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composite engineering

# FRP
## SYSTEM
## BETONTEX

**REINFORCEMENT AND STRENGTHENING OF CONCRETE AND MASONRY STRUCTURES**

MADE IN ITALY

# FRP
SYSTEM
**BETONTEX**

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**BETONTEX is a range of Fiber Reinforced Polymer (FRP) composite materials that includes fabrics, meshes, laminates, preformed bars, and anchoring elements in carbon fiber to be impregnated and/or bonded in situ using epoxy thermosetting resins.**
BETONTEX systems offer structural intervention solutions characterized by high tensile strength, minimal intervention thickness, and negligible mass increase.

EPD ITALY

**MESHES AND FABRICS**
in carbon fiber

**RESINS**
for bonding and impregnation

**CONNECTORS AND BARS**
in carbon fiber

**LAMINATES**
in carbon fiber

## APPLICATION FIELDS

**Reinforcement of Reinforced Concrete, Prestressed Concrete, and masonry structures:**

- Tie rods, confinements, and jacketing of buildings
- In-plane and out-of-plane reinforcement of structural elements
- Strengthening of arches and vaults
- In-plane reinforcement and stiffening of steel, timber, and reinforced concrete slabs
- Enhancement of compressive strength of masonry and concrete columns and piers

# CHARACTERISTICS AND ADVANTAGES

### HIGH MECHANICAL PERFORMANCE
Carbon fiber FRP reinforcements ensure high tensile strength, a high modulus of elasticity, and an excellent strength-to-weight ratio.

### MINIMAL IMPACT ON WEIGHT AND STRUCTURAL DIMENSIONS
The extremely limited thickness and lightness of the materials make these systems ideal for interventions where increases in mass and stiffness must be avoided.

### VERSATILITY AND CUSTOMIZATION OF THE DESIGN SOLUTION
The ability to vary the grammage, number of layers, and fiber orientation allows the reinforcement to be precisely calibrated according to specific design requirements, enabling targeted and minimally invasive interventions.

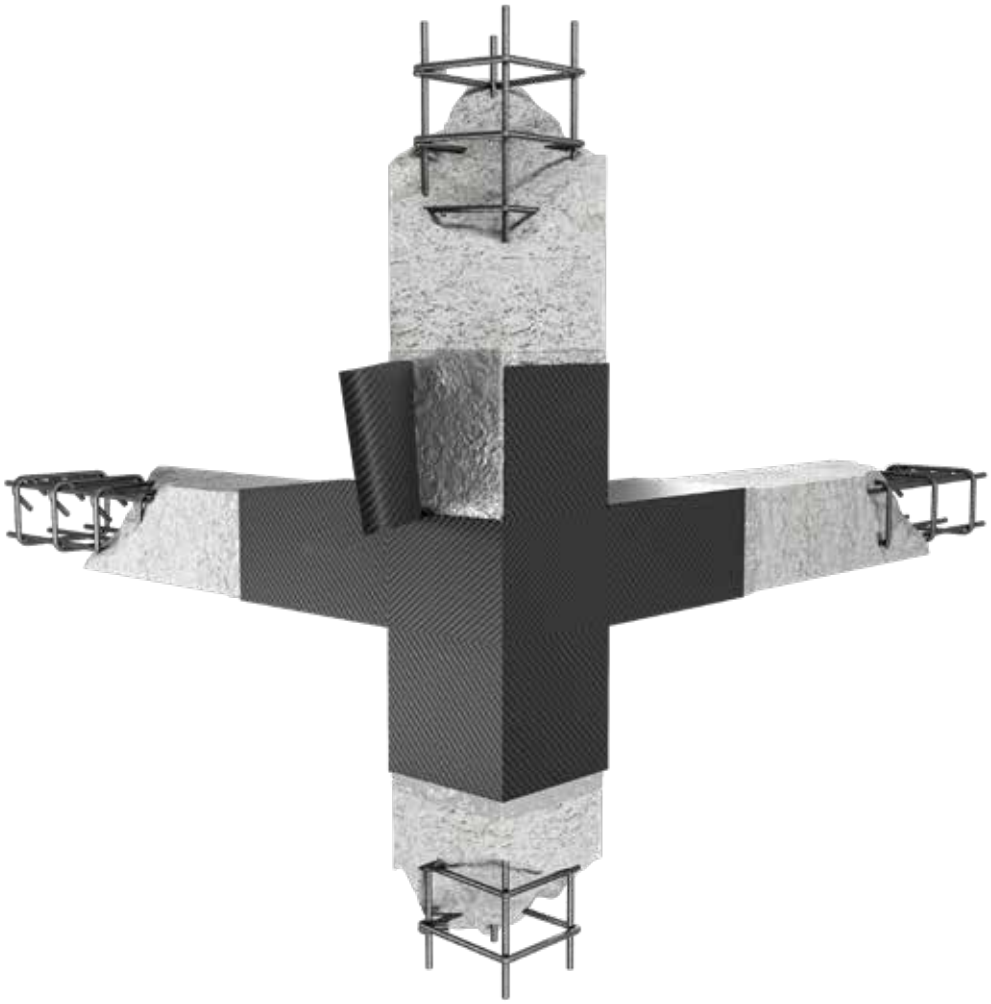
### WELL ESTABLISHED AND TESTED TECHNOLOGY
The widespread application of FRP systems in the reinforcement of reinforced concrete and masonry structures has demonstrated their effectiveness even in seismic retrofitting and upgrading interventions.

### RAPID INSTALLATION
The lightweight and handling ease of the materials facilitate their transport and installation, even in confined spaces or complex geometries.
The installation process is rapid and does not require extensive demolition, thereby reducing intervention time and costs.

### ENVIRONMENTAL SUSTAINABILITY
The systems, EPD certified, are eco-compatible with a low environmental impact.

# BEAM-TO-COLUMN NODE

The intervention involves the application of structural reinforcement systems in FRP, consisting of multiaxial and/or unidirectional carbon fiber fabrics applied at the beam-to-column node. The resulting reinforcement system ensures an increase in shear capacity and effective confinement of the joint.



**A. SUBSTRATE PREPARATION:**

- it is necessary to verify the suitability of the substrate for the application of the reinforcements. The surface must be regular and flat, not smooth but rough, followed by rounding of the edges with a radius of curvature ≥ 20 mm;
- in the presence of slight surface irregularities, proceed with the application of a two-component epoxy leveling layer;
- in case of more significant degradation, it is necessary to carry out repair using mortar or a cementitious screed with adequate mechanical properties;
- on a dry substrate, if necessary, apply an epoxy primer.

**B. APPLICATION OF THE REINFORCEMENT SYSTEM:**

- With the primer still fresh, proceed with the application of the first layer of adhesive resin;
- While the resin remains fresh, apply the unidirectional or multidirectional fabrics, ensuring continuous adhesion to the substrate and preventing the formation of bubbles, wrinkles, or folds;
- Apply a second layer of impregnating resin, accompanied by rolling with a bubble-breaker roller, to ensure complete fiber impregnation;
- In case a multilayer application is required, repeat the previous steps without reapplying the primer;
- While the resin is still fresh, a surface spreading of dry quartz sand may be performed to facilitate adhesion of subsequent finishing layers;
- where necessary, the insertion of local connectors to improve adhesion and interaction between the reinforcement and the substrate can be provided.

# ARCHES AND VAULTS

The reinforcement of arches or masonry vaults using FRP systems involves the application of unidirectional fabrics and bidirectional carbon fiber meshes, positioned on the intrados or extrados of the structure.

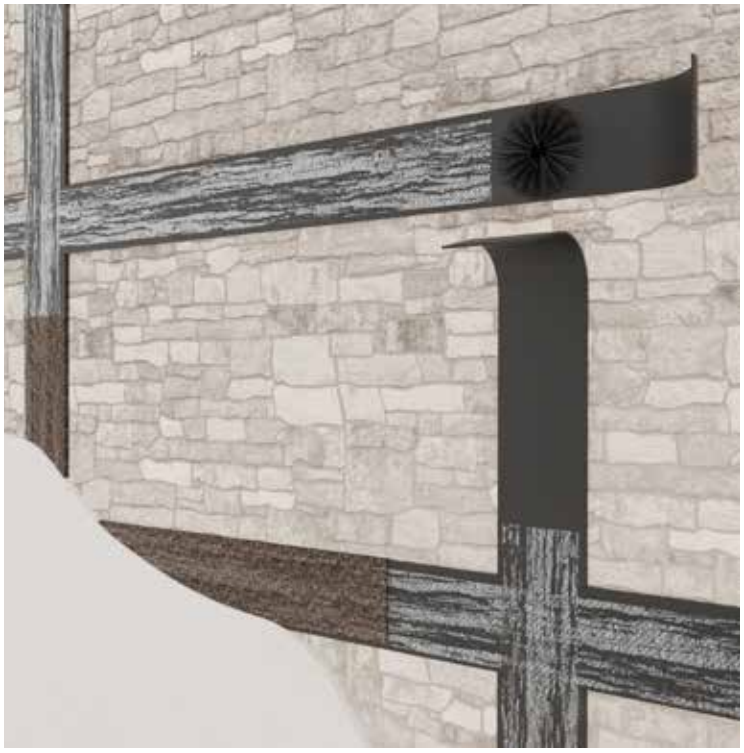
The application must be executed on a properly prepared substrate to ensure optimal adhesion of the reinforcement and to prevent possible detachment.

Such intervention on structural elements increases both the static and seismic capacities of the vault and inhibits hinge formation, thereby preventing collapse through kinematic mechanisms.

In the case of application to the extrados, it is essential to ensure adequate anchorage of the ends, achievable through preformed bow connectors.

For reinforcements installed on the intrados, careful attention must be given to potential premature detachment due to the curvature of the vault.

# MASONRY

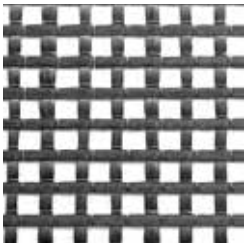


The intervention on masonry consists of the application of carbon fiber strips impregnated with epoxy resin, arranged to form lattices or positioned along the diagonals of the masonry panel.
This technique, primarily recommended for interventions on good-quality masonry, enables an increase in the bending and/or shear resistance of the masonry element.

In the presence of degraded masonry or heterogeneous masonry, it is preferable to adopt alternative techniques based on extensive plating.

To ensure the effectiveness of the intervention, thorough preparation of the substrate is essential to guarantee optimal adhesion and to prevent possible detachments. In the case of irregular surfaces, the application of a leveling mortar layer is used, which constitutes the bedding plane for bonding the strips.
The intervention can be completed by the use of transverse shear connectors.

## HIGH-STRENGTH AND HIGH-MODULUS MESHES AND FABRICS



Unidirectional, bidirectional, and multiaxial carbon fiber meshes and fabrics

## HIGH-STRENGTH PREFORMED LAMINATES WITH HIGH AND ULTRA-HIGH MODULUS

carbon fiber laminates

## HIGH-STRENGTH AND HIGH-MODULUS CONNECTIONS

Bowed bars
in carbon fiber

Carbon Fiber
bows

Fiber rods
of carbon

## RESINS AND ANCHORING MATERIALS


Epoxy resins for bonding
and impregnation


Chemical anchoring
epoxy, vinylester
or polyester


# REFERENCE STANDARDS

## IDENTIFICATION AND QUALIFICATION

- Guidelines for the identification, qualification, and acceptance control of fiber-reinforced polymer (FRP) composites intended for the structural reinforcement of existing constructions. May 2019.

## DESIGN

- CNR DT 200 R2/2025 – Italian guidelines for the design, execution, and quality control of static strengthening interventions using fiber-reinforced composites

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# FRP SYSTEM BETONTEX

## REINFORCEMENT AND STRENGTHENING OF CONCRETE AND MASONRY STRUCTURES

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ISO 45001 IIL-C (Certification)
ISO 14001 IIL-C (Certification)
ISO 9001:2015 SGS Certification
UNI/PDR 125:2022 SGS Certification
CSI RECYCLABLE COMPOSITES Licence FRP140001

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