

Reconstruction of the Overgauwseweg in Pijnacker

Th. Huybregts

C.T.N. Civiele Techniek Nederland B.V., Lochem, Netherlands

ABSTRACT: a project where the foundation reinforcement has also been used to brace an azobe (tropical timber) pile wall. In this manner both the load-bearing capacity as well as the stability of the road have been increased.

Tensar® geogrids are used to increase the stability of roads built on ground which has poor load-bearing capacity and where the sides of the road have small verges. When calculating the stability factor using circular slip surfaces, grids, which intersect the foundation, provide an extra restoring moment which increases the stability of such a road base.

An actual example, where a road base has been stabilised in an unusual manner, was carried out in September 1992 in Pijnacker. The Overgauwseweg is situated between two canals in which the water levels differ and in an area where the sub-soil has a poor load-bearing capacity.

Because of road redevelopment this road had to be widened and improved. In an initial design the engineering company Grontmij calculated the stability of the existing roadway using Bishop's method. Bishop's method considers the problem as a two-dimensional load case. The stability factor is a safety factor; the ratio between the restoring moment and the loading moment. The loading moment is the moment, around the centre of the circular slip surface, of the total weight of all ground and load within the circular slip surface. The restoring moment is the total moment around the centre of the circular slip surface from the friction and cohesion that can develop along the slip surface. By using grids the restoring moment is increased by the sum of the values given for long-term sustained loading of all the grids that intersect the circular slip surface, multiplied by the distance between the centre of the circular slip surface and the level at which the grid is placed. The result of these stability calculations were such that extra measures had to be undertaken to maintain long-term stability.

The first proposal was that on one side a 15m long steel pile wall would be driven in to the depth of the solid sand layer. In this way, the unstable side would be stabilised using a soil retaining construction. This solution was shown to easily exceed the estimated

cost of the reconstruction. Because of previous good experience Grontmij submitted the problem to C.T.N. Civiele Techniek Nederland b.v.

By using one or more layers of Tensar geogrids the safety factor for stability can be increased. It was only by installing grids quite deeply in the base of the road

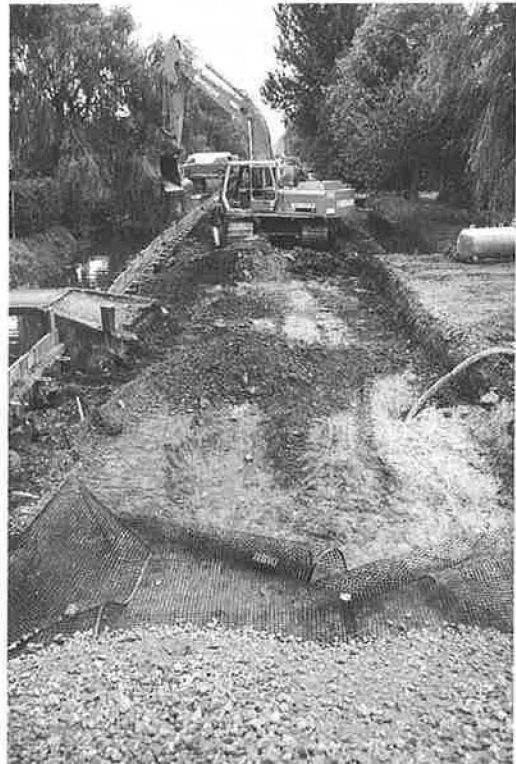


Photo 1.

which would be under the ground water table, that the target safety factor at for long-term stability could be achieved. Which, if it were to be carried out in this manner, would have given many practical problems. Therefore a design was made, in consultation with the engineering company Grontmij, in which a 5m deep azobe pile wall would be anchored to a layer of Tensar geogrids.

The stability factor calculated using the Bishop method was greater than 1.3, which was the minimum long-term stability factor required in this case.

The azobe pile wall was positioned alongside the unstable slope using an anchor at 1 m centres. Both the pavement and foundation layers of the original road were excavated and a layer of Tensar SS 35 geogrid was laid directly on top of the soft ground. On the side of the azobe pile wall the grid was wrapped around and on the inside of the fold a 70 mm steel pipe was fitted. The pile wall anchors were attached using turnbuckles to studding which had been welded to the pipe. A second layer of SS 2 grid was positioned to increase the load-bearing capacity and to increase the coherence of the foundation, because the foundation fill material interlocks with the apertures in the grids.

After the granular material had been laid and compacted, the turnbuckles were tightened with the result that the subbase reinforcement was secured to the pile wall. In the final design, account was taken of the load the anchors transfer to the grids.

An important advantage to the client was that the solution remained within budget and the reconstruction could take place more rapidly.

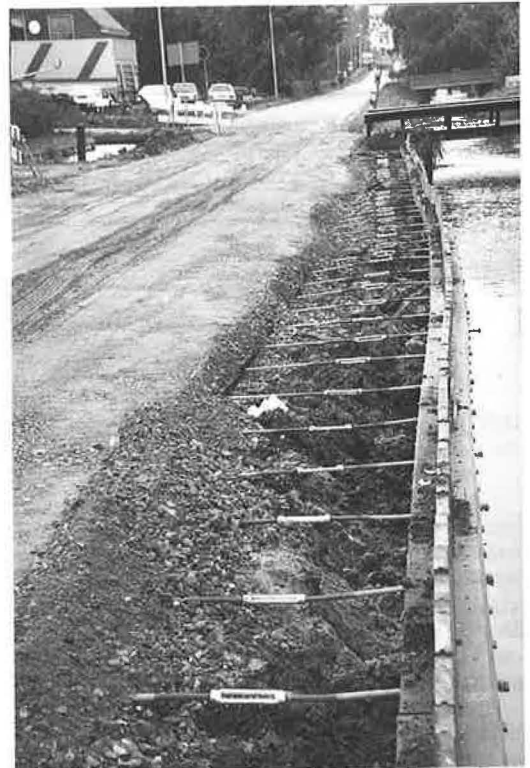


Photo 2.

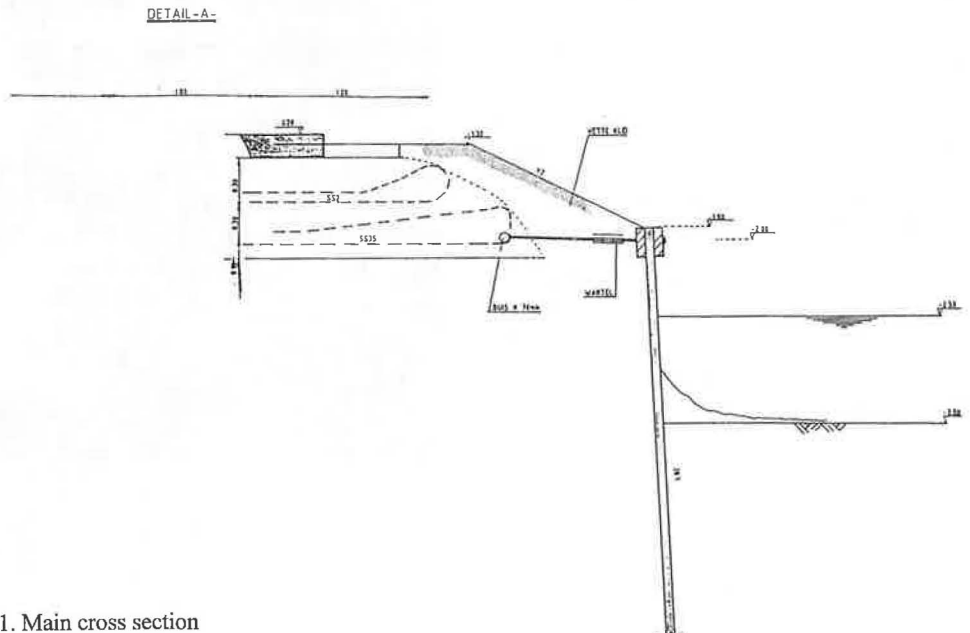


Figure 1. Main cross section