Summary of Proposals for Consideration

Proposals Held Over from Spring 2025 Board Meeting

Note: There were several proposals that were rejected during the Spring 2025 Board meeting; however, the proposals below were tabled for future consideration after the strategic planning meeting and additional fundraising plans are determined.

Project 25-02: Transforming 3D Printing Technology: Direct Utilization of Ready-Mix Concrete, $79,868 over 18 months, submitted by Texas State University. This project proposes researching the viability of using traditional ready mixed concrete in 3D printing applications using new equipment technology.

Project 25-03: Development of ConcreteWorks 2.0, $300,000 (of an estimated $1,500,000) over three years, submitted by The University of Texas at Austin. This aims to modernize and expand the existing ConcreteWorks software, which is widely used by Departments of Transportation (DOTs) for designing mass concrete structures and assessing durability risks. The current version is outdated and operates on aging systems. The proposed update will migrate the software to a web-based platform and incorporate data for blended cements and supplementary cementitious materials (SCMs) such as natural pozzolans and ground glass. Co-funding for this project is anticipated by the Federal Highway Administration (FHWA) and the Concrete Bridge Engineering Institute (CBEI) pooled fund.

Project 25-05: Quantifying the Value of Blending Cements, $250,000 (of an estimate of $1,000,000) over three years, submitted by Oregon State University. This study will analyze the chemical composition of blended cements and use modeling techniques to predict their performance in concrete mixes. The project will also explore how different cement blends impact water demand, permeability, and long-term durability. CAF's funding would serve as a matching contribution to an existing $660,000 commitment from the University Transportation Center.

Project 25-06: Investigating the Fresh Properties of Low Carbon Cement, $270,000 (of an estimated $775,000) over four years, submitted by Oklahoma State University. This project will assess workability, setting time, and other fresh properties of low-carbon cement blends. The research aims to develop practical testing methods that can be adopted by ready mixed concrete producers and contractors. Co-funding was expected from the FHWA's Low Carbon Transportation Materials program, but uncertainty due to federal funding shifts raises concerns about its viability.

New Proposals for Fall 2025

Project 25-12: Evaluation of Strength Variability in Ready-Mixed Concrete, $35,000 (of an estimated $210,000) over two years, submitted by Georgia Institute of Technology. This project aims to improve quality control in the ready mixed concrete industry by assessing variability in compressive strength, the most critical indicator of concrete performance. Strength variability arises from batch-to-batch differences, within-batch

inconsistencies, and laboratory testing errors. The research will employ an experimental design using Response Surface Methodology and Nested ANOVA to quantify and decompose variance components, helping identify the main sources of inconsistency in production. By integrating advanced statistical methods, the study will provide producers with practical tools to enhance uniformity and compliance with specifications. Matching contributions totaling $175,000 will cover student support and fees.

Project 25-13: DiscoverE Future City Program, $50,000 (of an estimated $1,131,500) for one year, submitted by DiscoverE. Future City is a nationwide educational program that challenges more than 80,000 middle and high school students each year to design and build cities of the future using the engineering design process. The program strengthens students' STEM knowledge, problem-solving, teamwork, and awareness of engineering careers. With proven impact, more than 90% of educators report gains in student skills and knowledge. Future City provides a unique opportunity to introduce youth to the role of concrete in sustainable infrastructure. Support from the Concrete Advancement Foundation would fund program delivery, create a "Best Use of Concrete" award, and expand access to industry resources and mentors. Major co-funding is provided by the Overdeck Family Foundation, Bechtel Corporation, NCEES, Shell, and ASCE.

Project 25-14: Concrete, Masonry, and Hardscape Workshop, $30,000 over 6–8 months, submitted by The Makers Hub. This project will create a replicable, community-based workshop model that provides hands-on masonry and concrete training for individuals interested in entering the trades. The two-day intensive program will include curriculum, instructor framework, safety guidelines, materials, and implementation resources to strengthen the early career pipeline and lower access barriers for underrepresented communities. Participants will gain experience in tool handling, concrete mixing and formwork, finish techniques, and trade career pathways, guided by qualified tradespeople and supported by industry volunteers.

Project 25-15: Smart Integration of Non-Destructive Technologies for Rapid, In-Situ Evaluation of Concrete Performance, $94,000 over 30 months, submitted by Kennesaw State University. This project will develop and validate a smart, integrated non-destructive evaluation (NDE) system that combines multiple sensing methods including ultrasonic testing, ground-penetrating radar, infrared thermography, electrical resistivity, and acoustic emission to provide more accurate, rapid, and reliable in-situ assessment of concrete quality. By fusing complementary technologies, the system will overcome the limitations of single-method approaches, enable early detection of cracks, voids, and delamination while reducing reliance on destructive testing. The project includes casting and testing concrete slabs with controlled flaws, validating the system against conventional methods, and producing a practical, portable tool with step-by-step user guidance.

Project 25-16: Integrating Advanced Concrete Evaluation Technologies into Construction and Engineering Education, $25,000 over 18 months, submitted by Kennesaw State University. This project will develop and implement a comprehensive course that integrates modern non-destructive testing (NDT) technologies into undergraduate and graduate construction and engineering programs. The course will equip students with theoretical knowledge and hands-on skills using tools such as ultrasonic testing, ground-penetrating radar, and infrared thermography. The curriculum

will include lectures, laboratory exercises, case studies, and guest lectures from industry experts, with emphasis on preparing graduates for real-world applications in construction quality, safety, and sustainability. Course materials and step-by-step guides will be developed to support instruction, and educational workshops will promote broader adoption across academia and industry.

Project 25-17: Carbonation and Life-Cycle Metrics Considerations for Recycled Aggregate Concrete, $250,000 over 36 months, submitted by the University of Miami and Florida International University. This project will evaluate recycled concrete aggregate (RCA) with a focus on source variability, optimized pre-treatment methods, and life-cycle impacts. Researchers will test RCA mixtures derived from both demolished concrete and rejected plant material, using laboratory characterization and scalable treatments, such as carbonation and limewater, to minimize absorption and porosity. Shortlisted RCA sources will then be incorporated into concrete mixtures for testing of fresh, mechanical, and durability properties, including strength, modulus, chloride sorption, corrosion, and carbonation resistance. The study will also extend environmental product declarations (EPDs) to include cradle-to-gate (A1-A3), end of life (C), and beyond end of life (D) phases, resulting in a more comprehensive life cycle assessment. The framework developed will guide industry adoption of RCA, contributing to circularity, reduced landfill waste, and progress toward carbon neutrality by 2050.

Project 25-18: AI Borderland Hackathon, $25,000 over six months, submitted by the Success Through Technology Education (STTE) Foundation.
This project will support the development of an AI-based tool designed to simplify the creation of performance-based specifications and acceptance criteria for concrete projects. The tool will allow engineers to input existing specifications and receive optimized, performance-based outputs through a user-friendly web platform, reducing barriers to adoption. To achieve this, STTE will host a hackathon that brings together developers to build a rapid prototype, enabling engineers to more easily meet durability, strength, and sustainability standards. By fostering wider use of performance-based specifications, the project will improve consistency and sustainability across the concrete industry. Matching contributions include support from Nusenda Credit Union, Texas Gas, the University of Texas at El Paso, the STTE Foundation, and the Raiz Foundation.

Project 25-19: Limestone Calcined Clay Cement for Botswana, $25,000 over two years, submitted by the Botswana International University of Science and Technology. This project will evaluate the potential of limestone calcined clay cement as a cost-effective and sustainable alternative to conventional cement in Botswana. The work will include developing a database of local clays, recycled clay bricks, and ceramic tiles suitable for use, as well as creating mix designs tailored to Botswana's conditions that meet national and international cement standards. The project will also assess the commercial viability of large-scale production. By reducing reliance on imported cement and lowering energy use, this research aims to decrease costs, cut greenhouse gas emissions, and create employment opportunities in Botswana's manufacturing sector. The funds requested will support data collection, materials, calcination and testing, laboratory analysis, and overhead.

Project 25-20: Next Generation Carbon-Based Composite Cements (C4) for Ultra-High Strength and Performance Concretes, $1,000,000 over 24 months, submitted by Academia of ACMCEN and Nakhchivan State University. This project aims to advance the development of carbon-based composite cements (C4) designed for ultra-high strength and performance reactive powder concretes exceeding 1 GPa compressive strength. The research will focus on incorporating industrial byproducts such as pulverized fly ash, marble powder, limestone dust, ceramic powder, and ground granulated blast furnace slag, enhanced by graphite nanoparticles (GNP). The integration of GNP aims to offset negative effects of byproducts, improve early strength gain, and enhance durability while reducing the reliance on Portland cement. The consortium will also establish a Center for Advanced Materials to support ongoing research, testing, and knowledge dissemination. Outcomes will include experimental and pilot data, practical applications for green binder composites, and widespread dissemination through publications, conferences, workshops, and international collaborations. The project seeks to reduce energy use, raw material consumption, and CO2 emissions while promoting innovative and sustainable infrastructure materials.

Project 25-21: Sustainable Pervious Concrete with Integrated Waste Materials and Performance-Enhancing Polymers, $199,459 over two years, submitted by the University of Delaware. This project will develop and validate pervious concrete (PC) systems that achieve reliable strength, durability, and permeability while incorporating multiple recycled waste materials such as recycled concrete aggregate, PET plastics, waste glass, and fly ash. To improve structural performance, epoxy-based polymer modifiers will be used to enhance matrix cohesion, tensile and flexural strength, and resistance to freeze-thaw cycles. The research will follow ASTM testing standards for compressive strength, flexural performance, permeability, and durability, supported by advanced characterization tools such as micro-CT imaging. Laboratory optimization will be followed by a pilot-scale field installation to evaluate constructability and long-term performance under real conditions. Outcomes will include mix classification charts, quality control protocols, and implementation guidance for municipal and commercial use. NovoCrete® will provide in-kind support with its mineral-based soil stabilizer for use in subbase layers, enhancing both structural and hydraulic performance.

Project 25-22: Graphene-Enhanced High-Volume Fly Ash Concrete for Pavement Applications, $150,000 over 18 months, submitted by Middle Tennessee State University. This project will investigate the use of graphene nanoplatelets (GNPs) to improve the performance of high-volume fly ash (HVFA) concrete mixtures for pavement applications. While HVFA concrete offers sustainability benefits, it often suffers from low early strength development. GNPs have been shown to enhance strength and shrinkage performance, but there is a lack of design-ready inputs for predicting long-term pavement service life. The research will develop optimized HVFA-GNP formulations and establish Level 1 PMED input datasets, including shrinkage, coefficient of thermal expansion, modulus of rupture, and strength development. Testing will also evaluate chloride resistance and abrasion. Outcomes will provide mix guidelines and a PMED input catalog for use by state Departments of Transportation. Matching contributions include data and field testing from state DOTs, materials from nanomaterial suppliers, and university lab cost-sharing.