CHEMFIT CARBOWRAP 9900

Unidirectional Woven Carbon Fiber Fabric for Dry Application Process – To Strengthen Concrete, Brickwork & Timber Under Flexural and Shear Load

PRODUCT DESCRIPTION

ChemFit CarboWrap 9900 is a high-strength, unidirectional woven carbon fiber fabric designed for external structural strengthening of concrete, masonry, brickwork, and timber elements. Manufactured using high tensile strength carbon fiber yarns with a heat-set weft for stability, the fabric is intended for installation via the **dry application process** (wet lay-up method) using compatible epoxy saturant resins. The fabric is lightweight, flexible, and conforms easily to complex geometries including beams, columns, slabs, chimneys, piles, and curved soffits. When saturated with a high-strength epoxy laminating resin, the system provides exceptional additional tensile capacity in the fiber direction (0°), significantly increasing flexural and shear strength without adding appreciable dead load or section dimensions. The fabric is supplied in convenient roll lengths and multiple widths for material-optimized installation.

PRIMARY APPICATIONS

ChemFit CarboWrap 9900 is recommended for use in conditions such as:

- Flexural strengthening (positive/negative moment) of reinforced concrete, masonry, and timber beams & slabs
- Shear strengthening (U-wraps, side bonding, complete wrapping) of concrete beams and columns
- Confinement (column wrapping) to increase compressive strength and ductility of concrete columns
- Seismic retrofit of masonry walls and beam-column joints
- Replacement of missing or corroded steel reinforcement
- Strengthening of structures for increased loading capacity (e.g., higher traffic, additional floors, new machinery)
- Correction of structural design or construction defects
- Strengthening of industrial floors, bridge decks, parking garages, silos, tunnels, and waterfront structures
- Strengthening of timber beams and trusses in historic or modern structures

KEY FEATURES AND BENEFITS

- **Unidirectional (0°) design** – Optimized tensile strength and stiffness in the primary load direction
- **Dry application process** – Wet lay-up with epoxy saturant; conforms easily to complex shapes and uneven substrates
- **High tensile strength** – Provides exceptional strengthening capacity with minimal weight increase
- **High modulus of elasticity** – Ensures efficient load transfer and limited deformation under service loads

- **Lightweight and thin** – Adds negligible dead load and does not increase section dimensions
- **Corrosion resistant** – Inert to chlorides, moisture, and most chemicals; ideal for aggressive environments
- **Heat-set weft fibers** – Maintains fabric stability and alignment during handling and installation
- **Conforms to complex geometries** – Flexible fabric wraps around curved surfaces, corners, and irregular profiles
- **Easy to cut and install** – Cut with standard scissors; installed with rollers and hand tools
- **Available in multiple widths** – 300 mm and 600 mm (50 m length rolls) for application efficiency
- **Excellent durability** – Resistant to freeze-thaw cycles, UV (when topcoated), and long-term environmental exposure
- **Cost-effective** – Faster and more economical than traditional strengthening methods (steel plate bonding, section enlargement)

PHYSICAL AND CHEMICAL PROPERTIES

Property	Specification
Appearance	Dry carbon fiber fabric (black)
Fiber orientation	Unidirectional (0°)
Construction	Warp: high-strength carbon fibers (approx. 95-99%); Weft: heat-set thermoplastic fibers (approx. 1-5%) for stability
Fiber type	PAN-based high-strength carbon fibers (12K or 24K tow)
Areal weight (dry fabric)	≥ 300 g/m² (carbon fiber only, varies by width specification)
Thickness (dry fabric, based on fiber content)	Approx. 0.167 mm (300 g/m² fabric)
Density (dry fiber)	Approx. 1.80 g/cm³
Roll length	50 m per roll (standard)
Roll widths	300 mm; 600 mm
Storage conditions	Store in original packaging in dry conditions (+5°C to +35°C), protect from direct sunlight, moisture, and dust
Shelf life	24 months from date of manufacture

MECHANICAL PROPERTIES

Carbon Fiber (Dry) Properties:

Property	Value (typical)	Test Method
Tensile strength	≥ 4,000 MPa (≥ 4,900 MPa for high-strength grade)	ASTM D3039 / ISO 10618
Modulus of elasticity (tension)	≥ 230 GPa	ASTM D3039 / ISO 10618
Elongation at break	≥ 1.5 – 1.7%	ASTM D3039 / ISO 10618

Laminate (Saturated) Properties (per ply, fiber content ~70%):

Property	Value (typical)	Test Method
Laminate nominal thickness per ply	Approx. 1.0 – 1.3 mm (including epoxy matrix)	EN 2561
Laminate tensile strength (characteristic)	≥ 3,500 MPa (average); ≥ 3,200 MPa (characteristic)	ASTM D3039 / EN 2561
Laminate modulus of elasticity	≥ 220 – 225 GPa	ASTM D3039 / EN 2561
Laminate elongation at break	Approx. 1.4 – 1.7%	ASTM D3039 / EN 2561
Interlaminar shear strength	≥ 35 MPa (ASTM D2344)	ASTM D2344
Design tensile strength (ACI 440.2R)	0.55 × characteristic strength (for environmental reduction factor CE)	ACI 440.2R

NOTE: Laminate properties depend on the epoxy saturant used, wet-out quality, curing conditions, and fiber volume fraction. Mechanical property values are representative for a properly installed wet lay-up system using a compatible high-strength structural epoxy saturant. All values are based on industry-standard equivalent product testing and assume correct installation and full cure.

PACKAGING AND STORAGE

Packaging:

- Rolls of **50 m length** (continuous fabric on cardboard core)
- **Widths:** 300 mm, 600 mm
- Packaged in cardboard box with sealed moisture-barrier liner

Storage:

- Store in original unopened packaging in a clean, dry location at +5°C to +35°C
- Protect from direct sunlight, moisture, dust, and extreme heat
- Keep rolls flat or on end; do not stack heavy items on fabric rolls
- Once opened, use within 7 days; protect cut fabric from moisture and dust
- Do not store near solvents, fuels, or strong chemicals

Shelf life: 24 months from date of manufacture (unopened, proper storage)

DOSAGE AND COVERAGE RATES

Surface Preparation Materials:

Layer	Approx. Consumption
Primer (epoxy primer)	0.3 – 0.5 kg/m² (per coat)
Epoxy putty (filler/surfacer)	As required for surface leveling
Saturant resin (impregnating / laminating resin) – first layer	1.0 – 1.5 kg/m²
Saturant resin – following layers (if multiple plies)	0.8 – 1.0 kg/m² per ply
Topcoat (UV protective coating, optional)	0.2 – 0.3 kg/m²

Fabric Coverage:

Fabric Width	Roll Length	Area per Roll
300 mm	50 m	15 m²
600 mm	50 m	30 m²

- **Yarn count:** Typical 12K or 24K carbon fiber tow
- **Overlap requirements:** Longitudinal splices – minimum 150 mm; transverse (end) splices – minimum 100 mm
- **Multiple plies:** Maximum 3-4 plies recommended (unless specifically designed by engineer)

NOTE: Consumption rates are approximate and depend on substrate porosity, surface profile, and application technique.

APPLICATION GUIDLINES

Surface Preparation:

- Concrete substrate must be sound, clean, dry, and free of dust, oil, grease, laitance, curing compounds, loose particles, and any contaminants
- Concrete compressive strength: minimum 15 MPa (C15) as per ACI 440.2R (minimum 2500 psi)
- Mechanically abrade (grinding, sandblasting, shot blasting) to achieve open, exposed aggregate texture (CSP 3-5 per ICRI)
- Fill voids, bug holes, honeycombs, and surface defects with epoxy putty/filler; level to smooth surface
- Round sharp corners (minimum radius 20 mm for complete wrapping) with grinding wheel

Mixing:

- For primer, putty, and saturant: refer to respective ChemFit epoxy resin product data sheets
- Mix each two-part epoxy component at low speed (400-600 rpm) for 2-3 minutes until uniform
- Do not exceed pot life; mix only usable quantities
- Never thin or dilute with solvents

Primer and Putty Application:

- Apply epoxy primer by brush or roller; allow to penetrate and become tacky (follow primer PDS)
- Fill surface defects with epoxy putty; sand smooth after cure

Fabric Cutting and Handling:

- Cut fabric to required dimensions using sharp scissors or utility knife
- For widths > 600 mm, cut from wider rolls or overlap multiple strips
- Handle fabric with clean, dry gloves to avoid contamination

Wet Lay-Up (Dry Application Process):

- Apply first coat of epoxy saturant resin to prepared substrate at 1.0-1.5 kg/m² by roller or brush
- Lay fabric into wet saturant; align fiber direction (0°) precisely with principal tensile stress direction (±5° tolerance max)
- Embed fabric by rolling with a ribbed roller (perpendicular to fiber direction, then parallel) to remove air bubbles and ensure full saturation
- Apply second coat of saturant (0.8-1.0 kg/m²) to fully saturate fabric; roll again for complete impregnation
- For multiple plies: apply additional saturant coat and next fabric layer before previous layer cures (wet-on-wet)

Curing:

- Allow full cure as per epoxy saturant product data sheet (typically 7 days at 23°C)
- Minimum 24 hours before light handling; 3-7 days before loading depending on temperature
- Protect from water, moisture, and physical damage during cure
- Lower temperatures extend cure time; higher temperatures accelerate
- Do not apply below +10°C or if temperature is falling

Quality Control:

- Visually inspect for full saturation (fabric should appear uniformly dark/transparent)
- Tap test (coin tap) to detect debonded areas (maximum acceptable debond area 5% per panel)
- For critical applications, perform in-situ pull-off testing (minimum 1.5 MPa or concrete failure)

HEALTH AND SAFETY

Carbon fiber fabric generates conductive dust when cut; use adequate ventilation and dust extraction. Wear nitrile gloves, safety glasses, and a dust mask when handling fabric. Carbon fiber dust is electrically conductive, so avoid contact with live electrical equipment. For epoxy resins (primer, putty, saturant), refer to the applicable ChemFit epoxy product SDS. Epoxy resins may cause skin and eye sensitization; use protective equipment and ensure ventilation. Wash hands thoroughly after handling, and do not eat, drink, or smoke while working. Refer to individual epoxy resin Safety Data Sheets for detailed information.

CLEAING OF TOOLS

Clean rollers, brushes, and equipment with acetone, xylene, or epoxy thinner immediately after use before resin cures. Cured epoxy requires mechanical removal. Dispose of waste materials in accordance with local regulations.

APPROVALS AND STANDARDS

ChemFit CarboWrap 9900 conforms to the following standards:

- **ACI 440.2R** – Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures
- **ASTM D3039 / D3039M** – Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials
- **ASTM D7565 / D7565M** – Standard Test Method for Determining Tensile Properties of Fiber Reinforced Polymer Matrix Composites Used for Strengthening of Civil Structures (wet lay-up)
- **ISO 10618** – Carbon fibre – Determination of tensile properties of resin-impregnated yarn
- **fib Bulletin 14 (2001)** – Externally Bonded FRP Reinforcement for RC Structures (International Federation for Structural Concrete)
- **EN 2561** – Carbon fibre reinforced plastics – Determination of tensile properties
- **CECS 146** – Technical Specification for Strengthening Concrete Structures with Carbon Fiber Reinforced Polymer Laminate (China)
- **GB 50728** – Technical Code for Safety Appraisal of Engineering Structural Strengthening Materials (China equivalent)
- Conforms to internationally recognized design methodologies for FRP external strengthening systems
- Suitable for strengthening concrete, brickwork, and timber under flexural and shear load

LEGAL NOTES

All technical data provided in this Product Data Sheet is based on laboratory testing under controlled conditions. Actual field performance may vary due to differences in substrates, application methods, site conditions, and environmental factors. ChemFit makes no warranty of merchantability or fitness for a particular purpose. Users shall conduct their own trials to validate product suitability for the intended application. ChemFit reserves the right to modify product specifications without prior notice. For the most current documentation, request the latest Product Data Sheet and Safety Data Sheet from ChemFit.

CHEMFIT CONSTRUCTION CHEMICAL AND SERVICES LIMITED

Office No. 8, 1KM Near Gaey Soap, Sargodha Road, Faisalabad
Tel: +923364544837
Web: www.chemfitchemicals.com
Email: chemfit.pro@gmail.com