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### Durability testing of FRP: The way forward

The durability of fiber reinforced polymers (FRP) has been the subject of continuing research for over 65 years. Initial studies focused on aerospace applications; later, emphasis shifted to infrastructure. The reliability of adhesive joints used in aircraft construction has resulted in increased use of composites. Comparable progress in the infrastructure sector is lagging due in part to the absence of a common durability testing protocol compounded by the inherent variability of wet lay-up applications using ambient cure resins.

Since durability evaluates performance of bonded assemblies, the effects of surface preparation, the interface, adhesive, the curing regime and exposure are automatically considered. Among researchers, there are significant variation in these parameters. This is a major reason for the relative lack of progress. For example, immersion in distilled water used for evaluating FRP-steel durability is taken from a 1960's pass / fail protocol intended to screen materials and has no bearing to actual service conditions of bridge repairs.

This presentation re-visits durability testing protocols used in research. The intent is to critically review exposures that were evaluated with a view to defining a common testing protocol for consideration by all researchers. Commonality in test parameters will enable findings from disparate studies to be

aggregated and used to develop predictive models correlating test results to service performance obtained from full scale demonstration projects. Increased confidence in long term durability of adhesive joints will promote greater FRP use.

#### Speaker Biography

Rajan Sen is Professor of Structural Engineering at USF where he held the Samuel & Julia Flom Chair and joint appointments in Architecture & Engineering. As NAS Jefferson Science Fellow at US Department of State, Washington DC he served as delegate to UNISDR at UN Geneva, on NSTC's Disaster Reduction/Infrastructure subcommittees and was a contributing member of the Science Coordination Working Group's Presidential Hurricane Sandy Task Force. On Editorial board of ASCE's Composites for Construction, he was Conference Chair for FRPRCS 10, served on several NSF and NAS review panels, has been NSF delegate to conferences worldwide, authored over 250 publications, edited two books, holds 3 patents, has been active in FRP field research on durability and marine corrosion repair funded by NAS, NSF, Army Corp of Engineers and FDOT. A member of ACI 440 and TRB AFF80 committees, he previously worked on design standards at BES Department of Transport, London, UK. An honor graduate of IIT KGP, he holds graduate degrees in Civil Engineering from University of British Columbia, Vancouver, Canada and SUNY, Buffalo. He is Fellow of ACI & ASCE, Distinguished Faculty Fellow at Office of Naval Research CIRD, and registered professional engineer in Florida.

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