The transportation network is one of the most critical components of the U.S. infrastructure, serving the needs of individuals, corporations, and governments in the flow of people and products across the nation and the globe. This network is part of a complex adaptive sociotechnical system and requires engineered solutions for both its social and technical components. Although the physical infrastructure of our transportation system is a visible reminder of the nation's investment and requirements for effective transportation solutions, the infrastructure framework that manages, maintains, and operates this system is frequently overlooked.

In this presentation, Dr. Long will present an overview of recent funded research projects completed as part of her sustainable infrastructures management research group. These studies, funded by the U.S. Department of Transportation, the Missouri Department of Transportation, the National Science Foundation and the Department of Energy, have focused on transportation infrastructure planning, transportation workforce development, public-private-partnerships in transportation, alternative energy infrastructure development and planning, and sustainability in supply chain and facility logistics, as well as vehicle electrification and engineering education. Her LED Traffic Indications Replacement Schedule research with MoDOT was named the Midwest High Value Research Project of the 2012 and will be featured at TRB in January 2013 as one of AASHTO's National “Sweet 16” Top Research Projects of 2012. Opportunities for collaboration with traditional engineers will be showcased and include specific examples.

Dr. Suzanna Long is an Assistant Professor with the Department of Engineering Management and Systems Engineering at Missouri S&T. She holds a Ph.D. and an M.S. in engineering management, a B.S. in physics and a B.A. in history from the University of Missouri-Rolla, and an M.A. in history from the University of Missouri-St. Louis. Her research interests include sustainable transportation Infrastructures, transportation workforce development, strategic global supply chain networks, transportation management, and sustainable energy management systems.
Disaster-Resilient Bridges Using Concrete Filled FRP Tubes
Presented by Dr. Mohamed ElGawady

The American Society of Civil Engineers (ASCE) estimated that more than one quarter of the US infrastructure is structurally deficient or functionally obsolete and it would take a $400 billion annual investment from all levels of government to substantially improve current infrastructure conditions. Rather than simply replacing aging infrastructure, structural engineers should seize this opportunity to rebuild an infrastructure that explicitly addresses the sustainability objectives of environmental remediation, disaster-resilient, and economic development. This presentation discusses an innovative eco-friendly bridge structural system that can accelerate bridge construction, reduce damage during strong earthquakes, and increase the sustainability of concrete bridges. The system consists of precast post-tensioned concrete filled fibre reinforced polymer tubes (PPT-CFFT). Both single column bridge piers and two-column bents were investigated. Each column in the PPT-CFFT specimens was constructed by stacking precast CFFT segments one on top of the other and then connecting the assembly structurally with unbonded post-tensioned Dywidag bar passing through a PVC duct located within the segments. During an earthquake ground motion, the segments will rock back and forth on top of each other dissipating the input seismic energy through radiation damping. The tests showed that PPT-CFFT piers can be used in bridge construction as a lateral load resistance system. The PPT-CFFT bents without external energy dissipaters displayed a lateral drift of approximately 9.2% without experiencing significant damage or residual displacement. The PPT-CFFT specimen with external energy dissipaters reached a drift angle of 9.2% with some damage.

Dr. Mohamed ElGawady earned his Ph.D. in structural engineering from the Swiss Federal Institute of Technology at Lausanne (EPFL) in 2004. He earned a bachelor in Civil Engineering (Honors) and master in Structural Engineering from Cairo University, Egypt. Previously, ElGawady has held positions at University of South Australia, Tokyo Institute of Technology, Washington State University, and University of Auckland. He worked also as a structural engineer for three years. Dr. ElGawady research includes seismic behavior of masonry and concrete structures. He is heavily involved in the development of modern building codes of earthquake-resistant masonry structures. He authored and co-authored 60 referred journal and conference papers as well as technical reports. His current research interest includes seismic behavior of unreinforced masonry (URM) structures, the application of Fiber Reinforced Polymers (FRP) in strengthening and repair of masonry/reinforced concrete structures, seismic behavior of reinforced concrete bridges, damage-free bridge columns, segmental construction, rocking mechanics, and the use of sustainable materials in seismic prone regions.