

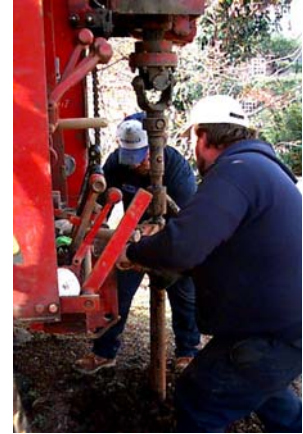
GEM Engineering, Inc.

GEOTECHNICAL ENVIRONMENTAL & MATERIALS SERVICES

Geotechnical Services for New Construction

The best structures in the world will not perform when supported on bad soil. For this reason, the geotechnical engineer is a key member of the design and construction team. Architects, other engineers and contractors provide the high-quality structure, while the geotechnical engineer ensures that this high-quality structure has a solid foundation. Geotechnical services for a new construction project generally involve six important steps.

1. The geotechnical engineer collaborates with the civil engineer, the structural engineer and the owner to make preliminary decisions regarding building locations, structural systems, site grades, slopes, other modifications that will be made to the site, etc. The geotechnical engineer determines appropriate locations and depths for taking soil/rock samples, as well as appropriate sampling and in-situ testing methods to be employed.
2. The exploration is carried out. A series of soil/rock samples are obtained from each boring location, paying special attention to foundation-bearing materials and subgrades for slabs and pavements.
3. Laboratory tests are conducted. Selected samples are tested for strength, moisture, density and other engineering properties.
4. The field and laboratory results are evaluated. Are the soils on the site undisturbed by human activity? Were they formed or deposited naturally through chemical weathering, water, wind, or glaciers? How will existing subsurface soil and bedrock such as shale, limestone or sandstone perform as bearing materials for the planned construction? What about soils that have been manipulated previously? What type of fill was used? Was it uncontrolled fill that has been dumped, but not compacted, or structural fill that has been compacted? Does the fill include buried debris? Can the contractor modify this material to ensure the load-bearing characteristics? Are sinkholes, unstable slopes, or other natural geologic hazards present?
5. A geotechnical report is prepared. The report answers these questions and provides detailed analyses of subsurface conditions across the site. The report's recommendations will guide the design and construction process. Recommendations are included for site preparation and drainage, foundations, slabs, basement/retaining walls, and pavements. Recommendations could include removing uncontrolled fill that contains deleterious material incapable of supporting a structure. In this case, the report would address how such unsuitable materials should be identified in the field and how much material must be removed from particular areas of the site. It also would define the characteristics of the structural fill needed to replace the unsuitable material.
6. Geotechnical services continue during site preparation and construction. The geotechnical engineer understands how the soil beneath a structure must perform, and has the training, equipment and knowledge of soil characteristics to make engineering judgments about soil problems encountered during construction.



How much do these services cost? Total fees for geotechnical engineering exploration, design and construction phase services typically range between one-quarter and one-half percent of the construction budget. A well executed geotechnical exploration often can pay for itself in reduced construction costs. Sound geotechnical input during construction can reduce the cost of unforeseen conditions encountered during construction.