REMR TECHNICAL NOTE CS-MR-3.11

CRACK REPAIR METHOD: POLYMER IMPREGNATION

PURPOSE: To provide guidance on use of polymer impregnation to repair cracks in concrete. (NOTE: Before selecting any method for repair of cracks, REMR Technical note CS-MR-3.1, "Selection of a Crack Repair Method," should be reviewed.)

DESCRIPTION: Monomer systems can be used for effective repair of cracks. A monomer system is a liquid that consists of small organic molecules capable of combining to form a solid plastic. Monomers have varying degrees of volatility, toxicity, and flammability and do not mix with water. They are very fluid and will soak into dry concrete, filling the cracks, much the same as water does.

Monomer systems used for impregnation contain a catalyst or initiator and the basic monomer (or combination of monomers). They may also contain a cross-linking agent. When heated, the monomers join together, or polymerize, becoming a tough, strong, durable plastic that greatly enhances a number of concrete properties.

EQUIPMENT, TOOLS, AND PERSONNEL REQUIREMENTS: Effective use of polymer impregnation systems requires experienced personnel and some special equipment such as a heater to heat the monomer on site.

APPLICATIONS AND LIMITATIONS: If a cracked concrete surface is dried, flooded with the monomer, and polymerized in place, the cracks will be filled and structurally repaired. However, if the cracks contain moisture, the monomer will not soak into the concrete at each crack face, and, consequently, the repair will be unsatisfactory. If a volatile monomer evaporates before polymerization, it will be ineffective. Polymer impregnation has not been used successfully to repair fine cracks.

Badly fractured beams have been repaired using polymer impregnation by drying the fracture, temporarily encasing it in a watertight (monomer-proof) band of sheet metal, soaking the fractures with monomer, and polymerizing the monomer. Large voids or broken areas in compression zones can be filled with fine and coarse aggregate before flooding them with the monomer, providing a polymer-concrete repair.

STEP-BY-STEP PROCEDURE: The concrete and cracks to be repaired should be thoroughly dried. The manufacturer's instructions for the particular monomer system chosen should then be followed.

REFERENCES: a. Causes, evaluation, and repair of cracks. ACI Committee 224. In: Journal of the American Concrete Institute, Vol 81, No. 3, American Concrete Institute, Detroit, MI, 1984, ACI 224.IR-84.

b. Polymers in concrete. ACI Committee 548. In: ACI Manual of Concrete Practice, Part 5, American Concrete Institute, Detroit, MI, 1983. ACI 548R-77.