

Fiber Reinforced Polymer (FRP) Reinforcing Bar

What is FRP Reinforcing Bar? A structural reinforcing bar made from filaments or fibers held in a polymeric resin matrix binder. The FRP Bar can be made from various types of fibers such as Glass (GFRP) or Carbon (CFRP). FRP bars have a surface treatment that facilitates a bond between the finished bar and the structural element into which they are placed.

FRP Bars are intended for use as concrete reinforcing in areas where steel reinforcing has a limited life span due to the effects of corrosion. They are also used in situations where electrical or magnetic transparency is needed. In addition to reinforcing for new concrete construction, FRP bars are used to structurally strengthen existing masonry, concrete or wood members.

Why is it innovative? FRP bars are a new type of structural material for the civil engineering community. The basic constituent materials for reinforced concrete design have changed very little in the past 100 years. Traditionally, composite materials have been used extensively in aerospace and consumer sporting goods where their high strength to weight characteristics were first exploited.

Corrosion of steel reinforcement in concrete structures causes deterioration of concrete resulting in costly maintenance, repairs and shortening of the service life of structures. Government agencies throughout the world have recognized the potential benefits to society if our infrastructure can last longer and are thus funding significant amounts of research in the field of FRP's.

What does FRP Change or replace? FRP bars are an alternative to steel rebar in many applications and to steel plate-bonding techniques for structural strengthening.

Where and when did FRP bars originate, has it been used and is expect to be used? The concept of FRP bars has been around since the 1960's, but advances in the field of polymers, advancements in production techniques and implementation of authoritative design guidelines have resulted in a rapid increase in usage of FRP bars in the last 5 years. FRP bars have been used in a number of FHWA funded Innovative Bridge Research projects as rebar in bridge decks (photo) and in a number of seawall and marine structure projects including the rehabilitation of Dry Dock #4 at Pearl Harbor Hawaii (photo). Other uses include slurry wall construction (photo) as "soft-eye" openings for tunnel boring machines, and reinforcing for ornamental and architectural concrete of all types. A great deal of research is being performed utilizing FRP bars as structural strengthening of existing concrete and masonry members to increase flexural and shear capacity. Examples of this technique have been used to remove the posted rating of a bridge in Missouri (photo) and seismic strengthening of un-reinforced masonry walls (photo).

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TxDOT Sierra de la Cruz Creek Bridge



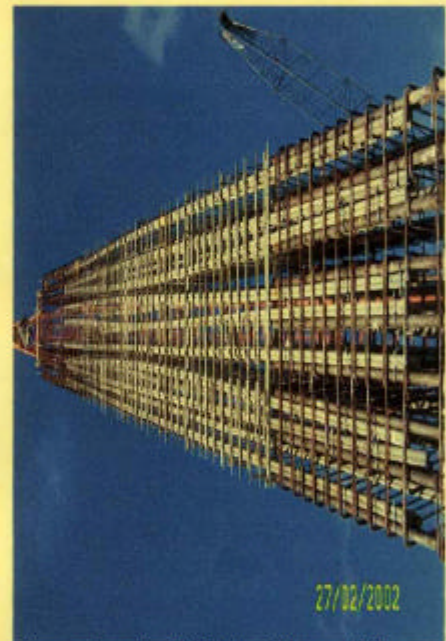
Seismic Strengthening of existing masonry



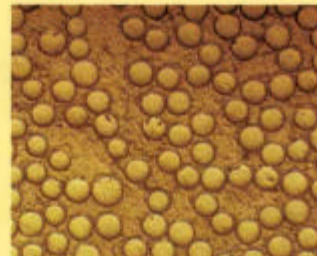
Structural Strengthening of Posted Bridge -
Martin Spring Bridge in Missouri



Restoration of Dry Dock #4 - Pearl Harbor



“Soft-eye” opening for TBM – Channel Tunnel Rail
Link, London England, River Thames Tunnel



Microscopic view of GFRP Bar