

WARNER'S CORNER

IT'S THE CAUSE THAT MATTERS



JAMES WARNER

We are often brought into projects because distress or deterioration is visible on a structure. As concrete repair professionals, we know, or should know, that the visible damage is often the result of hidden mechanisms within the concrete section. Should we fix only the visible damage, early failure of the repair is virtually guaranteed. And yet, we see such inappropriate repairs far too often.

In one case, concrete columns in a chemical process plant were severely cracked with only a few minor spalls noted. To address the problem, epoxy injection of the cracks was ordered, absent any consideration of the real problem, even though “rusty stains” were observed on the concrete surface. Within months, a column was said to “explode” by workers nearby, losing all structural support, forcing a plant shutdown, and requiring a major repair effort. It was very obvious the cause of the original cracking was corrosion of the reinforcement but that was not considered at the time. The epoxy injection did provide apparent containment until pressure of the growing corrosion product “exploded.”

In a less dramatic example, an open crack extended more than 200 ft (61 m) in a supported decorative slab plaza area of a convention center. The structure was only a few years old and the crack reportedly occurred soon after the opening of the center. It was nearly straight and only about 8 in. (203 mm) from and parallel to a construction joint. The crack was epoxy injected “so the movement would be taken by the joint as planned.” Shortly after, a new crack developed between the original crack and the joint. Nobody had considered the cause of the original crack, which was the existence of a structural expansion joint under the crack in the underlying structural slab. Interestingly, although the plaza slab was not bonded, the project plans contained a detail, calling for the plaza slab joint to be directly over the underlying structural joint.

In another case, minor surface settlement over a large water conduit caused the in-house engineer of a utility to order drainage and interior inspection of the conduit. Displacement of a joint and tearing of the waterstop was observed, which obviously allowed a large amount of water to leak into the surrounding soil, likely for an extended period of time. The ordered “repair” consisted of placing a flexible reinforced membrane over the joint on the interior to prevent further leakage. No consideration was given to further joint displacement, the condition of the surrounding soil, or its ability to provide adequate support—that is until tearing of the repair membrane and a sinkhole developed over the joint, endangering the foundation of an adjacent control structure. The leaking joint was not the problem; it was a result of deflection of the joint, which caused the original waterstop tear, likely due to the existence of faulty backfill soil. But whatever the condition of the soil preleak, the leakage had caused much greater damage and consolidation of the underlying deposit, resulting in very loose encapsulating soil and possibly an open void under the tube. This required an extensive investigation and compaction grouting operation to improve the soil so as to provide proper support, which was significantly more costly than had it been attended to in the original repair.

The true repair professional will always determine and consider the cause of any visible damage—the real problem.

Let us all be true professionals.

James Warner, PE, is an independent Consulting Engineer specializing in foundation and structural restoration and repair. Formerly a contractor in these specialties, he organized the original concrete repair program for World of Concrete and presented those seminars for 19 years. It was at one of his seminars that the seeds were sown for what is now the International Concrete Repair Institute (ICRI). He continues an active consultancy and is an Honorary Life Member of the Institute.