



# Design Factors for E'GRID Products:

## Weathering

### 1: Introduction:

In use, soil reinforcement materials may be subjected to either short-term or long-term weathering. The main detrimental component of this is attack by Ultra-Violet light (UV). This will, in time, cause breakdown of the structure of most polymers.

### 2: Short-Term Exposure:

Prior to a soil reinforcement product being buried, it may be exposed on the ground for a period from hours up to a few weeks. To screen whether products will suffer during this period a test in accordance with EN 12224 is a compulsory part of the approval process for CE Marking. A retention of strength of  $\geq 80\%$  in this test is deemed to be acceptable for products performing critical reinforcement roles.

When tested in accordance with EN 12224, samples of the lightest products in the ranges: E'GRID 2020 and E'GRID 50R suffered no significant changes in strength (ref).

### 3: Long-Term Exposure:

In some applications, e.g. embankments with wrap-around faces, a soil reinforcement product may be exposed to UV for long periods. In these circumstances a significant retention of strength is required for many years. To provide the necessary protection for such uses, all E'GRID products contain  $>2\%$  weathering-grade Carbon Black well-dispersed in their polymer matrix.

In Information published in 1987 (ref) it was estimated that a PP or HDPE product protected by the inclusion of  $>2\%$  finely divided Carbon Black would degrade at a rate of 2.5 microns per year if fully exposed to sunlight in the UK or similar northern European climates. The annual exposure to Ultra-Violet light in such climates at that time was 70-80 KiloLangleys per year. Based on recent data on international levels of exposure to U-V light (ref) and the above estimate it has been calculated that E'GRID Geogrids will retain 50% of their initial strength for the numbers of years shown in the table below.

The approximate regions covered by each column in this table are:

Region A: Canada, Europe and central China

Region B: USA, most of South America, Mediterranean Coastal areas, most of Asia

Region C: Central America, parts of South America, Africa, Middle East, Arabia, India, Australasia.

U-V Exposure Level	Kilo Langleys per year	≤120	120 - 160	≥160
Region		A	B	C
Product				
E'GRID 50R		80	60	48
E'GRID 65R		106	80	64
E'GRID 90R		>120	110	88
E'GRID 130R		>120	>120	>120
E'GRID 170R		>120	>120	>120
E'GRID 2020		>120	100	80
E'GRID 3030		>120	>120	>120
E'GRID 4040		>120	>120	>120

### Time to 50% of Initial Strength (Years)

- Notes: 1: More detailed information on regional variations is available on Ref. 2.
- 2: The times given are for full, direct exposure. Any shading, e.g by vegetation or nearby structures, or alignment out of direct sunlight will increase these times.

#### References:

- CE Marking – Durability Tests: Confidential Test Reports 12949/HPM005 and 12949A/HPM005: BTTG, Manchester, England, 1st August 2003
- Wrigley, N E: Durability and Long-Term Performance of Tensar Polymer Grids for Soil Reinforcement; Materials Science and Technology, Vol 3 pp 161-170, The Institute of Metals, London England, March 1987.
- Kilo Langley Map; Ciba Speciality Chemicals Inc., 1998.  
[www.cibasc.com/view.asp?id=6218](http://www.cibasc.com/view.asp?id=6218)

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