



POLITECNICO DI TORINO



APPLICATION OF SHAPE MEMORY ALLOYS IN IMPROVING THE PERFORMANCE OF INFRASTRUCTURE AND INCREASING THE DISASTER RESILIENCE OF COMMUNITIES

REGINALD DESROCHES

Professor and Associate Chair

Georgia Institute of Technology

School of Civil & Environmental Engineering

Atlanta, GA 30332-0355, USA

Abstract

The recent earthquakes in Haiti and Chile underscore the importance of developing new approaches and technologies to increase the performance of structures during earthquakes, and improve the disaster resilience of communities. The presentation will highlight the application on a new class of materials, namely shape memory alloys (SMAs), in mitigating the effects of earthquakes in buildings and bridges. Shape memory alloys are a unique metallic alloy which can undergo large deformations while reverting back to their original, undeformed shape. This unique property has led to the development of applications in the biomedical field (arterial stents), aerospace field (adaptive wings), and commercial industry (eyeglass frames). A multi-scale and multi-disciplinary approach is taken to explore the use of SMAs for applications in earthquake engineering. Several large scale applications are tested including a “smart” steel beam-column connection that uses shape memory alloys, innovative bracing systems, and recentering restraining devices for bridges. The large scale experimental tests and complementary analysis show great potential for the use of SMAs in seismic applications, and can significantly improve the disaster resilience of the built environment.



BIOGRAPHICAL SKETCH



Reginald DesRoches is a Professor and Associate Chair of Civil and Environmental Engineering at the Georgia Institute of Technology. His primary research interests are design of buildings and critical infrastructure under earthquake engineering, seismic risk assessment of lifeline systems, and application of innovative materials in rehabilitation of structures, and disaster resilience in developing countries. He has published over 200 articles in the general area of structural and earthquake engineering. Dr. DesRoches has served as Chair of the ASCE Seismic Effects Committee (2006-2010), and Chair of the executive committee of the Technical Council on Lifeline Earthquake Engineering (2010). He is currently a member of the executive committee of the National Academy of Sciences Disasters Roundtable, Vice Chair of WG7 for IABSE, and is on the Board for the Earthquake Engineering Research Institute (EERI). Dr. DesRoches has been a key technical leader in the U.S. response to the 2010 Haiti Earthquake. He has taken eight trips to Haiti since the earthquake, including a trip where he led a group of 28 engineers, architects, city planners, and social scientists, to study the impact of the earthquake with the goal of informing the Haitian government on effective ways to rebuild Haiti to be more resilient and sustainable. Dr. DesRoches was a recipient of the 2001 NSF CAREER Award, and the Presidential Early Career Award for Scientists and Engineers (PECASE) in 2002. The PECASE award is the highest honor bestowed upon scientists and engineers in the early stages of their careers. Most recently, he was a recipient of the 2007 ASCE Walter L. Huber Civil Engineering Research Prize, the Georgia Tech Outstanding Doctoral Thesis Advisor Award (2010), and the Georgia Tech ANAK Award (2008) for outstanding research, teaching, and service. He earned his Bachelor's of Science in Mechanical Engineering, Master's of Science in Civil Engineering, and PhD in Structural Engineering – all at the University of California, Berkeley.

DATE: Monday, JUNE 6TH, 2011

TIME: 2:30 PM

LOCATION: AULA ALBENGA 2nd floor, Department of Structural and Geotechnical Engineering (DISTR), Polytechnic of Torino

Faculty, graduate students, and all others are invited to attend.

Gian Paolo Cimellaro

Alessandro De Stefano