

GLASS FIBRE REINFORCED POLYMER (GFRP) REBARS

The New Strength of Construction

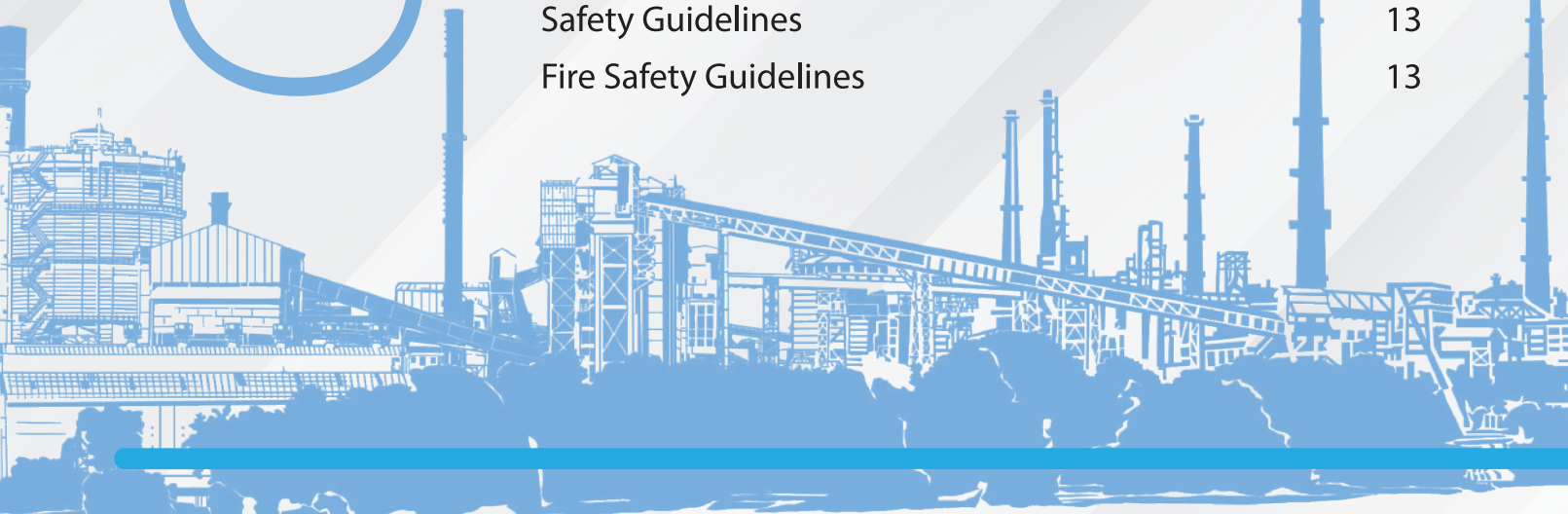
**NEW MATERIALS
BUSINESS**
An Initiative of Tata Steel



TECHNOC



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Tata Steel

Always Future-Ready!

Tata Steel aims to become the most respected steel company globally by achieving leadership in value creation and corporate citizenship. From setting up Asia's first integrated steel manufacturing unit in India over a century ago to becoming one of the leading global steel companies, Tata Steel's journey has been nothing short of inspiring. As we navigate today's rapidly evolving industrial landscape, we remain committed to staying ahead of the curve. By leveraging industry megatrends and strategic fitment, Tata Steel has expanded its horizons beyond steel, venturing into the exciting realm of new materials.

About New Materials Business

New Materials Business was set up in 2018 to counter the cyclicity of the steel business with a vision to explore opportunities in materials beyond steel. Today, the business has three verticals – Glass Fibre-reinforced Plastic (GFRP) Composites, Graphene and Medical Implant Materials.

Tata Steel's New Materials Business explores the potential of new, advanced materials for a variety of applications. The Composites Business is focused on developing FRP Solutions for Infrastructure, Industry, Railways and Smart Cities. The team has made a mark with innovations like India's first FRP Bridge installed at Jamshedpur, FRP Roofing Sheets, FRP Quarantine Chambers, Modular FRP Toilets and Security Cabins, Pressure Vessels and many more.

Out of our product basket of GFRP, we wanted to introduce GFRP Rebars in this brochure.



Tackling Corrosion in India's Infrastructure

Corrosion is a silent threat to India's infrastructure, damaging bridges, highways and industrial structures exposed to humidity, saline air and pollutants. It leads to costly repairs, structural failures and environmental strain, compromising safety and longevity.

The Cost of Corrosion

- **Economic Impact:** Corrosion leads to frequent repairs, increased maintenance costs, and reduced service life of structures. It is estimated that India incurs annual losses worth billions due to corrosion-related damages.
- **Safety Concerns:** Structural degradation caused by corroding steel poses significant risks to public safety, with incidents of collapses and failures becoming increasingly common.
- **Environmental Fallout:** Repeated repairs and replacements consume additional resources, adding to the environmental burden.

The Urgent Need for a Corrosion-Resistant Solution

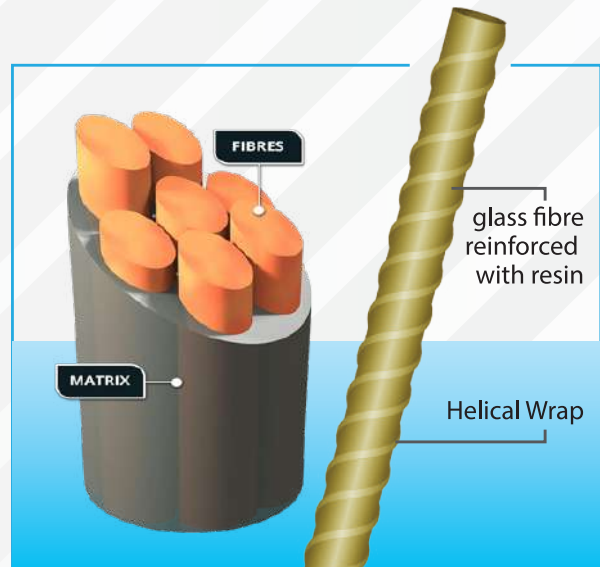
Traditional steel reinforcement, though strong and versatile, is vulnerable to corrosion, especially in coastal, marine and chemically aggressive environments. To safeguard India's infrastructure and ensure its longevity, the industry needs a material that combines strength, durability and corrosion resistance.



What are GFRP Rebars?

Glass Fibre Reinforced Polymer Rebars also known as GFRP Rebars are a cutting-edge solution designed to meet the demands of modern construction in India. These are made up of Glass fibre & Resin.

GFRP Rebars have been developed as a non-corrosive solution for reinforcement. They offer superior durability and performance in harsh environments like coastal areas, chemical industries and water infrastructure.

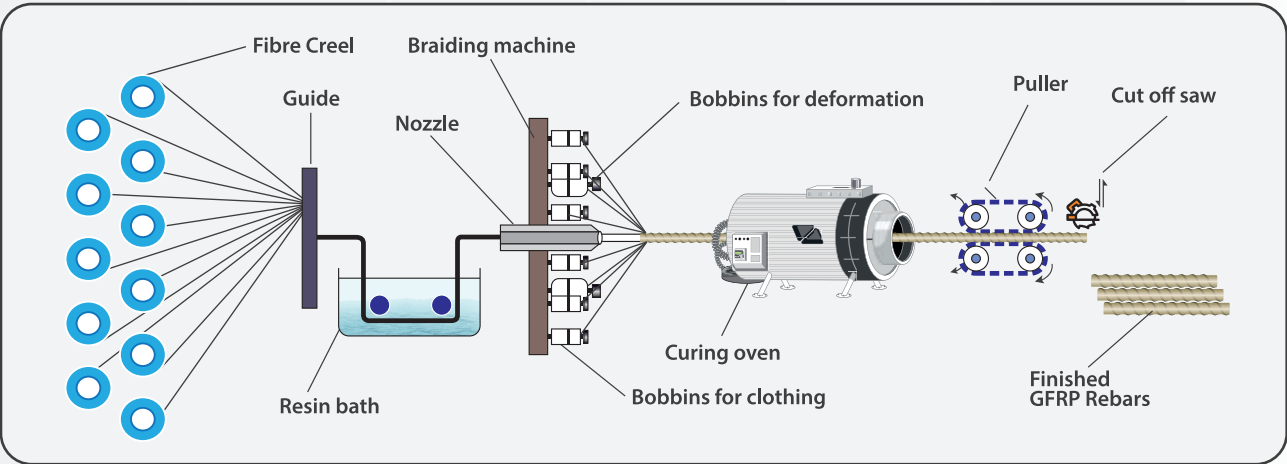


Features

 Lightweight	 Corrosion-resistant	 Strong
 Cost-effective	 Low Maintenance	 Longer Life
 Easy Handling	 Strong Bond Strength	 Customised Lengths
 Non-Conductive	 Non-Magnetic	 Non-Electromagnetic

Manufacturing Process

- Manufactured through a highly controlled pultrusion process
- Continuous glass fibres are drawn from spools and passed through a resin bath, where they are coated with a polymer resin, typically made of vinyl ester or epoxy
- This resin-coated fibre bundle is then pulled through a heated die, which shapes it into the required diameter and ensures uniform coating of the resin around the fibers
- The die also initiates the curing process, where heat solidifies the resin to form a rigid, solid composite material
- Once the curing is complete, the GFRP rebar is cut to the desired lengths and surface-treated to enhance bonding with concrete



Product Specifications

Straight Bar						
 0.065 Kg/mtr	 0.116 Kg/mtr	 0.175 Kg/mtr	 0.25 Kg/mtr	 0.45 Kg/mtr	 0.685 Kg/mtr	 1.07 Kg/mtr
 6mm	 8mm	 10mm	 12mm	 16mm	 20mm	 25mm
Upto 100 metres (In coil form)		Upto 12 metres (In straight bars)				
 Diameter			 Length Available		 Unit Weight	
Bend Bar						
Bend 90-degree bend Hook bend 45 degree bend S- Bend U – Bend Offset Bend						

* Note : Actual weight may vary as per tolerances

Technical Specification of GFRP Rebars

FRP Rebar (6, 8, 10, 12 mm)

S.No.	Properties	UOM	Tolerance	IS 18256 : 2023	TSL GFRP Rebar
1	Glass Content	%	±5	80	80
2	Tensile Strength	Mpa	min.	700 - 800	800 - 1000
3	Tranverse Shear Tensile	Mpa		= 130	135 - 200 Mpa
4	Tensile Modulus of Elasticity	Mpa		= 44800	45000 - 55000
5	Ultimate Tensile Strain	%		> 1.1	> 1.1
6	Glass Transition Temperature	°C		= 100	101-115
7	Water Absorption (24 hrs.)	%	min.	< 0.25	< 0.35
8	Alkaline Resistance	Mpa		= 80 %	= 80 %
9	Bond Strength	Mpa		= 7.6	<_15 Mpa

FRP Rebar (16, 20, 25 mm)

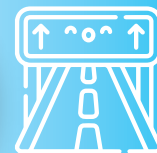
S.No.	Properties	UOM	Tolerance	IS 18256 : 2023	TSL GFRP Rebar
1	Glass Content	%	±5	80	80
2	Tensile Strength	Mpa	min.	700 - 800	16 mm ≥ 700 20 mm ≥ 650 25 mm ≥ 650
3	Tranverse Shear Tensile	Mpa		≥ 130	135 - 200 Mpa
4	Tensile Modulus of Elasticity	Mpa		≥ 44800	45000 - 55000
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*Note: Values may vary as per actuals.

Spectrum of Applications

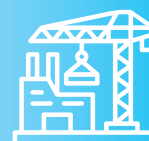
- Approach Slabs
- Walkways of Foot Over Bridge
- Slab Culverts
- "Bridge cum Bandhara, including Deck Slabs and Barriers between Piers"
- Concrete Roads including Jointed Plain Concrete Pavement
- Continuously- Reinforced Concrete Pavements (CRCP)
- Short-Panel Concrete Pavements (both cast-in-situ and precast)
- Retaining Walls
- Noise barriers
- Box Culverts
- Crash Barriers & Bridge Parapets
- Pedestrian Parapets and Railings
- Bulkheads and Bulkhead Copings
- Drains
- Plain Concrete Components

**ROADS
AND
HIGHWAYS**



- Deck slabs
- Underground Water Tanks
- Sewerage Treatment Plants
- Flooring
- Septic Tanks
- Chemical & wastewater treatment plants
- Boundary Walls

**INDUSTRIAL/
COMMERCIALS**



- Parking Garages
- Drainage
- Pavements/Internal Road
- Swimming Pools
- Sewage Treatment Plants
- Flooring
- Under Water Tanks
- Grade Slabs

REAL ESTATE



- Tunnel Eyes
- Mechanically Stabilised Earth Wall Panels and Copings
- Retaining Walls
- Bridge Decks and Bridge Deck overlays
- Noise barriers
- Crash Barriers and Bridge Parapets

BRIDGES AND TUNNELS



- Runways
- Drains
- Sewage Treatment Plants
- Underground Water Tanks
- Noise barriers
- Deck slabs
- Non-Structural Walls

AIRPORTS, PORTS & METRO STATIONS



Applications

Bridge Decks



Warehouse Flooring



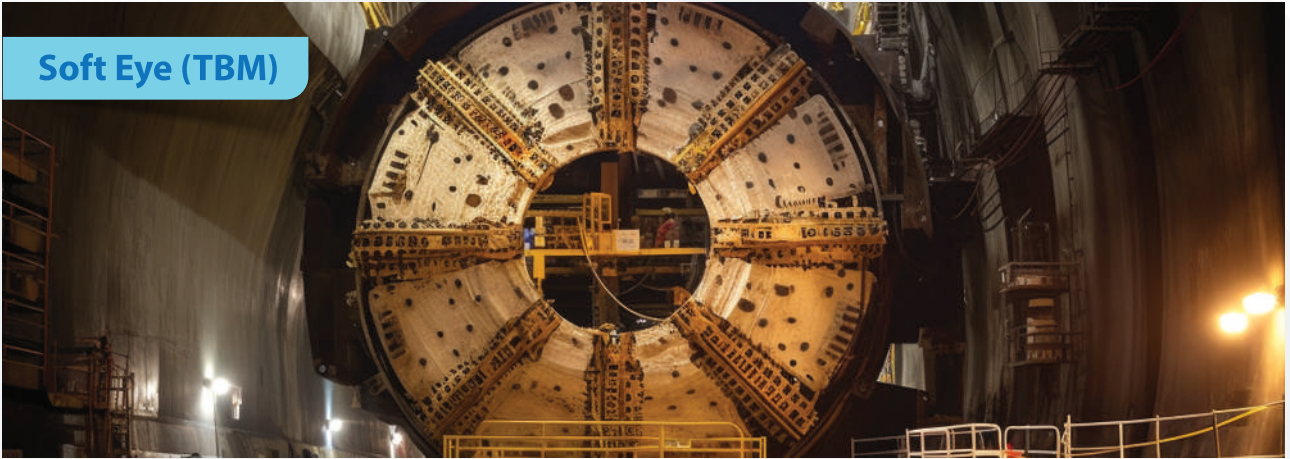
Crash Barrier



Grade Slabs



Soft Eye (TBM)



Roads



Water tanks (UG, Pools)



Drains



Benefits of GFRP Rebars

over conventional rebars



HIGH TENSILE STRENGTH

600-1200 Mpa

(500-550 Mpa for conventional rebars)

LOW DENSITY

~1900-2100 Kg/m³

(~7850 Kg/m³ or conventional rebars)



REDUCED RISK OF THERMAL CRACKING

Thermal expansion coefficient closer to concrete (conventional rebar can expand & contract more significantly)

EASE OF INSTALLATION

~120-150 Mpa

(~200 Mpa for conventional rebars)



THERMAL INSULATION

High

(Low for conventional rebars)

CORROSION-RESISTANT

100% corrosion-free

(Conventional rebars prone to corrosion)



NO NEED OF COATING TO RESIST CORROSION

(Conventional rebars need coating which adds costs & complexity)

NON-MAGNETIC & NON-CONDUCTIVE

(Conventional rebars are Magnetic - which can affect sensitive equipment)



NO MAINTENANCE REQUIRED

Saves maintenance costs

(Conventional rebar needs inspections & periodic maintenance to address corrosion)

HIGH STRENGTH TO WEIGHT RATIO

Making them lighter for the same strength

(Conventional rebars have a low ratio)



HIGHLY DURABLE

Resists chemicals and moisture - more durable

(Conventional rebars have limited durability and are prone to corrosion)

LONG SERVICE LIFE

75+ years

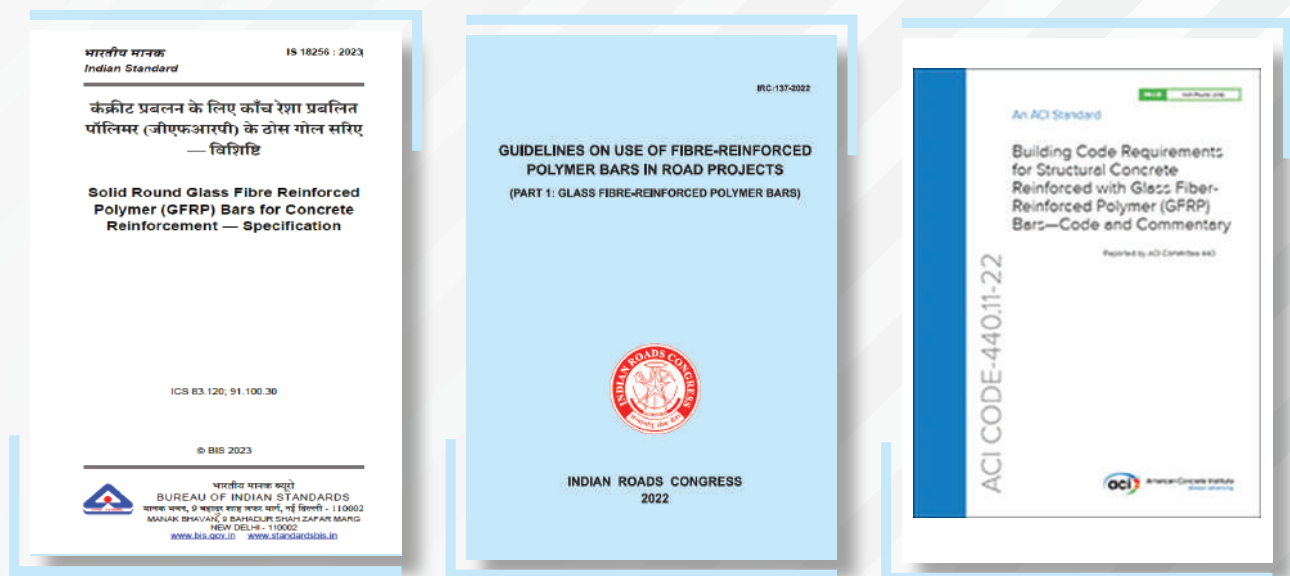
(20-30 years for conventional rebars, depending on exposure)



Industry Standards

Tata Steel's GFRP rebar comply with industry standards :

- IRC 137:2022 (Guidelines on use of fibre-reinforced polymer bars in road projects)
- ACI 440.6 (Guide for the Design and Construction of Structural Concrete Reinforced with FRP Bars)
- IS 18256 : 2023 (Solid Round Glass Fibre Reinforced Polymer (GFRP) Bars for Concrete Reinforcement — Specification)
- ASTM D7957 (Standard Specification for Glass-Fibre-Reinforced Polymer (GFRP) Bar for Concrete Reinforcement)
- ISO 9001:2015 certifications for quality management systems.



Authenticity & Packaging

GFRP rebars are carefully packed for safe transport and easy handling. They are bundled in coils or standard lengths, secured with Tata Steel branded HDPE straps for protection and easy identification.

Each package includes a product sticker with the Tata logo, specifications (diameter, length) and batch details, ensuring traceability and delivery of high-quality products in optimal condition.



International Case studies

Huntley Bridge, West Prince, Canada

The Huntley Bridge was constructed using a 200 mm cast-in-place deck slab over pre-cast pre-stressed Next F Beams with partial-depth flanges that serve as formwork. The beams were simply supported over a single span of 20 m.



Jizan Flood Mitigation Channel, Saudi Aramco

Saudi Aramco spearheaded a critical project of the construction of a 23km-long Jizan Flood Mitigation Channel in Saudi Arabia. Corrosion-resistant Glass Fibre-Reinforced Polymer Rebars were specified as the only rebar to be used to address the issues of flooding due to inadequate drainage systems and heavy seasonal rainfall. This world's largest GFRP rebar project was completed in 2022.



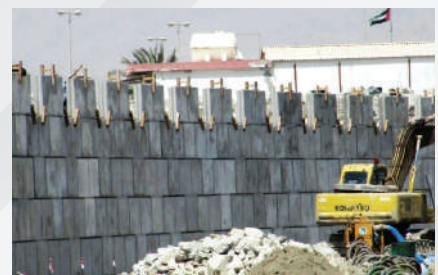
Matai Brain Research Institute, New Zealand

GFRP rebars have been used for construction of the slab for Matai Research institute , a world class research centre for brain, heart and body. GFRP rebars have been used because they are a quarter of the weight of steel, which makes it faster to install. The no-magnetic property makes it ideal for research centres due to sensitive machinery. It is also easy to cut on-site using standard cutting equipment.

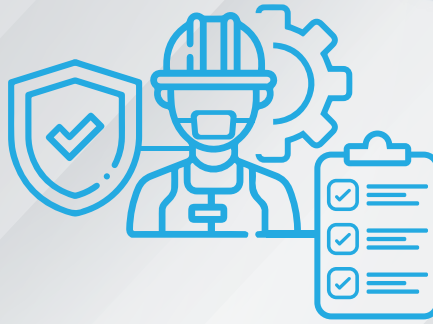


Dibba Harbour Canal Seawalls, Dubai

A marina development has a 600 m long access canal for light boats to access housing. It is located near the beaches of Dibba Harbour, UAE. GFRP rebars were selected for construction as they provide excellent life savings, even in highly corrosive and saline environments. These have been used for construction of thick pre-cast decorative quay wall panels. The total solution gives a design life of over 100 years.



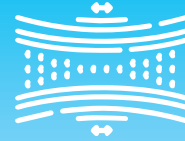
Safety Guidelines



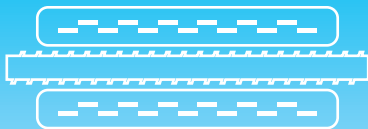
Always wear gloves, safety glasses, and dust masks to protect against splinters and dust.



Avoid bending, GFRP rebar is strong but not ductile like steel.



Use non-metallic tools (e.g., plastic or rubber mallets) to prevent damage to the surface.



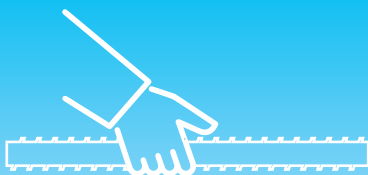
Store on flat or on padded supports to prevent deformation.



Cut with diamond or carbide blades and avoid inhaling dust; use water or dust collection systems when cutting.



Follow manufacturer guidelines for safe handling and installation.



Handle with care to avoid sharp edges from exposed fibers.



When lifting heavy bundles, use appropriate lifting equipment and techniques to prevent injury.



Ensure rebar is properly secured during installation to avoid accidental shifting or falls.

Fire Safety Guidelines

GFRP rebar has limited fire resistance; ensure adequate concrete cover to protect it from high temperatures. Avoid direct flame exposure during installation and handling, and follow local fire safety regulations.



NEW MATERIALS BUSINESS

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