
台灣大學應用力學研究所
演 講 公 告

主 講 人： Prof. Hung-Liang (Roger) Chen
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講 題： Direct Determination of Dynamic Elastic Modulus and
Poisson's Ratio of Timoshenko Prisms

主 持 人： 郭茂坤教授

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地 點： 台灣大學應用力學研究所402會議室

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Direct Determination of Dynamic Elastic Modulus and Poisson's Ratio of Timoshenko Prisms

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Abstract: The exact solution of the Timoshenko beam vibration frequency equation under free-free boundary conditions is determined with an accurate shear shape factor. The exact solution is compared with a three-dimensional (3D) finite element calculation using ABAQUS, and the difference between the exact solution and the 3D finite-element model are within 0.05% for both the transverse and torsional modes. Furthermore, a relationship between the resonance frequencies and Poisson's ratio was proposed that can directly determine the elastic modulus and Poisson's ratio simultaneously, without the need for iteration, unlike the equations provided by an industry standard. The frequency ratio between the first bending and torsional mode for any combination of specimen dimensions can be directly estimated. Rectangular concrete beam specimens with three different mix designs were produced, and the transverse and torsional frequencies of these beams were tested. Results show that using the equations proposed in this study, the Young's modulus and Poisson's ratio of the concrete beams can be determined more directly than those obtained from the industry standard and with excellent accuracy.

Reference:

Chen, H. L. and Leon, G., "Direct Determination of Dynamic Elastic Modulus and Poisson's Ratio of Rectangular Timoshenko Prisms", *Journal of Engineering Mechanics, ASCE*, Vol.149, No.9, 1-14, September 2019.

Biography:

Dr. Hung-Liang (Roger) Chen received his M.S. and Ph.D. from Northwestern University, Evanston, IL, in 1985 and 1988, respectively. He joined West Virginia University in 1989 as an Assistant Professor and was promoted to Associate Professor with Tenure in 1995, and promoted to Full Professor in 2000. He has been involved extensively with research in structural dynamics, nondestructive evaluation (NDE), dynamic soil-structure interaction, and material characterization of concrete, composites, timber and ceramic materials for about 30 years and has ongoing research in mass concrete, self-consolidating concrete, GFRP-reinforced CRCP, NDE and thermal barrier coatings. He serves on several technical committees for the American Concrete Institute, American Society of Civil Engineers, and American Society for Nondestructive Testing (ASNT) related to concrete, NDE, FRP, dynamics, and experimental analysis. Dr. Chen has received numerous honors and awards for his contributions in teaching and research. Dr. Chen is a Fellow of ASNT.