AUGUST 15, 2001 - Methods to Aid Structural and Geotechnical Engineers in Designing Slab-on-grade

Speakers: Dr. Robert L. Lytton, P.E. and Rifat Bulut

Dr. Robert L. Lytton, P.E., TAMU Civil Engineering Professor and forensic geotechnical engineering consultant, with a special expertise in expansive soils and suction, together with one of his PhD students, Rifat Bulut, gave a comprehensive and informative PowerPoint presentation of new design tools being developed for geotechnical and structural engineers to use in designing foundations in expansive soils.

The first part of Bob's presentation included examples of VOFLO2 to be used in determining soil movements (Em, Ym) without a foundation present, but with the possibility of modelling the effects of tree roots, root barriers, horizontal moisture barriers and vertical moisture barriers. The software developer, GeoStructual Toolkit hopes to have VOFLO2 on the market someday soon.

The second part of Bob's presentation was a demo of new finite element software for more accurately modeling flat or stiffened slab-on-grade of any shape and with any loadings. The program models the soil as a curved elastic half-space rather than as traditional Winkler springs. Output included moments, shears, defections, etc. with excellent graphical depiction of hot spots. Bob showed us the output of the design of an ell-shaped stiffened slab-on-grade which is Example #1 from the PTI manual. That example had previously been analyzed as an equivalent flat slab and overlapping rectangles. With the new and much more accurate software, Bob found the PTI 2nd edition was conservative for center lift but was very un-conservative (by a factor of 2!) for edge lift for that particular example. The software developer, also GeoStructual Toolkit, hopes to have it on the market by the end of the year.

The last part of Bob's presentation included some new tools for easily determining Em's and Ym's. By using the USDA's database of 130,000 soil samples, nomographs and other charts are now available to more easily determine PTI design values. For example, to determine Em values, the user only needs the liquid limit, plasticity index and volume change coefficient. One interesting thing found in reviewing the large database of samples was that there are cases where silt is also expansive!

A copy of Bob and Rifat's PowerPoint presentation, Methods to Aid Structural Geotechnical Engineers in Designing Slab-on-grade (3.9 Mb) can be download in an Adobe Acrobat format.

Also available is Laboratory Demonstration of the Suction Measurement by the Filter Paper Method (1.26 Mb) prepared by Mr. Rifat, which contains helpful slides showing the geotechnical engineer how to perform suction by the filter paper method; as well as his dissertation, Finite Element Method Analysis of Slabs on Elastic Half Space Expansive Soil Foundations (5.7 Mb) on which the PowerPoint presentation was based. Both can be downloaded in an Adobe Acrobat format.

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