



Construction of the new A74 motorway at Venlo (NL) **Geosynthetic Reinforced Earth (GRE) used as bridge abutment and soil pressure relief**

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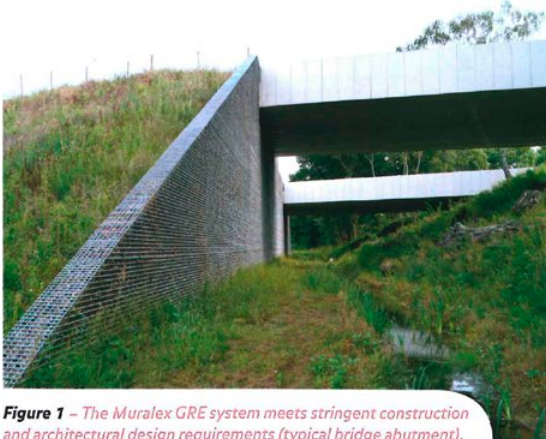


Figure 1 – The Muralex GRE system meets stringent construction and architectural design requirements (typical bridge abutment).

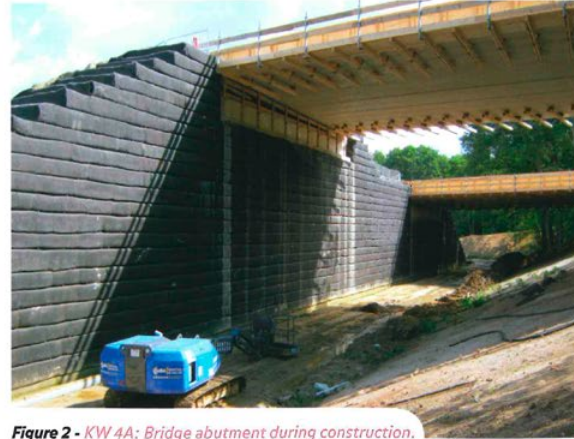


Figure 2 • KW 4A: Bridge abutment during construction.

The construction of a new section of the A74 motorway near Venlo (Netherlands) will address the increased cross-border traffic, thus relieving the pressure on the existing border roads. The A74 is planned to link the A73 (NL) and A61 (DE) motorways, providing a rapid direct link between the two neighbouring countries. The route of the motorway required the construction of several new bridges. In the search for an economical solution to integrate bridges KW 4, KW 4A and KW 5 into the landscape, the choice was made in favour of "Geosynthetic Reinforced Earth" (GRE) systems from HUESKER. The design calculations for these structures were undertaken in line with the guidelines outlined in EBGE0 2010 for the design of geosynthetic reinforced earthworks.

Building structure

The individual bridges were erected using the 'wrap around' construction method with Fortrac® geogrids. This flexible construction method is especially suitable for soft non-homogenous

subsoil conditions.

HaTe® nonwoven material was used as erosion protection on the exposed area of the geogrids. Instead of lost formwork in the form of angled steel reinforcement mesh, the KW 4 and KW 4A bridge abutments were erected using large panel formwork. This achieves particularly economical building progress and a flat slope face at the same time.

The Fortrac® Natur GRE system functions as an approach ramp for the bridge structure of the KW 4, standing approx. 7.0 m high. It also relieves soil pressure on the abutment which is clad with concrete panels. The limits of the horizontal wall deformations and the intended fill material, containing a high percentage of fly ash, required the use of a high tensile, low strain reinforcement which was also resistant to alkaline environments. Consequently, Fortrac® MP was found to be the most suitable choice of material.

The special properties of the polyvinyl alcohol (PVA), the yarn used in this product, ensure long-term resistance while complying with the permitted deformations.

KW 4A

This structure spans the Wilderbeek stream and also allows animals to pass under the A74. One of the bridge abutments was constructed as a geosynthetic reinforced support structure using the Muralex® GRE system. The bridge superstructure, which carries heavy goods traffic, was supported directly on the earthworks and was reinforced by high-modulus, low-creep Fortrac® MP geogrids. The tight time schedule to implement the project required intensive preloading of the soft subsoil in order to reduce long-term settlement to a reasonable level.

The maximum height of KW 4A is 11.0 m at the edges and 9.0 m at the support points. The spacing of the geogrid layers is a uniform 0.5 m. The

Abstract

The measures taken on the A73/A74 demonstrate convincingly the use of innovative construction methods even with complex civil engineering structures.

As a result of positive experiences gained world-wide with the Muralex® GRE system, it can be expected that this cost-efficient construction method, which also produces aesthetically pleasing designs, will gain greater acceptance.



Figure 3 - View of stripped formwork on front surface (KW 4).



Figure 4 - Use of large panel formwork to aid installation of the KBE Muralex® system (KW 4A)

Muralex® GRE system consists of a static supporting GRE base and a slim facing steel grid construction which can either be backfilled with stone or preseeded soil. The design also permitted the staggered placement of the steel grid construction, thus preventing the detrimental impacts of different settlement rates between the cladding and the GRE. If subjected to damage caused by vehicle impact or other 'unplanned' loading, the steel grid facing is easily replaced, as the cladding is non load-bearing.

KW 5

KW 5 is also designed with a complex architecture and offers pedestrians and cyclists a safe means of crossing the A74. The Fortrac® Natur GRE system was used here to relieve soil pressure on the abutments. The embankments designed with extra-steep slopes minimised the area of land used and reduced fill import compared with non reinforced embankments.



Figure 5 - Preloaded bridge abutment designed with KBE Muralex®.

Location	A73/A74 at Venlo (Netherlands)
Client	Rijkswaterstaat – Ministerie van Verkeer & Waterstaat
Contractor	Dura Vermmer Divisie Infra B.V. Groete Projecten A74
Construction period	March – May 2011
Products	Fortrac® 110/25-20/30MP, Fortrac® R 200/30-30MP, Fortrac® R 400/30-30MP, Fortrac® 80/30-20T, 55/30-20T, HaTe® B 150 K3 HaTe® BS 12 Muralex® GRE ●



Figure 6 - Completed bridge abutment designed with KBE Fortrac® Natur.