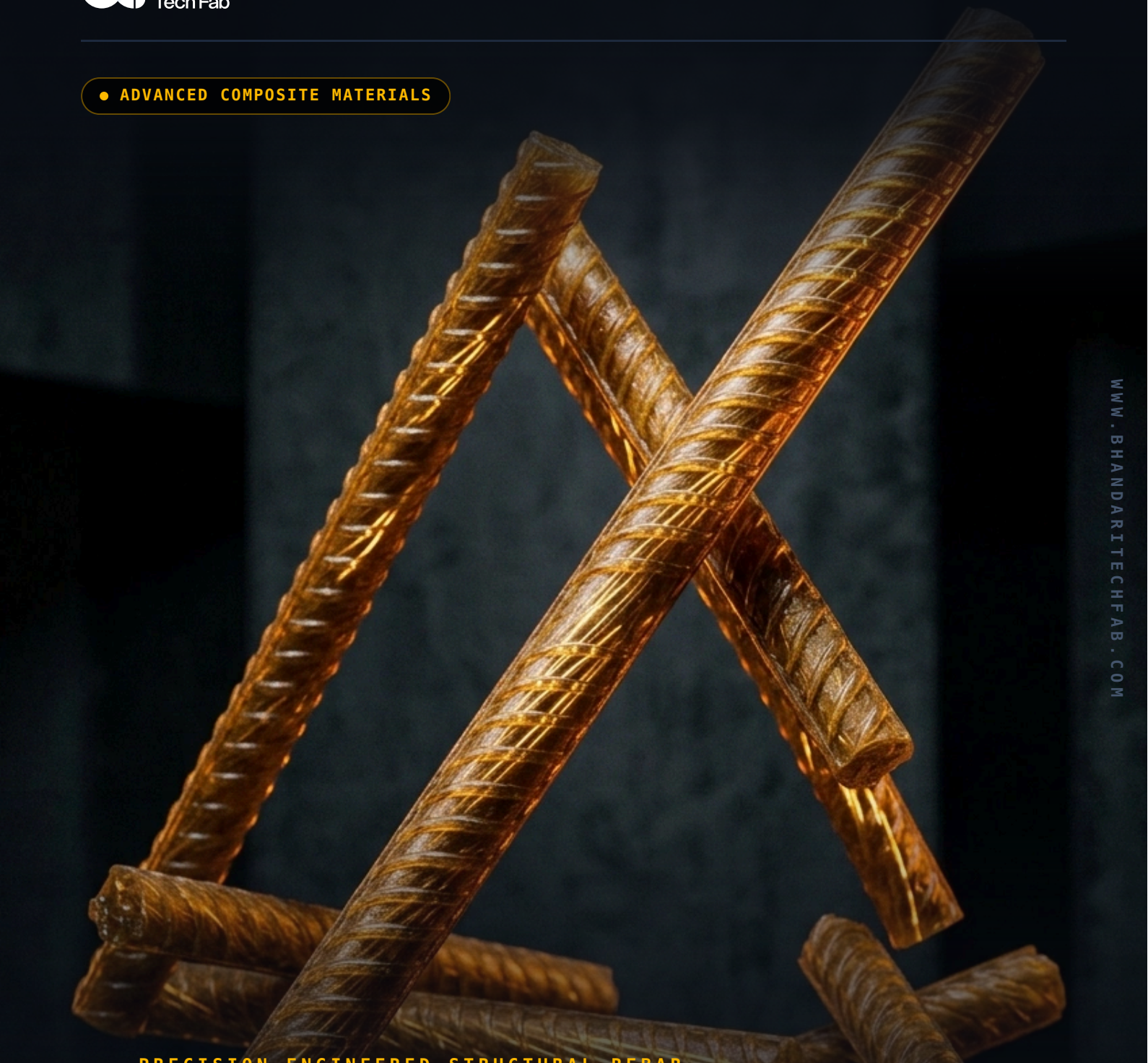
● ADVANCED COMPOSITE MATERIALS



WWW.BHANDARITECHFAB.COM

PRECISION-ENGINEERED STRUCTURAL REBAR

BUILDING A RUST-FREE WORLD

Bhandari TechFab Glass Fiber Reinforced Polymer (GFRP) rebars. Delivering 100% corrosion-free structural longevity for modern infrastructure.

100% RUST-FREE | 75% LIGHTER THAN STEEL | 1000+ MPA TENSILE

IS 18255 / 18256 • IRC:137-2022 • ISO 9001:2015

ADVANCING INFRASTRUCTURE

ENGINEERED FOR PERMANENT STRENGTH

STRONGER. LIGHTER. 100% RUST-FREE.

Bhandari TechFab manufactures high-tensile GFRP rebars that eliminate concrete corrosion forever. Engineered to outlast conventional steel with 100+ years of maintenance-free service.



PROUDLY MADE IN INDIA

Manufactured and batch-tested to IS 18256:2023 & IRC:137-2022 standards.

INSIDE THIS BROCHURE

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[01] WHAT ARE GFRP REBARS?

INTRODUCTION OF GFRP REBARS

GFRP

Glass Fiber Reinforced Polymer — a composite reinforcement bar in which continuous high-tensile glass fibers are locked inside a thermoset resin matrix. The result is a modern, corrosion-proof substitute for conventional steel reinforcement in concrete.

STRUCTURE

Thousands of aligned **E-glass rovings** carry the tensile load, while the cured resin binds them into a solid rod. A **helical surface wrap** gives the bar its mechanical grip inside concrete.

ORIGINS

Composite rebars were first used as concrete reinforcement in the **early 1970s**, with pioneering installations in the former Soviet Union and North America.

ADOPTION

Large-scale use grew through **Europe in the 1980s** and accelerated in **Japan in the 1990s**, where FRP reinforced the guideway structures of magnetically levitated train projects — and where the first FRP design guidelines were published in 1996.

TODAY

With over **50 years of proven field performance** across the USA, Canada, Europe, Japan and Australia, GFRP is now a globally accepted, standards-backed reinforcement — and since 2023, India has its own BIS codes for it.

WHY IT WINS

Concrete cracks; moisture and chlorides reach the steel; rust expands and breaks the structure from within. GFRP **removes corrosion from the equation entirely** — extending design life while cutting weight, handling effort and lifecycle cost.

ABOUT BHANDARI TECHFAB

● MADE IN INDIA

Bhandari TechFab LLP is a forward-thinking Indian manufacturer of Glass Fiber Reinforced Polymer (GFRP) products, committed to delivering high-performance, corrosion-free and sustainable reinforcement for modern infrastructure.

Built on the group's established technical-fabrics expertise, our GFRP division is a **new-generation venture** — designed from day one around automated pultrusion, rigorous batch testing and engineering-led customer support.

> *"We are a new-generation company completely rethinking structural reinforcement. No legacy constraints. Just pure, uncompromised* **innovation.***"*

Every bar we ship is engineered to replace steel — 100% corrosion-free, ultra-lightweight and built to last over 80 years — so the roads, bridges and buildings of a growing India never have to fight rust again.

2X

STRONGER IN TENSION

1000+ MPa tensile strength vs 500–600 MPa for steel rebar.

75%

LIGHTER THAN STEEL

10mm BTF bar weighs 1.60 kg vs 7.40 kg for equivalent steel.

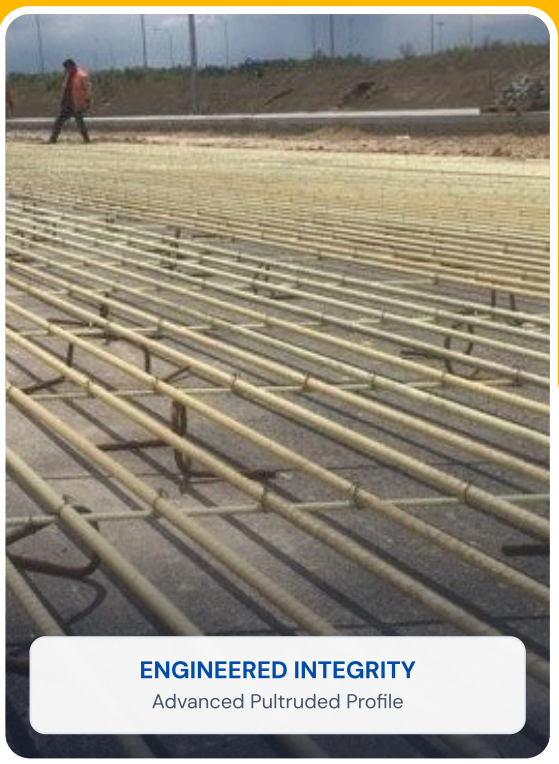
80–100+

YEARS SERVICE LIFE

Zero corrosion, minimal maintenance in harsh environments.

MISSION

To be instrumental in revolutionizing the Indian construction sector by manufacturing high-strength, sustainable, and 100% corrosion-resistant GFRP rebars that prolong structural lifespan while slashing maintenance costs.



ENGINEERED INTEGRITY
Advanced Pultruded Profile

VISION

To become India's most trusted engineering partner for composite reinforcement, setting gold standards for batch testing, automated pultrusion precision, and sustainable infrastructure.

- **V·01 Quality Assured**
- **V·02 Innovation Led**
- **V·03 Zero Rust**
- **V·04 Sustainable**

[04] THE BHANDARI EDGE

WHY PARTNER WITH BTF

Six commitments stand behind every metre of BTF GFRP rebar — from the pultrusion line to your pour.

01 Advanced Manufacturing Technology

Our facilities run the latest automated pultrusion lines, delivering flawless consistency, strength and precision in every GFRP product we make.

STATE-OF-THE-ART PRODUCTION

02 Consistent Quality & Performance

Every product is rigorously tested to meet and exceed stringent structural codes — guaranteeing uncompromising, repeatable performance.

EXCEEDING GLOBAL STANDARDS

03 Custom Solutions

A highly adaptive partner, capable of custom-engineering reinforcement — diameters, bends, stirrups and profiles — tailored precisely to your project.

AS PER PROJECT NEEDS

04 Expert Technical Support

Seasoned engineers support you at every step — design consultation, substitution guidance, BOQs and on-site implementation.

GUIDANCE AT EVERY STEP

05 Timely Delivery & Reliable Service

Time is critical in construction. Streamlined logistics ensure materials arrive exactly when and where you need them.

ON SCHEDULE, EVERY TIME

06 Commitment to Sustainability

Replacing steel massively reduces a project's carbon footprint. BTF GFRP is eco-friendly, durable and designed for a sustainable future.

BUILDING A GREENER TOMORROW

ATTRIBUTES OF BTF GFRP REBARS

01 Corrosion Resistant
Does not rust — ensuring long-term durability in even the harshest environments.

02 Water Resistant
Impervious to moisture and water damage; ideal below the water table.

03 Stronger
Higher tensile strength than traditional steel — 1000+ MPa ultimate capacity.

04 Low Thermal Expansion
Thermal behaviour closely matched to concrete, minimising internal stresses.

05 Lighter
High strength-to-weight ratio cuts transport, crane and handling costs.

06 Radio Transparent
Does not interfere with electromagnetic signals — safe for sensitive facilities.

07 Cost Effective
Reduces overall structural, logistical and lifetime maintenance expense.

08 Durable
Built to perform across demanding structural environments for decades.

09 Zero Maintenance
Minimal upkeep over the entire lifespan of the structure.

10 Lower Installation Cost
Streamlined handling and placement save total construction labour.

11 Longer Life Span
Extended performance longevity exceeding 80–100+ years in service.

12 Easy Handling & Cutting
Simple to cut and manoeuvre safely on site with standard tools.

13 Eco Friendly
Sustainable production with a substantially reduced carbon footprint.

14 Faster, Safer Installation
Lightweight bars speed up placement and shorten project timelines.

15 Dielectric
Electrically non-conductive — safe near power, traction and signalling.

16 Reduced Concrete Cover
No rust means cover can be optimised, saving concrete volume.

17 Easy to Transport
Coilable small diameters and low weight cut freight loads dramatically.

18 Savings in Overlap Cost
Optimised lap lengths and coil supply reduce wastage and joints.

[06] MATERIAL INSPECTION

ANATOMY OF A BTF GFRP REBAR



01 / CORE

High-Tensile E-Glass

Continuous glass rovings with superior fiber alignment for maximum structural load transfer along the bar.

02 / MATRIX

Thermoset Resin

A proprietary epoxy-based polymer matrix binds the fibers and ensures long-term chemical resistance.

03 / FINISH

Helical Wrap

Optimised bond geometry — the helically wrapped surface creates mechanical interlock with concrete.

AUTOMATED PULTRUSION

Advanced manufacturing ensures flawless consistency and precision, bar after bar.

ZERO RUST GUARANTEE

Inherently corrosion-resistant — engineered for aggressive, chloride-rich environments.

SUPERIOR ADHESION

Enhanced mechanical interlock delivers dependable bond strength inside the concrete.

[07] OUR PORTFOLIO

THE BTF PRODUCT RANGE

Four product families — one promise: high-performance composite reinforcement, engineered for modern infrastructure.



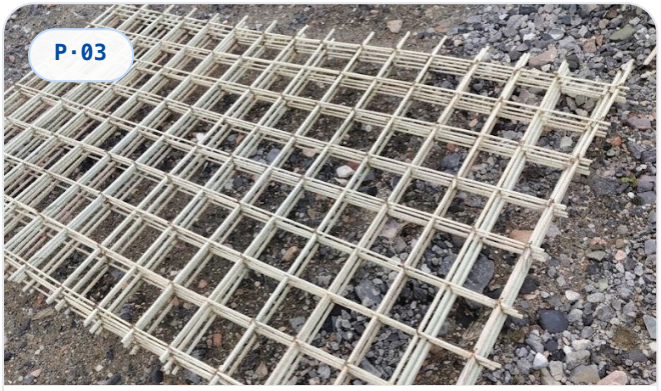
GFRP REBARS

High-strength, 75% lighter and 100% corrosion-resistant straight rebars engineered to outlast conventional steel with a 100+ year design service life.



GFRP BENT BARS & STIRRUPS

Factory-bent GFRP shapes manufactured precisely to engineering schematics — flawless corners, stirrups, hoops and complex structural profiles.



GFRP MESH & GRIDS

Ready-to-install, highly durable fiberglass grids that reinforce concrete flatwork, precast panels and pavements far faster than tying loose rebar.



CUSTOM FABRICATED GFRP

Highly adaptive, bespoke-engineered reinforcement — rock bolts, anchors and structural profiles tailored exactly to unique project requirements.

SUBSTITUTION BY TENSILE STRENGTH

Because BTF GFRP is roughly twice as strong in tension, a smaller GFRP diameter can replace a larger steel bar of equal ultimate capacity — at a fraction of the weight.

BTF GFRP DIA	WEIGHT / 12 M BAR		STEEL REBAR DIA	WEIGHT / 12 M BAR	WEIGHT SAVING
4.5 mm	0.468 kg	=	6 mm	2.75 kg	83%
6.0 mm	0.570 kg	=	8 mm	4.74 kg	88%
7.0 mm	0.900 kg	=	10 mm	7.40 kg	88%
8.0 mm	1.200 kg	=	12 mm	10.65 kg	89%
10.0 mm	1.600 kg	=	14 mm	14.52 kg	89%
12.0 mm	2.400 kg	=	16 mm	18.93 kg	87%
14.0 mm	3.240 kg	=	18 mm	24.00 kg	87%
16.0 mm	4.870 kg	=	22 mm	35.76 kg	86%
18.0 mm	6.280 kg	=	25 mm	46.22 kg	86%
20.0 mm	8.080 kg	=	28 mm	58.02 kg	86%
22.0 mm	9.800 kg	=	32 mm	75.79 kg	87%
25.0 mm	11.670 kg	=	40 mm	118.52 kg	90%

- Indicative values on an equal ultimate tensile capacity (=) basis.
- Final substitution must be verified by BTF engineering for each design.

MECHANICAL PROPERTIES VS METAL REBARS

MATERIAL PROPERTY	METAL REBARS	BTF GFRP REBARS
Tensile strength (MPa)	500 – 600	1000+
Shear strength (MPa)	120	≥ 150
Bond strength (MPa)	14*	≥ 11
Compression (MPa)	500	450
Modulus of elasticity (GPa)	160 – 200	≥ 50
Elongation (%)	25	≥ 1.5
Durability	As prescribed in building codes	80 years +
Density (T/m³)	7.8	1.9
Corrosion resistance	Appearance of rust	Stainless — stable even in alkaline concrete
Ecological compatibility	Ecologically friendly material	No harmful emissions in storage or use
Electrical conductivity	Conductive	Dielectric

- *Bond value per ACI 440.3R / CSA S806 / IS 15916 test methods.

DESIGN NOTE

LOWER STIFFNESS

GFRP's modulus is lower than steel, so deflection and crack-width checks — not strength — usually govern the design.

DESIGN NOTE

LINEAR-ELASTIC

GFRP has no yield plateau; codes apply environmental reduction factors to keep working stresses safely below ultimate.

DESIGN NOTE

MATCHED CODES

Design to IS 18256 / IRC 137 / ACI 440.11 rules — never as a one-to-one steel swap without engineering review.

WEIGHT & PACKING DATA

DIAMETER	WEIGHT / 12 M BAR	12 M BARS PER TON
3 mm	0.185 kg	5405
3.5 mm	0.280 kg	3571
4.5 mm	0.468 kg	2137
6 mm	0.570 kg	1754
7 mm	0.940 kg	1068
8 mm	1.200 kg	816
10 mm	1.600 kg	606
12 mm	2.400 kg	403
14 mm	3.240 kg	309
16 mm	4.870 kg	205
18 mm	6.280 kg	159
20 mm	8.080 kg	124
22 mm	9.800 kg	102
25 mm	11.670 kg	85

FORMAT · COILS

12 / 50 / 100 m lengths

Dia: 3 – 12 mm. Small diameters coil for compact, low-freight transport and long joint-free runs.

FORMAT · STRAIGHT BARS

12 m standard length

Dia: 3 – 25 mm. Bundled and strapped for crane-free manual handling on site.

CUSTOM ON REQUEST

Customisation — Non-standard lengths and diameters are available on request against project drawings.

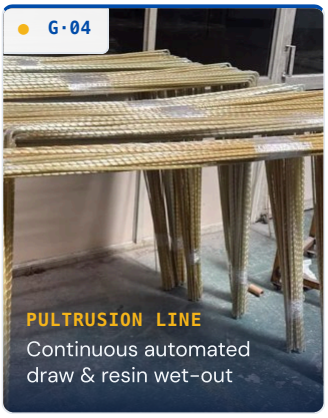
FROM OUR LINE TO REAL PROJECTS

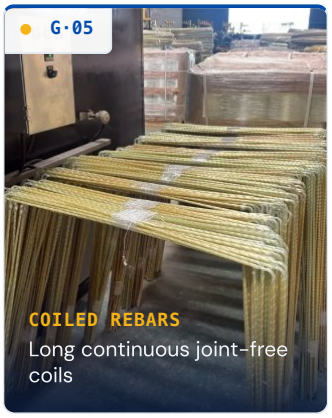
A closer look at BTF GFRP reinforcement — factory pultrusion, coiled runs, custom-bent stirrups and bundled jobsite dispatches.









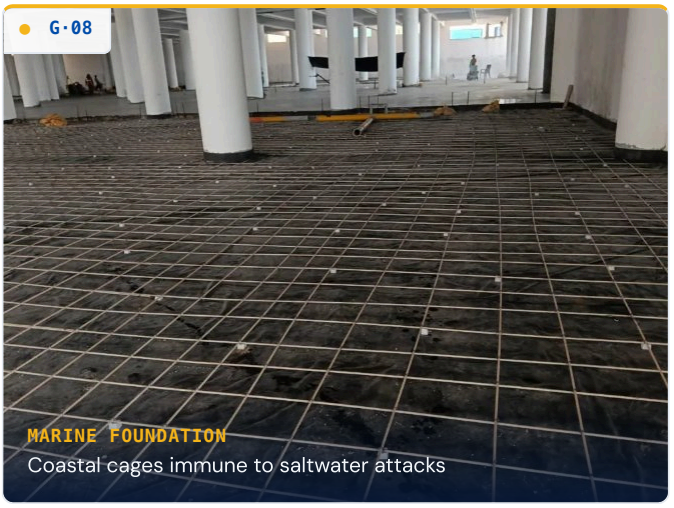




FIELD PROVEN IN STRUCTURAL POURS

BTF GFRP deployed across real-world bridge decks, marine coastal foundations, precast concrete and aggressive industrial environments.













STANDARDS & DESIGN GUIDES BUILT FOR INDIAN INFRASTRUCTURE

GFRP is no longer a niche material — it is codified. BTF GFRP rebars are manufactured and batch-tested against the Indian standards below. We don't yet have an active international certification or export footprint, but our engineering is benchmarked against the global design references opposite, so specifications stay consistent as we scale.

INDIA [BIS · IRC · MoRTH FRAMEWORK]

IS 18256 : 2023

Specification for GFRP bars for concrete reinforcement — the manufacturing standard BTF produces against.

IS 18255 : 2023

Methods of test for GFRP bars — governs our batch-wise laboratory testing programme.

IRC : 137 – 2022

Indian Roads Congress guidelines for GFRP reinforcement in road and bridge structures.

IS 15916

Referenced building-code framework for bond and structural test methodology.

DESIGN REFERENCE [HOW WE BENCHMARK OUR ENGINEERING]

ISO 9001:2015

Quality management certification governing our manufacturing and testing processes end to end.

ACI 440.1R & ASTM D7957

International GFRP design and specification benchmarks we engineer against for consistency — not yet an active export certification.

WORKING WITH STATUTORY BODIES

BTF supplies test data and documentation aligned to BIS, NHAI, IRC and MoRTH requirements, supporting approvals for roads, highways and public infrastructure projects across India. International certification and export markets are the next stage of our roadmap.

WORKING ON SITE — CUT, BEND, BIND

Crews familiar with steel adapt to BTF GFRP in a single day. Three rules cover almost everything.

[A] CUTTING

Cutting BTF GFRP is as easy as cutting steel — use an angle grinder, chop saw, band saw, hacksaw or diamond / hard cutting disc for a clean face.

SITE TIP

Use a proper cutting tool, not shears — pinching or trimming can fray the glass fiber threads at the cut end.

[B] BENDING

GFRP is linearly elastic up to failure — it cannot be bent permanently on site. Release the force and the bar springs back to its original shape.

THE BTF ANSWER

Order factory-made BTF bent bars and stirrups — precision-formed to your drawings before the resin cures, so every hook and stirrup arrives ready to tie.

[C] BINDING

Tie BTF bars exactly as you tie steel. Traditional binding wire works perfectly, as do plastic clips, zip ties and knitting wire with fixing clips.

BONUS

Light bars mean cages can be pre-assembled and lifted into place by hand — no crane required.

! **Design first, substitute second.** GFRP's lower modulus means deflection usually governs. Always confirm bar sizing, laps and cover with BTF engineering or your structural consultant against IS 18256 / IRC 137 — never swap steel one-to-one by diameter alone.

STORAGE

UV COVER

Store on level dunnage under cover or tarpaulin for extended outdoor storage periods.

HANDLING

NO HOOKS

Lift in bundles with fabric slings; avoid dragging over sharp edges that could nick the surface.

PLACEMENT

CHAIR + TIE

Use standard chairs and spacers; secure against floating during vibration of the pour.

TESTING & QUALITY ASSURANCE

Every BTF batch is sampled and tested to **IS 18255 : 2023** before dispatch — in-house QC backed by NABL-accredited third-party laboratories.

Tensile Strength
Ultimate tensile capacity verified ≥ 1000 MPa on a Universal Testing Machine.

Modulus of Elasticity
Stiffness measured for deflection-governed design confirmation.

Bond (Pull-Out)
Bar-to-concrete bond strength validated for anchorage and lap design.

Transverse Shear
Shear capacity across the bar section checked against ≥ 150 MPa.

Ultimate Strain
Elongation at break confirmed ≥ 1.5% for code-compliant ductility factors.

Density & Fiber Fraction
1.9 T/m³ density and glass-fiber mass fraction verified batch-wise.

Cross-Section & Geometry
Effective area and wrap pitch inspected on the line.

Moisture Absorption
Matrix integrity confirmed for wet, buried and marine service.

Alkali Resistance
Durability screening for the high-pH concrete environment.

HOW GFRP IS GRIPPED FOR TESTING

GFRP cannot be clamped bare in a UTM the way steel is — the jaws would crush or slip on the composite. Test specimens are fitted with **bonded anchor sleeves (couplers)** at each end that act as grippers, so the bar itself is loaded to true failure.

IN-HOUSE LAB	NABL LABS	TEST REPORTS
Batch-wise QC per IS 18255:2023	Independent third-party verification	Supplied with every project lot

CERTIFIED REPORTS [SAMPLE MECHANICAL TEST REPORTS — DOC NO. F/QA/225]

Full, unedited mechanical test reports for Ø6 mm, Ø8 mm and Ø10 mm GFRP rebar follow on the next three pages — **tested jointly by Bhandari Tech Fab LLP, Surat, Gujarat**, per IRC:137-2022, dated 25 July 2026.

MECHANICAL TEST REPORT GFRP REBAR Ø6 MM

Bhandari Tech Fab

MECHANICAL TEST REPORT	Doc No: F/QA/225
	Rev: 01

TESTING DATE	25 July 2026
PRODUCT NAME	GFRP REBAR
PRODUCT SIZE	Ø 6 MM
TESTED BY:-	Jointly

Sr No.	Test Name	Method of test Ref to	Unit	Specified requirement AS Per IRC- 137 2022	Result	Remarks
1	Cross Section Area	ASTM D 7205	mm^2	30 to 55	34.68	OK
2	Fiber Glass Content	IS 18255	%	≥ 75	76.26	OK
3	Density	ASTM D 792	gm/cc	-	2.11	OK
4	Ultimate Tensile Force	ASTM D 7205	Kn	27 min	36.24	OK
5	Tensile Modulus of Elasticity	ASTM D 7205	Gpa	≥ 45	48.87	OK
6	Short Term Water Absorption	ASTM D 570	%	≤0.25	0.22	OK

NOTE :-

BHANDARI TECH FAB LLP.
502, ADARSH MARKET-2,
RING ROAD, SURAT-395 002.
GUJARAT, INDIA.
No.: 96382 93829

LAB INCHARGE	QC MANGER	TPI / CLIENT
TESTED BY	VERFIED BY	APPROVED BY

info@bhandaritechfab.com +91 96382 93829 www.bhandaritechfab.com

Tested jointly by **Bhandari Tech Fab LLP, Surat, Gujarat** — Doc No. F/QA/225 · Rev 01 · Tested 25 July 2026 · Per IRC:137-2022.

MECHANICAL TEST REPORT GFRP REBAR Ø8 MM

Bhandari Tech Fab

MECHANICAL TEST REPORT	Doc No: F/QA/225
	Rev: 02

TESTING DATE	25 July 2026
PRODUCT NAME	GFRP REBAR
PRODUCT SIZE	Ø 8 MM
TESTED BY:-	Jointly

Sr No.	Test Name	Method of test Ref to	Unit	Specified requirement AS Per IRC- 137 2022	Result	Remarks
1	Cross Section Area	ASTM D 7205	mm^2	51 to 60	52.17	OK
2	Fiber Glass Content	IS 18255	%	≥ 75	76.21	OK
3	Density	ASTM D 792	gm/cc	-	2.04	OK
4	Ultimate Tensile Force	ASTM D 7205	Kn	40 min	56.15	OK
5	Tensile Modulus of Elasticity	ASTM D 7205	Gpa	≥ 45	50.12	OK
6	Short Term Water Absorption	ASTM D 570	%	≤0.25	0.21	OK

NOTE :-

BHANDARI TECH FAB LLP.
502, ADARSH MARKET-2,
RING ROAD, SURAT-395 002.
GUJARAT, INDIA.
Mo.: 96382 93829

LAB INCHARGE	QC MANGER	TPI / CLIENT
TESTED BY	VERFIED BY	APPROVED BY

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Tested jointly by **Bhandari Tech Fab LLP, Surat, Gujarat** — Doc No. F/QA/225 · Rev 02 · Tested 25 July 2026 · Per IRC:137-2022.

MECHANICAL TEST REPORT GFRP REBAR Ø10 MM

Bhandari Tech Fab

MECHANICAL TEST REPORT	Doc No: F/QA/225
	Rev: 03

TESTING DATE	25 July 2026
PRODUCT NAME	GFRP REBAR
PRODUCT SIZE	Ø 10 MM
TESTED BY:-	Jointly

Sr No.	Test Name	Method of test Ref to	Unit	Specified requirement AS Per IRC- 137 2022	Result	Remarks
1	Cross Section Area	ASTM D 7205	mm²	79 to 94	83.45	OK
2	Fiber Glass Content	IS 18255	%	≥ 75	80.34	OK
3	Density	ASTM D 792	gm/cc	-	2.05	OK
4	Ultimate Tensile Force	ASTM D 7205	Kn	60 min	72.84	OK
5	Tensile Modulus of Elasticity	ASTM D 7205	Gpa	≥ 45	55.55	OK
6	Short Term Water Absorption	ASTM D 570	%	≤0.25	0.23	OK

NOTE :-

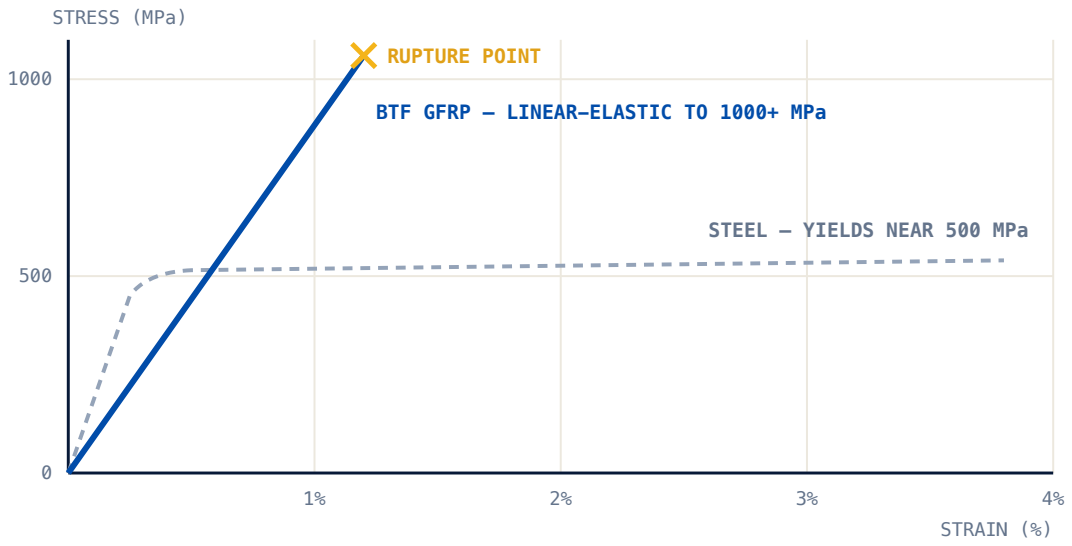
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Mo.: 96382 93829

LAB INCHARGE	QC MANGER	TPI / CLIENT
TESTED BY	VERFIED BY	APPROVED BY

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Tested jointly by **Bhandari Tech Fab LLP, Surat, Gujarat** — Doc No. F/QA/225 · Rev 03 · Tested 25 July 2026 · Per IRC:137-2022.

THE STRESS–STRAIN CURVE



WHAT IT MEANS · 01

NO YIELD POINT

GFRP loads in a straight line all the way to rupture — there is no plastic yielding phase like steel.

WHAT IT MEANS · 02

2X THE PEAK

Ultimate strength exceeds 1000 MPa — roughly double the capacity steel reaches at yield.

WHAT IT MEANS · 03

DESIGN FACTORS

Codes apply strength-reduction and environmental factors so service stresses stay safely below the rupture point.

STRENGTH & STIFFNESS

01 / TENSILE STRENGTH

1000+ MPa

ULTIMATE TENSILE STRENGTH · AT LEAST 2× STEEL

At least twice as strong as steel of the same diameter

BTF GFRP rebar is known for its superior tensile strength — **1000+ MPa** against 500–600 MPa for conventional steel rebar. That capacity lets the bar withstand high pulling forces and raises the load-carrying strength of the structure.

Combined with corrosion immunity, light weight and design versatility, high tensile strength makes BTF GFRP a compelling reinforcement choice for modern construction.



02 / MODULUS OF ELASTICITY

50+ GPa

STEEL: 160–200 GPa

Lower stiffness than steel — an advantage in some applications

The modulus of elasticity (Young's modulus) measures a material's stiffness. For GFRP rebar it is significantly lower than for steel: around **50 GPa** (specified ≥ 50 GPa), compared with 160–200 GPa.

This is often misread as a disadvantage, yet it can work in your favour. In slabs on grade — floors, parking areas, roads and highways — the lower modulus lets the concrete flex more under load, which can help spread stresses more evenly and reduce the risk of cracking. Deflection and crack-width checks still govern the design (see page 12).



03 / SHEAR STRENGTH

150+ MPa

TRANSVERSE SHEAR · BTF SPECIFICATION

Shear capacity depends on fiber orientation

The shear strength of BTF GFRP rebar is strongly influenced by the orientation of the reinforcing fibers within the polymer matrix.

BTF specifies a transverse shear strength of ≥ **150 MPa** and checks it as part of batch testing (see page 18).



DESIGN NOTE

GFRP is linear-elastic up to rupture, so design codes apply strength-reduction and environmental factors. Design to IS 18256 / IRC 137 — never as a one-to-one steel swap.

DURABILITY & CHEMICAL RESISTANCE

04 / DURABILITY

80–100+ YRS

DESIGN SERVICE LIFE

Impressive longevity, even in harsh environments

Corrosion resistance — BTF GFRP rebar is immune to corrosion, even where moisture, chemicals or salt water are present. The structure keeps its integrity over time, cutting the risk of deterioration and the need for costly repairs or maintenance.

Lower dead load — the reduced weight of the bar also lowers the overall dead load on the structure, which is particularly helpful for projects with weight restrictions or seismic considerations.



05 / ALKALINE RESISTANCE

ALKALI

RESISTANT · HIGH-PH CONCRETE

Resistant to a wide range of chemicals, including alkalis

GFRP rebar is made of high-strength glass fibers embedded in a polymer resin matrix, giving it strong resistance to chemicals and alkalis. That makes it well suited to harsh settings such as marine structures and roadways exposed to de-icing salts.

This inherent resistance to chemical and environmental degradation protects long-term structural integrity and reduces repair and maintenance interventions throughout the life of infrastructure projects — a promising way to improve both the performance and the sustainability of base-slab construction.



WHERE IT MATTERS MOST

Marine and coastal works, water and wastewater plants, chemical and ETP facilities, and roads exposed to salts — see applications on page 28.

LONG-TERM LOAD & DEFLECTION

06 / CREEP RUPTURE

100 YRS

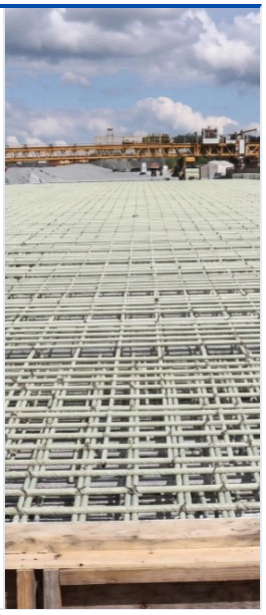
SERVICE LIFE WHEN SUSTAINED LOAD STAYS BELOW 50% OF CAPACITY

Failure under high stress held over a long period

Creep rupture is the failure of a material exposed to high stress for a long time. For GFRP rebar it means rupture of the bar under sustained high tensile stress, and it has been studied for this behaviour.

Creep coefficient —research on RC beams reinforced with GFRP rebar of 900 MPa minimum guaranteed tensile strength found that a 100-year service life can be assured when the sustained load stays below 50% of the bar's maximum tensile capacity.

Long-term performance —creep tests were run under sustained tensile stress equal to 20% and 40% of the bar's ultimate tensile strength for up to 1,670 hours.



07 / DEFLECTION

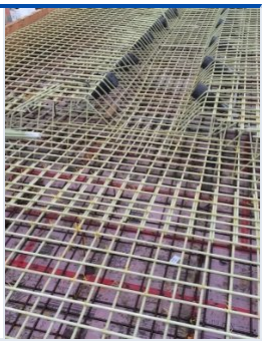
HIGHER

DEFLECTION THAN EQUIVALENT STEEL-REINFORCED UNITS

Design for serviceability first

GFRP bars combine high tensile strength with lower stiffness, so deflections are likely to be higher than in equivalent steel-reinforced members.

Deflection and crack-width checks therefore usually govern the design, not strength — see the design notes on page 12.



RESEARCH FINDINGS

Creep figures are research findings. Actual performance varies with the manufacturing process, environmental conditions and the specific application — always consult a structural engineer for your design.

BOND, CRACKING & HEAT FLOW

08 / BOND BEHAVIOUR

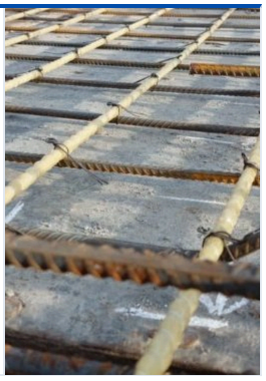
11.5 MPa

AVERAGE BOND STRENGTH · RIBBED BARS

Dependable bond between bar and concrete

Bond behaviour is critical to how a GFRP bar performs inside reinforced concrete. Ribbed GFRP bars have shown a peak bond energy of **89.4 N·mm** and an average bond strength of **11.5 MPa** (BTF specification: ≥ 11 MPa).

Concrete strength and cover — these appear to have only a limited effect on the bond strength of GFRP rebars.



09 / CRACK WIDTH

kb

BOND-DEPENDENT FACTOR

Same method as steel, plus one factor

Crack width is a critical part of how GFRP rebar behaves in reinforced concrete. The calculation for a GFRP-reinforced section is the same as for a steel-reinforced section, with one difference: a bond-dependent factor (**kb**) is included in the GFRP formula.



10 / THERMAL CONDUCTIVITY

LOW

THERMAL CONDUCTIVITY

Less thermal movement, less cracking

GFRP rebar has low thermal conductivity, which reduces the risk of thermal expansion and contraction and limits the potential for cracking and spalling in the base slab.



HOW BOND IS VERIFIED

Bond (pull-out) strength is tested to IS 18255:2023 as part of our batch testing — see Testing & Quality Assurance on page 18.

THERMAL, ELONGATION & FIRE

11 / THERMAL EXPANSION

LOWER

EXPANSION VS STEEL (ABOUT 12 µm/m°C)

Expands and contracts less than steel

Thermal expansion describes how a material grows or shrinks as its temperature changes. GFRP rebar has a lower coefficient of thermal expansion than steel, whose coefficient is around 12 µm/m°C.

This lower movement helps minimise cracking and damage in the surrounding concrete.



12 / ELONGATION

1.5%+

ULTIMATE STRAIN · STEEL ABOUT 25%

Elastic right up to rupture

GFRP rebar shows far less elongation at failure than steel — at least 1.5%, against about 25% for steel. It carries very high tensile force elastically to rupture instead of yielding and stretching, which can be an advantage where limiting deformation matters.

The trade-off is that there is no ductile yield plateau, which is why design codes apply strength-reduction factors (see the stress–strain curve on page 22).



13 / FIRE RESISTANCE

COVER

FIRE ENDURANCE DEPENDS ON COVER AND COOL ANCHORAGES

Concrete cover protects the bar

Bars embedded in concrete are shielded by the concrete cover. Considerable fire endurance can be achieved even with relatively small cover, provided the anchorages of the GFRP bars stay sufficiently cool.

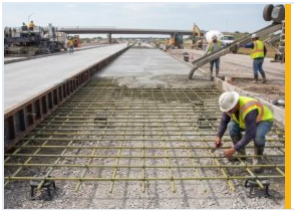
The resin matrix softens at high temperatures, so fire-rated elements must be designed case by case. For project-specific fire performance, contact BTF engineering or consult your structural engineer.



FIRE & HIGH-TEMPERATURE SERVICE

For fire-rated elements or sustained high-temperature service, confirm the design with BTF engineering — see FAQ Q.08 on page 29.

APPLICATIONS OF BTF GFRP REBARS



A·01

RCC ROADS

Rust-free, durable rigid pavements designed to eliminate cracking and extend service life by 50+ years.



A·02

PAVEMENTS & RUNWAYS

Corrosion-immune dowels and tie bars for highways, toll plazas, and heavy airport runway aprons.



A·03

DRAINAGE INFRASTRUCTURE

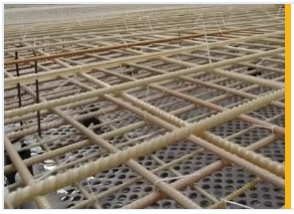
Culverts, storm channels, and roadside drains that withstand continuous moisture without degrading.



A·04

CRASH BARRIERS

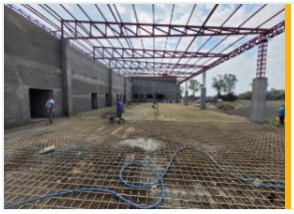
High-impact road safety barriers offering superior energy absorption and zero environmental rust.



A·05

FRICTION SLABS

Heavy-duty railway track slabs and bridge abutments requiring non-magnetic fatigue endurance.



A·06

INDUSTRIAL FLOORINGS

Heavy-duty factory and warehouse slabs resisting forklift traffic, chemical spills, and heavy racking.



A·07

PARKING STRUCTURES

Multilevel parking decks and ramps immune to automotive chemical runoff and moisture ingress.



A·08

CONCRETE SLABS & COLUMNS

High-tensile reinforcement for structural columns, retaining walls, and suspended floor slabs.



A·09

CHEMICAL & ETP PLANTS

Industrial processing units, acid storage bunds, and effluent treatment tanks under extreme chemical exposure.



A·10

WATER & WASTEWATER

Desalination facilities, clarifiers, aeration tanks, and pumping stations with zero chemical degradation.



A·11

DAMS & MARINE STRUCTURES

Coastal breakwaters, jetties, sea walls, and piers permanently exposed to saltwater splash.

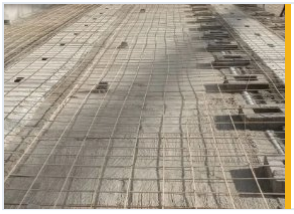
SPECIFICATION ALIGNED

IS 18256 · IRC:137

Engineered for national highways, bridges, and aggressive coastal environments across India.

Where design life matters most, GFRP matters most. Wherever moisture, chlorides, industrial chemicals, or dynamic fatigue attack steel, BTF GFRP removes the failure mode entirely.

APPLICATIONS OF BTF GFRP REBARS



A·12

RCC FLOORINGS NEAR SEA

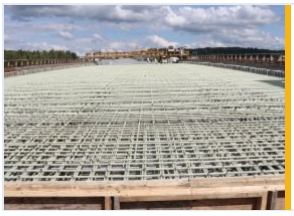
Coastal warehouse slabs and port facilities exposed to high humidity and salt-air ingress.



A·13

HIGHWAY CONSTRUCTION

Expressway corridors, continuous reinforced concrete pavements, and bridge transition zones.



A·14

BRIDGE DECKS

Lightweight, high-strength reinforcement extending bridge deck design life beyond 100 years.



A·15

BARRIER & RETAINING WALLS

Earth retaining walls, highway sound barriers, and perimeter security walls built for impact.



A·16

UNDERGROUND WATER TANKS

Sub-surface reservoirs, raw water storage, and sumps maintaining 100% water purity with zero leaching.



A·17

SWIMMING POOLS

Permanently wet, chlorinated leisure pools and water parks with zero rust staining.



A·18

APPROACH SLABS

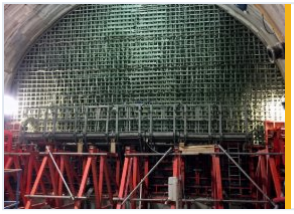
Bridge transition slabs engineered to resist uneven settlement and continuous dynamic wheel impact.



A·19

HOSPITAL MRI AREAS

Non-magnetic, dielectric reinforcement eliminating electromagnetic field interference for diagnostics.



A·20

TUNNELING & TEMPORARY WORKS

TBM soft-eye break-through walls, tunnel precast segments, and temporary underground supports.



A·21

PRECAST CONSTRUCTION

Precast panels, box culverts, and modular architectural units with faster cycles and lower freight.



A·22

BRIDGES & FLYOVERS

Elevated viaducts, flyover piers, ramps, and cantilevers engineered for seismic endurance.

LONG-TERM INTEGRITY

100+ YEARS LIFESPAN

Zero corrosion, zero maintenance, non-magnetic, and 75% lighter than traditional steel.

Where design life matters most, GFRP matters most. Certified against Indian standards to support infrastructure approvals across highways, ports, and urban transit.

FREQUENTLY ASKED QUESTIONS

Q.01

What are BTF GFRP rebars?

Advanced Glass Fiber Reinforced Polymer reinforcement engineered to replace steel — with superior corrosion resistance and 1000+ MPa tensile strength.

Q.02

How much lighter than steel are they?

About 75%. A 10 mm BTF bar weighs 1.60 kg per 12 m length versus 7.40 kg for the equivalent steel bar — transforming handling and freight.

Q.03

Can the bars be bent on site?

No — GFRP is elastic and springs back. Bends, stirrups and hoops are factory-made to your drawings and delivered ready to tie.

Q.04

How do I cut them?

With the same tools as steel: grinder, chop saw, band saw, hacksaw or diamond disc. Clean cuts prevent fiber fray at the ends.

Q.05

Is GFRP covered by Indian codes?

Yes. IS 18256:2023 (specification), IS 18255:2023 (test methods) and IRC:137-2022 (roads & bridges) formally codify GFRP in India.

Q.06

Why is it ideal for corrosive environments?

GFRP is inherently corrosion-resistant — moisture, salt and chemicals that destroy steel simply don't react with it, protecting structure life.

Q.07

Can I swap steel one-to-one?

No — substitution is by tensile capacity and deflection check, not diameter. Use the table on page 11 and confirm with BTF engineering.

Q.08

Where should GFRP not be used?

Where codes require plastic ductility from the bar itself — e.g. certain seismic moment frames — or sustained temperatures beyond the resin's rating. Our team advises case-by-case.

Q.09

How is it delivered and stored?

Straight 12 m bundles (3–25 mm) or coils of 12/50/100 m (3–12 mm). Store on level supports, covered for long outdoor exposure.

Q.10

Does BTF help with design & BOQs?

Yes — substitution tables, lap/anchorage guidance, test certificates and consultant support come standard with every project.

SUSTAINABLE BY DESIGN

LESS ENERGY	LESS FREIGHT	LONGER LIFE	ZERO TOXINS
TO PRODUCE THAN STEEL	75% LIGHTER LOADS	BUILD ONCE, NOT TWICE	SAFE IN STORAGE & USE

GFRP rebar is a **sustainable construction solution** — it requires significantly less energy to produce than steel, and its light weight cuts fuel burned in transport and the labour of every lift on site.

Its corrosion resistance is the bigger story: structures that **don't need repair, rehabilitation or early replacement** save the enormous embodied carbon of doing the work twice. An 80–100+ year service life is the most sustainable specification there is.

As Indian construction embraces greener practices, BTF GFRP is set to play a vital role in resilient infrastructure that prioritises **both performance and environmental responsibility** — one rust-free structure at a time.

THE MISSION, RESTATED

REPLACING STEEL WITH SMARTER STRENGTH. — every project we supply brings the shift one pour closer.

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Bhandari Tech Fab

BHANDARI TECHFAB LLP
GFRP REBAR DIVISION

READY TO BUILD THE FUTURE OF CONSTRUCTION?

Join the engineers, contractors and developers choosing lighter, stronger, corrosion-free structures. Request a quote, a sample bar, or a substitution BOQ for your next project.

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