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American Society of Civil Engineers



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2023 Fall Lecture Series

Structural Engineering 2030: Shifting Paradigms in Engineering

Saturday, November 4, 2023

**Tufts University Science & Engineering Complex, Robinson Auditorium,
Room 253, 200 College Avenue, Medford, MA 02155
9:30 AM - 2:00 PM Lectures**

SEI Boston Chapter is pleased to present the 26th Fall Lecture Series. The featured lectures are as follows:

Lecture 1 - Reflections on Structural Engineering - Computers and Design

Derek Barnes, PE, Principal, LeMessurier

Computer-Aided Structural Engineering (CASE) is the use of software and associated tools to assist in the design and analysis of structures. CASE is essential for modern structural engineering, enabling engineers to handle complex problems, improve efficiency, and collaborate effectively with other disciplines. However, CASE also poses challenges such as interoperability, reliability, and an over-reliance on computer models. This presentation will demonstrate how CASE can be used to simplify design, bound design problems, and streamline workflow using examples of high rise commercial developments with multiple phases. The presentation will also discuss the importance of customizing commercial software with in-house add-ins developed and tailored to improve a firm's workflow. In highlighting LeMessurier's history of developing programs to assist with drawing production and structural analysis, Derek will showcase how CASE can help engineers create efficient and realistic solutions for complex design problems.

Lecture 2 - Reflections on Structural Engineering - Simplified Design

Nathan Roy, PE, Principal, LeMessurier

Codes, methods of analysis, computer programs, and delivery methods continue to grow more complex, posing challenges to the structural engineering profession. As structural engineers respond and adapt amidst this complexity, it is essential to maintain focus on fundamental principles and simplified methods to guide the design process. This presentation will explore the concepts, methods, and importance of simplified engineering to SIMPLIFY how we work, SIMPLIFY the structural systems we create and SIMPLIFY how we communicate. The presentation will also highlight examples from practice.



This lecture series provides three Professional Development Hours (PDH)

Supported by the staff of The Engineering Center Education Trust



Lecture 3 - Evolving and Diversified Design Roles, Responsibilities and Risks of Project Participants

David Hatem, PC, Partner, Donovan Hatem

In the last two decades the design and construction industry has experienced substantial evolutions in the conventional roles, responsibilities, and risks (“3Rs”) of project participants under the long-dominant traditional Design-Bid-Build (“DBB”) delivery method.

This presentation will commence with a brief “baseline” recap of the 3Rs under traditional DBB especially focused on design issues. The discussion will then address 3Rs in:

- Varied DBB Approaches
- Conventional Design-Build (“DB”)
- Early Contractor Involvement Approaches
 - CM/GC
 - Progressive DB

The keys to successful implementation of these diversified approaches and their implications on the 3Rs of project participants are:

- Transparency
- Clarity and consistency
- Contractual documentation
- Fairness and balance

Lecture 4 - Infrastructure Materials – Development of Non-Proprietary Ultra-High-Performance Concrete (UHPC) for Infrastructure Applications

Richard Mulcahy, Materials Field Control Engineer, MassDOT

Jianqiang Wei, PhD, Associate Professor, University of Massachusetts Lowell

Sergio F. Breña, PhD, Professor, University of Massachusetts Amherst

Ultra-high-performance concrete (UHPC) is an extremely durable material with excellent mechanical properties, due to its ultra-high compressive, tensile, and bond strength, enhanced flowability and consolidation, resistance to creep, shrinkage, and chloride ion penetration, and near zero permeability. To achieve this kind of performance, UHPC must be carefully formulated with precise and optimized quantities of cementitious materials, fillers, fine aggregate, water, chemical admixtures, and steel fibers, with a very low water-cementitious ratio, to create a composite material with discontinuous steel fiber reinforcement and pore structure. The Massachusetts Department of Transportation (MassDOT) is exploring multiple infrastructure applications that can incorporate UHPC, including joints, overlays, repairs, rehabilitation, and bridge beam fabrication. This research aims to develop non-proprietary UHPC mix design formulations with locally sourced and attainable materials that can be implemented at ready mix batching plants or precast/prestressed concrete fabrication facilities. This presentation will review current and future MassDOT UHPC specifications and applications, development of non-proprietary UHPC mix design formulations, and results from laboratory and small-scale mockup testing.

Speakers



Derek Barnes, PE, Principal, LeMessurier

Derek Barnes is a Principal at LeMessurier, a leading structural engineering firm based in Boston. He has over 18 years of experience in designing and analyzing complex structures, such as commercial high-rise buildings, stadiums, air-rights projects, and mixed-use developments. He has been involved in some of LeMessurier's most challenging and innovative projects, most recently the Fenway Center Phase II, The Hub on Causeway, and New Balance Track projects. He is an expert in using computer aided structural engineering tools and developing in-house add-ins to streamline the firm's workflow and create efficient structural solutions.



Nathan Roy, PE, Principal, LeMessurier

Nathan is a Principal with LeMessurier and has over 17 years of experience as a structural engineer on a wide breadth of project types in institutional, cultural, residential healthcare, retail and athletic sectors. Through collaboration with architects, owners and contractors, he has overseen the successful implementation of structural designs for new buildings, renovations of historic structures and specialty construction support. Nathan takes pride in developing simple elegant structural solutions that support the building architecture with an understanding of the construction process. Nathan has created curriculum and taught at the Boston Architectural College for 10 years and is also the current president of the Structural Engineering Association of Massachusetts (SEAMASS).



David Hatem, PC, Partner, Donovan Hatem

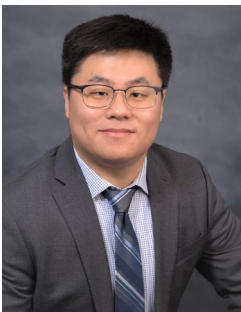
David J. Hatem is a partner in the Boston-based law firm Donovan Hatem LLP. David's practice specializes in representing engineers and architects and advising professional liability insurance underwriters on project-specific insurance matters. David teaches Legal Aspects of Civil Engineering at Northeastern University Graduate School of Engineering and has continuously served as Counsel for ACEC/MA since 1988. He has authored and edited numerous articles and publications in his field of expertise. In recognition of his extraordinary career dedicated to the engineering sector, he received the Engineering Center Education Trust 2016 Leadership in Professional Services to the Engineering Community Award and the 2008 ACEC Distinguished Service Award, and was appointed an Honorary

Member of the Boston Society of Civil Engineers in 2022.



Richard Mulcahy, Materials Field Control Engineer, MassDOT

Richard Mulcahy is the Materials Field Control Engineer for the Massachusetts Department of Transportation Research and Materials Section, where he is primarily responsible for managing the inspection and testing programs for materials source verification and precast/prestressed concrete; developing and updating MassDOT materials and construction specifications; and leading cement concrete research, including best practices in concrete workmanship, alkali silica reaction (ASR), pyrrhotite degradation, alternative cementitious materials solutions, fiber reinforced concrete, and ultra-high performance concrete. Richard joined the Department in 2009, immediately following his graduation from the College of Civil Engineering at Northeastern University, where he obtained his Bachelor of Science Degree



Jianqiang Wei, PhD, Assistant Professor, University of Massachusetts Lowell

Jianqiang is an Assistant Professor in the Department of Civil and Environmental Engineering at the University of Massachusetts Lowell. He obtained his Ph.D. in Civil Engineering from Columbia University and worked as a Postdoctoral Research Associate at Purdue University and the University of Southern California. He has over 15 years of research experience in the area of sustainable structural materials, cement chemistry, durable concrete, and additive manufacturing of cementitious composites. He has authored over 80 peer-reviewed journal publications, conference proceedings, and presentations in interdisciplinary research at the interface of civil engineering and material.



Sergio F. Breña, PhD, Professor, University of Massachusetts Amherst

Sergio F. Breña is a Professor and Associate Department Head of Civil and Environmental Engineering at the University of Massachusetts Amherst. He has over 25 years of experience in laboratory and field testing of structures and structural systems and over six years of structural design experience. He is a member of several professional organizations including ASCE, the American Concrete Institute (ACI), the Precast/Prestressed Concrete Institute (PCI), and the Earthquake Engineering Research Institute (EERI). He currently serves as a voting member of ACI Building Code subcommittees ACI 318-C, ACI 318-H, PCI's Design Standard Committee and Industry Handbook Committee. His research interests include design and behavior of structural concrete members, concrete material performance, and field performance of structures and materials.

Event Schedule:

9:30 AM - 10:00 AM	Check In/Registration/Coffee
10:00 AM - 10:05 AM	Opening Remarks
10:05 AM - 10:40 AM	Reflections on Structural Engineering - Computers and Design
10:40 AM - 11:15 AM	Reflections on Structural Engineering - Simplified Design
11:15 AM - 12:15 PM	Evolving and Diversified Design Roles, Responsibilities and Risks of Project Participants
12:15 PM - 1:00 PM	Lunch/Activity
1:00 PM - 2:00 PM	Infrastructure Materials – Development of Non-Proprietary Ultra-High-Performance Concrete (UHPC) for Infrastructure Applications
2:00 PM - 2:05 PM	Closing Remarks

Getting There:

The venue is one block from the Medford/Tufts stop on the E Branch of the MBTA Green Line and metered street parking is available along Boston Avenue.

Registration Deadline: Thursday, November 2, 2023

Registration Fees

\$100 BSCES Members, \$125 Non-Members

\$85 Public Sector Members, \$100 Public Sector Non-Members

\$20 Senior Members (65+), First 12 students are free with Student ID

Information/Registration:

Register to attend this meeting and pay by credit card online [here](#). To register online for an event at the BSCES member rate you must login using your BSCES assigned username and password. If you do not know your BSCES member login information, email bsces@engineers.org or call 617/227-5551.

Twelve students can register to attend this lecture series for free on a first-come, first-served basis by entering their contact information and student ID number [here](#).

You can also register for this event by mail or email. To do so, download and complete a [BSCES Event Registration Form](#) and follow the submission instructions. Cancellations received after November 2, 2023 and no-shows will be billed.