

# E E R I N Y N E – A S C E E E S D L E C T U R E

## EFFECTS OF FREQUENCY & RATE OF CYCLIC LOADING OF SOILS ON THE INPUT FOR SITE RESPONSE ANALYSES

### MLADEN VUCETIC



Professor Vucetic obtained his B.Sc. and M.Sc. degrees in Civil Engineering in 1976 and 1981 from the University of Zagreb, Croatia. Prior to his obtaining a Ph.D. in 1986 from RPI in the USA, he worked on research and design projects in Zagreb at the Civil Engineering Institute and spent a year in Oslo as research fellow at the Norwegian Geotechnical Institute (NGI). His academic career began at Clarkson University in 1986 and a year later he joined the UCLA faculty of Civil & Environmental Engineering, from which he retired in 2018. He continues teaching at UCLA and conducting research in his soil dynamics laboratory. Professor Vucetic has taught undergraduate courses on soil mechanics, geotechnical engineering, soil lab testing and strength of materials, and graduate courses on geotechnical and earthquake engineering, and soil and structural dynamics. He has made numerous research contributions in the fields of dynamic behavior of soils, soil liquefaction, response of soil-nailed excavations to seismic loads and development of GIS geotechnical site databases for seismic microzoning. He is author / co-author of several state-of-the-art papers and many journal papers, conference papers and research reports.

### THE LECTURE

The response of soil deposits to dynamic events depends on the cyclic behavior of these soils which is described by the cyclic stress-strain loops. Consequently, the inputs of computer models for evaluation of the seismic site response and related soil amplification include the properties of cyclic loops and their variation with the cyclic shear strain amplitude,  $\gamma$ , and the number of cycles of the strong ground motion. The most frequently-used input required are the shear modulus reduction curve,  $G/G_{max}$  versus  $\gamma$ , and damping curve,  $\lambda$  versus  $\gamma$ . There are many parameters that affect these input curves, including the soil type, confining stress, geologic history, and the frequency and rate of cyclic shear loading or straining. Among them, the effects of the frequency and rate of cyclic straining have not yet been sufficiently recognized and taken into account in engineering practice, although they can profoundly affect the outcome of a dynamic site response analysis. This lecture will present results of recent studies on the effects of the rate of shear straining and cyclic loading frequency on the shape of cyclic loop and resulting shapes of modulus reduction and damping curves, and discuss implications in practical problems.

Thursday, September 27<sup>th</sup>

5:30 – 7:30 pm

WSP USA

1 Penn Plaza, 2<sup>nd</sup> Floor, NYC

Networking 5:30-6 pm • Lecture 6-7 pm

Attendance is **Free**

RSVP to [nyne@eeri.org](mailto:nyne@eeri.org) by 9/24/18

Limited space, first come basis

1 PDH (pending)

PDH cost: \$0 (EERI/ASCE members) - \$25 (non-members)



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