Base Course Reinforcement with Fortrac® T - Geogrid 'Herrenberg' Recycling Centre

HUESKER
REPORT

Introduction

A recycling centre was constructed at Herrenberg (South Germany) in 1996/1997 for Böblingen Rural District Council with recycling area, wood collection point and composting areas for tree and garden refuse. The design and local site supervision contract was awarded to ICP engineering company Prof. Czurda and Partners of Karlsruhe, construction work being undertaken by RMS Richard Mayer GmbH + Co. KG, road-and foundation construction, Sindelfingen, at their Tübingen office.
The required base-course reinforcement, Fortrac® 40/40-35T geogrid, was manufactured and supplied by HUESKER Synthetic in Gescher.

Subsoil Conditions

The entire area of about 20,000 m², on which the recycling centre was to be built, was made-up ground some 20 metres thick, which had previously been placed without any control on composition or compaction. This fill material had been placed in 2 m layers (or more), spasmodically controlled using a back-tipping and pushing out method. The result was an inhomogeneous surface with varying load-bearing characteristics.

The E_{v2} levels measured at the formation level were showing values of 20 MN/m² to 30 MN/m².

Base course construction

On account of this difficult initial situation, the planning engineer, ICP engineering company Prof. Czurda and Partners of Karlsruhe, proposed that the base courses should be geosynthetically reinforced. The base course in the bituminous paved areas was designed as a combined frost protection - bearing layer, 0.42 metres thick, comprising a 0/56 mm coarse limestone gravel. On the concrete paved areas (0/32 mm, gravel-chip-sand mix), being the wood collection point and areas for tree/garden refuse, an application of 600 mm wet-mix concrete in two layers was planned, each 300 mm. A deformation modulus of $E_{v2} \geq 100$ MN/m² was required for the formation level of the wet-mix concrete and combined frost blanket respectively. To obtain this standard it was essential to lay a suitable geogrid as a base-course reinforcement in both areas. This was appropriately installed on the formation.

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Field test results

A field test measuring 8 x 10 metres was set up in October 1996 during the earthworks construction phase. Two types of Fortrac® geogrid by HUESKER Synthetic were tested, namely Fortrac® 35/35-35 and Fortrac® 40/40-35T, having the following characteristics:

Geogrid in high-modulus polyester	**Maximum tensile load** longitudinal/transverse kN/m	**Maximum tensile-load elongation** longitudinal/transverse %	**Mesh width** longitudinal x transverse mm
Fortrac® 35/35-35	35/35	12/12	35 x 35
Fortrac® 40/40-35 T	40/40	9/9	35 x 35

The imposed requirement of $E_{v2} \geq 100$ MN/m² was satisfied in both test areas. The Fortrac® 40/40-35T geogrid was chosen due to a very good E_{v2}/E_{v1} compaction ratio in this test area, producing values of less than 2.10, and also because it was considered prudent to provide reserve tensile-strength in the geogrid on account of the very varied load-carrying capability of the subgrade. The results of the completed plate load bearing tests are as follows:

Test Area 1: Fortrac® 40/40-35T Test-No: LP 1	**Test Area 1: Fortrac® 40/40-35T Test-No: LP 2**	**Test Area 2: Fortrac® 35/35-35 Test-No: LP 3**	**Subgrade Test-No: LP 4**
E_{v1} = 63,5 MN/m²	E_{v1} = 56,1 MN/m²	E_{v1} = 61,1 MN/m²	E_{v1} = 18,8 MN/m²
E_{v2} = 122,6 MN/m²	E_{v2} = 115,4 MN/m²	E_{v2} = 131,5 MN/m²	E_{v2} = 28,7 MN/m²
E_{v2}/E_{v1} = 1,93	E_{v2}/E_{v1} = 2,06	E_{v2}/E_{v1} = 2,15	E_{v2}/E_{v1} = 1,53

Conclusion

The investigation proved that the installation of the Fortrac® 40/40-35T geogrid effectively achieved the required load-carrying capability. The imposed requirements were shown to have been met in this case by a relatively light, flexible, woven geogrid. This was of major economical significance in terms of the construction project, given that the surface to be reinforced measured approximately 20,000 m².

The load-bearing checks carried out continuously during the construction work by ICP engineering company Prof. Czurda and Partners, Karlsruhe, confirmed compliance with imposed requirements in all the aspects examined. As a result, the earthworks were duly completed on schedule and adopted.

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