



## Florida Department of Transportation Research Reinforced Concrete Pipe Cracks - Acceptance Criteria BDK 84 977-06

Reinforced concrete pipe (RCP) is widely used by the Florida Department of Transportation (FDOT) in installations expected to serve for periods of decades before replacement, and extremely slow deterioration of RCP can be accepted. However, cracks in RCP are often found by inspectors shortly after placement, and a decision must be made whether the cracks are inconsequential and the installation can be approved, or if repairs or replacement are required.

To address this need, researchers from the University of South Florida undertook a project to develop acceptance criteria for RCP cracks. Their objectives were: to determine the parameters that influence self-healing of cracks; to determine the maximum crack width that is likely to undergo autogenous healing and mitigate corrosion of the pipe's steel reinforcement; and to formulate a guideline model for pipe acceptance criteria.

Work began with a review of the literature and an investigation of the practices and experiences of departments of transportation regarding RCP cracks. A survey showed that few transportation agencies had maximum allowable crack width guidelines for in-place RCP. The American Association of Highway and Transportation Officials (AASHTO) specified maximum in-place widths of 0.100 inch and 0.010 inch for noncorrosive conditions and corrosive conditions, respectively. The literature generally indicated that it was reasonable to expect autogenous healing to occur for cracks less than 0.020 inch, but that no healing could be expected for cracks larger than 0.100 inch. In any case, specific conditions were needed for healing to proceed; high humidity conditions were insufficient.

Experiments in the laboratory with RCP samples found no self-healing during a two-month immersion test period and that, during that time, significant corrosion of steel reinforcement could take place. Corrosion was much less with 0.020-inch cracks than with 0.100-inch cracks. The



*Experimental setup showing RCP section with induced crack of selected width. The test chamber for chloride exposure is fastened to the section with sealant.*

presence of moderate chloride ion concentrations was severely aggravating. Nevertheless, for 500 ppm chloride, RCP with 0.100-inch cracks could be expected to perform for decades, and RCP with 0.020-inch cracks could be expected to perform up to the 100-year durability mark. In the case of 0.100-inch cracks, spalling was an especially aggravating factor that significantly increased corrosion rates.

The researchers formulated their findings into possible acceptance guidelines based on crack width in the range 0.020 to 0.100 inch and chloride exposure from 0 to 2000 ppm.

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