

JIANGSU CHEMLEAD NEW MATERIAL CO. , LTD.

FRP REBAR

Product Manual

BROCHURE

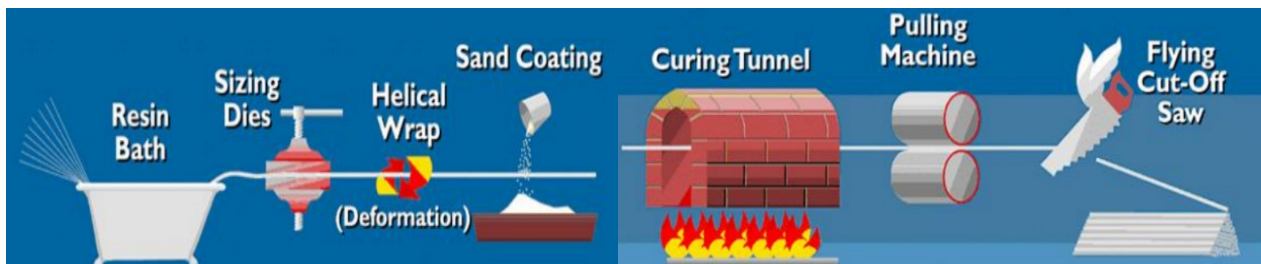
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Introduction of Fiber Reinforced Polymer

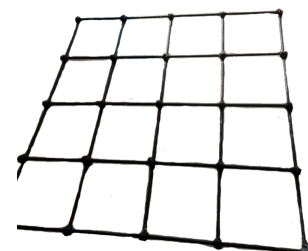
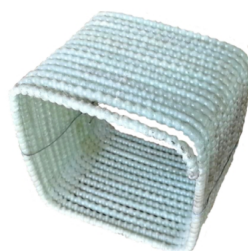
FRP(Short of Fiber Reinforced Polymer) is a kind of composite material mad through the composite process with polymer resin as the matrix such as glass/basalt fiber or carbon fiber as the reinforcement. It has the advantage of high tensile strength, low weight , corrosion resistance and non-conductive than the steel.

Production Process

Glass fiber reinforced polymer rebar (GFRP) is made from high technical performance resin (UP/VE/EP/PU) and glass fiber by pultrusion process.



Products



Technical Information

GFRP REBAR--Performance Parameter																
E-Modulus (GPa)									40-60 GPa							
Fiber Content (%)									70%-80%							
Shear Strength (MPa)									≥150							
Approx. Density (g/cm ³)									1.8-2.1							
Dia. (mm)	4	6	8	10	12	14	16	18	20	22	25	28	30	32	34	36
Approx. Weight (g/m)	25	55	100	160	230	300	385	490	590	710	930	1160	1280	1520	1700	1860
CSA (mm ²)	12.5	26.8	47.7	78.5	113	154	185	234	289	342	442	554	636	804	908	1017
Tensile Strength (Mpa)	1150	1100	1050	980	870	764	752	744	716	695	675	658	637	626	615	603
Ultimate Tension (KN)		31	53	72	99	117	149	189	225	270	342	405	450	504	550	592

Compare with Steel

- .Light Weight
- .High Tensile Strength
- .Corrosion Resistance
- .Anti-static Conditioning
- .Excellent cuttability
- .No-conductive(electric, thermal)
- .Flame Resistance
- .Continuous threaded profile
- .Flexibility
- .No electrical conductivity
- .Wide range of various dimensions

Standard

National Standard

CJJ-T192-2012 盾构可切削混凝土配筋技术规程
JGT 406-2013 土木工程用玻璃纤维增强筋
GB 50608-2010 《纤维增强复合材料建设工程应用技术规范》

International Standard

ACI440-3R
ASTM
CSA807
ISO10406

Application Area

Circular Diaphragm Wall
Costal Engineering
Slab such as Floor, Road & Bridge
Tramcar Station
Sandwich Wall

1、GFRP Rebar for Metro

Introduction of Circular Diaphragm Wall






The construction of the subway station always should be a deep foundation pit project, which needs to be constructed with a retaining wall. Then construction technology of underground continuous wall and retaining wall were widely used for temporary protection.

In the shield launching shaft and receiving shaft area of station, because the performance of glass fiber reinforcement is roughly the same as the shrinkage coefficient of concrete, and it can bond with concrete well, it has lower shear strength and higher tensile strength, and can be broken by shield machine grinding and cutter head. Therefore, it is possible to replace ordinary steel bars with glass fiber reinforcement in the shielding structure of the subway shield shaft, reducing manual cutting and removing the supporting piles within the shield range, greatly reducing the cutting loss of the shield cutter head, and improving the shielding efficiency. The efficiency of the tunnel and exit not only effectively improves the safety of subway construction, but also achieves a significant increase in economic benefits. In addition, the glass fiber reinforcement machine is simple and convenient, the construction process is simplified, and the operation is extremely convenient.

Suitable Size of Straight Bar:

No.	1	2	3	4	5	6	7	8	9	10	11
Diameter	Φ10	Φ12	Φ14	Φ16	Φ18	Φ20	Φ22	Φ25	Φ28	Φ32	Φ34
Weight (g/m)	160	230	300	400	490	590	710	930	1160	1520	1700

Suitable Type of Bending Bar:

No.	1	2	3	4	5
	Reinforcing Rib	Spiral Bar	Sealing Bar	Hook Bar	Triangular Bar
Sample					

Brief Description of Soft-Eye:



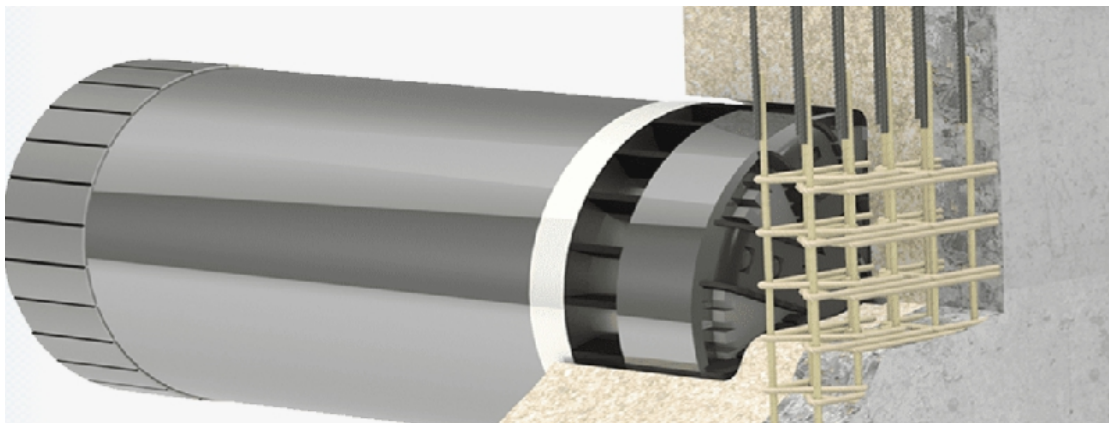
Note:

- ① Bounding should be adopted when connecting steel bars and glass fiber bars or connecting glass fiber bars of different sizes;
- ② Because the size of the glass fiber ribs cannot be changed at will and can only be processed once, when processing and maintaining the structural glass fiber rib cage, the cross-sectional area and size of the glass fiber ribs should be accurately grasped.
- ③ Glass fiber bars should be used as erecting bars instead of compression bars.
- ④ Ensure that the surface of the glass fiber tendons are wound to increase the adhesion between the concrete and the glass fiber tendons.
- ⑤ The concrete and glass fiber reinforcement should be lapped strictly in accordance with the design drawings, and the glass fiber reinforcement and glass fiber reinforcement should be lapped according to 40d.
- ⑥ Ensure that the glass fiber content in the glass fiber tendons is within the range of 70-80%, and that the glass fiber must be an alkali-free glass fiber roving.
- ⑦ Because the glass fiber bar is made of thermosetting resin, its shape will not change after it is shaped. Although it will be deformed to a certain extent under the influence of external force, it will immediately return to its original shape after unloading. Therefore, no modulation equipment such as a steel bar straightening machine is required.
- ⑧ Ensure that the glass fiber tendons are intact, and it is strictly forbidden to cause scars, cracks and fiber exposure to avoid deviations due to surface defects.

Project Case

1. Project Name: General Contracting Project of Guangzhou Rail Transit Line 10 and Simultaneous Implementation (No. 1 Work Area)

Project Overview: Guangsteel New Town Station is located in the southern industrial area of Guangsteel New Town planned in Fangcun area, at the intersection of two roads. Guangzhou Iron and Steel New Town Station Dongsha Station, Xilong Station, and Foshan Line 11 are arranged in the north-south direction. Use glass fiber reinforcement at the entrance of the shield tunnel.



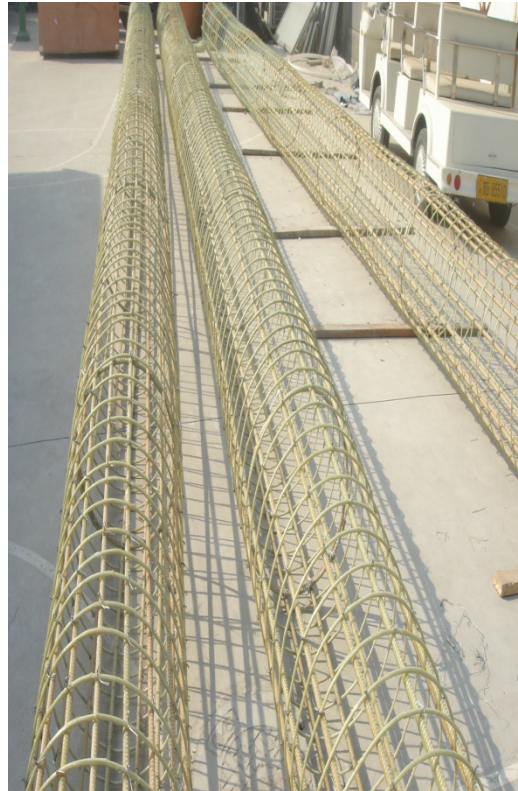
2. Project Name: The Fourth Civil Engineering Project of Chengdu Rail Transit Line 17 Phase II Project

Project Overview: The Civil Engineering Section 4 of the second phase project of Chengdu Rail Transit Line 17 starts at the north end of Renmin Park Station and ends at the west end of Beimen Bridge Station. The work content is "2 stations and 2 sections", namely, Xijiedajie Station, Beimen Bridge Station (reconstruction of Shahe River Flood Drainage Canal), People's Park Station-Xidajie Station, Xidajie Station-Beimen Bridge Station, and Northwest Section well. Xidajie Station is an underground three-story 14m island platform station with a length of 395.7m, a total width of 23.9m in the standard section, and a buried depth of about 25.58m in the track surface. It is constructed by half-cover excavation. Beimen Bridge Station is an underground two-story 12m island platform with a station length of 244.1m, a standard section total width of 21.3m, and a buried depth of about 22.3m on the track surface. The half-cover method is adopted for construction. The total length of the left line of the section line is 3913.231m, the total length of the right line is 3839.238m, and the total length of the whole line is 7752.469m. It is a double-hole circular tunnel with an outer diameter of 8.3m for a single-hole tunnel. It is constructed by the shield method. The main ancillary works include 12 shield tunnels, 2 connecting passages and pump rooms, 5 connecting horizontal passages, and 1 air shaft and connecting passage.



3. Project Name: Chengdu Rail Transit Line 19 Phase Two Phase One

Project Overview: The second phase of Chengdu Rail Transit Line 19 starts from Jiujiang North Station (not included) to Hejiang Station (reserved). The line is about 43.17km long, all of which are underground lines. There are 12 stations, 1 parking lot, and 2 main substations.



2、GFRP Rebar for Costal Engineering

Introduction

In marine engineering, reinforced concrete structures often cause steel corrosion, structural failure, and reorganization due to the intrusion of chloride ions. Because of its good performance, FRP tendons are considered to be the most effective material to replace steel in marine engineering.

Chemlead has studied the mechanical properties of GFRP bar material after corrosion in 60°C and 40°C water, acid, seawater, alkali, alkali+seawater and other five solutions through laboratory simulation. The results show that it has an impact on the corrosion resistance of GFRP bar. The most serious is the alkali+seawater solution, but the tensile strength of GFRP tendons does not drop more than 30%, and the elastic modulus does not change more than 12%, showing good corrosion resistance. On this basis, the GFRP bar has been tested for its resistance to dry and wet cycles for 4 cycles. The test shows that the GFRP bar has good resistance to dry and wet cycles. The microscopic morphology of GFRP bars after corrosion was observed by SEM, and it was analyzed that the intrusion of moisture and OH⁻ was an important factor that caused the decline of the mechanical properties of GFRP bars.

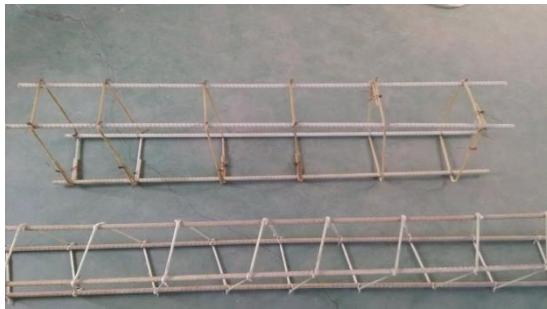

In order to simulate the actual environment of GFRP bars in the project, through self-made invention patents, the durability research of GFRP bars under the action of corrosive environment/stress was carried out, which filled the gaps in this research in China. The test results show that the tensile strength of GFRP bars has a small attenuation under this condition, and the tensile strength does not decrease by more than 11% under the 15% stress condition and the corrosive liquid for 1000h.

The test results meet the Canadian ISIS certification system's requirements for the durability of GFRP bar D1. Combining the Canadian ISIS system and the model proposed by Micelli in the United States, it is inferred that the service life of the GFRP bar exceeds 60 years. Based on the test data and the Arrhenius equation, curve fitting and calculation are carried out, and it is predicted that the life of the GFRP bars selected for this project in the coastal area of Jiangsu will exceed 50 years, which can meet the actual needs of marine reclamation projects.

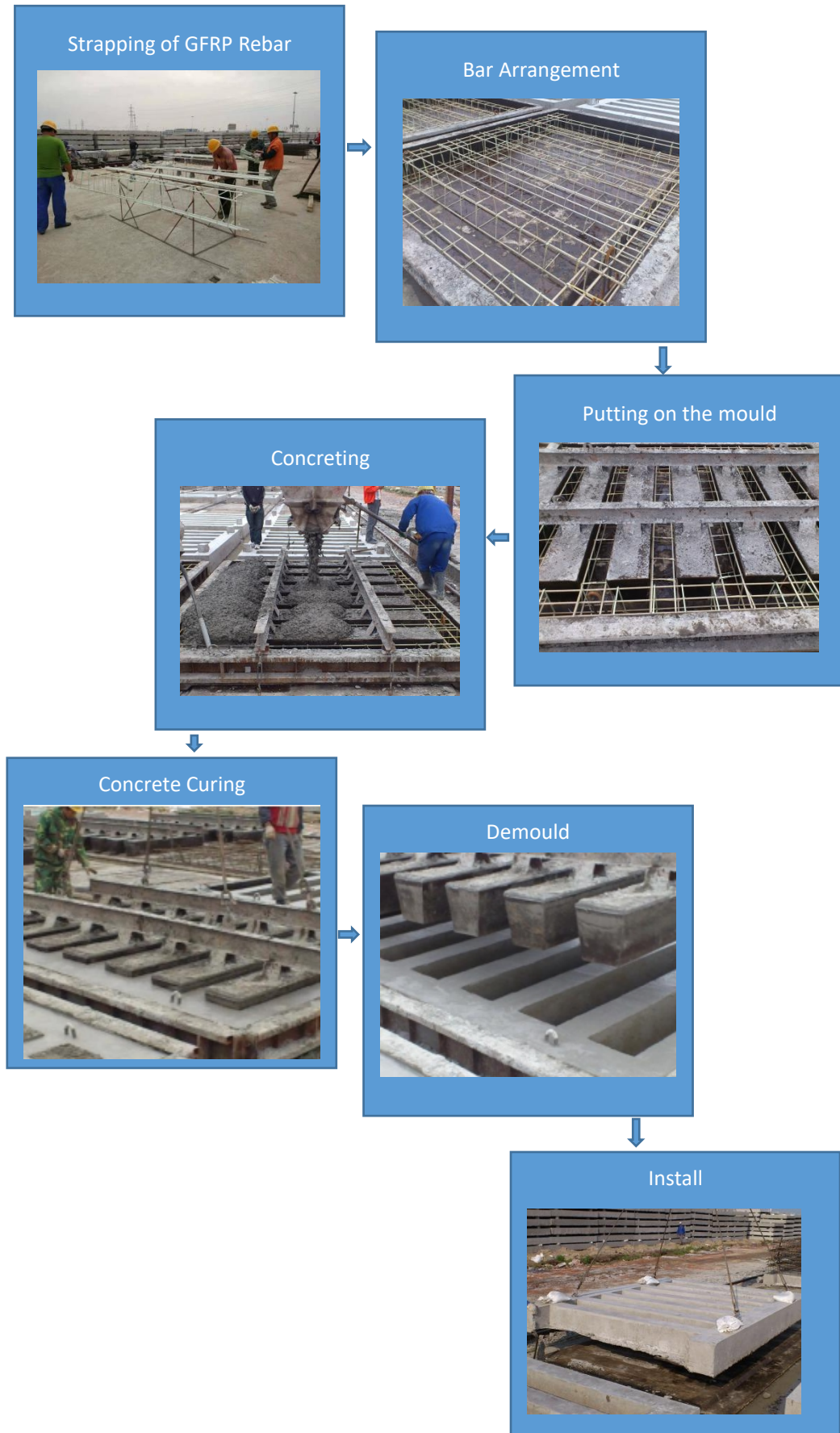
Suitable Size of Straight Bar:

Diameter	Φ6	Φ8	Φ10	Φ12	Φ14	Φ16	Φ18	Φ20
Weight (g/m)	50	100	160	230	300	400	490	590

Suitable Type of Bending Bar

	Stirrup Bar	
Sample		

Brief Description of Construction:



Project Case

Project name: The first phase project of Dongtai Tiaozi Nikuang Wai (wave retaining wall)

Project overview: Reinforced concrete structures in marine engineering often cause steel corrosion and structural failure due to the intrusion of chloride ions. In recent years, GFRP bars have attracted widespread attention from scientific researchers due to their good performance and are considered to replace steel bars in marine engineering. The most effective material.

The main problem that causes the failure of concrete structure in marine reclamation projects is the corrosion damage of steel bars caused by the infiltration of chloride ions. For a long time, researchers have used methods such as adding rust inhibitors and cathodic protection to solve the problem of steel corrosion. After the 1960s, with people's in-depth research on fiber reinforced plastic (FRP) reinforcement, scholars at home and abroad generally believe that the use of this new type of polymer material is the most effective way to solve the corrosion of steel bars.

There is a serious shortage of sand and stone materials in the coastal areas of Jiangsu, and it is difficult to guarantee the supply of building materials required for large-scale reclamation projects. The outsourcing of river sand, stones and stone materials requires high transportation costs and difficult lifting. It is urgently needed through scientific research, utilization of local resources, and research and development. High-durability marine materials to ensure the smooth implementation of coastal development projects.



Project Name: Rizhao Taohuadao Fishery Co., Ltd. Artificial Reef Construction Project

Project overview: According to the ocean dynamics and geographical location characteristics of the eastern sea area of Taohua Island in the Shanhaitian Tourist Resort of Rizhao City, 12 units were selected to construct 12 units of square steel concrete integral components in the sea area of 67.6809 hectares. For artificial reefs, the unit artificial reefs have a vertical spacing of about 100m and a horizontal spacing of about 100m. The design size of each unit artificial reef is 92m×70m. The 352 triangular steel-concrete integral components in the unit artificial reef are divided into 22 groups and arranged evenly around each unit reef. The 11,000m³ stones are divided into two piles in the middle of each unit reef. The distance between the individual reefs is not less than 5 m, and the reef throwing gauge is 27392m³.

Features: Use the corrosion resistance of glass fiber instead of steel bars to pour concrete and prolong the service life of artificial reefs



3、GFRP Rebar for Wharf

Fiber-reinforced composite material ribs have the characteristics of high tensile strength, strong corrosion resistance, strong magnetic wave permeability, and strong designability. In the Yangshan Port automated wharf, used for road reinforcement in the area of AGV automatic transport vehicles

Project Case

project name: Shanghai Yangshan Port Automated Wharf Project

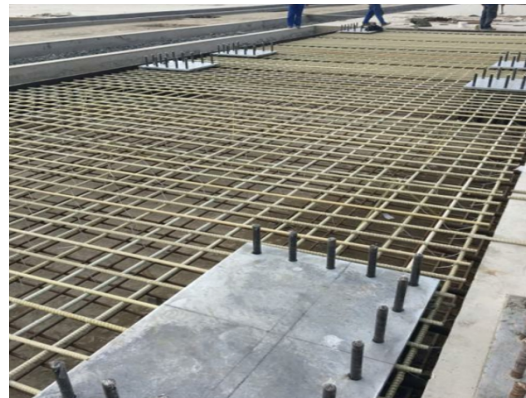
Project Overview: The Shanghai Yangshan deep-water port area, located outside the mouth of Hangzhou Bay, is composed of dozens of islands such as Dayangshan and Xiaoyangshan. It is China's first port to be built on an island. Yangshan Port is about 32 kilometers northwest of Shanghai Nanhui Luxhao Port, and about 90 kilometers south of Ningbo Beilun Port. It is only 45 nautical miles away from international routes. It is the closest deep-water port to Shanghai and has become the new coordinate of Shanghai International Shipping Center.

Yangshan Gangshan Phase IV has a total land area of 2.23 million square meters, and most of the natural water depth in front of the terminal is 11 to 15 meters. In the fourth phase of Yangshan, a total of 7 container berths will be built, and the total shoreline of the container terminal will be 2,350 meters. The designed annual passing capacity will be 4 million TEUs at the initial stage and 6.3 million TEUs in the long term. Looking at the world, it is unprecedented for such a large-scale automated terminal to be completed and put into operation at one time.

After the container ship docks, the automated loading and unloading bridge crane lifts the container to the transfer platform, and then is hoisted to the automated guided vehicle by another quayside trolley. Set the line to drive to the designated box area, then lift the container to the guide car support, and finally hoist the container to the box area by the automated rail hoist. The entire loading and unloading process is unmanned operation, and the manager can monitor the whole process in the central control tower.

Compared with the previous traditional container terminals, the biggest difference between the Yangshan Phase IV automated terminal is the innovation of the loading and unloading technology, which also brings new issues to the civil construction. The terminal needs a lot of magnetic nails to locate the automated trolley. If conventional steel bars are used to cast the concrete structure, there will be interference. The China Communications Third Shipping Bureau design uses glass fiber reinforcement to replace the steel bars, basically without interference.

In addition, the project also widely used products such as composite guardrails, power transmission rods, etc., which effectively avoided the impact of steel corrosion on the project life.



4、 GFRP Rebar for Road & Bridge

Advanced composite materials have shown great potential in the civil field, especially in highway infrastructure. Fiber-reinforced polymer (FRP) building materials are lightweight, easy to install, and have a high strength-to-weight ratio and durability. It can be customized according to the required properties: size, strength, stiffness and overall structure.

Considering the demand for more sustainable building materials, FRP building materials continue to grow, because FRP is an ideal material for repairing degraded and poorly performing concrete infrastructure. . Fiberglass composite materials enhance the strength and performance of existing highway infrastructure in harsh environments, which may be the primary reason for the deterioration of the original structure.

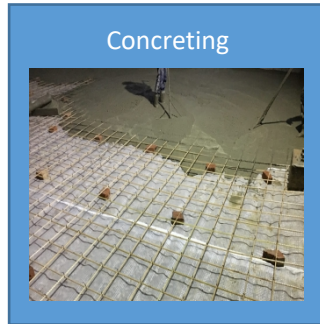
The following are some of the advantages of using FRP in the construction/repair of highways and other concrete infrastructure:

- High strength to weight ratio
- Excellent fatigue resistance
- Corrosion resistance
- Reduce overall cycle cost
- Easy to install
- Timely and effective maintenance and construction process

Suitable Size of Straight Bar:

Diameter	Φ6	Φ8	Φ10	Φ12	Φ14	Φ16	Φ18	Φ20
Weight (g/m)	50	100	160	230	300	400	490	590

Brief Introduction of Construction:



Project Case

project name: Nanjing Olympic Sports Suning Plaza, Jiangsu Province

Project Overview: The Olympic Stadium Suning Plaza project belongs to the second phase of the landmark building of Hexi CBD. It is located in the center of Hexi CBD. It covers an area of 32,900 square meters with a total construction area of 460,000 square meters. It is invested and developed by Suning Real Estate Group. The main structure of the project has 88 floors and is 400 meters high. It will refresh the current record of the height of the main structure of a skyscraper in Nanjing and become the "first building in Jiangsu". In terms of road reinforcement, the road reinforcement of Suning Plaza uses glass fiber reinforcement instead of traditional steel bars, which is quick to construct, has a large bearing capacity, and has obvious corrosion resistance.

