

# RockRebar®

Basalt Rebar (BFRP) is the Lowest Carbon Footprint Industry Recognized, Structural Reinforcement for Concrete Known.

**A modern tech solution for the internal reinforcement of concrete.**

## RockRebar®

- A structural, non-rusting, lightweight, nonconductive, transparent to RF & microwave.
- Makes concrete structures durable in aggressive environments.
- Provides 3X longer service life compared with structures reinforced with steel.
- Brown basalt fiber reinforced polymer BFRP rebar and the white fiberglass GFRP rebar are now the only two “glass state” structural fibers officially recognized for concrete reinforcement.
- The June 2016 official printing of AC-454 now labels BFRP (continuous basalt fiber reinforced polymers) aka **RockRebar®** produced from just “one” (1) raw material, sustainable naturally occurring volcanic basalt rock. And a special manmade recipe for production E-CR (corrosion resistant) fiberglass requiring over “ten” (10) components each with its own carbon footprint. As sufficiently similar in overall performance as to be interchangeable for use as concrete reinforcements.
- **RockRebar®** is certified by ICC-ES Acceptance Criteria 454 and FDOT Section 932-3.  
**Report Number: IR-5.10\_NRR\_AC454/932**
- Complies with ASTM D7957 and CSA S807 material standards for Epoxy Reinforced Solid Round Glass State Fiber Rebar Bars for Concrete Reinforcement.

## *Product Benefits*

- **RockRebar®** will never rust, the most important solution to modern construction technology and to preventative maintenance due to expensive repairs.
- **RockRebar®** is only 1/4th the weight and over 2.5 times stronger than traditional steel rebar. Creating savings on shipping costs and labor, as well as safety on handling.
- **RockRebar®** does not require expensive heavy lifting cranes on job sites, creating additional savings and easy to handle in remote construction sites where road access might be limited.
- **RockRebar®** is naturally resistant to alkali, rust, and acids. Moisture penetration from concrete does not spall. Needs no special coating like steel or fiberglass rods.
- **RockRebar®** is a proven corrosion resistant reinforcement designed to provide structures more than 3X longer service life as compared with steel reinforced concrete.
- **RockRebar®** non-corrosive nature makes it extremely valuable in terms of lifecycle requiring far less replacements necessary and broadly applicable to the entire construction industry.
- **RockRebar®** is perfect for marine environments and chemical plants where corrosion is a continuous problem. The only product in the marketplace that addresses “alkaline” and “PH” using basalt glass / epoxy, allowing them to be used with salt water.
- **RockRebar®** unlike steel, “glass-state” basalt reinforced epoxy is transparent to radio frequency and microwaves.
- **RockRebar®** is non-magnetic, UV stable, as well as electrically non-conductive, excellent for use in high voltage areas.

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**The references below should be referred to by the Engineer regarding the application of BFRP Rebar for concrete reinforcement.**

**USA**

- [ACI 440.1R-15 \(2015\)](#) “Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer Bars”, ACI Committee 440, American Concrete Institute
- [ACI 440.3R-12 \(2012\)](#) “Guide Test Methods for Fiber-Reinforced Polymers (FRPs) for Reinforcing or Strengthening Concrete Structures” ACI Committee 440, American Concrete Institute
- [ACI 440.4R-04 \(Reapproved 2011\)](#) “Prestressing Concrete Structures with FRP Tendons” ACI Committee 440, American Concrete Institute
- [ACI 440R-07 \(2007\)](#) “Report on Fiber-Reinforced Polymer (FRP) Reinforcement for Concrete Structures,” ACI Committee 440, American Concrete Institute
- [ACI 440.5-08 \(2008\)](#) “Specification for Construction with Fiber-Reinforced Polymer Reinforcing Bar”, ACI Committee 440, American Concrete Institute
- AC 454.
- <https://fdotwww.blob.core.windows.net/sitefinity/docs/default-source/structures/innovation/frp/2019bei-nolan-223-bfrprcstds.pdf>? Basalt FRP-RC standardization for Florida dot structures

Some important differences between steel and FRP (Fiber Reinforced Polymer) rebar should be considered when designing concrete members and or structures using “glass-state” BFRP and GFRP reinforcements for concrete. Design engineers should consider requirements and recommendations stated in published design and construction guides when using FRP rebar in structural applications.

Direct substitution of FRP rebar with steel rebar may not be possible in some cases due to difference in mechanical characteristics and surface configurations.

Since the FRP rebars have lower modulus of elasticity than steel rebars, the design in most cases may be governed by deflection serviceability limit state (SLS) rather than ultimate limit state (ULS).

The design codes below provide a maximum limit for the stress under sustained load for “glass-state” BFRP and GFRP rebars.

**In general, the designer shall consider the following:**

- Do not substitute BFRP reinforcing bars for steel reinforcing bars on an equal area basis, due to differences in material properties.
- Specifically design reinforced concrete members for BFRP rebar, considering properties of the material and effects, on strength, deflection, and crack width.
- In most cases, deflection will control design of concrete structures reinforced with BFRP rebar based on value of modulus of elasticity of BFRP rebar.
- Comply with Section 01330 – Submittal Procedure

*Applications*

**RockRebar®** is designed to reinforce concrete in:

### Transportation structures:



- Roads
- Driveways & parking lots
- Bridges & tunnels
- Traffic barriers

### Marine:



- Sea Walls
- Decks and pilings
- Swimming pools
- Piers

### Buildings:



- Wall pannels
- Foundation
- Columns

### High Voltage & Electromagnetic Fields:



- MRI room
- Transformer pads
- Excelent dielectric



## Availability



**RockRebar®** in North America is available in bars of the following diameters:

#2 (1/4"-6 mm), # 2.5 (8mm), #3 (3/8"-10mm), #4 (1/2"- 12.7mm), #5 (5/8"- 16 mm), #6 (3/4"- 19 mm), #7 (7/8"- 22 mm), #8 (1"- 25mm)

Regular lengths of 20' and 40' are available. Bars can be cut to length for orders with detailed bar lists.

**RockRebar®** up to and including #4 is also available in 200-meter (650') coils ready to ship:



4mm x 200-meter coil @ 21 Lbs. (9.5 kg) is 28"Ø x 4.75" thick or 71.12cm Ø x 12cm thick.

6mm x 200-meter coil @ 33.5 Lbs. (15 kg) is 36"Ø x 4.75"thick or 91.44 cm Ø x 12 cm thick. = #2

8mm x 200-meter coil @ 52.5 Lbs. (23.8 kg) is 45"Ø x 4.75" thick or 114.3 cm Ø x 12cm thick = #2.5

10mm x 200-meter coil @ 86 Lbs. (9 kg) is 56"Ø x 5" thick or 142.24 Ø x 12.7 cm thick = #3

12mm x 200 meters coil 143 Lbs. (64.8 kg) is 78"Ø x 5.75" thick or 198.12 cm Ø x 14.6 cm thick = #4

**RockRebar® Technical Characteristics (ASTM D7957, CSA S807)**

Primary materials: Basalt fiber and epoxy resin.

NOMINAL DIAMETER				NOMINAL CROSS SECTIONAL AREA		UNIT WEIGHT/ LENGTH		GUARANTEED ULTIMATE TENSILE FORCE		GUARANTEED ULTIMATE TENSILE STRENGTH		MEAN ULTIMATE TENSILE STRAIN	MEAN TENSILE MODULUS OF ELASTICITY		SHEAR STRENGTH TESTING RESULTS
BAR SIZE	fraction	in	mm	in <sup>2</sup>	mm <sup>2</sup>	lbs/ft	g/m	kip	kN	ksi	MPa	%	msi	GPa	MPa
2	1/4	0.25	6	0.05	32.25	.051	75.153	8.4	37	182	1258	2.52	8907	61.41	212.61
2.5	5/16	0.3125	8	0.08	52	.057	83.85	13.1	58	174	1198	2.50	8907	61.10	229.44
3	3/8	0.375	9.525	0.11	71	.109	159.12	16.0	71	145	1138	2.40	8750	60.4	198.31
4	1/2	0.5	12.7	0.20	129	.178	261.3	27.9	124	140	1111	3.37	8905	60.0	208.21
5	5/8	0.625	15.875	0.31	199	.287	425.1	41.8	186	135	1087	2.30	8905	58.4	198.28
6	3/4	0.75	19.05	0.44	284	.424	620.1	57.3	255	130	1043	2.25	8905	57.1	196.20
7	7/8	0.875	22.225	0.60	387	.568	830.7	70.7	314	147	1010	2.22	8905	56.0	193.10
8	1	1	25	0.79	510	.757	1102.1	101.9	453	129	989	2.06	8905	56.0	185.91

FIBER MASS CONTENT	MOISTURE ABSORPTION IN 24 h at 50°C [122°F]	MOISTURE ABSORPTION TO SATURATION AT 50°C [122°F]	MEAN GLASS TRANSITION TEMPERATURE (DSC)		MEAN APPARENT HORIZONTAL SHEAR		MEAN TRANSVERSE SHEAR STRENGTH	
%	%	%	°F	°C	psi	MPa	ksi	MPa
≥80	≤0.1	<0.5	≥251	≥122	≥7525	≥53	≥30.1	≥207

**RockRebar® coils**

RockRebar® Nominal Diameter in inch, mm and #			Coil eight 200 meters (650 feet)		Weight per 39'6" length (12 meters) lbs and kg		Shear Strength Mpa & ksi		Guaranteed design tensile strength ASTM Mpa & ksi		Stiffness Young's modulus = elastic modulus of elasticity GPa & ksi	
Inch	mm	#	Lbs	Kg	Lbs	Kg	Mpa	ksi	Mpa	ksi	GPa	ksi
0.170	4	1	21	9.5	1.2	0.54	N/A	N/A	1430	207	92	13,334
0.25	6	2	33.5	15	2.1	0.953	N/A	N/A	1415	205	89	12,908
0.315	8	2.5	52.5	23.8	3.25	1.474	201	29	1405	204	87	12,618
0.393	9.525	3	86	39	4.85	2.2	208	30	1380	200	86	12,473
0.472	12.7	4	143	64.8	9.47	4.3	219	31	1319	191	85	12,328

**CHEMICAL COMPOSITINS %**

	<b>E-CR Glass</b>	<b><i>Basalt</i></b>
<b>SiO<sub>2</sub> Silicon dioxide</b>	<b>58-63</b>	<b>53.26</b>
<b>CaO Calcium oxide</b>	<b>21-23</b>	<b>8.5</b>
<b>Al<sub>2</sub>O<sub>3</sub> Aluminum oxides</b>	<b>10 - 13</b>	<b>17.3</b>
<b>MgO Magnesium oxide</b>	<b>2- 4</b>	<b>4.1</b>
<b>Na<sub>2</sub> O Sodium oxide</b>	<b>0-1.2</b>	<b>2.6</b>
<b>K<sub>2</sub>O Potassium oxide</b>	<b>0-1.2</b>	<b>1.6</b>
<b>Fe<sub>2</sub>O<sub>3</sub> Ferric oxide</b>	<b>0-0.4</b>	<b>4.7</b>
<b>FeO Ferrous oxide</b>	<b>NA</b>	<b>5.3</b>
<b>TiO<sub>2</sub> Titanium dioxide</b>	<b>1.0-2.5</b>	<b>1.1</b>
<b>MnO Manganous oxide</b>	<b>NA</b>	<b>0.2</b>
<b>P<sub>2</sub>O<sub>3</sub> Phosphorus oxide</b>	<b>NA</b>	<b>0.2</b>
<b>ZnO Zinc oxide</b>	<b>0-3.5</b>	<b>NA</b>
<b>B<sub>2</sub>O<sub>2</sub> Boron oxide</b>	<b>NA</b>	<b>NA</b>
<b>P<sub>2</sub>O<sub>5</sub> Di phosphorus pentoxide</b>	<b>NA</b>	<b>0.28</b>
<b>Cr<sub>2</sub>O<sub>3</sub> Chromium (III) oxide</b>	<b>NA</b>	<b>0.06</b>



## Safety

***RockRebar® is an inert, glass-state, volcanic basalt rock reinforced food grade epoxy and NOT considered a hazardous waste under federal RCRA regulations. No special storage considerations needed. Dispose of as solid waste in accordance with local, state, and federal regulations.***

***When using and handling RockRebar®, proper personal protective equipment (PPE) is required. RockRebar®, has a helical wrapped surface covered with cut quartz that may be abrasive to skin without proper PPE. Proper PPE includes safety glasses, canvas gloves and shirts with sleeves, long work pants, and sturdy work shoes or boots. Exposure to Skin and respiratory from dust when cutting or grinding should be avoided. In case of INHALATION of cutting or grinding dust, move victim to fresh air. If breathing has stopped, administer CPR. Call a physician. SKIN Wash effected area with soap and water. Wash contaminated clothing before reuse. INGESTION Call a physician or poison control center immediately. If professional advice is not available, DO NOT induce vomiting or give anything by mouth to an unconscious person. EYE Flush eyes with water and seek immediate medical attention.***

***CAUTION with RockRebar® COILS!!!***

***HOLD ON TO LOSE END UNCOIL SLOWLY KEEPING CONTROL AS SPRING TENSION RELAXES AND COIL OPENS TO A STRAIGHT ROD***

***Precautions for Safe Handling and Use on coils. Always stand inside coils when opening and be sure others are aware the coil could spring open. Be sure persons are away!!!! Except for unwiring bound coils and or bundles, no special precautions needed. Coiled and or bundled material has EXTREAM spring action potential. Beware when handling and or opening!! Beware of a potential "strike" from unexpected opening of coil or bundle. Stand inside coil to be opened! Cut only (1) one binding wire at a time! Watch and feel and CONTROL the spring tension!!***

### **Packaging Shipping, and Labeling**

Straight bars will be shipped to the project site in bundles. Bundle sizes vary by bar length and diameter. Lead time is subject to plant production schedules at the time of order processing. Customer-specific packaging requirements may be available upon request. Material traceability markings per ASTM D7957 or CSA S807 will be present on straight bars.

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### **Storage and Handling**

Follow guidelines in ACI440.5-08, “Specification for Construction with Fiber-Reinforced Polymer Reinforcing Bars.” In general, field handling and placement is similar to epoxy coated or galvanized steel bars.

***Do not use FRP rebars as lift hooks.***

Field cut basalt bars using a diamond or masonry abrasive sawblade

Sealing the ends of basalt bars is not necessary.

Zip ties or plastic-coated tie wire ties are the preferred option for most projects.

## **References**

DFOT. (2021). *Fiber Reinforced Polymer Reinforcing*. Retrieved from FDOT Florida Department of Transportation: <https://www.fdot.gov/structures/innovation/frp.shtm>

## **Disclaimer**

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