Department of Civil Engineering and Engineering Mechanics
Columbia University

Friday, January 14, 2010 (11:00-12:00 pm)
644 Mudd

Dr. Yiska Goldfeld
Faculty of Civil and Environmental Engineering
Technion - Israel Institute of Technology

Damage Identification Static and Dynamic Approaches

Dynamic and static identification procedures for assessment of the stiffness distribution in structures with the aid of an inverse-problem algorithm are presented. The procedures are based on a FE model of the structure with an unknown stiffness distribution and a subset of measured data. In the dynamic procedure, the modal parameters are functions of the physical properties of the structure, such that changes in the latter induce in the modal properties. The stiffness distribution is identified using iterative procedure based on a direct stiffness evaluation by the curvature mode shape. The static procedure is based on strain measurement technologies using Brillouin Time Domain Reflectormetry (BOTDR) . BOTDR can measure the strain distribution along a fiber, with a spatial resolution of about 1m. Therefore, this study suggests new crack indicators, and examines, both analytically and experimentally, their correlation with BOTDR readings of damaged reinforced concrete beams.

Dr. Assaf Klar
Faculty of Civil and Environmental Engineering
Technion - Israel Institute of Technology

Rational Analysis of reinforced earth walls using kinematic constraints

Reinforced soil walls commonly include facing elements which affect the mechanical behavior of the system. However, the design procedures involved in the existing codes and manuals (e.g. FHWA, BS8006, AASHTO, etc.) do not consider the structural contribution of the facing to the wall stability. A new computer based method for the analysis of reinforced soil walls which takes into account the interaction between the facing and the soil reinforcement layers is presented. This method demands full compatibility between the reinforcement layers and the deforming wall, and is solved as an optimization problem on this constraint. This kinematic compatibility (KC) method entails several assumptions regarding the interaction between the three components of the system (soil, wall, and reinforcement). Comparison between the KC method and a more rigorous continuum analyses is presented. Results show that the KC method is capable of replicating the behavior of the more rigorous system, with a good agreement on both the value of maximum tensile forces in the reinforcement and shear and bending moment distributions along the wall. The KC method has a certain advantage over continuum methods, such as finite element or finite difference, since it requires limited input data that can easily be obtained from field tests.