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16. Abstract

An experimental program was performed to evaluate durability of FRC produced with four fiber types (polypropylene/PP, polyvinyl-alcohol/PVA, hooked-end steel/St, and cellulose/Cell). The effect of cellulose could not be evaluated because good fiber distribution was not achieved in laboratory mixing. Transport properties indicated that the addition of fibers to concrete improved the resistance of mass transport of deleterious materials; steel fibers were best. Fibers provided for post-cracking resistance; again, steel fibers were best. FRC beams produced with two concrete classes were subjected to simulated saltwater (immersed and wet/dry) and swamp (acid) environments for 27 months. Effect of fibers on durability could not be assessed reliably based on test results from either average residual strength (ASTM C1399) or flexural performance tests (ASTM C1609) because of non-uniform degradation and stress/strain distributions, as well as development of multiple cracks. Indirect tension testing (IDT) was identified as a more effective approach to achieve a uniformly-degraded cross-section and uniform stress/strain distribution. FRC specimens were subjected to an additional six months of saltwater conditioning, after which cracking and post-cracking behavior was assessed with IDT using testing and data interpretation procedures specifically designed to capture the effects of fibers. Test results indicated that PP fibers had the best resistance to saltwater environments (immersed and wet/dry), while PVA fibers had the worst, and resistance of steel fibers was somewhere between these two. However, steel fibers did not do well in fully immersed environments, but showed little or no degradation in wet/dry environments. The detrimental effect of acetic acid on aggregate and cement overwhelmed the degradation mechanism in swamp water, so the effect of fibers could not be distinguished for this environment. It was concluded that PP has the best durability for non-structural applications in saltwater environments. Steel may be suitable in non-submerged saltwater environments, particularly for structural applications, but should not be used if it will be in direct contact with reinforcing bars because it was found to accelerate corrosion of the bars. PVA should not be used in saltwater environments. Finally, it was concluded that transport properties alone are not necessarily good indicators of resistance to degradation.

17. Key Word	18. Distribution Statement
FRC, transport property, conditioning, beam test, post-cracking, toughness, IDT, Resilient deformation ratio	No Restrictions

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