Embankments

Embankments on Piles

N25 South Ring Road: Sarsfield Road to Bandon Road, Cork, Republic of Ireland
Reinforced Embankment using Rigid Inclusions & Stabilenka® High Strength geotextile

Situation

As part of the ongoing improvement of the N25 South Ring Road, in County Cork Ireland the at-grade roundabout junctions at Sarsfield Road and Bandon Road on the N25 were to be grade separated. The proposed solution was a flyover consisting of a dual carriageway carrying the east-west traffic above both roundabout junctions. The main contractor for the N25 Bandon/Sarsfield interchanges upgrade is SIAC Construction Limited.

Two single-span bridges will be used to carry the east-west traffic over the Bandon Road roundabout and a double span bridge over the Sarsfield roundabout. Reinforced earth embankments will form the approaches and the link between bridges. New on/off slip roads will be provided to the east of Sarsfield and midway between the two roundabouts.

The central section of the scheme involved the construction of the new road alignment partly founded on the existing road and partly on the existing natural ground and will consist of embankments up to 8 m in height and part at grade. The existing site geology consists of glacio-alluvial deposits, primarily silty or gravelly with some peat deposits. Some sections of the proposed new road alignment are to be constructed over deposits of peat and silt to a 18 m depth.
The adopted ground improvement system proposed by the main contractor for these areas of soft ground was the installation of vertical mortar/concrete inclusions (known as "Rigid Inclusions"). This Rigid Inclusions can be formed using a hollow rotation auger through which the concrete is pumped as it is extracted from the ground. Rigid and Semi-Rigid Inclusions are a ground improvement technique intended to improve the soil globally and to reduce its deformability by the use of these Semi-Rigid reinforcement columns. It does not aim to bypass the compressive ground. The objective is to reduce global and differential settlement by improving the soil so it is able to carry the loads imposed by the overlying embankment; these columns distribute the loads uniformly throughout the soil mass that then behaves as a composite – concrete column/soil material.

A geosynthetic reinforced transition layer, made of a good quality well compacted granular material layer is installed above the top of the inclusions to assist in the uniform transfer of the embankment loads into the composite improved soil below.

The British Standard BS 8006:2010 was used to design the geosynthetic reinforcement, which assumes that the embankment loads are transferred via the horizontal reinforcement through the inclusions. Two orthogonal uniaxial layers of reinforcement are laid over the inclusions to transfer the load of the embankment.

BS 8006:2010 also identifies a minimum height requirement of fill placed over piles/inclusion to ensure the arching or stress redistribution occurs. In order to comply with this minimum thickness and based on the spacing of the inclusions and their effective diameter a minimum thickness of fill above the inclusions of 1.53 m was determined to be required. This essentially meant forming the top of the inclusions below the existing ground level, for the at grade sections or close to the surface in embankment situations.

The adopted construction sequence was as follows:

- Excavate down approx. 2 m below existing ground level
- Install a reinforced working platform comprising of reinforcement/separation geotextile and 600 mm of well graded granular fill
- Install Rigid inclusions to within 500 mm of the top of the platform
- Removal of the top 300 mm of working platform (200 mm above the inclusions heads)
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- Installation of the Stabilenka® on the trimmed working platform surface & anchor at edges
- Install granular fill for the basal reinforced platform and road formation sub-grade
- Placement of a temporary surcharge on the road formation level to encourage settlement/reinforcement tensioning to occur prior to road surfacing

HUESKER’s distribution Partner in Ireland, Irish Tar, supplied various grades of Stabilenka® (300 kN/m up to 1000 kN/m) during 2012 in customised roll lengths to suit the varying width and length of the road sections which helped to minimise waste on site. The completed section of road is due to open to traffic in late early 2013.

Stabilenka® had also been adopted on the previous phase of the N25 South Ring Road at the grade separated Kinsale Road roundabout as basal reinforcement over piled supported approach embankments.

The Advantages

- Low Maintenance: Minimised deformation of the embankment after construction
- Elimination of effects on adjacent components, e.g. pipes, foundations, etc.
- Stabilenka® reinforcement provided optimal design objectives of high strength and low strain
- Customised roll lengths minimising waste
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Location: N25 South Ring
Road: Sarsfield Road to Bandon Road
Improvement, Cork, Republic of Ireland
Client: National Roads Authority/Cork
City & County Council
Consultant: RPS
Contractor: SIAC Construction Ltd
Construction: 2012
Products: Stabilenka® 1000, 800, 600, 300

Edge of Basal Reinforced Platform showing anchorage length returned around a Gabion used on the previous Kinsale Road Improvement scheme.