3904 Virginia Ave • Cincinnati, Ohio 45227 • Phone (513) 271-6000 • Fax (513) 271-4420

Geogrid Quality
Finished Product and Raw Materials

Over the past 20 years, the geogrid industry has seen significant growth in grade separation applications including segmental block retaining walls (SRW) and steepened reinforced soil slopes (RSS). This growth has directly led to introduction of new geogrid products, as well as an influx of multiple resin suppliers (raw material suppliers). The availability of new products in the market brings new challenges to the design engineer. While product diversity typically means more competitive pricing and savings to the engineer's clients, it also places a burden on the engineer to ascertain such new products and resin suppliers meet industry guidelines for performance and safety. Geogrid reinforcing is expected to provide a 75 to 100 year design life under current standards of design practice (NCMA or AASHTO). So, how does the engineer verify the quality of the geogrid reinforcing considered in design? The engineer must be assured of not only the quality of the finished product; but equally the quality of the raw materials (resins) used to manufacture the product.

The geogrid industry has established a well defined protocol for assessing the quality and performance of finished products. Quality control and quality assurance (QC/QA) programs typically include ultimate tensile strength testing in accordance with accepted methods (ASTM D6637) for each lot of geogrid produced. In addition to determining the ultimate (short-term) tensile strength, the creep characteristics of the geogrid are determined for a 75 to 100 design life. Creep is often evaluated using accelerated methods (ASTM D6992 – Stepped Isothermal Method), which must be confirmed using conventional creep test methods (ASTM D5262). The engineer must also consider performance characteristics of the geogrid that should include soil interaction and direct sliding properties (ASTM D6706 Pullout and D5321 Direct Sliding), resistance to installation damage during compaction (ASTM D5818 Guideline for Installation Damage), and geogrid-segmental block connection when used in SRW design (ASTM D6638 Geogrid Connection). The geogrid supplier should be able to provide supporting data and/or certification that the geogrid quality (tensile strengths) and performance characteristics of the geogrid meet published data.

Additionally, the geogrid manufacture should be capable of certifying the raw materials used in the manufacture of the geogrid. **The certification should address the resin used in manufacture of HDPE or PP geogrid or the PET fiber used in the manufacture of PET**

geogrid. As an example, the PET geogrid industry has established defined raw material characteristics that address long-term durability and product quality. PET fiber used to manufacture geogrid material must exhibit a molecular weight greater than 25,000 g/mol and a carboxyl end group count less than 30 mmol/kg. The geogrid manufacturer's certification for PET fiber molecular weight and carboxyl end group demonstrates that the geogrid manufacturer has conducted periodic testing of received raw materials that verifies compliance with industry standards.

In addition to the geogrid manufacturer's fiber certification, certification (Mill Certificates) should be provided by the PET fiber supplier (resin supplier) indicating that all lots provided to the geogrid manufacturer meet industry standards for molecular weight (>25,000 g/mol) and carboxyl end group count (<30 mmol/kg). Lot certification by the PET fiber supplier (resin supplier) assures both the geogrid manufacturer and the engineer that the fiber will provide long-term performance for the design life of the structure. **This situation is analogous to the steel industry where a fabricator provides certification for finished products and the steel mill provides certification for the raw material (i.e. steel bar, coils, etc).** The geogrid manufacture provides certification on the finished product, and the fiber (resin) supplier provides certification of the raw material (PET fiber, PP or HDPE resin) used to manufacture the geogrid.

The certification alone should not be accepted as sufficient. The geogrid manufacturer should demonstrate that sufficient controls are in place to track and document raw material procurement, geogrid production, finished product storage, final sale, and shipping. If controls are not in place there is no clear evidence that the material certifications apply to the product delivered to the site. Control procedures are critical in maintaining a clear and precise chain of custody from raw material procurement to product delivery. An ISO 9001:2000 certificate (or similar) demonstrates the manufacturer has a quality management system that complies with recognized, widely accepted industry standards. The IS0 9001:2000 certificate is instituted by 3rd party consulting firms working for the International Organization for Standardization. An ISO certificate implies that the manufacturer is audited yearly to assure the quality management system is implemented. Subsequently, the engineer is assured that the manufacturer is capable of providing a meaningful certification and the finished product delivered to the site meets the design intent.

In summary, the question is simple, "How do you know that the product delivered on your project is representative of the product tested?"