



GLASS FIBER REINFORCED PLASTIC REBAR FOR CONSTRUCTION

Introducing **TensileX™** GFRP Rebar -
“Redefining Strength, Redefining Construction”

Introduction

Extraco, India established in the year of **2009** is a leading Manufacturer of,

- » GRP/GRV/GRE pipes and Fittings.
- » GRP Horizontal and Vertical tanks. (Chemical tanks and Fuel storage tanks).
- » FRP Water storage tanks, Rainwater harvesting tanks and Septic tanks.
- » GRP Sewerage and Drainage System.
- » GRP Moulded and Pultrusion products.
- » Abrasion resistant Pipes.
- » Transmission Poles and Lighting Poles.

Serving customers and industries throughout the world with a "state-of-the-art factory" located at Tada, Andhra Pradesh, with an advanced plant and machinery encompassing a covered shed area of **75,000 sq. ft** in a total extent of **7.15 Acres**.

Extraco has set a bench-mark in the composites field, producing excellent quality and maintenance free products.

Introducing **TensileX™**: Redefining Strength, Redefining Construction Revolutionizing construction practices, **TensileX™** is a cutting-edge FRP rebar that offers superior strength, durability, and corrosion resistance. Engineered to exceed industry standards, **TensileX™** empowers builders to create stronger, more sustainable structures.

Manufactured in accordance with **IS 18256:2023** and other international standards, **TensileX™** GFRP rebar is approved for use in India by the following organizations:



MoRTH



NHAI



IRC



BIS



Accreditations

Extraco India has been accredited with the following certificates:

- » **ISO 9001:2015** for Design, Manufacturing, Erection and Commissioning of Glass Reinforced Fibre Plastic (GRP), Glass Fibre Reinforced Epoxy (GRE), Glass Fibre Reinforced Vinylester (GRV) Pipes and Fittings, GRP/FRP Storage Tanks for Chemical, Fuel and Water and other GRP/FRP Specialty Products.
- » **AWWA C950** certificate for GRP pipes and Fittings (TUV).
- » **PESO certificate** for FRP Underground Fuel storage tanks (Single Wall and Double Wall).
- » **UL 3rd Edition** approval for FRP Underground Fuel storage Tanks.



Our Quality Policy

We are committed to delivering high-quality composite products and services that exceed customer expectations. We achieve this through:

- » **Continuous Improvement:** Constantly striving to enhance our processes and products.
- » **Customer Focus:** Understanding and meeting the specific needs of our clients.
- » **Defect-Free Products:** Delivering products without defects, on time, every time.
- » **Employee Empowerment:** Involving our employees in quality initiatives.
- » **Technological Advancement:** Investing in advanced technologies to improve efficiency and quality.
- » **Regulatory Compliance:** Adhering to all applicable legal and regulatory requirements.

History of Rebar

- » In the 1970s, researchers began experimenting with FRP as a replacement for steel rebar in reinforced concrete. Glass fibers (GFRP) were among the first types used due to their relatively low cost and corrosion resistance.
- » Early projects demonstrated the potential of GFRP Rebar in environments with high exposure to chlorides, such as coastal infrastructure and bridges.
- » By the 1990s, GFRP Rebar had moved from experimental use to commercial availability.
- » Companies began producing standardized GFRP Rebar for specific applications, such as bridge decks, seawalls, and parking structures.
- » International research and development led to improvements in manufacturing processes, such as pultrusion, which enabled the efficient production of high-quality GFRP Rebar.

GFRP Rebar



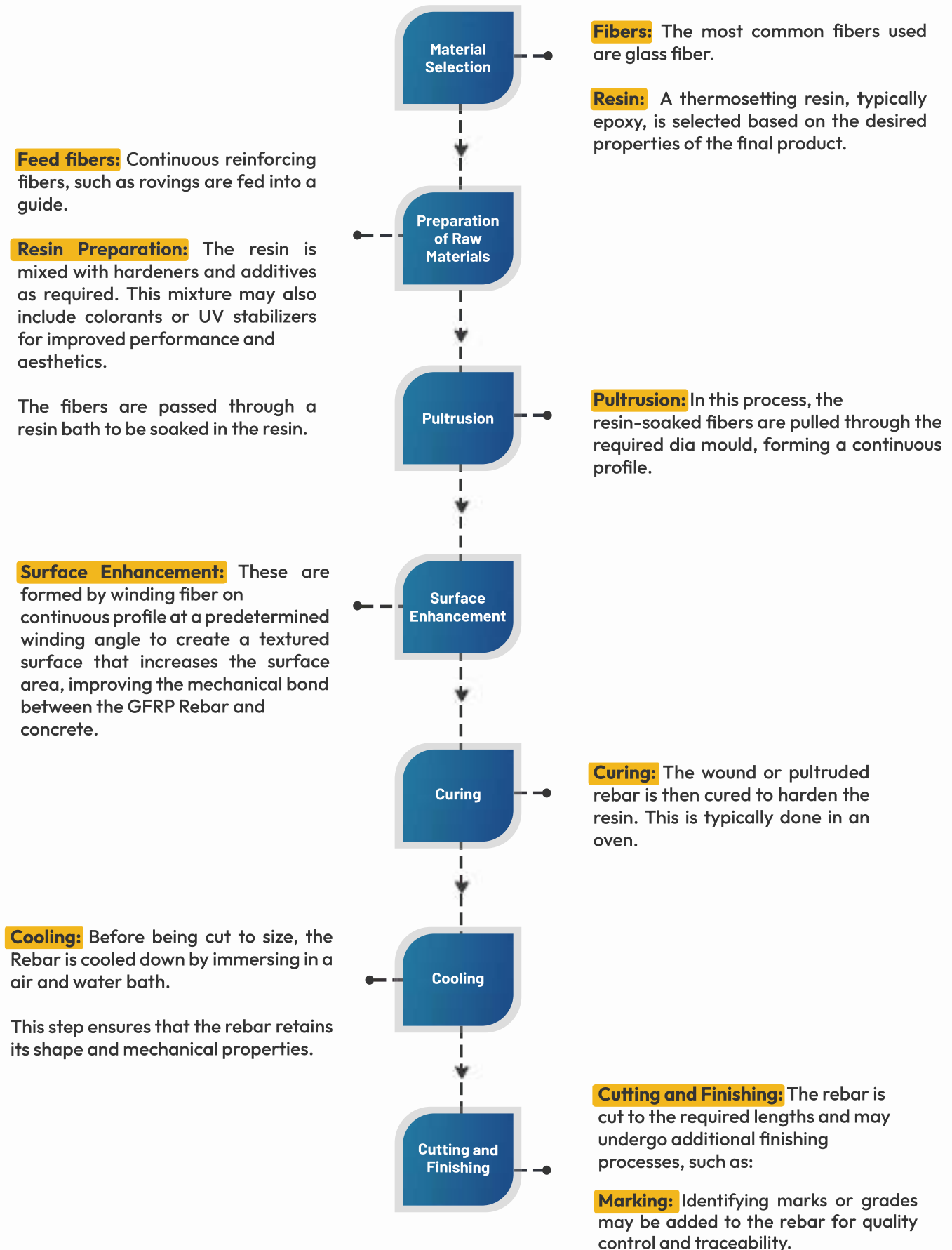
Sizes

TensileX™ fiberglass rebars are supplied in the following forms:

- » **Ø 4 – 32 mm:** 12 meters long rebars or at customer's request.
- » **Ø 4 – 12 mm:** coils of up to 100 meters.
- » Due to the properties of fiberglass rebar, it can be twisted into coils without loss of strength and quality. The coils can be packed using packing tape, plastic wrap or cable ties.

Manufacturing Process

The manufacturing process of GFRP Rebar involves several key steps



Advantages of Rebar



1

Corrosion Resistance

GFRP Rebars do not corrode, offering long-term durability in harsh environments.



6

Low Thermal Expansion

GFRP Rebars have minimal thermal expansion, reducing the risk of cracking in concrete structures.



2

High Strength-to-Weight Ratio

Despite being lightweight, GFRP Rebars provide high tensile strength, enhancing structural integrity.



7

Reduced Environmental Impact

GFRP Rebars have a lower environmental footprint compared to traditional steel rebars.



3

Chemical Resistance

GFRP Rebars resist a wide range of chemicals, making them ideal for corrosive environments.



8

Reduced Maintenance Costs

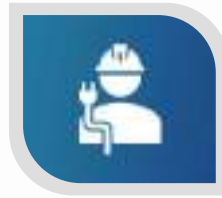
The durability of GFRP Rebars reduces the need for maintenance and repair over time.



4

Non-Magnetic

GFRP Rebars are non-magnetic, making them suitable for use in sensitive environments such as MRI rooms.



9

Non-Conductive

GFRP Rebars are non-conductive, eliminating the risk of electrical conductivity in structures.



5

Long Service Life

GFRP Rebars offer extended service life due to their resistance to corrosion and environmental degradation.

Comparison of Steel VS GFRP Rebar

STEEL	GFRP REBAR	ADVANTAGES OF GFRP REBAR OVER STEEL
Conductive	Non Conductive	0X Conductive
If the diameter of an GFRP Rebar is 6mm, the equivalent diameter for a steel TMT bar would typically be around 8mm.	For an 8mm steel TMT bar, the equivalent diameter for GFRP would typically be around 6mm. Based on its tensile strength.	3 / 4 X Diameter (based on its strength)
Costlier	Cheaper	50% Cheaper
Tensile Strength is 390Mpa	Tensile Strength is 1200Mpa	3 X Stronger
Density of Steel is 7860 Kg/m ³	Density of GFRP Rebar is 2000 Kg/m ³	4 X Lighter
Steel Rods are susceptible to corrosion when exposed to moisture.	GFRP Rebar are inherently corrosion-resistant, making them ideal for use in environments prone to corrosion.	5X Rust Free

Comparison of Weight (Steel VS GFRP Rebar)

The equal strength diameter means the outer diameter of fiber glass rebar the strength parameter of which corresponds with same of steel rebar of the same diameter

Steel rebar, class A-III (A400C)		GFRP Rebar	
Dynamic diameter (mm)	Weight 1 m / kg	Outer diameter (mm)	Weight 1 m / kg
Ø6	0.222	Ø5	0.030
Ø8	0.395	Ø6	0.051
Ø10	0.617	Ø7	0.066
Ø12	0.888	Ø8	0.084
Ø14	1.210	Ø10	0.137
Ø16	1.580	Ø12	0.202
Ø18	2.000	Ø14	0.256
Ø20	2.470	Ø16	0.360
Ø22	2.980	Ø18	0.544
Ø25	3.850	Ø19	0.595
Ø28	4.830	Ø20	0.620
Ø32	6.310	Ø22	0.644
Ø36	7.990	Ø24	0.804
Ø40	9.870	Ø28	1.100



Steel TMT Rod Vs GFRP Rebar



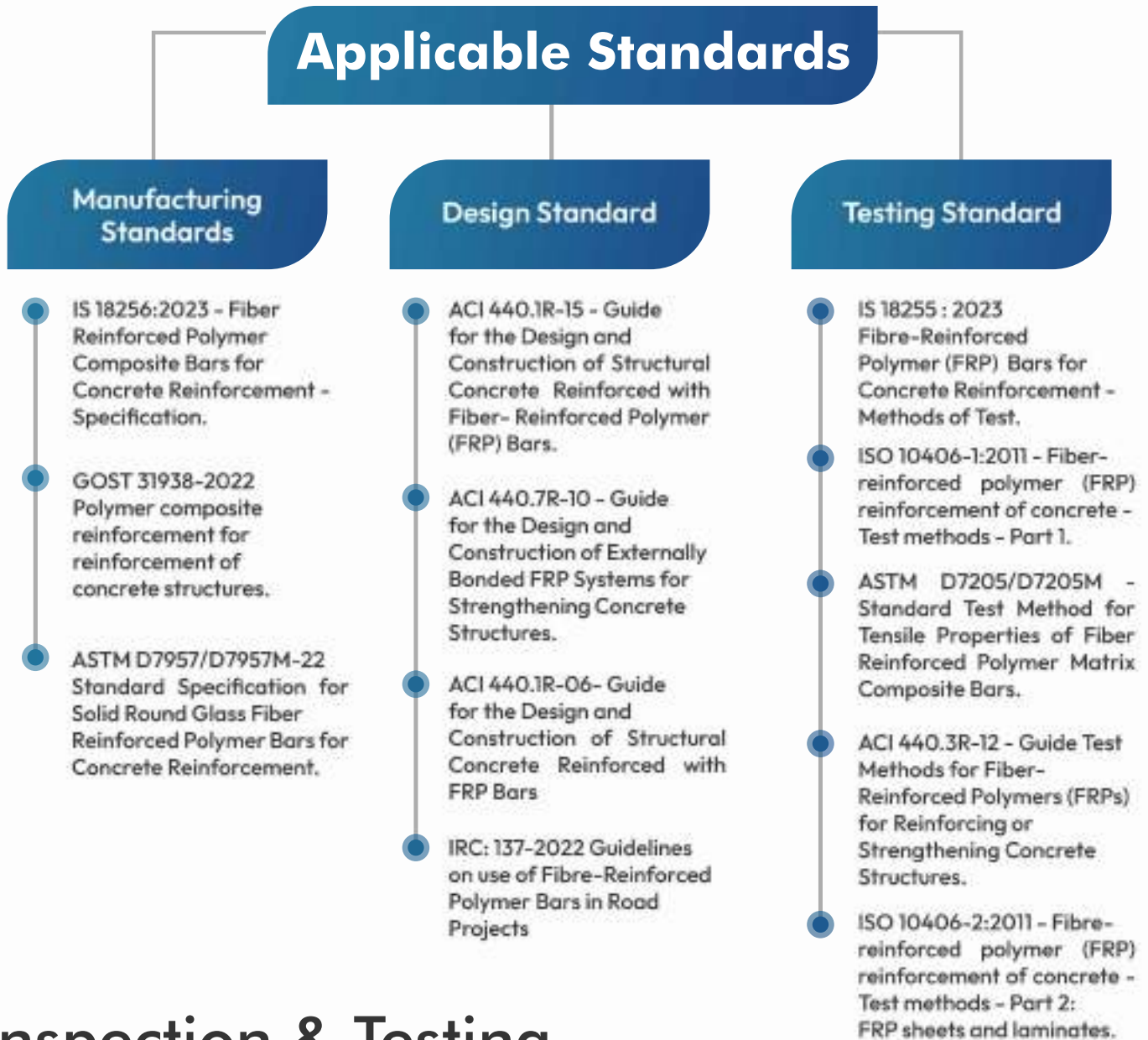
Comparison of Properties (Steel VS GFRP Rebar)

Characteristics	Steel Rebar, class A-III (A400C)	GFRP Rebar
Material	Steel	Glass roving bonded with epoxy resin-based polymer
Maximum tensile strength, MPa	390	1200
Modulus of elongation, %	14	2.3
Thermal conductivity coefficient, Watt/(m * °C)	46	0.35
Elastic modulus, MPa	2,00,000	50,000
Coefficient of expansion, $\alpha \times 10^{-5}/^{\circ}\text{C}$	13 - 15	9 - 12
Density, t/m ³	7.8	1.9
Length	Bars 6 - 12 m long	According to the customer's request
Durability	According to the building regulation	Estimated durability at least 80 years
Minimum operating temperature, °C	-40	-50
Maximum operating temperature, °C	350	60 to 80
Maximum strength in compression, MPa	350	300

Comparison of Strength (Steel VS GFRP Rebar)

Steel rebar, class A-III (A400C)			FRP Rebar			
Dynamic diameter	Cross-section	Tensile strength	Outer diameter as per TS	Nominal diameter	Cross-section	Tensile strength
mm	mm ²	N	mm	mm	mm ²	N
Ø4	12.6	4914	Ø4	3.2	8	8800
Ø5	19.6	7644	Ø5	4.2	13.8	15180
Ø6	28.3	11037	Ø6	5.2	21.2	23320
-	-	-	Ø7	6.2	30.2	33220
Ø8	50.3	19617	Ø8	7.2	40.7	44770
-	-	-	Ø9	8.2	52.8	58080
Ø10	78.5	30615	Ø10	9.2	66.4	73040
-	-	-	Ø11	9.5	70.8	77930
Ø12	113.1	44109	Ø12	10.5	86.5	95200
-	-	-	Ø13	11.5	103.8	114197
Ø14	154	60060	Ø14	12.5	122.7	134921
-	-	-	Ø15	13.5	143.1	157372
Ø16	201	78390	Ø16	14.5	165	181550
-	-	-	Ø17	15.5	188.6	207455
Ø18	254	99060	Ø18	16.5	213.7	235087
-	-	-	Ø19	17.5	240.4	264446
Ø20	314	122460	Ø20	18.5	268.7	295532
-	-	-	Ø21	19.5	297	326662
Ø22	380	148200	Ø22	20.5	329.9	362885
-	-	-	Ø23	21.5	362.9	399152
-	-	-	Ø24	22.5	397.4	437146
Ø25	491	191490	Ø25	23.5	433.5	476867
-	-	-	Ø26	24.5	471.2	518315
-	-	-	Ø27	25.5	510.4	561490
Ø28	616	240240	Ø28	26.5	551.3	606392
-	-	-	Ø29	27.5	593.7	653021
-	-	-	Ø30	28.5	637.6	701377
-	-	-	Ø31	29.5	683.1	751460
Ø32	801	312390	Ø32	30.5	730.2	803270
-	-	-	Ø33	31.5	778.9	856807
-	-	-	Ø34	32.5	829.2	912071
-	-	-	Ø35	33.5	878.3	966170
Ø36	1018	397020	Ø36	34.5	934.3	1027781
-	-	-	Ø37	35.5	989.3	1088226
-	-	-	Ø38	36.5	1045.8	1150398
-	-	-	Ø39	37.5	1103.9	1214297
Ø40	1257	490230	Ø40	38.5	1163.6	1279923

Applicable Standards



Inspection & Testing

PROPERTY	REQUIREMENT	STANDARD
Glass Fibre content (Mass Fraction)	≥ 75 percent	IS 18255
Glass transition temperature (T _g)	≥ 100 °C	IS 18255
Degree of cure	≥ 95 percent	IS 18255
Measured cross-sectional area	As per Table 1	IS 18255
Ultimate tensile force	As per Table 1	IS 18255
Tensile modulus of elasticity	≥ 45 GPa	IS 18255
Ultimate tensile strain	≥ 1.1 percent	IS 18255
Moisture absorption (Short term)	≤ 0.25 percent	IS 18255

Application Areas (GFRP Rebar)



Industrial Floors

(Shopping & Office Centers, Warehouses, Logistics Shops, Factories, Industrial Buildings).



Hydraulic Structures

(Dams, Piles, Shafts, Water Channels, Bank Reinforcement).



Reinforcement of Foundations, Floors, Walls In Low-Rise Construction (Up To 3 Floors).



Military, Chemical and Protective Structures.



Underground and Surface Multi-Level Parking Areas.



Bridges, Footpaths, Paving Slabs.



Cement-Concrete Roads, Runways.



Agriculture (Agro-Industrial Facilities).



Bridges, Tunnels, Metro, Railway Construction.



Hospitals.

Bent Elements

Blending the strength of Glass fibers with the versatility of polymer, GFRP bent elements hold significant promise in construction. Expertly crafted, they integrate smoothly into a variety of architectural contexts, pushing past traditional boundaries. Capable of adapting to complex designs, these elements enhance structural strength and durability while fostering creative expression.

The blend of engineering and artistry in GFRP bent elements marks a new era in architectural innovation and construction techniques.

Bent bars of round cross section, consisting of many continuous glass fibers arranged in the longitudinal direction and impregnated with a thermosetting polymer binder (resin). The outer layer of the elements has periodic ribs (winding).



Size

Composite bent elements are O-shaped, U-shaped & L-shaped rebars of standard sizes (Ø4-16 mm). All products are made to order in accordance with the drawings / technical specifications from the customer, where accurate measurements and lengths are stated.

Benefits of using GFRP Bent Elements

The use of bent elements allows a better distribution of tensile and deformation loads, making the frame integral and therefore more durable, which positively affects the strength of the reinforced concrete product.

Advantages of Bent GFRP Elements

- » **Cost Savings in Overlapping**
Unlike traditional TMT bars, GFRP elements do not require overlapping, which reduces material and labor
- » **Minimized Rebar Waste**
GFRP bent elements are custom-made to precise dimensions, reducing waste and minimizing rebar scraps during construction.
- » **Superior Strength**
Glass Fiber Reinforced Polymer (GFRP) offers superior strength compared to steel in specific applications, due to its advanced composition and mechanical properties.
- » **Rust Resistance**
GFRP is inherently rust-proof, ensuring a longer lifespan and reducing the need for maintenance over time.
- » **High Chemical Resistance**
GFRP resists chemical corrosion, making it an excellent choice for structures exposed to harsh chemical environments, including marine and industrial applications.
- » **Ideal for Tunnel Construction**
The non-conductive and corrosion-resistant properties of GFRP make it particularly suitable for tunnel construction, where these characteristics are essential for safety and durability.

Application Areas (Bent Elements)

Bent composite (fiberglass) elements are used in construction to create three-dimensional reinforcement frames.

The use of bent elements is necessary to strengthen the corner and end sections of structures, at the interfacing points of the responsible elements (beams with walls, piles with the upper part of the foundation, foundation elements, etc.).

Composite bent elements are also used:



To create a rigidity frame in foundations, beams and floors.



To create vertical columns and walls.



To bundle a foundation at corners.



To bundle a base and slab.



To form column frames.



To manufacture long-length concrete products (pillars, piles).

Case Studies

- » **Road construction** (reinforcement of roads and roadbed; cement-concrete roads, airport runways, railway construction).
- » **Transport facilities** (construction of bridges, tunnels, metro, gas stations, underground and surface multi-level parking areas).
- » **Infrastructure facilities** (pavements, footpaths, paving slabs).
- » **Military, chemical and protective facilities.**



Highway in Zelika, Belgium.



Regional highway, Poland.



Heavy duty road, Russia.



Treatment facilities, Russia.



Bridge, Poland.



Gas station, Russia.



Pumping station, Russia.



Metro, Russia.



Railways, Belgium.



Driveways, Thailand.



Parking lot, Paraguay.



Road, Israel.

Storage & Transportation



- » Rebar is stored horizontally on racks or specially designated storage areas.
- » When storing GFRP rebar for a long time it is necessary to protect it from ultraviolet exposure.
- » For cutting of bars, it is recommended to use angle grinder to get non-damaged and non-deformed cut of the bar.
- » To bind the bars together you can use both the binding wire and plastic clamps/clips.

DIAMETER	TYPE OF PACKING	LENGTH OF BAR	QTY OF REBARS IN A PACK	METERS IN A COIL
4mm	Straight bar/coil	12 Meters	50	12/50/100 meters
6mm	Straight bar/coil	12 Meters	50	12/50/100 meters
8mm	Straight bar/coil	12 Meters	25	12/50/100 meters
10mm	Straight bar/coil	12 Meters	15	12/50/100 meters
12mm	Straight bar/coil	12 Meters	15	12/50/100 meters
14mm	Straight bar	12 Meters	5	-
16mm	Straight bar	12 Meters	5	-
18mm	Straight bar	12 Meters	5	-
20mm	Straight bar	12 Meters	5	-
22mm	Straight bar	12 Meters	5	-
24mm	Straight bar	12 Meters	5	-
26mm	Straight bar	12 Meters	5	-
28mm	Straight bar	12 Meters	5	-
30mm	Straight bar	12 Meters	5	-
32mm	Straight bar	12 Meters	5	-

CONTACT US



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