Timeless But Transforming

An update on industry professionals' geotextile fabric and geogrid toolbox

By Pete Hanrahan, CPESC

Uses and applications for geotextile fabric and geogrids—commonly used in soil separation, stabilization and load support projects—have evolved rapidly over some 50 years of existence. Their evolution was first tracked in a July/August 2009 *Storm Water Solutions* article. This follow-up article presents a brief review of some of the major geosynthetic products groups, along with several others that have gained ground in the world of geotextiles.

Toolbox Review

Non-wovens are the most commonly recognized geotextile. Non-woven polypropylene fabric has a felt-like consistency and combines strength and flow ability. These fabrics are strong and permeable, allowing for a myriad of applications. They often are used as a separator between subsoils and rock riprap. They also are used to separate soils and sized stone in drainage applications, both at ground level and subsurface.

Like non-wovens, woven geotextiles also are made from polypropylene. That, however, is where the similarities end. Manufacturing processes, product characteristics and applications differ dramatically when dealing with wovens. Narrow strands of polypropylene tape are woven together during manufacturing, allowing for toughness at the cost of permeability. By effectively bridging over poorer-quality soils, woven geotextiles can provide tremendous savings in material costs and project life cycles.

Woven monofilament geotextiles add yet another popular option to the geogrid toolbox. In the manufacturing process, individual polypropylene filaments are woven together to form a fabric that resembles nylon screen cloth. Woven monofilaments are available with varying opening sizes to match up appropriately with site soils.

Spun-bonded geotextiles are a rugged type of non-woven geotextile fabrics appropriate for many applications, especially in landscape construction. They are used extensively by landscapers to separate subsoils from surface stone or mulch. Like wovens and non-wovens, spun-bonded geotextiles also are applied extensively in varied construction applications.

The housing developer on this mechanically stabilized earth job in Westerly, R.I., was able to develop additional lots on the property by using the structural solutions.

Ever-Expanding Repertoire

There are more options when it comes to geosynthetics. Uniaxial geogrids are geosynthetic open-face grids. The strongest is a single-direction, commonly used in soil retention applications. Often used to stabilize disturbed soils, uniaxial geogrids are used behind modular-block retaining walls, living walls and other structures.

In a typical retaining wall application, uniaxial geogrids are rolled out behind the walls—from the wall to the limit of disturbance—in repeated lifts that vary with design. These soil layers are compacted steadily during the construction process. The combination of compaction, proper drainage and grid stabilization produces a backfilled area that is stabilized and secure. In virtually all wall construction projects, uniaxial geogrids are used behind any wall more than 3 to 4 ft in height.

A veteran designer would explain that the wall is just a facade and serves no role in stabilizing the soil behind it. For this reason, uniaxial geogrids consistently show up on construction details for wall structures, underlining the importance of proper soil stabilization behind them.

Biaxial geogrids are equally strong in both directions. They most commonly are applied to stabilize soils beneath roadways, parking lots and

other traffic-bearing surfaces while minimizing stone and gravel use. Thousands of miles of biaxial geogrids have been installed under these surfaces over the past few decades.

Emerging Product Groups

While geosynthetics are used widely as stand-alone products, they also have become components in a wide variety of manufactured systems for specialized applications.

Geosynthetic tubes are made up of geosynthetic fabrics sewn together, forming a tube capable of confining fill material. Utilizing high-strength material, these tubes are capable of containing pressurized soils. The tubes often are filled with slurry, with the tube construction allowing for soils to be contained, while at the same time allowing water to bleed out the walls of the tube. Geosynthetic tubes can be used as breakwaters, dikes, to dewater dredge materials and to contain contaminated waste materials.

Mechanically stabilized earth structures are used on slopes, retaining walls and embankments. Placed in layers, such structures can provide dramatically steepened slopes to site-specific required heights and angles. These structures also can be applied to stabilize soil behind retaining walls and as a foundation at the base of slopes.

Filter bags constitute another product group manufactured from geotextile fabrics. Dewatering bags, constructed from non-woven geotextiles, are used to filter sediment from turbid waters flowing from construction sites, pipe breaks and other exposed soils. Many other filter bag products are used to filter storm water runoff, often to protect storm water inlet structures.

Turbidity curtains and other related products frequently are installed in streams to protect the water bodies from sediment when in-stream or nearby land-disturbing activity is taking place.

Geosynthetics also are used to construct water-inflated dams, spill-containment booms, ditch checks, water-diversion structures and other emerging systems.

Conclusions

In just a little more than a half-century, geotextile fabric and geogrids have established themselves as a cost-effective product group in their own right. In addition, they have become components in a wide array of specialty products. With filtration, load support, load distribution and soil stabilization benefits, there is no doubt that geotextile fabric and geogrids will continue their dramatic growth for many years to come. SWS

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