



Design Factors for E'GRID Products:

DURABILITY

1: Introduction:

In use, soil reinforcement materials may be subjected to many environmental factors that could have an influence on their durability. For example: chemical attack (acids and alkalis), micro-biological attack, oxidation and hydrolysis. The key features that enables a product to resist these factors is material selection.

2: Materials used to Manufacture E'GRID Products:

The materials selected for the manufacture of E'GRID products are internationally-sourced engineering grades of Polypropylene (PP) and High Density Polyethylene (HDPE). These two types of polymer are among the most inert of all bulk materials available to the engineer. They are widely used in critical applications such as gas pipes, hot and cold water pipes and fittings, chemical storage, automobile fuel tanks and various under-bonnet applications including battery cases. In a study carried out when the use of Geogrids was in its infancy it was concluded that PP and HDPE are the ideal materials for their manufacture (ref). They are resistant to chemical and biological attack and well-protected from oxidation by anti-oxidants included by their makers. They are not subject to hydrolysis. There is no known solvent that will dissolve PP or HDPE at ambient temperatures

The only addition to the base polymer during E'GRID product manufacture is Carbon-Black masterbatch. This is included to provide protection against weathering. No externally-sourced re-cycle materials, including post-consumer re-cycle, are used in the manufacture of E'GRID products.

3: Specific Tests on E'GRID Products:

As part of their assessment for CE Marking it was necessary to subject samples of E'GRID products to various environmental durability screening tests. These were:

- ENV ISO 13438: Resistance to Oxidation
(Note: This standard uses exposures equivalent to 25 years at ambient temperatures. These exposures were extended to the equivalent of 125years (HDPE) and 100years (PP) at ambient temperatures)
- EN 12225: Resistance to Micro-Biological Degradation
- EN 14030: Resistance to Acid and Alkali Liquids

The samples tested were of the lightest grades of products in the ranges: E'GRID 50R and E'GRID 2020.

At the end of the tests the retained strength of exposed samples compared to control samples tested at the same time is shown in the table below (ref):

Test Method	Notes	Retained Strength (%)		
		E'GRID 50R	E'GRID 2020	
		MD	MD	CMD
Oxidation: ENV ISO 13438 (Basic) Extended to 125/100yr equivalent	100°C for 56 Days 110°C for 28 Days 100°C for 280 Days 110°C for 112 Days	102.36 103.82	101.10 100.62	104.34 100.28
Micro-Biological: EN 12225	16 Weeks	101.14	101.40	101.40
Chemical: EN 14030 Method A EN 14030 Method B	Inorganic Acid Inorganic Base	100.45 102.21	100.75 102.18	102.23 103.73

4: Conclusion:

E'GRID products manufactured from PP and HDPE do not suffer from environmental attack in soil reinforcement applications.

Therefore: **$RF_D = 1.0$**

References:

- Wrigley N E: Durability and Long-Term Performance of Tensar Polymer Grids for Soil Reinforcement: Materials Science and Technology, Vol 3, March 1987, The Institute of Metals, London, England.
- CE Marking – Durability Tests: Confidential Test Reports 12949/HPM005 and 12949A/HPM005, 1st August 2003, BTTG, Manchester, England.

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