INTERNATIONAL SOCIETY FOR MICROPILES

TAKING MICROPILES TO NEW HEIGHTS

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Special Lecture

Reticulated Micropiles for Restoration of Historic Structures Foundations after Natural and Manmade Disasters

Abstract: The mass destruction of thousands of historic buildings and bridges throughout Europe during WWII served as a backdrop for the creation of Reticulated Root Piles (RRP) and reticulated structural stitching (Internal Reinforcement Method, IRM). Dr. Fernando Lizzi provided the genius and genesis for a technology so far ahead of its time, that academicians and practitioners not intimately familiar with the technology are still trying to develop methods of analyses to implement these systems. As a young officer, Lizzi was captured by the British Army and sent to a POW camp where he remained for the duration of the war. Lizzi knew he would be returning to devastation. He understood that the repair and reconstruction of these unreinforced masonry (URM) structures would require new methods of construction which would restore as closely as possible the original æsthetics. While Lizzi was a POW, he applied his knowledge of engineering and the concept of "biomorphic transformation" to devise a technique of using micropiles in a reticulated geometric configuration based on the root structure of trees: "pali radice, root piles. The same methodology was used in the creation of the IRM, which when correctly applied, converts a URM structure into a reinforced masonry structure. This approach was used by Lizzi throughout Italy and Europe on over sixty of the most famous buildings and bridges. Lizzi was truly a pioneer in structural, geotechnical, preservation, and seismic engineering.

The objective of this paper, which is focused on the geotechnical engineering aspects of reticulated reinforcement of structural foundations and slope stabilization, is to introduce new users to micropiles and the use of RRPs. Detailed information about analysis and design of RRPs for more experienced designers is provided for both the theoretical and applied context. Starting with background information about the motivation for the invention of this technology, components of the reticulated micropile group and uses are then presented in detail. Next, a case study about the investigation and retrofit of a historic church tower in Paducah, Kentucky, which is near the New Madrid earthquake fault, is used as an example of calculations for RRPs and IRM technology for earthquake loading. Two case studies are provided to show how this technology can be utilized for the stabilization of Ancient Puebloan sites and structures in the American Southwest. Lastly, a brief discussion is directed towards the Ukrainian people for potential use of RRPs and IRM technologies in reconstructing their country's historic sites and structures.

James Mason, Ph.D., P.E.,
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James A. Mason, Ph.D., P.E., has more than 40 years of engineering experience that encompasses bridges, buildings, historic structures, geotechnical, and bridge and building foundation engineering, to also include teaching and conducting research at several major universities. Dr. Mason has been employed with the National Park Service for over 7 years as the structural, geotechnical, preservation, and seismic engineer for the Vanishing Treasures Program. The breath of projects that he has been directly involved with for the NPS has been from Ancient Puebloan sites and structures throughout the southwestern US, historic buildings and churches in both the US and Puerto Rico, including historic forts. Example projects are: Cliff Palace and Spruce Tree House alcove in Mesa Verde National Park, Pueblo Bonito and Chetro Kytl in Chaco Canyon National Historic site, the Convento and Church at Mission San Jose in San Antonio, Texas, The San Jose Church, Fortin de San Geronimo de Boqueron and Fort El Morro, in San Juan, Puerto Rico, to the Civil War era Fort Union, located about 70 miles east of Santa Fe, New Mexico. Dr. Mason incorporates all his technical disciplines to provide a holistic approach to preservation engineering within the guiding principles of primum non nocere (first, do no harm) with acknowledgement and utmost respect of cultural heritage, past and present.