Civil Engineering Seminar

The Astani Department of Civil & Environmental Engineering presents

Assistant Professor Mohammed Alnaggar,
Civil and Environmental Engineering Department, School of Engineering
Rensselaer Polytechnic University

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Place: RRI 101

Predicting Reinforced Concrete Aging and Deterioration: Experiments or Modeling?

Our nation's infrastructures are in a very bad condition. The economical and societal impact of which cannot be underestimated. While concrete is the most used construction material all around the world, it is one of the most complex materials too. Heterogeneity at nearly every length scale is a main challenge. In addition, being born as a liquid that solidifies over time through chemical reactions adds another multi-physics layer of complexity. In literature, one can find a numerous experimental programs as well as computational models that describe the same phenomenon, yet still, both efforts are mostly done independently. In this presentation, a road map is presented to understand, quantify and predict the complex long-term behavior of this material through the integration of modeling and experimentation to provide an experimentally validated multi-scale multi-physics predictive framework for concrete long term behavior.

About the Speaker

Alnaggar got his B.Sc. and M.Sc. from Zagazig University in Egypt. His M.Sc. published research was one of the very early applications of Neural Networks use in Compensating Time-Delay in active control of seismically excited structures. In 2014, he got his PhD from Northwestern University, Evanston, IL. In his Ph.D. research, he worked on developing physics-based models of aging and deterioration of concrete materials. His research focused on Alkali silica reaction (ASR) modeling coupled with creep and shrinkage. After joining RPI, he focused on understanding the coupling and synergies between different aging and deterioration mechanisms affecting the long term behavior of concrete materials and structures using innovative experimental investigations and multi-scale multi-physics computational modeling techniques. His work covered reinforced concrete degradation due to corrosion, Freeze thaw and ASR coupled effects as well as understanding load transfer mechanisms in Ultra High Performance Concrete. His current research aims at addressing pressing Natural Hazard effects on the aging built infrastructure.

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