

FRP Composites in the Face of Fire: Insights from Research and Industry

Upcoming NEx Workshop at the ACI Concrete Convention – Fall 2023

Fire incidents in structures pose significant threats to life, property, and the environment. To address this critical concern, the NEx 1-day workshop will bring together leading experts, researchers, and industry professionals to delve into the latest developments and innovations in ensuring fire safety of fiber-reinforced polymer (FRP) composites in construction. This workshop will be held on November 1, 2023, during the ACI Concrete Convention in Boston, MA, USA.

This workshop aims to provide a comprehensive exploration of topics related to fire and FRP composites, with a focus on fire rating, fire resistance, fire endurance, and fire safety. Attendees will gain valuable insights into how FRP materials and structures perform under fire conditions and the implications for real-world applications. This workshop is co-sponsored by ACI Committee 440, Fiber-Reinforced Polymer Reinforcement, and Joint ACI-TMS Committee 216, Fire Resistance and Fire Protection of Structures.

The workshop will include two sessions: session 1 from 9 a.m. to 12 p.m. and session 2 from 2 p.m. to 5 p.m., featuring nine presentations by researchers and industry experts. Both ACI Committee 440 and Joint ACI-TMS Committee 216 will provide updates on committee work related to fire endurance of nonmetallic building materials. Steve Szoke, ACI Distinguished Staff and Code Advocacy Engineer, will deliver the first presentation, “Code Requirements and Permissible Applications for Concrete Internally Reinforced with GFRP.” As a Code Advocacy Engineer, Szoke will provide code requirements and fire protection criteria in building codes for structural concrete reinforced with glass fiber-reinforced polymer (GFRP) reinforcement. He will highlight the use of polymer fibers to enhance the performance of structural concrete in fire scenarios. The second presentation by Venkatesh Kodur, Distinguished Professor and Director of the



Szoke



Kodur



Green

Center on Structural Fire Engineering and Diagnostics, Michigan State University, will focus on “Strategies for Enhancing Fire Performance of Concrete Structures incorporating Fiber Reinforced Polymers.” The performance problems associated with FRP-reinforced concrete structures will be illustrated. He will highlight various factors influencing the fire response of FRP-reinforced concrete members and the development of a rational design methodology for evaluating the fire resistance of concrete members incorporating FRP. The third presentation on “Fire Performance of Concrete Structures with Internal and External FRP Reinforcement” will be delivered by Mark Green, Professor, Queen’s University. He will provide an overview of the research that focuses on reinforced concrete members (columns, beams, and slabs) strengthened with FRP sheets and plates and GFRP reinforced concrete slabs. He also will explain the effectiveness of insulation on the fire endurance of FRP-strengthened members.

The fourth presentation by Steven Nolan, Senior Structures Design Engineer, Florida Department of Transportation (FDOT), will discuss “Highway Bridge Fire Damage Experiences and Fire Resilience Considerations for Bridges with FRP.” As a Technical Lead Coordinator for FDOT, Nolan



Nolan



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Alkhrdaji



Al-Khalifa



Walsh



Sumar

will provide insight on fire incidents above and under highway bridges, highlighting differences between conventional building design fire resistance and potential considerations for bridges designed with FRP reinforcement or members. The fifth presentation will be by Shuna Ni, Assistant Professor in the Department of Fire Protection Engineering, University of Maryland, on “Fire Impact of Vehicle Fire Exposure on Polymer Concrete Overlays.” She will highlight the impact of vehicle fire exposure on polymer concrete overlays, revealing how brief exposure affects properties, such as surface hardness, skid resistance, and bond strength.

The second session will cover FRP internal and external reinforcement as well as pultruded composite structures. First, Tarek Alkhrdaji, Senior Vice President, Structural Technologies, will discuss “Fire Resistance of Concrete Structures Strengthened with Externally Applied FRP Reinforcement.” He will not only address the fire resistance of concrete structures strengthened with externally applied FRP reinforcement but also highlight the methodology that can be used to calculate the fire resistance with external fire protection systems. The second presentation will be by Hassan Al-Khalifa, Group Leader, Civil and Building Systems Engineering, Saudi Aramco, on “Experimental Investigation and Finite Element Simulation of GFRP Reinforced Concrete on Grade Slab Exposed to Fire.” He will present the results of experimental investigations and finite element simulation of concrete slabs reinforced with GFRP bars that include the fire behavior of full-scale GFRP bar-reinforced concrete slab subjected to the industrial fire load.

Next, Kevin Walsh, Associate Teaching Professor and Director, University of Notre Dame, and Principal Engineer, Frost Engineering & Consulting, will discuss “State of the Art Regarding Heat and Fire Resistance of Pultruded FRP Structural Members in the AEC Industry.” He will emphasize the recommendations that were drawn from the study to improve the fire resistance of pultruded structural members for better implementation into the built environment. The final presentation by Shamim Rashid Sumar, Senior Vice President

of Codes and Standards, National Ready Mixed Concrete Association, will focus on “Fire Safety Testing of ICF Wall Construction.” She will offer insights into a research project that has been conducted in collaboration with the Insulating Concrete Forms Manufacturers Association. She will analyze how to enhance fire safety when working with insulating concrete form (ICF) systems.

Overall, this workshop will be an in-depth discussion of fire safety in construction, encompassing a diverse range of topics, including internal and external FRP composites, polymer concrete, pultruded composite shapes, and ICF. The upcoming sessions will explore the latest developments, research findings, and innovative strategies for enhancing fire performance in these critical areas. The esteemed speakers will share their expertise to inspire collective action for advancing fire safety standards and practices within the construction industry.

NEX is interested in supporting the advancement of fire applications of FRP composite materials. The Center of Excellence has funded two projects aimed at developing testing strategies for FRP bars and FRP pultruded shapes in fire-related applications. The collaborative efforts to be showcased, including industry partnerships and research endeavors, will exemplify the dedication of professionals toward building a safer and more resilient built environment.

To register for the workshop, visit www.concrete.org/events/conventions/currentconvention. For more information on NEX, visit www.nonmetallic.org.

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