GEOTECHNICAL ENGINEERING SERVICES

Engineering Client Success

FIELD INVESTIGATION

Subsurface explorations are normally provided by drilling equipment mounted on trucks or tracked or balloon tired all-terrain vehicles. In unusual conditions such as sites inaccessible to all-terrain vehicle equipment or inside buildings, portable power or hand equipment is available. Likewise, special procedures such as hollow-stem auguring, wash-boring, undisturbed sampling and rock coring can be furnished. Geotechnical drilling methods and standard penetration tests are performed in accordance with current ASTM D-1452 and D-1586 procedures (i.e., split-barrel sampler, 140 pound hammer, 30 inches free fall). Field personnel document subsoil profiles, geology of the area, soil type, ground water data, standard penetration test results (SPT) and other pertinent observations at the site. Environmental drilling and well installation can also be provided in conjunction with geotechnical investigation or as a separate project.

LABORATORY TESTING

Laboratory testing typically consists of determining the unconfined compressive strength, natural bulk density and natural moisture content of soil samples collected in the field. Additionally, special tests such as Triaxial Compression, Direct Shear, Consolidation, California Bearing Ratio, Gradation Analysis, Atterberg Limits and Permeability can be conducted, if required.

Results of unconfined compressive strength, natural bulk density and natural moisture content tests provide basic engineering properties of soils. Triaxial and Direct Shear are conducted to determine the angle of internal friction, cohesion and stress vs. strain curves. The angle of internal friction and cohesion are commonly used for analysis of bearing capacity, slope stability and lateral earth pressures (sheet pile designs). Consolidation tests are performed to estimate the amount and rate of future settlement. The California Bearing Ratio is used in the design of bituminous or concrete pavements. Gradation Analyses and Atterberg Limits are primarily used for soil classification and as correlations with engineering properties.

ENGINEERING ANALYSIS

Engineering analysis and recommendations are typically provided under the following categories.

Subsoil Conditions

Subsoil conditions are the main factors in determining the feasibility of constructing a structure and are a major influence on the cost of a project. After completion of the field investigation, field results are documented along with laboratory data on boring log reports. Each log presents the project description (project name and location, client's name, driller's name, date of drilling and ground surface elevations, as required), soil stratification, ground water data, SPT values and laboratory data.

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Ground Water Conditions

Evaluation of ground water conditions primarily consists of water level readings taken in the boreholes during and after completion of drilling. This information is used to predict the effect of ground water on design and construction of proposed structures. Further ground water analyses can be performed by installing piezometers, observation wells or pumping wells. Aquifer characteristics may then be modeled. If required, ground water samples can be obtained to determine possible presence and extent of contamination.

Earthwork

Earthwork recommendations include evaluation of sub-grade soil conditions, stability, surface condition and suitability of on-site soils as backfill or filter material. Furthermore, recommendations for sub-grade stabilization, compaction requirements, embankment slope design and footing excavation procedures are typically included.

Foundations

Selection of a foundation system is based on subsoil conditions and project characteristics (type of structure, loading, size, etc.) After a careful review of available information, an applicable foundation system (shallow or deep) will then be recommended. In the case of poor subsoil conditions, practical and economical ground modification or stabilization methods will be presented. Earth retention systems can also be designed or evaluated.

Floor Slab and Pavement

The most common pavement types are rigid (concrete) and flexible (bituminous). Design of a pavement system requires an evaluation of subgrade soil conditions, type of traffic, climate, ground water conditions, etc. Subgrade stabilization methods, pavement system thickness, type of material (aggregates, asphalt cement, portland cement) and physical properties of the material (concrete strength, etc.) are also specified, if required.

Design Review & Field Monitoring

Often, project characteristics are not finalized at the time of subsurface explorations. If the project design changes after completion of the initial geotechnical investigation, a consultation is suggested, in order to verify that the original evaluation and recommendations are still applicable. Additional field inspection and construction monitoring can be provided upon request.

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