University at Buffalo
Department of Civil, Structural and Environmental Engineering
School of Engineering and Applied Sciences

ENGINEERING SEMINAR

Advanced Concrete Materials

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Dr. Ranade's research group specializes in the development, multi-scale investigations, and structural applications of advanced concrete materials. Concrete is the most used engineering material in the world due to its low cost, commercial availability, moldability, compressive strength, mass, and chemical inertness to most materials; however, a critical deficiency of concrete is its brittleness that leads to uncontrolled cracking under tension and causes a number of durability and resilience problems. Motivated by the goal of overcoming this core deficiency of concrete, Dr. Ranade's students perform fundamental and applied research to develop novel ductile concrete materials for a variety of structural applications. In this process, new mechanisms of material behavior such as microstructural changes in concrete, fiber/matrix interactions, rebar/concrete bond behavior, dynamic rate and thermal effects, influence of material ingredients on mechanical and rheological properties, influence of crack pattern on transport properties, material-structural interactions, etc. are discovered. The overarching goal of Dr. Ranade's research is to improve structural resilience and durability through innovation in materials.

Abstract

This presentation provides an overview of the ongoing research on advanced concrete materials at UB. Dr. Ranade's doctoral students are currently working on three major topics of research: (1) Development of a systematic methodology for performance-based design of advanced concretes, (2) Novel use of precast ductile concrete covers for corrosion mitigation in reinforced concrete infrastructure, and (3) Effects of elevated temperatures on the properties of engineered cementitious composite (ECC) and its bond with rebar. The first topic of research addresses the lack of a standard design procedure for advanced concretes, which forces structural engineers to choose from a limited number of commercially available advanced concretes with fixed properties leading to inefficient solutions. The second topic utilizes the damage tolerance and crack width controlling ability of ductile concretes to provide an extremely durable cover for reinforced concrete infrastructure elements, thus significantly reducing maintenance needs and extending service life. Under the third topic, hybrid combination of steel and polymer fibers to develop an advanced concrete with significantly improved thermal behavior is investigated. The presentation will discuss all these three topics plus other active areas of concrete materials research at UB.

Date: Friday, September 29, 2017 Time: 11.00 am
Location: 140 Ketter Hall, North Campus, University at Buffalo