Crack Repair with Pressure-Grouted Epoxy Adhesives

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The injection method of filling concrete cracks with epoxy adhesives can be used to fill any concrete crack .002 inches or more in width. Cracks 1/64 inch wide and 6 to 8 feet deep have been successfully filled; with wider cracks, penetration is virtually unlimited. Within 24 hours the crack is not only sealed against moisture, but is capable of bearing full structural loads.

Research for more permanent methods of crack repair stemmed from the practice of V'ing out cracks for depths up to 1 inch and filling the surface flush with epoxy paste adhesives. The adhesives were excellent for this purpose, but being stronger than the concrete, they would not yield to structural deflection or temperature changes. Stresses created in the structure often cracked the concrete adjacent to the epoxy joints.

Tests suggested that the way to spread the stress loads properly in a cracked concrete structure would be to inject the epoxy adhesive to the full depth of the crack, thus distributing the stresses as the designer had intended.

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Problems encountered at first were solved by the formulation of fast-setting epoxy adhesives and the development of new application equipment and methods. Because the adhesive sets in a few minutes when mixed in a mass, the resin and curing agent are pumped through two separate pumps into a mixing head which blends them just before crack injection.

The epoxy adhesive can be applied in the winter at temperatures as low as 40 degrees F., and in rainy weather. The adhesive is designed to displace water in cracks and to bond to damp concrete with the same strengths it would have if the concrete was dry.

The epoxy adhesive used in pressure injection consists of modified resins and hardeners which are mixed together in a special gun just before injection and cure quickly through chemical reaction.

The adhesive formulations are solvent-free and do not incur shrinkage after cure which could lead to bond failure. The mixed adhesive has a pot life of 5 minutes and cures completely in 24 hours. The cured adhesive has good flexibility and is resistant to temperatures from 70 degrees F. below zero to 300 degrees F., freeze-thaw cycles, water, climatic changes, sunlight, acids, chemicals, gasoline, solvents and lubricating oils.

The portable pressure injection equipment consists of a special gun connected by hoses to the two adhesive components and an electric or air-driven pump with 300 psi capacity.

V'ing the cracks was eliminated by a strippable plastic which is brushed on the outside of the cracks—on interior wall surfaces when required—and penetrates sufficiently to prevent the injected epoxy from oozing out. When the adhesive cures, the seal is stripped off without marring the concrete or surface finishes.

Special devices now make it unnecessary to drill holes in the cracks for fittings, but small ports are exposed at regular intervals. The gun is placed directly to the first port on the crack surface and pressure is applied until the adhesive begins to exude from the next port in line. The gun is then shifted to the second port and the same procedure is followed for the full length of the crack.

Pressure injection of cracks usually takes place when the concrete has shrunk at low temperatures and the cracks are at their widest points. For all practical purposes, a crack attains its maximum width about 5 hours after sundown. Sealing material, therefore, is applied between the hours of 11 p.m. and 8 a.m., and later in the morning only if the sun has not hit the repair area.

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