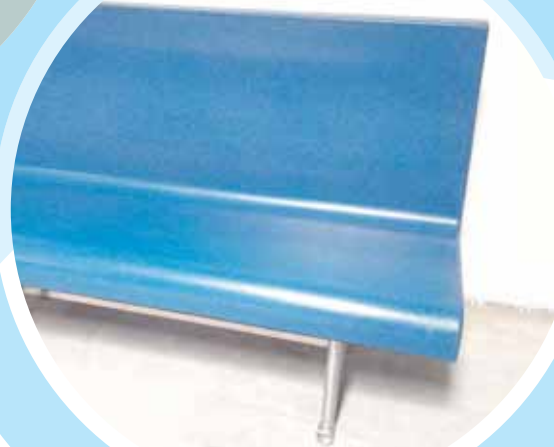


# PRODUCTS CURRENTLY MANUFACTURED AND SUPPLIED BY JAM

SIDE PANEL



BENCH



TOILET



## Design Capabilities:

- Structural design of composites as per international standards like BS, ASTM, EN etc.
- Micro & Macro mechanical analysis for composite laminates
- Laminate specifications based on analysis
- FEA modelling and analysis of composites using FEA program.



FRP Toilets

# FRP Testing Facility:

We have in-house labs to test the manufactured FRP products for mechanical and fire testing specifications. Our labs are equipped with:

MUFFLE FURNACE



UNIVERSAL TESTING MACHINE



LIMITING OXYGEN INDEX TEST APPARATUS



FLAMMABILITY TEST APPARATUS



BARCOL HARDNESS TESTER



DIGITAL OVEN



IZOD IMPACT MACHINE



SMOKE DENSITY TEST APPARATUS





# VARIOUS STAINLESS STEEL APPLICATIONS FOR STATION DEVELOPMENT

LITTER BINS



PLANTERS



GATES



BENCH



RAILINGS





BOLLARD & LIGHTING



GRATING & DRAIN COVER



PANEL & SIGNAGES



CLADDING



CANOPIES





[illegible]

The image features a light blue background with several horizontal, slightly wavy lines in a darker blue shade. Overlaid on this are large, semi-transparent blue circular shapes that overlap each other, creating a layered, abstract effect. The circles are positioned such that they cover parts of the horizontal lines, adding depth to the design.