

Estimation of the allowable design loads of FORTRAC® geogrids according to BBA certificate

According to [1], [2],[3] and [4] the allowable design load F_d of FORTRAC® geogrids can be estimated as follows:

$$F_d = \frac{F_k}{A_1 \times A_2 \times A_3 \times A_4 \times \gamma_B} \quad [\text{kN/m}]$$

with:

- F_k [kN/m] Characteristic tensile strength (EN ISO 10319);
- A_1 [-] Partial material factor for creep, time dependent, Table 1;
- A_2 [-] Partial material factor for transport, mechanical installation damage, Table 2;
- A_3 [-] Partial factor for joints and connections, if no joints are applied in reinforcing direction: $A_3 = 1,00$;
- A_4 [-] Partial factor for environmental effects (resistance to UV light, effects of temperature, chemical resistance, microbiological resistance), Table 3;
- γ_B [-] Reduction factor of safety for design, manufacture, availability – and extrapolation of data, Table 4.

For FORTRAC® geogrids the characteristic strength F_k is mentioned in the product type.

Example: Fortrac 80/30-20

Characteristic tensile strength in longitudinal direction 80 kN/m.

Characteristic tensile strength in cross direction 30 kN/m.

Mesh size approximately 20 mm.

Table 1: Partial material factor A_1 for creep of FORTRAC® geogrids

Duration of use or design life											
	1 hour	1 day	1 week	1 month	1 year	2 years	3 years	5 years	10 years	60 years	120 years
A_1 [-]	1,20	1,28	1,33	1,37	1,43	1,47	1,49	1,50	1,53	1,56	1,67

For other duration of use A_1 can be calculated by linear interpolation.

Soil temperature less than 30°C.

95 % level of confidence.

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Table 2: partial reduction factor for mechanical damage A_2 for FORTRAC® geogrids according to BBA certificate.

Soil type	FORTRAC® geogrid types			
	35/20-20	55/30-20	80/30-20	110/30-20
Sand	1,17	1,06	1,03	1,04
Sandy gravel	1,17	1,09	1,13	1,07
Coarse crushed limestone	1,29	1,19	1,19	1,18

Table 3: partial reduction factor for environmental effects A_4

pH-value of soil	2,0-4,0 acid	4,0-9,0 neutral	9,0-10,0 alkali
A_4 [-]	1,15	1,03	1,10

Table 4: factor of safety for design, manufacture, availability - and extrapolation of data γ_B according to [4]

	60 years	120 years
γ_B [-]	1,05	1,10

Allowable design strength for type _____; $F_d =$ _____ kN/m

Remarks:

References

1. *Merkblatt für die Anwendung von Geotextilien und Geogittern im Erdbau des Strassenbaus (German guidelines for geotextiles and geogrids in soil- and road construction)*, FGSV, Köln, 1994.
2. *BS 8006 Code of Practice for Strengthened/reinforced soils and other fills*, BSI, London, 1995.
3. *Empfehlungen für Bewehrungen aus Geokunststoffen (Recommendations for Reinforcement with Geosynthetics) – EB GEO, DGGT, Germany, 1997.*
4. *British Board of Agrément Technical Approvals for Construction, Roads and Bridges Agrément Certificate No. 01/R125, Detail Sheet 2, second issue, UK, April 2005.*