

CONCRETE REINFORCEMENT · PRODUCT MANUAL · EDITION 2026.11

Basalt FRP Rebar

Basalt fiber reinforced polymer (BFRP) reinforcing bars, Ø3 to Ø25 mm, straight or coiled.
Published classes, sizes, standards, handling and the ordering checklist.

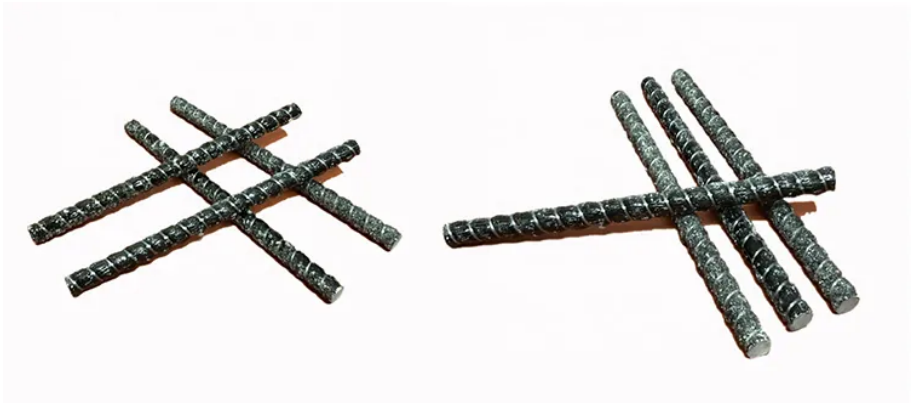


Fig. 1 · Cut pieces of basalt FRP rebar with the helical bond surface (supplier photograph).

Document	F1-PM-BFRP-001 · Rev. 2026-11
Product	Pultruded basalt fiber reinforced polymer (BFRP) bars for concrete reinforcement
Fiber / matrix	Continuous basalt filament drawn from basalt rock; vinyl ester or epoxy resin
Classes	1,100 MPa (Ø3–Ø12), 1,000 MPa (Ø25); 50 GPa modulus class; 1.9–2.1 g/cm³
Standards	ASTM D8505/D8505M-23 · CSA S807:19 · ISO 10406-1:2015 · GB/T 26743-2011 · JG/T 406-2013
Supply	Made by FengDu New Material (Chongqing, China); exported by F1 Composite against a project schedule

Reading this manual. Every value in it is a class restated from published typical values. None is a guaranteed value, a design value or a certification. ASTM D8505 and CSA S807 guarantee tensile force, modulus, bond and durability per size from a qualification report, and that report, issued for the size actually offered, is what the engineer designs with. It travels with the quotation.

1. Scope and product description

This manual covers straight basalt FRP reinforcing bars and coils supplied by F1 Composite. The bar is pultruded from continuous basalt filament in a thermoset resin, with a helical fiber wrap for bond and a sand-coated finish on request. It does not corrode electrochemically, weighs about a quarter of steel size for size, carries no electrical current and no magnetic signature, conducts little heat, and is cut with a diamond or abrasive blade. It is linear-elastic to rupture, with a modulus about a quarter of steel's, so members are designed to an FRP code rather than by substituting steel sizes.

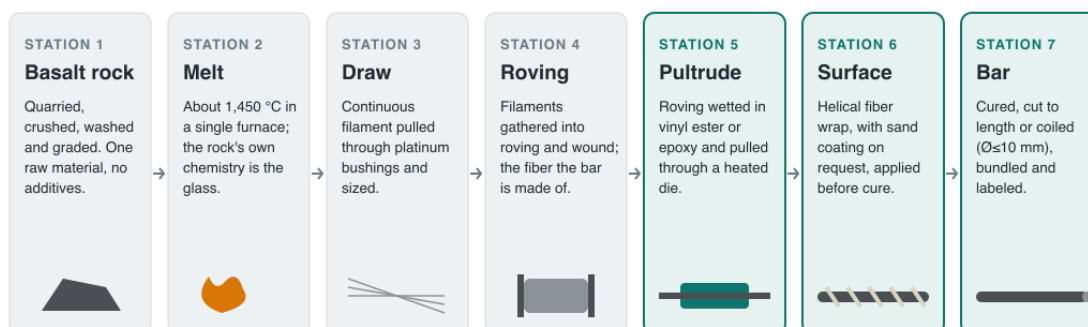
Factory-formed bends, hooks and mesh are not part of the standard basalt product and are raised as an inquiry; where a project needs shapes, F1's GFRP family supplies factory bends and mesh that a designer may pair with straight basalt bars.

2. From basalt rock to a reinforcing bar

Basalt fiber is the only reinforcement fiber made from one raw material. Volcanic rock is crushed, washed and graded, melted at about 1,450 °C in a single furnace with no batch chemistry to formulate, and drawn through platinum bushings into continuous filament, which is sized and wound as roving. The roving is wetted in vinyl ester or epoxy resin, pulled through a heated die, wrapped and cured, then cut to length or coiled. FengDu New Material pultrudes the bar from bought-in continuous basalt roving, and the fiber lot is recorded against each bar lot on the production record.

FROM BASALT ROCK TO A REINFORCING BAR

Seven stations; the same melt-and-draw route as glass fiber, with rock in place of a formulated batch.



Why the fiber matters, and why it is not the whole story

Basalt filament is stiffer and stronger than E-glass and keeps its properties to a higher temperature: that is where the 1,100 MPa and 50 GPa classes come from.

Fiber volume, resin, surface and process set what a bar guarantees, and the resin sets its temperature limit. The report per size, not the fiber, is what the engineer designs with.

Stations 1 to 4 belong to the fiber producer, 5 to 7 to FengDu New Material's pultrusion line; the fiber lot is recorded against each bar lot.

Bends and mesh are not on this line; they are raised as an inquiry, and a project may pair straight basalt bars with GFRP shapes where the designer allows.

Schematic, not to scale. Temperatures and classes are typical published values; the process details of the offered bar are confirmed on the quotation.

Fig. 2 · Seven stations from quarry to bundle. Stations 1 to 4 are the fiber producer's, 5 to 7 the pultruder's.

Basalt filament is stiffer and stronger than E-glass filament and keeps its properties to a higher temperature, which is where the bar's 1,100 MPa and 50 GPa classes come from. Fiber volume, resin, surface and process decide how much of that reaches the bar, and the resin, not the fiber, sets the bar's temperature limit: the matrix softens above its glass transition (100 °C class), so fire-rated members are designed by cover and detailing, as for GFRP.

3. Published properties, as classes

Property	Published class	Basis and what it means
Tensile strength	1,100 MPa (Ø3–Ø12) · 1,000 MPa (Ø25)	Published typical values. Guaranteed tensile force per size comes from the qualification report; strength rarely sets the bar.
Tensile modulus	50 GPa class (52–55 GPa published)	Above the 44.8 GPa ASTM D8505 floor and the CSA S807 Grade I threshold of 50 GPa. A quarter of steel: crack width and deflection govern.
Elongation at rupture	about 2.6% (Ø3–Ø12)	Linear to rupture; no yield plateau. Sections are proportioned for concrete crushing with the bar kept elastic.
Density	1.9–2.1 g/cm ³	Published unit masses reconcile to 1.9 g/cm ³ . A Ø16 mm bar is about 0.38 kg/m against 1.58 kg/m in steel.
Alkali and seawater exposure	75–80% strength retained after 900 days immersion	Published durability statement. Ask for the test method, specimen scope and report; ASTM D8505 and CSA S807 set their own exposure tests.
Electrical and magnetic	Non-conductive, nonmagnetic	MRI suites, rail detection loops, substations, data centers.
Thermal conductivity	below 1 W/m·K	No thermal bridge through an insulated element; steel is about 50 W/m·K.
Temperature	Resin Tg 100 °C class	The fiber tolerates far more heat than the resin; the bar is not a fire-rated bar.
Surface	Helical fiber wrap; sand coating on request	Bond and transverse shear are tested per size to the governing standard.
Forms	Straight bars to cut length; Ø≤10 mm also coiled	Bends, hooks and mesh by inquiry.

3.1 Against GFRP and steel

Property	BFRP (published class)	GFRP 45 / 60 (F1 family)	Steel Grade 60
Tensile strength	1,000–1,100 MPa class	530–840 MPa guaranteed minimum (ASTM D7957); about 900–1,000 MPa typical	420 MPa yield, 620 MPa ultimate
Tensile modulus	50 GPa class	45 or 60 GPa class	200 GPa
Behaviour to failure	Linear to rupture, about 2.6%	Linear to rupture, 1.1% or more	Yields at about 0.2%, then stretches
Density	1.9–2.1 g/cm ³	1.9–2.1 g/cm ³	7.85 g/cm ³
Corrosion	None; 75–80% retained, 900 days (published)	None; 80% retained after ASTM D7705 exposure	Rusts once chlorides or carbonation reach the bar
Product standard	ASTM D8505-23; CSA S807:19; ISO 10406-1	ASTM D7957-26; CSA S807:19	ASTM A615; EN 10080
US building code	None of its own: ACI 440.11 covers glass bars only	ACI CODE-440.11-22	ACI 318
Shapes	Straight bars and coils; bends by inquiry	Factory-formed stirrups, bends, mesh	Bent, cut and welded on site

Class values, not a datasheet. BFRP values are published typical values; GFRP values are ASTM D7957 minimums and F1's modulus classes; steel is ASTM A615 Grade 60.

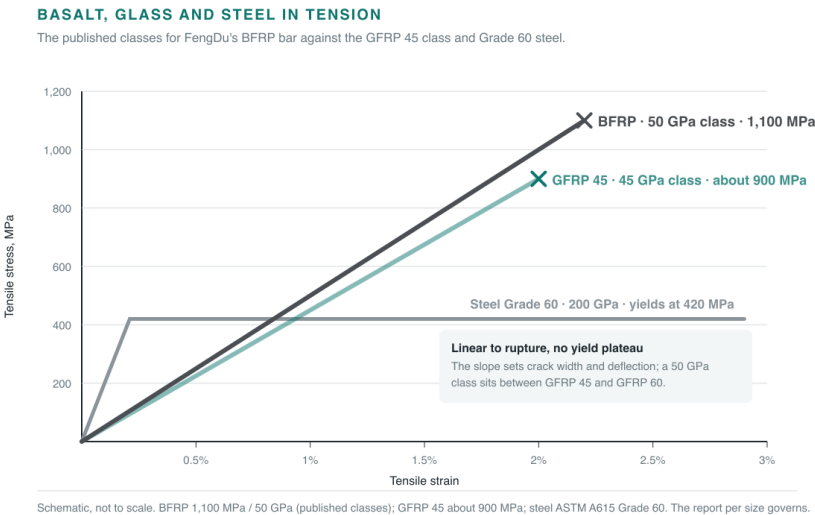


Fig. 3 · Basalt, glass and steel in tension (schematic). Both FRP bars are linear to rupture above steel's yield; the slope sets crack widths and deflections.

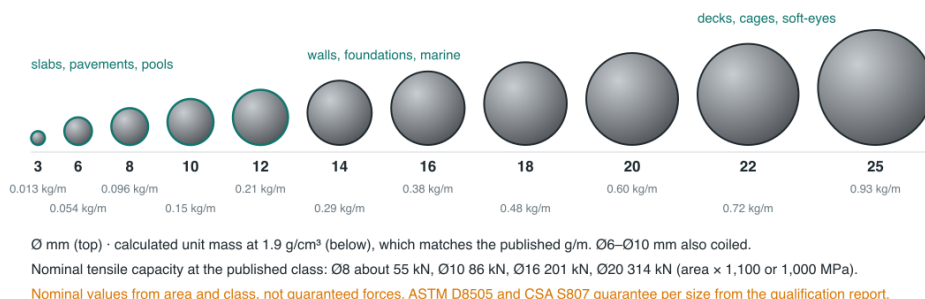
4. Sizes: area, mass and nominal capacity

Eleven inquiry diameters, one modulus class. Mass is calculated at 1.9 g/cm³, which matches the published g/m. Nominal capacity is nominal area multiplied by the published strength class (1,000 MPa taken for Ø14 and above pending the size report); it is not a guaranteed force and not a design value.

Ø mm	Area mm ²	Mass kg/m	Metres per tonne	Class MPa	Nominal capacity kN	Form
3	7.1	0.013	74,458	1,100	8	Bar or coil
6	28.3	0.054	18,615	1,100	31	Bar or coil
8	50.3	0.096	10,471	1,100	55	Bar or coil
10	78.5	0.149	6,701	1,100	86	Bar or coil
12	113.1	0.215	4,654	1,100	124	Straight bar
14	153.9	0.292	3,419	1,000	154	Straight bar
16	201.1	0.382	2,618	1,000	201	Straight bar
18	254.5	0.483	2,068	1,000	254	Straight bar
20	314.2	0.597	1,675	1,000	314	Straight bar
22	380.1	0.722	1,385	1,000	380	Straight bar
25	490.9	0.933	1,072	1,000	491	Straight bar

11 DIAMETERS · Ø3 TO Ø25 MM

One inquiry list from micro-bars for thin precast to Ø25 mm cage bars; one modulus class across the range.



Schematic, drawn to one scale. Inquiry sizes, not a stock list; measured area, tolerance and unit mass come from the quotation.

Fig. 4 · The eleven diameters to one scale with calculated unit mass.

4.1 Lengths, coils and packing

Straight bars are cut to the project length; 6 m and 12 m are the usual planning lengths, and bars up to about 11.8 m load into a 40 ft high-cube container (roughly 12 to 20 t depending on diameter and packing; at 0.38 kg/m a tonne of Ø16 mm bar is about 2,600 m). Longer bars need an open-top or flat-rack booking or an agreed cut length. Ø6–Ø10 mm bars are coiled on a reel, which cuts freight volume for slab and pavement orders; confirm straightening and handling on site before choosing coils. Bundles are strapped, labeled by diameter, length and quantity and protected from abrasion; coils are wrapped and palletized.

5. Steel substitution guide, and why not to use it alone

The published guide gives the BFRP diameter whose nominal tensile capacity at the published class matches the yield capacity of a steel bar. It is reproduced here because buyers ask for it, with the caveat that matters more than the table.

Steel bar	BFRP bar of equal nominal tensile capacity
Ø10	Ø6–Ø8
Ø12	Ø8
Ø14–Ø16	Ø10
Ø18	Ø12
Ø20–Ø22	Ø14
Ø24	Ø16
Ø26	Ø18
Ø28–Ø30	Ø20

Caveat. The table equates ultimate tensile capacity only. FRP-reinforced members are governed by serviceability (crack width and deflection at a modulus a quarter of steel's), bond and development length, and sustained-load limits under ACI 440.1R, CSA S806 or the code the project adopts. Those checks usually need more bar area than the strength match, sometimes more area than the steel it replaces. The project designer sizes the bar with the certified values of the offered size; nobody substitutes from this table.

6. Where basalt rebar is specified

Element	Why	Usual sizes
Marine, seawalls and coastal concrete	Chloride corrosion is the failure mode; the published seawater immersion data speaks to this exposure.	Ø10–Ø25 mm
Bridge decks, barriers and highways	De-icing salt and traffic disruption justify a corrosion-free deck; the 50 GPa class helps on deflection-governed spans.	Ø14–Ø25 mm
Slabs, pavements and industrial floors	Crack control over a large thin area, no rust staining, bars light enough to place by hand.	Ø6–Ø12 mm, coils for Ø≤10
Foundations in aggressive soils	Chloride or sulfate groundwater; rafts and pile caps that are expensive to repair.	Ø12–Ø25 mm
Culverts, channels and stormwater	Wet-dry cycling and saline groundwater in linings, box culverts and headwalls.	Ø8–Ø16 linings; Ø16–Ø25 walls
Tunnels, soft-eyes and mining	Reinforcement a TBM or roadheader can cut, and that does not rust in groundwater.	Ø16–Ø25 mm cages
MRI, rail, substations and data centers	Nonmagnetic, electrically insulating reinforcement with nonmetallic chairs and ties.	Ø8–Ø20 mm
Pools, tanks and water plants	Shells, tanks and channels in wet or chemically aggressive service.	Ø8–Ø16 mm

In the United States and Canada public work runs through owner producer lists and domestic-content rules; elsewhere acceptance rests on the engineer's review of the D8505 or S807 data for the offered bar.

7. Standards and documents

Layer	Documents	What to ask for
Product standards	ASTM D8505/D8505M-23 (basalt and glass FRP bars); CSA S807:19 (R2024), basalt included, modulus grades I–III; ISO 10406-1:2015 test methods; GB/T 26743-2011 and JG/T 406-2013 (Chinese product standards)	The standard and edition the qualification report was tested to, per size.
Design codes	ACI CODE-440.11-22 covers glass bars only: a US building using basalt needs the engineer's design to ACI 440.1R guidance and the authority's acceptance. CSA S806 and S6 accept S807 bars of either fiber. EN 1992-1-1:2023 Annex R where the national annex adopts it.	Which code the designer will use, so the right properties are certified.
Approvals and listings	ICC-ES AC454 and state DOT lists cover named GFRP producers. F1 holds no ICC-ES, DOT, CE or ETA listing for basalt bars and claims none.	The documents your authority requires, so we can say what FengDu can evidence.

7.1 Documents that travel with an order

- Product and size data: fiber and resin, surface, measured area, unit mass, guaranteed tensile force and modulus for each offered size.
- Qualification and durability: test methods and editions, laboratory, bond, transverse shear, alkali and seawater exposure and retained properties.
- Production records: batch identification, inspection records, packing list and handling instructions for the released order.
- Shipping: commercial invoice, packing list, bill of lading, certificate of origin (Form E, Form F or non-preferential, per destination).

8. Handling, cutting and placing

Step 1 · Design with the certified values. The project designer sizes the bar to the governing FRP code using the guaranteed force and modulus of the offered size, not the substitution guide.

Step 2 · Order shapes in advance. Straight bars and coils are the standard product. Raise bends, hooks and mesh as an inquiry; never bend, heat or weld a cured bar on site.

Step 3 · Receive, support and protect. Check labels, quantities and damage on arrival. Store off the ground and out of prolonged sun; protect from impact and abrasion.

Step 4 · Cut with a blade. Diamond or abrasive blade with the bar supported on both sides and dust extraction; no shears, bolt cutters or torch. Wear eye, hand and respiratory protection.

Step 5 · Tie it down and inspect. Nonmetallic chairs set the cover; tie the light mat so it cannot float. Check spacing, cover and laps against the FRP design before the pour.



Fig. 5 · The helical fiber wrap over the basalt core (supplier photograph).

9. Price basis and ordering checklist

Quotations are built per metre or per bar for a schedule, and per tonne or per container for a repeating program. Price per kilogram misleads: a tonne of BFRP is about four times the length of a tonne of steel. Public FOB listings observed in October 2026 for basalt bars from Ø6 to Ø25 mm ran from roughly \$0.6 to \$1.6 per metre, rising with diameter; basalt fiber costs more per tonne than E-glass, so a BFRP bar prices above the same GFRP size. The project price is the one in the RFQ response.

Driver	What moves the number
Diameter	Material scales with cross-sectional area: a Ø20 mm bar costs about four times a Ø10 mm bar per metre. Quote the schedule, not an average.
Resin and test scope	Vinyl ester or epoxy matrix, sand coating and third-party reports to D8505 or S807 each add cost per metre.
Lengths and coils	Project cut lengths add handling but cut site waste; coils for Ø≤10 mm cut freight volume.
Packing and freight	Freight is bought per container; FOB, CIF, DAP or DDP decide who carries freight, insurance, duty and clearance.

9.1 What an inquiry needs

Item	Detail
Bar schedule	Diameters, cut lengths or coils, quantities and bar marks, or your BOQ and drawings.
Standard and documents	ASTM D8505, CSA S807 or the specification your project cites, and the reports your engineer or purchaser requires.
Shapes, if any	Bend, hook or mesh drawings, raised as an inquiry.
Destination and timing	Delivery country or port, target date, shipment phases and any sample evaluation.
Terms	FOB, CIF, DAP or DDP, so offers compare on the same basis.

9.2 How an order runs

Step 1 · Review the schedule. Confirm destination, standard, sizes, lengths or coils and quantities; resolve missing details before the order.

Step 2 · Confirm the offer. Agree product data, sample needs, inspection scope, price basis, MOQ, lead time and shipping terms.

Step 3 · Release and inspect. Freeze drawing revisions and acceptance criteria; identify lots and check dimensions and records agreed for the order.

Step 4 · Pack and dispatch. Agree labels, bundle quantities, protection and shipment phases; check bar length against the packing and transport plan.

10. Disclaimer

This manual is published by F1 Composite as product reference for specifiers and buyers. Values are published typical values restated as classes; they are not guaranteed values, design values or certifications, and nothing here is an ICC-ES, DOT, CE or ETA approval. Project compliance is established by the qualification report for the offered size, the production-lot certificate and any project-specific testing agreed in the order. Photographs of concrete work on the product page show steel-reinforced projects and illustrate the element, not a basalt installation.