The Kappe Lecture Series

AMERICAN ACADEMY OF ENVIRONMENTAL ENGINEERS & SCIENTISTS®

2024

Sharing the knowledge of today's practitioners with tomorrow's engineers and scientists.

The 2024 Kappe Lecturer

Craig H. Benson, PhD, PE, BCGE, BCEE, NAE

University of Wisconsin-Madison | University of Virginia

Craig H. Benson is Wisconsin Distinguished Professor Emeritus at the University of Wisconsin-Madison and Dean of Engineering and Hamilton Professor Emeritus at the University of Virginia. Benson is a geoenvironmental engineer with expertise in waste management, waste containment systems, recycling and beneficial reuse, and sustainability. He served as Dean of Engineering at the University of Virginia and as a Department Chair and Director of Sustainability Research and Education at the University of Wisconsin-Madison. Benson has a BS from Lehigh University and the MSE and PhD from the University of Texas at Austin, all in Civil Engineering with an emphasis in geoenvironmental engineering. He is a member of the US National Academy of Engineering (NAE) and the National Academy of Inventors (NAI), as well as a Fellow in the American Association for the Advancement of Science (AAAS).

Benson has been conducting research related to protection of the environment for nearly four decades, with primary focus on environmental containment of wastes; beneficial use of industrial byproducts; and sustainable infrastructure. He is recognized as a foremost international authority on waste containment systems, and is widely sought after for his expertise in design, operation, and performance assessment of waste disposal facilities. Benson is currently evaluating sustainable reuse of historically disposed coal combustion products, developing guidance on managing landfill gas and odor issues and quantifying the physical and social correspondence between landfill odors and odor complaints, and evaluating the efficacy of plastic waste recycling and upcycling. He frequently consults as an expert in waste containment systems and sustainability.

Benson's research experience involves laboratory studies, large-scale field experiments, and predictive modeling. He has published more than 300 refereed articles based on his research and has received numerous research awards, including the Karl Terzaghi Award, Ralph Peck Award, Huber Research Prize, Alfred Noble Prize, Croes Medal (twice), Middlebrooks Award (twice), Collingwood Prize, and Casagrande Award from the American Society of Civil Engineers and the Award of Merit, Ivan Johnson Award for Outstanding Achievement, and the Best Practical Paper Award (twice) from ASTM International. Benson is the 2024 Kappe Lecturer for the American Academy of Environmental Engineers and Scientists.

Benson has a distinguished record of public service, having served as Editor-in-Chief of the Journal of Geotechnical and Geoenvironmental Engineering, President of the ASCE Geo-Institute (GI), Chair of the GI Geoenvironmental Committee, Vice Chair of the Executive Committee of ASTM Committee D18 on Soil and Rock, Chair of ASTM Committee D18.04 on Hydraulic Properties and Barriers, and Chair of Section 4 of the National Academy of Engineering.

EDUCATION

- BSCE, Lehigh University – 1985
- MSE, University of Texas at Austin – 1987
- PhD, University of Texas at Austin – 1989

CREDENTIALS & AFFILIATIONS

- US National Academy of Engineering – 2012
- US National Academy of Inventors – 2018
- American Association for Advancement of Science, Fellow, Inducted –2019
- Professional Engineer, State of Wisconsin
- Board Certified Environmental Engineer, American Academy of Environmental Engineers and Scientists
- Board Certified Geotechnical Engineer, Geo-Institute of the American Society of Civil Engineers

AWARDS & RECOGNITIONS

- Kappe Lecturer, American Academy of Environmental Engineers and Scientists — 2024
- Karl Terzaghi Award, Geo-Institute of the American Society of Civil Engineers — 2021
- A. Ivan Johnson Outstanding Achievement Award, ASTM International — 2015
- Fellow, ASTM International — 2011
- Fellow, American Society of Civil Engineers — 2009
- Fellow, Sigma Xi, Scientific Research Honor Society — 2017
- Academy of Distinguished Alumni, University of Texas at Austin — 2009
- Diplomate, Geotechnical Engineering, Academy of Geo-Professionals — 2009

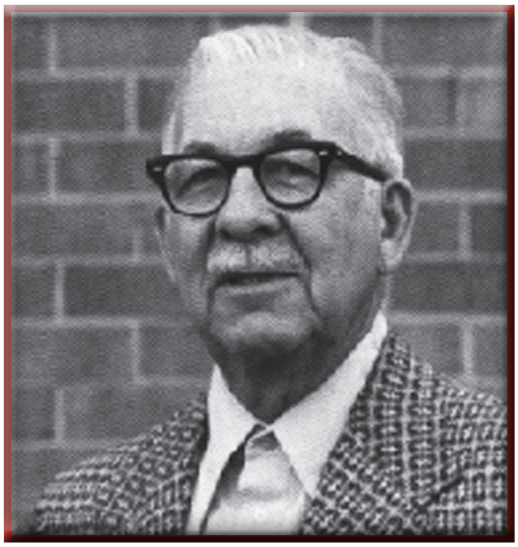
Abstracts of Lectures Offered

Elevated Temperature Landfills: Causation, Impacts, and Best Management Practices Learned from the Field

Elevated temperature landfills (ETLFs) are municipal solid waste landfills (MSW) with waste temperatures substantially in excess of 65 oC that persist over a large area for a sustained period of time. Phenomena commonly associated with ETLFs include substantial and rapid settlements; strong leachate with high BOD and COD, high VOC concentrations, and high total suspended solids; landfill gas depleted in methane and rich in carbon monoxide and hydrogen, and very strong odors that often result in strained relationships with the local community. Remedial measures to address ELTFs can cost in the $100Ms. When the first ETLFs were encountered, they were poorly understood and perceived as an "existential threat" to the solid waste industry. The mechanisms responsible for ELTFs were unclear and a subject of intense debate, as were the appropriate remedial actions. Extensive research and field experience derived through industry-academic partnerships over nearly two decades have clarified the mechanisms that cause ETLFs as well as identified appropriate best management practices (BMPs) to address impacts and return the landfill to a stable equilibrium state. BMPs have also been developed for landfill operations, including characterization of heat generating potential of different waste streams, pre-treatment approaches for heat generating wastes, and disposal strategies to manage the accumulation of heat. This presentation will provide the historical evolution of our understanding of ETLFs and illustrate how BMPs developed from field experience result in successful outcomes at actual MSW landfills. Recommendations are provided that are important to current students as well as seasoned professionals.

Field Performance of Final Covers for Containment of Long-Lived Waste Forms: Lessons Learned from the Field

Engineers design containment facilities to store long-lived waste forms that can be a threat to the environment for 1000s of years (e.g., low level radioactive waste). These designs are based on current knowledge and principles, but the facilities are required to have a service life of a millennium or more, far beyond any modern engineering experience. Over the last decade, we have had the opportunity to exhume and inspect final covers on containment facilities for long-lived waste forms that have been in-service for up to three decades, providing a glimpse of the degradation mechanisms and the condition that may exist in the future. We have also had the opportunity to construct and monitor more than 50 full-scale test sections simulating final covers, providing unique insight into field-scale hydrologic performance and the mechanisms controlling performance. These observations, along with lessons learned from studying natural analogs in the environs of containment facilities, have reframed and refined our perspective on design of final covers for waste containment over very long service lives that go far beyond our experience. This experience has shown that, when possible, designs that embed natural principles and/or are congruent with the natural surroundings tend to be the most resilient and the most effective in the long-term. In contrast, designs that are incongruent with natural surroundings tend to degrade more quickly, with their attributes and performance altered to be more consistent with the surroundings. Observations made in the field, and the lessons learned, will be shared in this presentation. Recommendations are provided that are important to current students and seasoned professionals.



"A man's debt to his profession is to help those that follow."

STANLEY E. KAPPE, P.E., DEE, a successful environmental engineer, believed he owed a debt to the profession that rewarded him so well. During his life, he gave of himself to his university and to his profession through countless hours of volunteer activity. And through this Lecture Series, he continues to share his good fortune with tomorrow's environmental engineers and scientists.

He graduated from Pennsylvania State University in 1930 with a bachelor's degree in sanitary engineering. He served with the Pennsylvania State Health Department and the U.S. Army Corps of Engineers before joining the Chicago Pump Company as its Eastern Regional Manager in 1935. In 1945, he founded Kappe Associates, Inc., a water supply and wastewater equipment company headquartered in Rockville, Maryland, and continued as its Chief Executive Officer until his death in 1986.

His peers recognized his contributions to the profession by numerous awards, including the AWWA Fuller Award, the WEF Arthur Sidney Bedell Award, the WPCAP Ted Moses and Ted Haseltine Awards, and the AAEES Gordon Maskew Fair Award. In 1985, Pennsylvania State University named him Outstanding Engineer Alumnus.

Stanley E. Kappe was an activist member and leader in several national and Chesapeake region professional societies. He served as the Executive Director of the American Academy of Environmental Engineers (now the American Academy of Environmental Engineers and Scientists) from 1971 to 1981.

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