LEHIGH UNIVERSITY | P.C. Rossin College of Engineering and Applied Science

# 2021 Fall

# FAZLUR RAHMAN KHAN DISTINGUISHED LECTURE SERIES

*Honoring a legacy in structural engineering and architecture*

**Presentations will be held in Whitaker Lab 303 at Lehigh University**

**Presentations also held via Zoom Webinar,**
***To register go to www.lehigh.edu/frkseries***

**Wednesday, October 27, 2021**
**4:30 P.M. EST**
***Phillip Gould***
St. Louis University
Senior Professor
Washington University
St. Louis, MO

FROM SLIDE RULE TO FEA: SOME HIGHLIGHTS ALONG THE WAY

Brief comments on the author's professional career, from an aspiring structural designer of buildings and bridges to further graduate study and then an academic and research career, are offered. In deference to the namesake of this lecture, based on recollections of a junior engineer working closely with Fazlur Khan, Dr. Gould offers some observations on Khan's early career. Dr. Gould's subsequent academic and professional activities initially focused on thin -shell analysis, especially the emerging field of hyperbolic cooling towers. The advanced capabilities of the SHORE family of computer programs that were developed in the course of the shell research provided an important tool in the design and explanation of some unique extreme loading situations for both cooling towers and chimneys. As his career progressed, he became very involved in earthquake engineering with strong focus on education and mid-America issues. In the course of teaching graduate subjects, he authored several textbooks and enabled the dissemination of current knowledge as editor of the journal ENGINEERING STRUCTURES.
Moving on to applications of the research of Dr. Gould and his students, potentially destructive loading conditions that have impacted chimneys and cooling towers are briefly described. While chimneys and cooling towers of increasing height have been successfully constructed for decades, in the present context of resiliency they both possess an undesirable structural characteristic in that they are globally statically determinate. Dr. Gould's studies of extreme events that caused a severely damaged cooling tower and a collapsed chimney are used to illustrate selected aspects of their structural performance. The response of each structure is examined with the objective of validating and augmenting design characteristics that may improve their behavior under any imaginable loading condition. The application of nonlinear analysis techniques that may be useful in predicting the response of such structures to multi-hazard design conditions beyond current code requirements is suggested.

**Wednesday, November 17, 2021**
**4:30 P.M. EST**
***Richard Sause***
Joseph T. Stuart Professor of Structural Engineering
Director, Advanced Technology for Large Structural Systems (ATLSS) Center
Director, Institute for Cyber Physical Infrastructure & Energy
Lehigh University
Bethlehem, PA

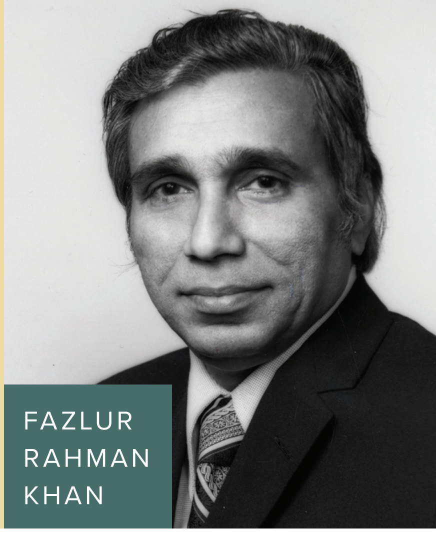
A RESEARCH PERSPECTIVE ON SEISMIC PERFORMANCE OF STEEL BUILDING STRUCTURES

Steel buildings designed and constructed in the US and other regions with modern seismic standards are anticipated to perform very well with respect to life safety under the expected earthquake demands. For ground motions at the maximum considered earthquake intensity, the probability of collapse is relatively small; however, the probability of structural and nonstructural damage is relatively large for ground motions with shorter return periods comparable to the expected life of these buildings, so questions about seismic resilience remain. Research to improve steel building seismic performance is ongoing with a focus on reducing damage by reducing global lateral drift, avoiding localization of drift, and reducing accelerations. Recent research results include innovative structural mechanisms, such as self-centering, to permit lateral drift without structural damage, as well as various damping systems to reduce drift. Current research seeks to control distributions of internal forces to minimize drift localization and to reduce accelerations. This presentation provides a perspective on current research questions and research outcomes toward improving steel building seismic performance.

## ABOUT THE KHAN SERIES

In step with the abounding vitality of the time, structural engineer **Fazlur Rahman Khan** (1929-1982) ushered in a renaissance in skyscraper construction during the second half of the 20th century. Fazlur Khan was a pragmatic visionary: the series of progressive ideas that he brought forth for efficient high-rise construction in the 1960s and '70s were validated in his own work, notably his efficient designs for Chicago's 100-story John Hancock Center and 110-story Willis (formerly Sears) Tower — the tallest building in the United States since its completion in 1974.

Lehigh endowed a chair in structural engineering and architecture and has established this lecture series in Khan's honor. It is organized by **Professor Dan M. Frangopol**, the university's inaugural holder of the Fazlur Rahman Khan Endowed Chair of Structural Engineering and Architecture, and sponsored by the Departments of Civil & Environmental Engineering, and Art, Architecture & Design.



FAZLUR RAHMAN KHAN

*This lecture series is sponsored by:*
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1 PDH will be awarded to eligible attendees for each lecture.

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