LESSONS LEARNED:

GEOTECHNICAL ENGINEERING

OBSERVATIONS AND LESSONS FROM THE SCHOOL OF EXPERIENCE

GEOTEXTILES: Design by Function

The use of geosynthetics has increased extensively over the last two decades to the point where they are now commonly used in construction. Geosynthetics include geotextiles, geogrids, geocomposites, and geomembranes, among others. Geotextiles are the most common type of geosynthetic and the focus of this "***Lessons Learned***".

Geotextiles are fabrics that are used in earthwork, dams, buildings, and pavement construction to solve earthwork problems, provide reinforcement, drainage, filter water, and/or separate dissimilar materials. Geotextiles are made of synthetic polymers typically consisting of polypropylene, polyester, and polyethylene, and typically are "woven", or "non-woven". Since some polymers perform better in certain aggressive soil environments than others, it is important to consider the environment in which the geotextiles will be used.

A good example of geotextile use is if you drive past a construction site, you will often see a black or gray fabric "silt fence" about 2 feet high along the limits of construction. The silt fence is used to inhibit the transport of most soil particles off the project site while allowing water to pass through the fabric. In this situation, the geotextile is used for filtration. In addition to filtration, common uses of geotextiles include separation, reinforcement, and drainage.

There are many different types of geotextiles with various applications. Some are better suited for certain applications than others so proper selection/specification of a geotextile for a specific need is important. Woven geotextiles are typically used for reinforcement and separation where strength is important, while non-woven geotextiles are typically used for filtration and drainage where permeability is important. However, these functions are not exclusive of each other. For instance, a non-woven geotextile might be used to separate dissimilar materials and filter the flow of water. Typical uses of geotextiles include:

Separation: Separation of materials is needed when soil or dense graded aggregate is used over, or in contact with, an open graded stone. A geotextile at the interface of dissimilar materials prevents the finer particles from migrating into the void spaces of the open graded stone. Both woven and non-woven geotextiles are used in this application.

Reinforcement: Soils typically have little or no tensile strength. Geotextiles used for reinforcement have high tensile strengths that can improve the strength of the soil. Typical applications include construction over soft soils, strengthening of soil subgrades below pavements, and in the construction of geotextile reinforced slopes. Reinforcing geotextiles are typically woven.

Filtration: Geotextiles are also used to filter water much in the same way as a coffee filter allows coffee to flow through the filter while holding back the coffee grounds. Instead of coffee grounds, a geotextile holds back soil particles while allowing water to pass through the geotextile. A typical filtration application is wrapping open graded stone for a drain line or French drain with a geotextile to hold back the soil particles and allow water to be conveyed to the drain. Since soils have different particle sizes, it's important to specify a geotextile filter for the soils being retained so that water flows, but soil particles do not clog the geotextile over time. Both woven and non-woven geotextiles are used in this application.

Drainage: Drainage can be accomplished with certain geotextiles that provide a path for water to flow within the plane of the geotextile. Certain geotextiles may be used for drainage as long as planar flow is relatively small. Applications may include landfill drainage, chimney drains in dams, or drainage of groundwater from fine grained soils subjected to consolidation surcharging. Non-woven fabrics are most often used in drainage applications.

As can be seen, geotextiles need to be selected based on the intended function of the geotextile, often on the gradation of soil particles, and environmental factors. It is not uncommon for a contractor to request to use a different geotextile due to cost, availability, or because the alternate geotextile has worked well in the past. While similar geotextiles can often be substituted, substitutions should not be made without the specifying engineer's review and concurrence.

We hope this "***Lessons Learned***" will be helpful to you on future projects where geotextiles are used. For more information on this topic, please contact your nearest ECS office.

Respectfully,
ECS Corporate Services, LLC