FIBERGLASS REINFORCEMENT

MAKING CONSTRUCTION EASIER

A Non Corrosive Alternative in Concrete Reinforcement

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Composites' Development

1940s – First structural applications of modern composites in naval and aerospace industries

1950s – Introduction of composites in automotive and oil industries

1960s – Development of advanced composites (defence industries) and first applications in construction industry

1970-1990s:

Technological development of manufacturing processes
Requirement of increasing construction speed
Demand for electrically nonconductive material (MRI medical equipment)

Up to mid-1990s the Japanese had the most FRP reinforcement applications

In the 2000s China became the largest user of composites with their applications from bridge decks to underground works

Current leaders in composite use – USA and Canada

Worldwide applications

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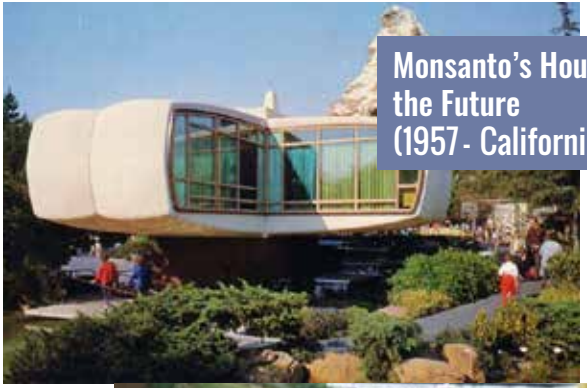
Samples of world applications:

- Potter County Bridge and Bettendorf Bridge (USA)
- National Institute of Health (Betesda, USA)
- Manitoba Bridge, Saint-Francois Bridge (Canada)
- Hospital in Isedzaki City (Guama Prefecture, Japan)
- Underground subway in Fuxing and railway stations in Yishan, Shanghai (China)
- Railway tunnel under the Thames river (London, England)
- Runway strip at Zurich airport (Switzerland)



Monsanto's House of the Future (1957 - California, USA)

Highway 401, Toronto, Canada

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Worldwide applications

3rd Concession Bridge, Ontario, Canada, 2008

University of Miami bridge, USA

I-635 Bridge,
KansasCity,USA

18th Street Bidge,
Manitoba,Canada,2010

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Types of fiber reinforced polymer bars:

- Glass fiber reinforced polymer bar (GFRP)
- Basalt fiber reinforced polymer bar (BFRP)
- Carbon fiber reinforced polymer bar (CFRP)
- Aramid fiber reinforced polymer bar (AFRP)

Advantages of GFRP:

- Transparent to magnetic fields, radio frequencies
- Thermally and electrically nonconductive

FRP bar

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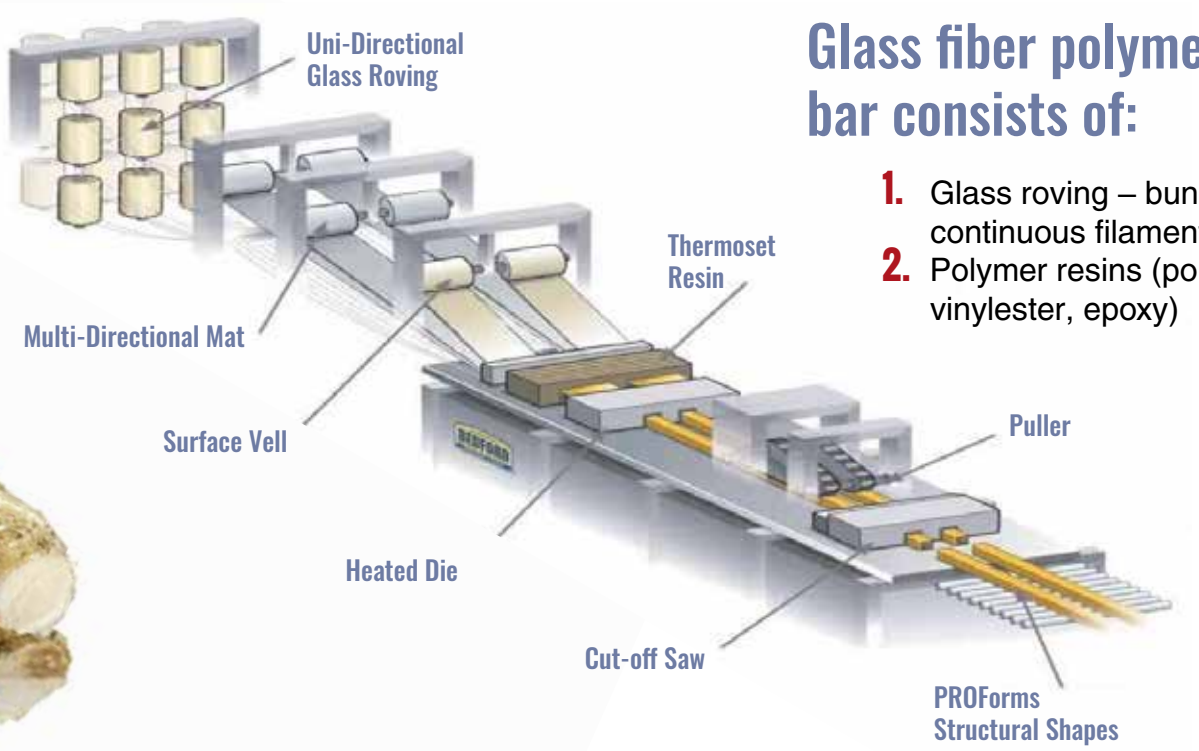

Glass fiber polymer bar consists of:

1. Glass roving – bundles of continuous filaments
2. Polymer resins (polyester, vinylester, epoxy)

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Applications and Standards

GLASS FIBER REINFORCED POLYMER (GFRP) BARS ARE PROUDLY **MADE IN GHANA**

USING LATEST TECHNOLOGIES AND BEST WORLD PRACTICES AND RECOMMENDATIONS OF **AMERICAN CONCRETE INSTITUTION (ACI)** AND **ASTM STANDARDS**. Standards approved by **GHANA STANDARDS AUTHORITY**

VIVA FIBERGLASS REBAR IS AN ALTERNATIVE TO CONVENTIONAL STEEL REBAR

BUT WITH

HIGH	LOW
Corrosion resistance	Maintenance
Strength	Weight
Impact resistance	Concrete layer

ALL CONCRETE FUNDATIONS

MINING AND TUNNELING

MARINE APPLICATIONS

SPECIALIZED CONCRETE CONSTRUCTION

BRIDGE DECKS

ROADS

CHEMICAL ENGENEERING

Applications and Standards

Viva Fiberglass Reinforcement is produced in accordance with best world practice and recommendations of **American Concrete Institution** standards.

Quality is controlled by **Ghana Standards Authority** and confirmed by **Bureau Veritas**. Respective quality certificates are prepared for each batch.

We are pleased to make quality changes in construction industry of West Africa and be first of a kind in delivering revolution technology to West African communities.

American Concrete Institute
Always advancing

BUREAU VERITAS

GHANA STANDARDS AUTHORITY
REPUBLIC OF GHANA

Applications and Standards

FIBERGLASS REINFORCEMENT

American Concrete Institution

440.11-22: Building Code Requirements for Structural Concrete Reinforced with Glass Fiber-Reinforced Polymer (GFRP) Bars

440.1R-15: Guide for the Design and Construction of Structural Concrete Reinforced with FRP Bars

440.5-08: Specification for Construction with Fiber-Reinforced Polymer Reinforcing Bars

440.6-08: Specification for Carbon and Glass Fiber-Reinforced Polymer Bar Materials for Concrete Reinforcement

440.3R-12: Guide Test Methods for Fiber-Reinforced Polymer (FRP) Composites for Reinforcing or Strengthening Concrete Masonry Structures

440.2R-08: Guide for the Design and Construction of Externally Bonded FRP Systems or Strengthening Concrete Structures

440.7R-10: Guide for the Design and Construction of Externally Bonded Fiber- Reinforced Polymer Systems for Strengthening Unreinforced Masonry Structures **American Association of State Highway & Transportation Officials**

AASHTO GFRP-1: AASHTO LRFD Bridge Design Guide Specifications for GFRP- Reinforced Concrete Bridge Decks and Traffic Railing

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Advantages

- Impervious to chloride ion, low pH chemical attack and bacteriological growth
- Non-existent corrosion, rust free
- Non Toxic
- 80+ years of lifespan and corrosion resistance

- Cost effective vs traditional iron rods
- Maintenance free
- Easily cut and machined
- Easy and
- Rapid Installation

- 7 x lighter in weight than the equivalent strength of steel rebar
- Less rebar diameter
- Less handling
- Less load on basement

- High Fatigue endurance and Impact Resistance
- Up to 2 x tensile strength of steel

Applications

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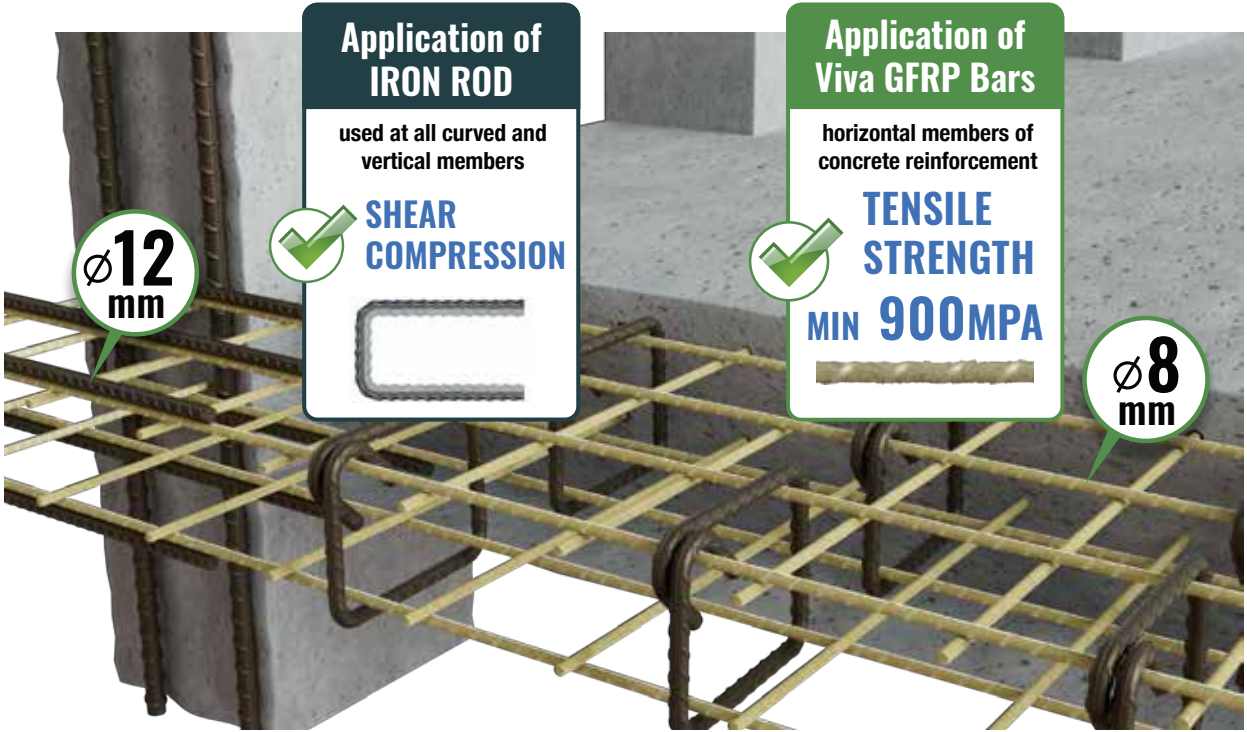

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Save money with GFRP advantages

Direct savings on material 37,89%

1 ton of 10 mm high tensile (ultimate tensile strange 39,25 kN) steel has 1,608 meters and costs 950 USD
Same meters of 7 mm Viva Bar (ultimate tensile strength 44,16 kN) costs 660 USD

Savings – 290 USD per 1 ton*

Save up to 5% without overlaps

Standart overlap is 50 sizes of the diameter or 0,5 m for 10 mm steel
One coil of VIVA Bar 7 mm has 150 meters.
Standart length of 1 steel rebar is 11,8 meters which means that on 150 meters there will be 12 overlaps or 12 meters of waists (0,32*2*12)
This will give us 128,6 meters of overlaps on 1 ton of steel (12*(1,608/150))
Thus when you avoid overlaps with Viva Bar you are additionally

Saving 52,7 USD per 1 ton

*price comparison is made with High Tensile Iron Rods 500Mpa and may fluctuate within diameters

Additional savings with GFRP

Transportation

1 truck can take 20 tons of steel reinforcement or 32,160 meters (10 mm)
Same truck by weight will take 277,778 meters of GFRP 7 mm which is equivalent to 172,8 tons of 10 mm steel rebar

Therefore you may **save 88% of your transportation expenses** with VIVA Bar

Overall project speed up

Since VIVA bars are lighter and can be coiled, it takes less time to transport them to the top floors (for multistorey constructions) and lay them on the site, which will allow to economize money by paying less amounts to workers and complete the project faster.

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Examples of practical implementation

Since establishement in 2017 Viva has supplied reinforcement to thpusands of project around Africa for different types of projects: Roads, Bridges, Industrial, commersial and residansial buildings etc.

We are grateful to all our clients for their choice of innovative, modern and ‘green’ material that will serve its purpose on a one side and save money on the another.

Below you can find examples of some of projects around African continent.

We hope to see you as our future client!

Construction of a church, Madina, Greater Accra

Consultant: Project and estate department of church of pentecost

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Examples of practical implementation

Beach hotel project, Axim area, Western Region

Consultant: Eng. Philip K.Yeboah
(Ndede Construction company LTD)

Construction of Ecoblock office building, Pokuase, Accra-Kumasi road

Consultant: Eng. Kwabena Bempong

Examples of practical implementation

Construction of Palace mall, Atomic Junction, Aburi road

Consultant: Eng. Solomon Oguah (ABP Consult)

Pokuase Interchange Project, Accra-Kumasi Road

Consultant: Eng. Kwabena Bempong (Associated Consultants)

Contractor: Zhongmai Engineering Ghana LTD

Examples of practical implementation

Example of practical implementation of Viva Fiberglass reinforcement in Cote d'Ivoire

Atomic Police Campus

Contractor: De Simone Group

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Examples of practical implementation

Beach Resort Project
Sakumono, Accra

Factory Project
Tema Industrial Area

Examples of practical implementation

Oyarifa Park by Indigo Homes

Consultant: Associated Consultants

GNPC
Research and Technology Centre of GNPC (Accra, Ghana)

Consultant: CONPRO LTD / BI-ARCHITECT CONSULT
Contractor: CONSAR LTD

Examples of practical implementation

Construction of an Art Center at Community 25, Tema

Contractor: Atlantic contract works ltd

Construction of gated community real-estate project at Community 27, Tema

Contractor: Nyame Dua Homes LTD

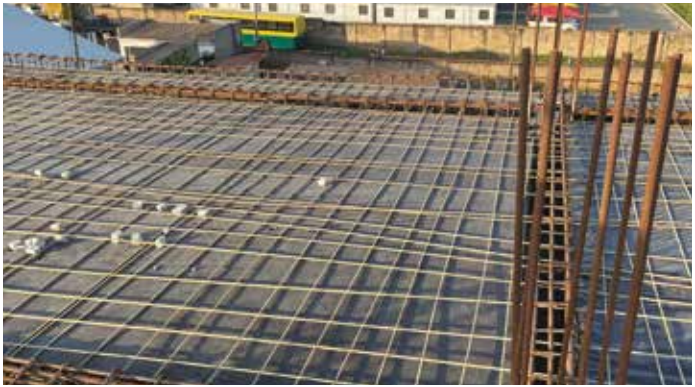
Examples of practical implementation

REBEACON HEIGHTS business center (Accra, Ghana)

Consultant: Ing. Solomon Oguah Location: HAATSO

Community 25 business center (Tema, Ghana)

Consultant: AKADAMS CONSTRUCTION LTD AND ARCHITECTURAL BUILDING PLANNER



Examples of practical implementation

Typical residential 2-floor building (Accra, Ghana)

2-floor commersial building (Kara, Togo)

Examples of practical implementation

Tema Port Expansion (Phase 2)

Client: Meridian Port Services
Contractor: JV EIFFAGE/Desimone
Designer: AECOM
Location: Tema, Ghana

Korley Bu Hospital

Contructor: Nichona Construction

Examples of practical implementation

Legon Stadium (ACCRA)

Constructor: CONSAR LTD

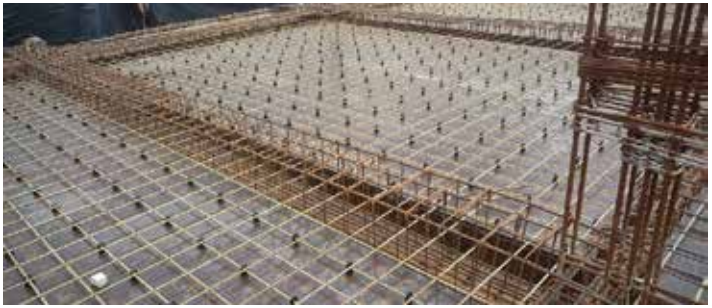
Appartment block, Tema, Community 25

Constructor: RINICK COMPANY LTD

Examples of practical implementation

The MONARCH

Developer: MOBUS PROPERTIES
Designer: EUDIA-PLUS Engineering Services LTD
Location: Accra, Ghana



The Cinnamon

Developer: HDG Homes
Location: Airport City, Kumasi, Ghana

Examples of practical implementation

Best Western Premier Hotel

Developer: HDG Homes
Designer: Project Scribe Engineering
Client: KOSS Assets LTD
Location: Kumasi Airport City

Bamburi Palm Villas

Developer: FAIRDEAL PROPERTIES
Designer: EM SQUARE DESIGNS Consulting Structural Engineers
Location: Bamburi, Mombasa, Kenya

Examples of practical implementation

AquaVista Residences

Developer: Fairdeal Properties
Designer: EM SQUARE DESIGNS Consulting Structural Engineers
Location: Nyali, Mombasa, Kenya

Apartment block

Designer: Project Scribe Engineering
Contractor: GJ Engineering and Contracting LTD
Location: Tseaddo, Accra, Ghana

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Contact us for any assistance you may need for use of GFRP bars:

+233 24-545-87-97
info@vivafiberglass.com

You are also invited to visit our website:

www.vivafiberglass.com

Look for
VIVA Fiberglass Reinforcement
on **Facebook** and **LinkedIn**