EPOXY INJECTION FOR CRACK REPAIR

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During the past seven years repairs to cracks in various types of structure have been carried out using epoxy and other synthetic resins. Cracks in floor slabs, walls, precast units, underwater structures, etc. were included in the defects for which remedies were sought by using some type of injection process. In most cases it was desirable that complete structural restoration be achieved and for this reason epoxy resins with their excellent adhesion and stable volume characteristics together with their high tensile and compressive strengths, were selected.

The equipment available at that time, which was generally of the pressure pot or grease gun type, imposed severe limitations on the type of epoxy resin which could be used. The long pot life required meant that, generally, only the higher viscosity resins could be used which, in turn, created difficulty when penetration of fine cracks was essential, as the pressures then required were often beyond the capacity of the equipment.

The experience gained in this early work pointed to the need for equipment which would be capable of handling short pot life, low viscosity epoxy resins. Suitable equipment has been developed which also permits direct injection into the crack thereby eliminating the earlier time consuming placement of valve stems, etc.

Fig. I shows the material dispensing unit with its two component material reservoirs and calibrated dispensers. The unit is automatically recycling and ensures that the materials are continuously delivered to the mixing head in the correct proportions. The two components are thoroughly combined in the mixing head visible in Fig. II and injected directly into the crack within the 5 - 10 min. pot life. The low viscosity of the resin used, approximately 300 centipoises, permits entry into cracks as fine as .002 inches at the surface. The pressures available, up to 600 p.s.i., ensure that penetration is then complete into the finest hairline cracks.

Before commencing injection the surface of the crack is sealed off except at the regularly spaced injection ports. These ports can be seen in Fig. II. The surface seals used range from adhesive tapes to epoxy putties; the selection being dependent on crack width and surface texture.

Injection is commenced at the lowest point and continues until the material emerges from the next higher port. The lower injection port is then sealed off and injection recommenced at the next higher port. This process is repeated until the crack is completely filled.

After the resin has hardened the surface seal is removed and the surface is restored by painting, etc. The appearance of the crack after injection but before painting is shown in Fig. III.

The compressive strength of the resin used is 13,000 p.s.i. and the tensile strength 8,000 p.s.i. which is quite adequate for repair work in concrete, masonry and many other structural materials.

The satisfactory long term performance of repair work of this nature can be judged from the history of the N.Z.R. Ferry Terminal at Wellington. Berthing of the ferry under difficult conditions had created cracks in a major underwater beam (approx. 10 ft x 10 ft in cross section). Some five years ago these cracks were injected with epoxy resin, the efficacy of which was tested by subsequent core drilling. Since the repairs were carried out the beam has been subjected to repeated impacts without suffering further damage.

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