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A steep slope reinforced with geosynthetic reinforcement and with natural ground cover

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ABSTRACT: A reinforced soil solution was chosen for the construction of a noise barrier alongside an existing motorway because of limited landtake. To satisfy the specified landscaping requirements the slope-face was made from stacked turfblocks which gave a totally natural appearance, even while construction was in progress.

Limited space for construction means there is a growing need to construct steep slopes. For example alongside motorways, as a result of widening or the installation of noise barriers. Moreover the requirement is that the slope blends with the environment In general this means that a steep slope must have a natural facing. Due to lack of space the designer of an earthen wall alongside the A58, a major road near Tilburg close to the exit to Goirle, was forced to design a wall with a steep slope. The specification stipulated that a reinforced soil construction using a sand-fibre composite should be employed. The construction partnership 'Van Hees Tilburg and HWZ Brabant' that had taken on the work proposed to Rijkswaterstaat (the government department responsible for the maintenance of roads) that the wall should be constructed using Tensar geogrids. Using this construction the front of the slope would be faced with an erosion resistant layer incorporating natural ground cover. The layer could be constructed using, the so-called wraparound method, an anti-erosion mat, or stacked grass turfblocks. From the financial viewpoint this alternative appeared advantageous for both the client and the construction partnership.

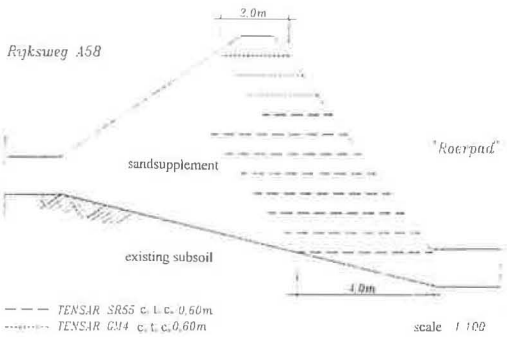

Figure 1. Cross section of the reinforced soil solution.

The grids used in this application are produced by punching holes in a continuous sheet of engineering grade, high density polyethylene which is subsequently stretched in a single direction. This stretching aligns the long-chain molecules in the direction of stretching. As a result high tensile strength and stiffness are achieved at low strains. In collaboration with various universities and research establishments, the maufacturer has carried out substantial research into the use of this sort of grid in reinforced soils. This research has been directed in the main to the durability and creep characteristics of the material. A computer program, based on the Bishop's method, was used to perform the calculations for the reinforced soil construction. When calculating the circular slip surfaces that intersect the reinforced soil layers the grids provide an additional restoring moment that increases the stability of the slope. In principle it is possible, by using this method of reinforced soil, to construct a vertical wall covered in natural vegetation. For aesthetic reasons it is in general preferable to let the wall slope slightly backwards. For the RW 58 project a slope of approximately 60^0 was chosen.

The client could choose from a number of different ways to provide an erosion resistant facing to the slope. The stacked grass turfblocks method was chosen for this project because of potential damage by vandalism to the wraparound detail or the anti-erosion mat. A second important consideration was that the slope would look natural even during construction.

Implementing this method of soil reinforcement was simplicity itself. After positioning temporary formwork to the angle of the slope the first layer of geogrid was laid and pinned to the slope with steel

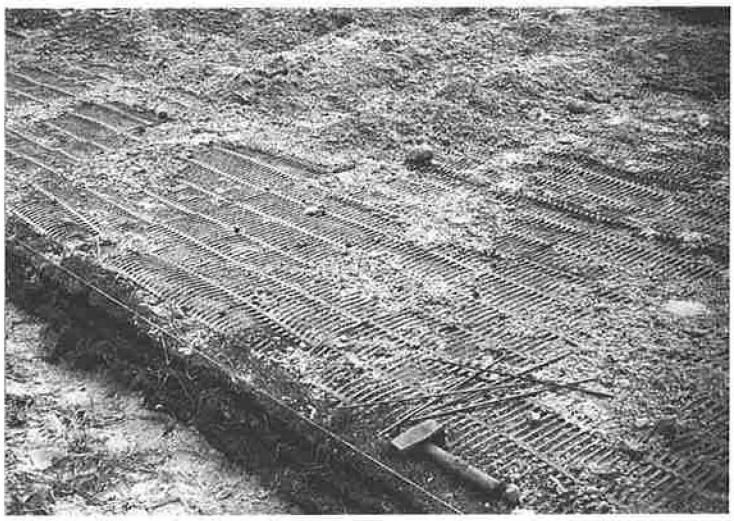

Photo 1. Construction at full speed

Photo 2. Final result

pins. The grids were tensioned manually and fill was deposited and compacted. 0.30m wide and about 0.05m thick turfblocks were stacked to the angle set by the formwork. When a fill layer of 0.60m had been compacted the next layer of grid was pinned to the blocks using steel pins. When doing this it is important that the grids do not protrude from the slope. Once again the grids were tensioned and the fill material was placed. In this way the reinforced soil construction was built up, layer by layer.

The result is a noise barrier, approximately 200m long and 7m high, on the building side the appearance of which catches the eye due to the natural ground cover.