Global Synthetics
Australian Company – Global Expertise

TECHNICAL NOTE

Secugrid® - Comparative Installation Damage Tests

TN-SG 7

NAUE

The robustness of a geosynthetic is crucial not only to its long-term performance but its ability to properly perform its engineered function at all. Geogrids, in particular, must be strong against the imperfect conditions that characterise nearly all construction sites. These challenges include rough edges on aggregate, the operation of heavy equipment on site, weathering and exposure, inexperienced handling, etc.

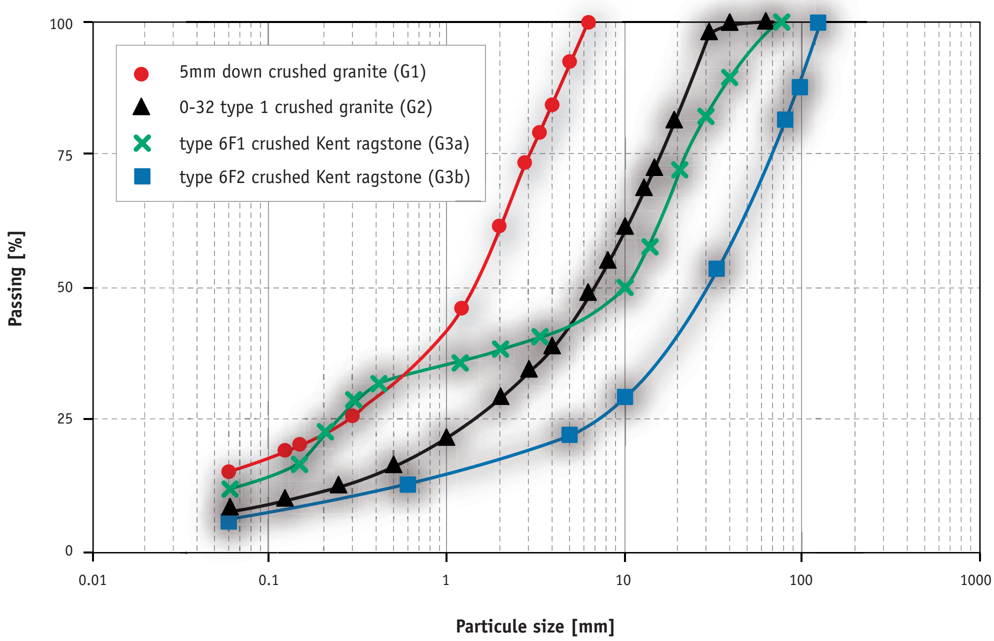
ERA Technology Limited (UK) carried out installation damage testing on reinforcement geogrids from different manufacturers to evaluate how the products commonly available in the market compared in terms of robustness. Using different gradings of fill material to simulate varying site conditions, the tests were conducted in accordance with British Standard BS 8006-1 (2010) and ISO TR 20432 (2007).
Two of the key geogrids included in the testing were a flat bar, welded junction polypropylene (PP) Secugrid® 30/30 Q1 (SG 30/30 Q1) geogrid manufactured by NAUE and a punched and drawn, multidirectional PP geogrid from Tensar International (TriAx TX 160). With their significantly different aperture styles and manufacturing methods, they provide an interesting contrast.

For each geogrid, three gradings of fill were used:

Grading 1 (G1): 5mm down crushed granite, d_{50} = 1.4mm
Grading 2 (G2): 0-32mm Type 1 crushed granite, d_{50} = 6.6mm
Grading 3 (G3): Type 6F1 crushed Kent ragstone, d_{50} = 10mm (3a)
Type 6F2 crushed Kent ragstone, d_{50} = 32mm (3b)

For each grading of fill material, compaction was carried out as shown in figure 2.

Figure 1
Grading curves of fill material used in the installation damage testing



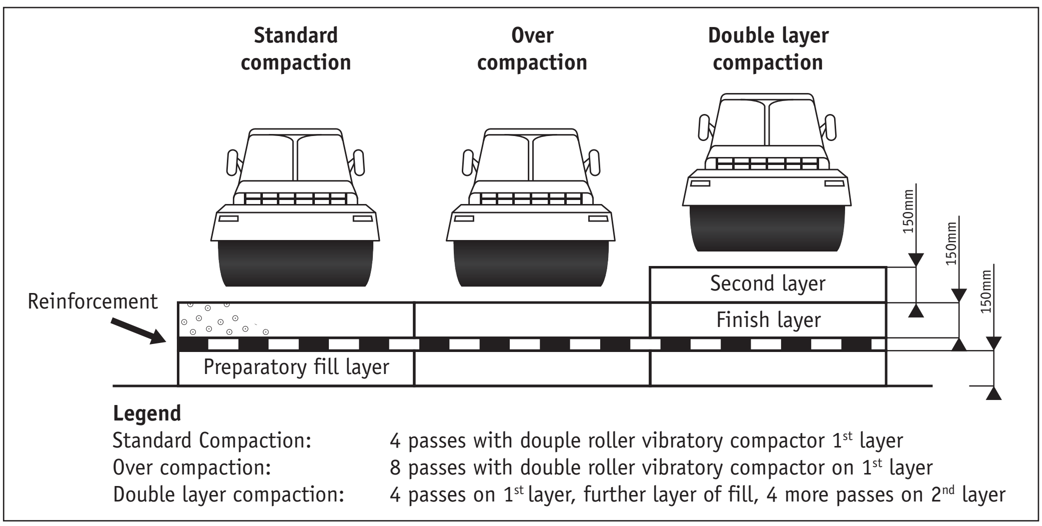


Figure 2
Type of compaction used for each fill material

Table 1
Number of broken ribs on each sample following Installation Damage

	Standard compaction		Over compaction		Double layer compaction	
	SG 30/30 Q1	TriAx TX 160	SG 30/30 Q1	TriAx TX 160	SG 30/30 Q1	TriAx TX 160
G1	0	0	0	0	0	0
G2	1	19	0	1	1	1
G3	0	9	6	103	3	28

Table 2
Installation Damage Factors (RF_{ID}) for Secugrid® 30/30 Q1 and TriAx TX 160

	Standard compaction		Over compaction		Double layer compaction	
	SG 30/30 Q1	TriAx TX 160	SG 30/30 Q1	TriAx TX 160	SG 30/30 Q1	TriAx TX 160
G1	1.10	1.31	1.10	1.31	1.17	1.38
G2	1.28	2.00	1.17	1.39	1.14	1.38
G3	1.46	1.56	1.21	1.92	1.20	1.76

After the installation damage was simulated but before the remaining tensile strength in each geogrid was tested, the number of broken geogrid ribs was documented. Table 1 provides a summary of the results for the different fill materials and compaction types used.

BTTG Testing and Certification Ltd (UK) conducted the subsequent tensile testing in accordance with the EN ISO 10319-1996 procedure. Installation Damage Factors (RF_{ID}) were derived according to ISO TR 20432, in which RF_{ID} is defined as the ratio of the mean tensile strength of undamaged sample vs. the mean tensile strength of the damaged sample.

The results of the Installation Damage Factors are summarized in table 2.

Conclusion

Geogrid users have an enormous number of product choices in the marketplace and these include vastly different product constructions and characteristics. While many individual tests can provide support for the utilization of each product, one must consider the overall data available across multiple tests to get a complete idea of how the product will perform in the field.

This includes the need to develop a proper understanding of material robustness against installation damage (e.g., from compaction) so that a geogrid serves the purpose it is specified for.

In these installation damage tests, the Reduction Factors (RF_{ID}) indicate that Secugrid® 30/30 Q1 is extremely robust against mechanical damage. Under all of the various conditions tested regarding grading and type of compaction, Secugrid® 30/30 Q1 consistently showed the greatest residual tensile strength when compared to the performance of the mutli-directional TriAx TX 160 with its relatively thin bars.

The more a geogrid resists damage, the better the site performance will be. Robustness at installation means the geogrid will possess greater residual strength. It will enter service more closely to its as-manufactured, as-engineered characteristics; and that provides stronger base / subbase aggregate restraint and better site integrity.

The rigid, flat bars of Secugrid® and its welded junctions provided the best performance and greatest resistance to installation damage.

References

BS 8006-1:2010 (2010). Code of practice for strengthened/reinforced soils and other fills ERA Technology Ltd. (2008). Installation Damage to BS 8006-Annex D on various products, ERA Test Report No. 2008-0033, UK, March 2008.

BTTG Testing and Certification Ltd. (2008). Tensile tests on installation damaged materials, BTTG Test Report No. 10/13308, UK, November 2008.

ISO TR 20432 (2007). Guidelines for the determination of the long-term strength of geosynthetics for soil reinforcement.

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