

TECHNICAL REPORT TITLE PAGE

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Effective Structural Concrete Repair

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Volume 1 - Repair of Impact Damaged Prestressed Concrete Beams with CFRP
Volume 2 - Use of FRP to Prevent Chloride Penetration in Bridge Columns
Volume 3 - Evaluation of Repair Materials for Use in Patching Damaged Concrete

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8. ABSTRACT

Structural concrete is one of the most commonly used construction materials in the United States. However, due to changes in design specifications, aging, vehicle impact, etc.– there is a need for new procedures for repairing concrete (reinforced or prestressed) superstructures and substructures. Three repair methods were evaluated:

- Carbon fiber reinforced polymers (CFRPs) for use in repairing damaged Prestressed concrete bridges
- Fiber reinforced polymers (FRPs) for preventing chloride penetration of bridge columns
- Various patch materials

Repair of Impact Damaged Prestressed Concrete Beams with CFRP (Volume 1) Four full-sized Prestressed concrete (PC) beams were damaged and repaired in the laboratory using CFRP. It was determined that the CFRP repair increased the cracking load and restored a portion of the lost flexural strength. As a result of its successful application in the laboratory, CFRP was used to repair three existing PC bridges. Although these bridges are still being monitored, results to date indicate the effectiveness of the CFRP.

Use of FRP to Prevent Chloride Penetration in Bridge Columns (Volume 2) Chlorides (which are present in the majority of deicing materials) can act as a catalyst in the corrosion of reinforcement in reinforced concrete. One way of preventing this corrosion is to install a barrier system on new construction to prevent chloride penetration. Five different fiber reinforced polymer wrap systems are being evaluated in the laboratory and field. Although in the initial stages of evaluation, to date all five FRP wrap systems have been effective in keeping the chloride level in the concrete below the corrosion threshold.

Evaluation of Repair Materials for Use in Patching Damaged Concrete (Volume 3) There are numerous reasons that voids occur in structural concrete elements; to prevent additional problems these voids need repaired. This part of the investigation evaluated several repair materials and identified repair material properties that are important for obtaining durable concrete repairs. By testing damaged reinforced concrete beams that had been repaired and wedge cylinder samples, it was determined that the most important properties for durable concrete repair are modulus of elasticity and bond strength. Using properties isolated in this investigation, a procedure was developed to assist in selecting the appropriate repair material for a given situation.

9. KEY WORDS

structures, bridges, PCC, Portland cement
concrete, repair, patch, chloride, corrosion

10. NO. OF PAGES

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