

# IMPLAST 2010

*A Symposium on Plasticity and Impact (including Blast) Mechanics*

## Plenary



### *Extreme Loading of Critical Infrastructure*

#### **DR. STANLEY C. WOODSON**

Research Structural Engineer  
U. S. Army Engineer Research and Development Center  
Geotechnical and Structures Laboratory

**Thursday, October 14, 2010, 8:30 AM**

Physical infrastructure takes many insulting loads – impact from barges and trucks, extreme weather conditions, fire, storm surge, seismic, and blast to name a few. Computational tools to analyze the failure states of infrastructure and design mitigation measures are undoing continuous improvement. This talk will present a summary of ongoing research on blast loading of several types of infrastructure and design of mitigation measures to prevent catastrophic failure. In the course of this blast research it has become evident that integrated design considering multiple hazards is needed for infrastructure. The talk closes with some recommendations for areas of research needing further attention.

Dr. Woodson has over thirty years of civil engineering experience. His background is rather unique in that he has experience in the design and analyses of conventional structures, civil works structures, and hardened structures. At the U.S. Army Research and Development Center (ERDC), Dr. Woodson is primarily responsible for planning and conducting experimental and analytical studies related to the large-deflection response of structures, including the effects of dynamic loads. His work has significantly impacted the Corps' design procedures for both civil works and military structures. For example, Dr. Woodson co-authored the Corps' design manual, *Strength Design of Reinforced Concrete Hydraulic Structures*, and he co-authored two chapters of the tri-service manual, *Design and Analysis of Hardened Structures to Conventional Weapons Effects*. He currently serves on the technical steering committee to revise the manual, *Design of Structures to Resist the Effects of Accidental Explosions*. His contributions to these and other documents rely on his understanding of the fundamental mechanics and behavior of structural systems. Major sponsors of his research studies have included the Department of Homeland Security, the Corps of Engineers, the Defense Threat Reduction Agency, the US Department of State, the Federal Emergency Management Agency, the Department of Defense Explosives Safety Board, the Bureau of Alcohol, Tobacco, and Firearms, the US Secret Service, and the National Maglev Initiative. Dr. Woodson is currently conducting research studies on various aspects of the response of conventional structures and critical infrastructure to improvised explosive devices. He is the technical manager of research efforts funded at over \$7M annually, of which almost all are from sources outside the Corps of Engineers. He is also investigating the effects of deterioration on navigation lock structures on the Mississippi River with the objective of developing long-term monitoring programs. Dr. Woodson routinely provides consultation on structural issues throughout the world. He has authored over 80 technical publications and presented more than 40 lectures at national/international conferences.

Dr. Woodson assumes leadership roles in professional activities. He is a past chairman of the American Concrete Institute technical committee 370, Effects of Short-Duration Loads, and a current member of committee 421, Design of Slabs. He has served as president of the American Society of Civil Engineers (ASCE) at the local and state levels, and as chairman of the ASCE District 14 Council. Dr. Woodson was selected as the 1992 ASCE Zone II Government Engineer of the Year. He was the 1999 recipient of the Vogel Award, which recognizes outstanding research at the Engineer Research and Development Center. In 2009, Dr. Woodson was awarded the Meritorious Civilian Service Award, the second highest award provided to civilian employees within agencies of the federal government of the United States.

Dr. Woodson consistently teaches graduate courses as an adjunct professor at Mississippi State University, through the ERDC Graduate Center in Vicksburg. In particular, his courses are in regard to reinforced concrete structures and blast effects on structures. He has served as adjunct faculty and/or as a special appointment member on several Doctoral committees and numerous Masters committees at various universities, including Mississippi State University, Louisiana State University, Penn State University, University of Missouri, University of Alabama, Rensselaer Polytechnic Institute, and the University of Puerto Rico.