The Donald M. Burmister Lecture
Department of Civil Engineering and Engineering Mechanics
Columbia University

Laboratory Testing of Rock for Evaluations of Linear and Mildly Nonlinear Static and Dynamic Properties

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March 19, 2024						March 20, 2024		
Los Angeles	**New York**	London	Paris/ Rome/ Frankfurt	Nur Sultan	New Delhi	Beijing/ Singapore	Tokyo	Sydney
11:00	**14:00**	18:00	19:00	23:00	23:30	2:00	3:00	5:00

Room 829, S.W. Mudd (Columbia University)

Zoom registration: http://www.columbia.edu/cu/civileng/ling/burmister

ABSTRACT The linear and mildly nonlinear dynamic properties of basalt rock from the Idaho National Laboratory, USA, were investigated in this study. Two types of basalt rock were tested: (1) vesicular basalt which had some voids, and (2) aphanitic basalt which had almost no voids. The combined resonant column and torsional shear (RCTS) device was employed to evaluate the shear wave velocity (Vs), the shear modulus (G) and the material damping ratio in shear (D) of the rock over shearing strains ranging from about 10^{-5}% to 0.02%. The elastic threshold shear strain (γ_t^e) for basalt specimens ranged from about 10^{-3}% to 10^{-2}%. The linear dynamic properties (V_S, G_{max}, and D_{min}) and nonlinear dynamic properties (G/G_{max} - log γ and D - log γ curves) exhibited little change with confining pressure. The minimum value of G/G_{max} was 0.84 at γ = 0.014%. On the other hand, the maximum value of D was 2.12 % at γ = 0.013%. As a simple geotechnical engineering comparison, the nonlinear curves of basalt and sand are compared. Also, it is important to note that both solid and hollow specimens of basalt were tested.

About the Speaker Dr. Kenneth H Stokoe, II has been working in the areas of field seismic measurements, dynamic laboratory measurements, and dynamic soil-structure interaction for more than 50 years. He has been instrumental in developing several small-strain field seismic methods for in-situ shear wave velocity measurements and recently a large strain method for nonlinear measurements of shear wave velocity. He has also developed two types of resonant column systems (fixed-free and free-free) that are used to evaluate dynamic soil and rock properties in the laboratory. Over the last 33 years, Dr. Stokoe has led the development of large-scale mobile field equipment for dynamic loading of geotechnical systems, foundations and structures, an activity that has been funded by the National Science Foundation, first in the NEES program for 20 years and now for 9 years in the NHERI program. The equipment has already led to the development of new testing methods to evaluate soil nonlinearity and liquefaction directly in the field. Dr. Stokoe has received several honors and awards, including election to the National Academy of Engineering, the Harold Mooney Award from the Society of Exploration Geophysicists, and the C.A. Hogentogler Award from the American Society for Testing and Materials, the H. Bolton Seed Medal and the Karl Terzaghi Distinguished Lecturer from the American Society of Civil Engineers, the Bengt Broms Lecture from the Swedish Geotechnical Society, the Geo-Legends Recipient from the ASCE Geo-Institute and the Joe J. King Professional Engineering Achievement Award from the University of Texas.

The late Prof. Donald M. Burmister (1895-1981) is one of the pioneers in the field of Soil Mechanics and Geotechnical Engineering. He established the Soils Laboratory at Columbia University in 1933. He was a faculty member for 34 years before retiring in 1963. During his tenure at Columbia University, he investigated earthworks and foundations for over 400 projects. Most notably among these were the Brookhaven National Laboratory, the Throgs Neck, Tappan Zee and Verrazano Narrows Bridges, the First New York World Fairs at Flushing Meadows, and the reconstruction of the White House in 1950. He has developed several soil testing methods and his soil classification system is still widely used. He also contributed to the first use of digital computer in conjunction with his theory of the layered pavement system.

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