The Geo-Institute Shallow Foundations Technical Committee will live-stream the *session* "Advancement in Shallow Foundations" on Wednesday, December 9, at 2 PM EST. The talks include:

Talk #1: Shallow Foundations with Ground Improvement in North Texas (presented by Ishtiaque Hossain, Ph.D., P.E., ECS Limited)

Shallow foundations are among the most commonly used foundation systems in various types of development due to their simplicity and cost-effectiveness. These foundations rely on distributing structural loads within the near-surface soil strata and are generally more economical than deep foundation systems. However, challenging subsurface conditions such as undocumented fill, soft soils, and loose soils can make conventional shallow foundations unsuitable. In many of these situations, ground improvement techniques can be employed to enhance subsurface conditions, increase bearing capacity, and reduce settlement, thereby making shallow foundations feasible while maintaining project economy.

This presentation provides an overview of several widely used ground improvement methods, including their mechanisms, installation processes, typical applications, and factors influencing the selection of one method over another. The presentation will also discuss how improved ground systems integrate with conventional spread foundations and highlight potential limitations and pitfalls associated with these approaches. A few case studies from North Texas will be shared to discuss the practical application. The objective is to familiarize attendees with available ground improvement technologies and provide practical insights into how these systems can be utilized to enable cost-effective shallow foundation solutions on challenging sites.

Talk #2: National Western Center Projects (CCD), Denver, Colorado (Presented by Nur Hossain, Ph.D., P.E., GEOCAL)

This major redevelopment effort consists of multiple subprojects, including an underpass design, several pavement designs, a retaining wall design, and recommendations related to pad-ready design for a building pad. One of the highlights of these projects, because of its complexity, was the Equestrian Center Retaining Wall design. Existing artificial fill materials comprising thick deposits of coal ash, wood debris, asbestos, animal carcasses, and manure (organics), among other deleterious materials, are the main characteristics of the project site. Nur designed the Equestrian wall using lightweight cellular concrete,

which addressed long-term global stability and settlement issues in the wall foundations. This innovative wall design is expected to help CCD save about $8 million by allowing about 5-foot to 12-foot-thick organic and coal ash layers to remain in place.

Talk #3: The Fundamental Concepts Governing the MSR and Discussion on the Effects of Stress Level and Strain Level on its Behavior (Presented by Ali Doostvandi, S.M.ASCE)

The modulus of subgrade reaction (MSR) remains one of the most widely adopted parameters for the design and analysis of mat foundations using Winkler-based models. Although the method offers a practical and computationally efficient approach for estimating foundation settlement, contact pressure, shear force, and bending moment, selecting an appropriate MSR value remains a significant challenge because it is influenced by the complex interaction between the foundation and the supporting soil. This presentation reviews the fundamental concepts governing the MSR and discusses the effects of stress level and strain level on its behavior. A comprehensive database consisting of 152 plate load tests and 48 documented large mat foundation case histories on both sand and clay is presented to investigate the variation of measured MSR values under different foundation scales and soil conditions. The compiled data demonstrates that MSR values obtained from plate load tests are, on average, approximately one order of magnitude greater than those measured for full-scale mat foundations, highlighting the significant influence of foundation size. Comparisons with commonly used design recommendations further indicate that Terzaghi's correlations generally overestimate MSR values for large mats found on sand, while tending to underestimate MSR values for large mats on clay, particularly for very large foundations. Similarly, Bowles' recommendations are shown to consistently overpredict MSR values for large mat foundations on both sand and clay. The database presented and observations provide practical guidance for selecting more representative MSR values in engineering design and improve the understanding of scale effects in shallow foundation analysis.

Talk #4: Parametric Study: Stabilization of Airfield Pavement Subgrade Using Recycled Plastic Pin (Presented by Omer Alzeghoul, U.S. Army Corps of Engineers)

Mating systems are used for many applications for the military as temporary surfaces to reduce ground pressure exerted by aircraft, heavy equipment, vehicles, and construction material. The U.S. military uses the AM2 airfield matting systems as rapidly constructed airfields to distribute the load on the subgrade pavement to overcome the deformation effect on the pavement. However, most mats are tested and used for soils with a minimum California Bearing Ratio (CBR) range of 5 to 6. However, using the Airfield Mats on softer soil can be challenging. The subgrade needs to be stabilized to transfer the load properly, which requires substantial preparation for the subgrade pavements. The Recycled Plastic Pin (RPP) is an engineered material manufactured using recycled plastic waste and has been proven effective to stabilize shallow slope failures. RPPs are lightweight and less susceptible to chemical and biological degradation than alternative reinforcing elements. RPPs can stabilize the soil under the matting system and control deformation. The current study presents the effectiveness of RPP in stabilizing the soft soil under the AM2 matting system. The study investigated the performance of the RPP-supported AM2 system using 2D & 3D Finite Element Analysis. Different RPP length and spacing have been utilized on soils with a CBR range of 1 to 5. Based on the FEM analysis results, the RPPs with closer spacing created a group effect and can effectively reduce the vertical displacement and support the foundation system under the AM2 mats.