

# NEx's Second Year of Funding

**B**uilding on the success of the first-year funding and contributions made to the construction industry, NEx: An ACI Center of Excellence for Nonmetallic Building Materials was provided additional funding for its second year of operation. NEx received sponsorship of more than 575,000 USD for project funding in 2022 from its Sustaining Member, Aramco Americas, which was covered in the April 2023 edition of NEx *insights*. In addition, NEx secured a substantial sponsorship of over 700,000 USD for its 2023 projects.

Aramco Americas' sponsorship demonstrates its continued support and commitment to NEx's initiatives and highlights the importance of advancing nonmetallic building materials in the construction industry. NEx is using these funds to support projects under its core functions, including standards and guidelines, research and development, technical advocacy and awareness, and professional development. The sponsorship enables NEx to expand and enhance its activities, driving innovation and progress in the field of nonmetallic building materials.

## Standards and Guidelines

Similar to 2022, NEx continues to play a crucial role in promoting the development and acceptance of design and construction codes and specifications specifically tailored for nonmetallic building materials. This commitment is exemplified by its ongoing projects in the field of standards and guidelines, which encompass areas such as polymer soil stabilization, bendable concrete, fiber-reinforced polymer (FRP) dowels, and FRP composite mesh:

**“Develop Polymer Soil Stabilization Code and Include in ACI 230—Soil Cement Document,”** executed by **Anand J. Puppala, Texas A&M University:** The project aims to develop a comprehensive guideline for polymer soil stabilization to be included in ACI 230 or ACI 548 documents (new or an updated existing document). The guideline will address important aspects such as available techniques, material specifications, mixture procedures, environmental impact, selection guidelines, and quality control measures to promote effective and sustainable use of polymer soil stabilization in construction practices.

**“Develop Guideline and Materials Specification for Bendable Concrete,”** executed by **Victor C. Li, University of Michigan:** The primary goal of this project is to create a user guideline that provides comprehensive support for the use

of bendable concrete in the construction sector. The guideline will be presented in a newly developed document, offering detailed insights into the production process, quality control measures, and structural applications of bendable concrete.

**“Develop Guideline and Materials Specification for FRP Dowels,”** executed by **Peter Taylor, Iowa State University:** This project aims to develop a comprehensive guideline for the use of FRP dowels in the construction industry, aligning with the guidelines provided for steel dowels in ACI 330 and ACI 325 documents. It will cover essential aspects such as FRP dowel sizes, material specifications, design guidelines, testing methodologies, and their application in construction.

**“Develop Guideline and Materials Specification for FRP Composite Mesh,”** executed by **Francisco De Caso, University of Miami:** The main objective of this project is to develop a comprehensive guideline to provide designers, users, and specifiers with an overview of the use of FRP composite mesh in concrete structures that extends beyond buildings, looking at the material properties (to include glass and basalt FRP meshes), construction and implementation, specification needs, and design approaches.

## Research and Development

NEx's continued investment in research and development projects signifies its dedication to fostering collaboration, knowledge sharing, and practical advancements in nonmetallic building materials. These funded projects encompass a wide range of research areas within the scope of nonmetallic building materials. The ultimate goal of funding these projects is to ensure that the research outcomes can be swiftly translated into practical applications within the construction sector. Under this core function, the following five projects are sponsored by NEx:

**“Proposed Testing and Acceptance Criteria for GFRP Bar Couplers,”** executed by **ICC-ES:** This project is to develop new acceptance criteria for testing and evaluation of steel and FRP mechanical splice and coupler systems for FRP reinforcing bars for building code compliance. It is proposed that an acceptance criterion is developed in accordance with International Building Code (IBC) Section 104.11, and International Residential Code (IRC) Section R1404.11.

**“The Use of Synthetic Macrofibers to Improve Crack Control and Water Tightness in Environmental Structures,”** executed by **Behrouz Shafei, Iowa State**

**University:** This research project aims to design and evaluate the use of synthetic macrofibers in concrete mixtures used in environmental engineering concrete structures. The research results will be used to update current ACI code and specifications.

**“Conduct State-of-the-Art and Develop Recommendations to Address Fire Endurance/Resistance of Pultruded Structural Members,”** executed by **Kevin Walsh, University of Notre Dame:** This is a state-of-the-art study on the fire resistance (including the effects of elevated temperatures due to fire) of composite pultruded structural members to establish available fire testing information from literature and industry limitations compared with applicable code requirements to develop recommendations to improve the fire endurance of pultruded structural members.

**“Study and Improve on Fire Endurance/Resistance of Polymer-Modified Concrete,”** executed by **Venkatesh Kodur, Michigan State University, and Srishti Banerji, Utah State University:** The proposed research will undertake comprehensive experimental and numerical studies and establish the thermal and mechanical properties of polymer concrete (PC), as well as the fire resistance ratings for typical PC beams. The proposed research will result in optimum strategies for achieving practical fire resistance ratings in PC beams.

**“Develop a Plan for Fire Testing FRP Structural Concrete,”** executed by **Venkatesh Kodur and Mohannad Naser:** This project is to develop a testing program, together with fire testing protocols, for undertaking needed fire resistance tests on FRP-incorporated structural concrete members and for its possible adoption by the IBC.

## Technical Advocacy and Awareness

NEx continues to amplify its advocacy activities with greater dedication and focus. By leveraging trade shows, workshops, and other platforms, NEx is driving the awareness, acceptance, and adoption of nonmetallic materials in the industry. This year, NEx is sponsoring seven projects and initiatives to support technical advocacy and awareness. In the first half of 2023, NEx was proactively involved in various industry trade shows, including the Transportation Research Board annual meeting and World of Concrete. These trade shows served as platforms for NEx to promote the benefits and applications of nonmetallics in construction.

NEx creates awareness on the use of nonmetallics in building and construction. This is achieved by offering insights into field applications and user experiences with FRP-reinforced concrete. NEx organized a well-attended, full-day workshop on “FRP Reinforced Concrete: User Experience and Success Stories” during the ACI Concrete Convention – Spring 2023, with generous sponsorship from Aramco Americas.

Moreover, NEx places significant emphasis on educating young professionals about the implementation of the new code, ACI CODE-440.11-22, “Building Code Requirements for Structural Concrete Reinforced with Glass Fiber-Reinforced Polymer (GFRP) Bars—Code and Commentary.” NEx supports the development of Chapter talks and Seminar series through the ACI platform to introduce the concept of FRP bars as structural reinforcement to an audience with limited prior exposure to this technology.

Additionally, NEx has initiated a NEx monthly webinar series in collaboration with ACI University, focusing on nonmetallic technology and application in building and construction. The available NEx webinars include Practical Utilization of the New ACI Code 440.11 on GFRP Reinforced Concrete: Manuals for Engineers and Contractors; Pultruded Non-Metallics (NM) Solutions for the Built Environment: Why, What, How!?!; and GFRP Bars as an Internal Reinforcement to Concrete: Advantages, Misconceptions & Effect on Green House Gas Emissions. For more information, visit [www.nonmetallic.org/resources](http://www.nonmetallic.org/resources).

## Professional Development

As part of the ongoing commitment to promote technology transfer, NEx engages in the development and delivery of educational programs and certification courses catered to engineers, contractors, and the wider construction workforce:

**“ACI CODE-440.11 Certificate Program Development,”** executed by **ACI:** This program is focused on elucidating the design philosophy for GFRP reinforced concrete and ACI CODE-440.11. It will encompass specifications for construction using GFRP reinforcement, addressing unique considerations in handling and placing GFRP reinforcement, and presenting case studies of successful construction projects. This certificate program will be conducted through ACI University, granting participants a digital credential upon program completion.

**“Develop and Deliver Introductory Material (Guest Lecture) for Universities on Nonmetallics in Building & Construction,”** executed by **David Lange:** This initiative aims to promote the potential of nonmetallic materials to students who will soon enter the profession and provide them with a greater appreciation for the possibilities represented by nonmetallic building materials.

**“Develop a 5-Day Course for Nonmetallics in Building & Construction,”** executed by **Ayman S. Mosallam, University of California, Irvine:** This course will cover important topics that are needed to familiarize and train entry-level engineers to increase their knowledge and awareness of available resources.

For more information on NEx, visit [www.nonmetallic.org](http://www.nonmetallic.org).