2017 ASCE- GI Los Angeles

Geotechnical Spring Seminar

April 12th, 2017, Long Beach CA

Lecture 1: The Role of Time in Liquefaction Hazard Evaluation

Liquefaction has caused a great deal of damage in past earthquakes around the world. Laboratory studies have provided useful insight into the complex mechanics of liquefiable soil behavior, and field investigations of case histories have led to the development of useful empirical procedures for evaluating the potential for triggering and the consequences of liquefaction. However, conventional laboratory tests offer a simplified representation of earthquake loading and field case histories are sparse over ranges of conditions that are of interest in professional practice. Recent laboratory tests involving the type of transient loading that soils are subjected to in actual earthquakes has revealed complexities in their response to loading cycles of different amplitudes, and has confirmed the dependence of soil deformations on post-triggering loading. Careful examination of ground motions recorded at sites that liquefied also offers insight into the pre- and post-triggering behavior of liquefiable soils. These results, along with the dearth of case histories from very large magnitude earthquakes in the empirical database, illustrate the need to account for timing in liquefaction hazard evaluations. This need is particularly important for long-duration motions, such as those that occur in subduction zone environments. This presentation will review liquefiable soil behavior and the implications of very long duration ground motions on that behavior, and describe a framework that allows the timing of liquefaction to be taken into consideration in the evaluation of liquefaction hazards. The framework allows separation of loading into pre- and post-triggering components, and allows different ground motion intensity measures to be used to characterize triggering and consequences. The correlation of consequences of liquefaction to post-triggering ground motion intensity is shown to improve the accuracy of, and reduce uncertainty in, predictions of the response of liquefiable soils. Such an approach has benefits for evaluation of performance.

Bio

Steve Kramer received his B.S., M.Eng., and Ph.D. degrees from the University of California, Berkeley in 1977, 1979, and 1985, respectively, and joined the geotechnical group in the University of Washington Department of Civil Engineering in 1984. His primary research interests include soil liquefaction, site response analysis, seismic slope stability, and hazard analysis. Much of his current research work is in the area of performance-based earthquake engineering, specifically the integration of probabilistic response analyses with probabilistic seismic hazard analyses. Kramer has been the recipient of the Presidential Young Investigator Award from the National Science Foundation, the Arthur Casagrande Professional Development Award from ASCE, a Walter Huber Research Prize from ASCE, the ASCE Norman Medal. He was named 2012 Academic Engineer of the Year by the Puget Sound Engineering Council and received the 2016 M.J. Nigel Priestley Prize from the European Centre for Training and Research in Earthquake Engineering. He is the author of the book Geotechnical Earthquake Engineering and co-developer of the computer programs, ProShake and EduShake. He was a Senior Research Scientist in the International Centre for Geohazards at the Norwegian Geotechnical Institute (NGI) in 2003, and is also a member of the faculty of the European School for Advanced Studies in the Reduction of Seismic Risk (the ROSE School) at the University of Pavia in Italy. Kramer has served as a consultant to private firms and government agencies on earthquake-related projects in the U.S. and abroad.

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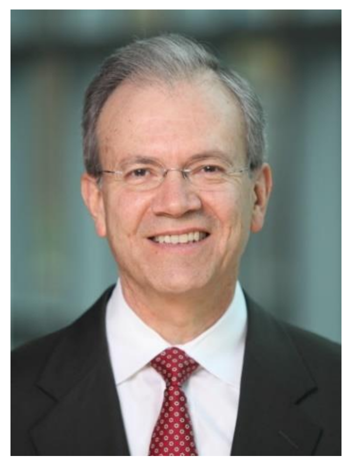
Lecture 2: Engineering Challenges of the Dams of the Panama Canal Expansion

Dr. Lelio Mejia will present an overview of the Panama Canal Expansion Project and of the dams that form the new Pacific Access Channel, known as the Borinquen Dams. The expansion project has approximately doubled the Canal's capacity and allows the largest cargo and passenger ships in the world to transit through the historic waterway. Dr. Mejia will describe the geotechnical challenges associated with the dam design, such as the site geologic and seismic setting, the foundation conditions, and the design stability criteria. He will discuss the design concept and illustrate the key features of Dam 1E, the largest of the Borinquen Dams.

Bio



Lelio Mejia is a Senior Principal with Geosyntec Consultants, Inc. in Oakland, California and a leading international authority in the field of dam and levee engineering. Lelio currently serves as Chair of the United States Society on Dams (USSD) Earthquakes Committee; as a Member of the ICOLD Committee on Seismic Aspects of Dam Design; and as a Member of the National Research Council (NRC) Committee for the State of the Art and Practice in Earthquake Induced Soil Liquefaction Assessment. Until recently, he was a Secretarial Appointee to the Advisory Committee on Structural Safety of Department of Veterans Affairs Facilities and Chair of the Governance Board of the National Network for Earthquake Engineering Simulation (NEES). He has also served as Lecturer for Geotechnical Earthquake Engineering at the UC Davis and an Extension Instructor in Geotechnical Engineering at UC Berkeley.

His expertise of 35+ years in seismic design and performance of dam structures led Dr. Mejia to direct the investigation and seismic stability evaluation of more than 25 large earth dams, to serve on technical review boards and expert panels for U.S. Federal and State Agencies, water and power utilities, and other owners on various dam projects; and to lead the design and construction of more than 15 major dam projects worldwide. Most recently, he was project manager and chief engineer for the design and construction inspection of a large embankment dam that is part of the $5.25 billion expansion of the Panama Canal. Dr. Mejia's expertise further include soil dynamics, soil liquefaction assessment and mitigation, foundation engineering, and soil-structure interaction analyses of hydraulic structures, power plant and harbor facilities. He has authored over 90 peer-reviewed technical papers and was a member of the editorial board for the American Society of Civil Engineers Journal of Geotechnical Engineering. He developed earthquake loading criteria that have been adopted by the International Commission on Large Dams (ICOLD) for the seismic design of dams worldwide.

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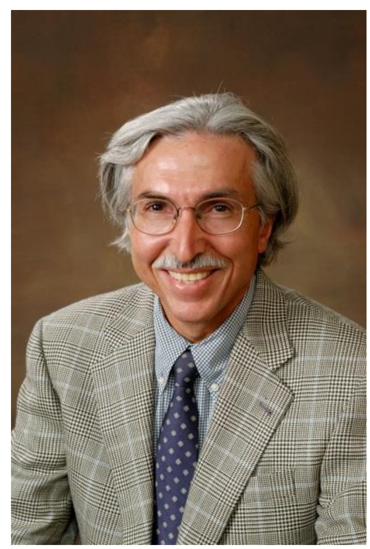
Lecture 3 (Ken Lee Lecture): Settlement of the Kansai International Airport Islands

The Kansai International Airport was constructed in Osaka Bay in 18- to 20-m-deep seawater to avoid noise pollution and land acquisition disputes. Construction of the 511-ha Island I began in 1987 and Runway I began operation in 1994. Construction of the 545-ha Island II began in 1999, and Runway II began operation in 2007. Using more than 2.2 million vertical sand drains fully penetrating into the 17.3- to 24.1-m-thick Holocene clay layer and 430 million cubic meters of fill material, the project is viewed as an engineering marvel. On the basis of a detailed review of the geology of Osaka Bay, construction of the Airport Islands, and permeability and compressibility of the Holocene and Pleistocene subseabed deposits that reached a depth of 400 m below the seafloor at the Kansai Airport site, settlement analyses were conducted assuming the uniqueness of end-of-primary void ratio–effective vertical stress relationship and the C_α/C_c law of compressibility. Airport Island I has already settled below the 4-m above sea level surface elevation required by the design specification, and the surface elevation of Island II is predicted to be 4 m above sea level by 2023 to 2036. Airport Islands I and II will be at sea level, respectively, by 2067 or sooner and by 2058-2100. By the end of the 21st century, Island I and Island II are predicted to settle, respectively, 17.6 m and 24.4 m.

Bio



Gholamreza Mesri, a world authority on the behavior of soils and a leader in the study of the compressibility and consolidation of soils and ground improvement, is the Ralph B. Peck Professor Civil Engineering at the University of Illinois at Urbana-Champaign. Together with Karl Terzaghi and Ralph B. Peck, he co-authored the Third Edition of Soil Mechanics in Engineering Practice.

Professor Mesri has taught short courses in Geotechnical Engineering, attended by large number of engineers, in Canada, Mexico, Norway, Sweden, Australia, Malaysia, and Japan. Professor Mesri has served as consultant to government and private organizations in relation to construction projects in North and South America, Europe, Africa, Asia, and Australia, including airports, offshore facilities, tunnels, hydroelectric developments, building foundations, and landslides. Professor Mesri is currently serving as a member of the Geotechnical Expert Panel for the New International Airport in Mexico City. He is a member of the International Commission on Restoration of Metropolitan Cathedral of Mexico City, a member of the International Commission on Swelling Rocks, ISSMGE Technical Committee on Soft Soils Foundation Engineering, and a founding member of the International Committee on Coastal Geotechnical Engineering.

Professor Mesri is a member of the American Society of Civil Engineers, the Canadian Geotechnical Society, and International Society of Soil Mechanics and Foundation Engineering. Among his honors Mesri includes the 1988 and 2004 Norman Medal, the 1992 Thomas A. Middlebrook Award, and the 2015 Karl Terzaghi Award of the American Society of Civil Engineers.