

GEOCOMPOSITE PEEL STRENGTH: The Difference Between Four Peel Strength Tests

This technical note addresses the confusion about the four testing methods for one property, geocomposite peel strength (or ply adhesion, or bond strength.) The American Society for Testing Materials has three tests for peel strength that are currently active: they are ASTM D413, ASTM F904, ASTM D7005 and the Geosynthetic Research Institute had one listed as well, GRI-GC7. These testing methods are all different testing methods for ply adhesion and are written based on the type of materials tested. The ASTM D7005 test is specifically developed for drainage geocomposites and is approved by the ASTM Geosynthetics Committee D35. This test method has been determined to be the most appropriate testing method for drainage geocomposites. This technical note summarizes the different testing methods and explains why ASTM D7005 is recommended for testing peel strength of drainage geocomposites.

Summary of the Four Peel Strength Tests

The test ASTM D413 (1998) is the "Standard Test Method for Rubber Property-Adhesion to Flexible Substrate." The specimen strip is 1 inch wide and the strain rate is 2 inches/minute. This test covers "*the determination of the adhesion strength between plies of fabric bonded with rubber or the adhesion of the rubber layer in articles made from rubber attached to other material*(Scope 1.1)."

The test ASTM F904 (1998) is the "Standard Test Method for Comparison of Bond Strength or Ply Adhesion of Similar Laminates Made from Flexible Materials." The specimen strip is 1 inch wide and the strain rate is 12 inches/minute. This test "*covers a procedure for comparing the bond strength or ply adhesion of similar laminates made from flexible materials such as cellulose, paper, plastic film, and foil. This includes laminates made from various processes: adhesive laminates, extrusion coatings, extrusion laminates, and coextrusion*(Scope 1.1)."

The test ASTM D7005 (2003) is the "Standard Test Method for Determining the Bond Strength (Ply Adhesion) of Geocomposites." The specimen strip is 4 inches wide and the strain rate is 12 inches/minute. "*This index test method defines a procedure for comparing the bond strength or ply adhesion of geocomposites. The focus is on geotextiles bonded to geonets or other types of drainage cores*(Scope 1.2)."*This test includes geocomposites of geotextiles thermally bonded to geogrids or geonets.*

The test developed by the Geosynthetic Research Institute, GRI-GC7 is the "Determination of Adhesion and Bond Strength of Geocomposites." This test method has been replaced by ASTM D7005 and has ceased to exist.

Conclusion

The test ASTM D7005 is the most appropriate test because it has been specifically developed for geocomposites, items which have dissimilar material bonding. Conversely, ASTM F904 is created for comparing ply adhesion of similar laminates. ASTM D413 is specifically designed for materials containing rubber which geocomposites do not. In addition ASTM D413 is for testing planar adhered surfaces, not for objects that have irregularities. The ASTM D7005 strip specimen is wider, 4 inches as opposed to 1 inch for D413 and F904. This allows for a more representative sample, because geogrids and geonets have drainage cores (ribs) that are not continuously laminated. Therefore ASTM D7005 is the most applicable and reliable test for geocomposites.