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CASE HISTORY

Stabilization of the foundation soil of the highway embankment in the construction of the third lane of the Milan-Genoa Highway, Lombardia, Italy

PRODUCT	TENAX LBO 301 SAMP bioriented geogrids TENAX TNT 500 geocomposites
LOCATION	Lombardia, Italy
OWNER	Autostrada Milano-Serravalle SpA
DESIGNER	Da Rios Consultants - Milano
CONTRACTOR	Torno SpA, Itinera SpA, Progetti Costruzioni SpA, Rabbiosi SpA, Grassetto SpA

PROBLEM

In order to improve the quality of its services, Autostrada Milano-Serravalle SpA decided to enlarge the Milan-Po River section of the highway, building up a third lane. The geotechnical investigation showed a number of high plasticity, high compressibility clay layers at the embankments base elevation. These clays under embankment consolidation, would have largely settled, badly threatening the planarity of the new, enlarged highway. A traditional solution had to face the following problems:

- the presence of thick, compressible, clay layers, interbedded into sandy deposits;
- the need to avoid differential settlements;
- the budget and time constraints.

SOLUTION

To stabilize the base of the embankments and to avoid differential settlements without cut-and-fill works, the following solution has been chosen. A layer of TENAX TNT 500 geocomposite has been placed at the base of the highway embankment to drain the groundwater. A layer of 0,30 m of granular mix has been placed and compacted till 95% of Proctor modified density. A layer of TENAX LBO 301 SAMP bi-oriented geogrid has been placed to reinforce the soil and then covered with 0,30 m of compacted granular mix. TENAX LBO 301 SAMP geogrid is specifically designed for base reinforcement through uniform load distribution. The geogrid reinforces the soil through two main mechanisms: direct resistance to tensile stresses and interlocking, which prevent any lateral movement of

the soil.
The perfect connection between the grid and the soil comes from both the friction on the solid area of the grid and from the passive earth pressure generated by the transverse bars of the geogrid under load. In order to define the layout of the reinforcement, plate loading tests on the foundation soil and on the geogrid-reinforced layer have been carried out. The elastic modulus of the foundation passed from 3-4 MPa on the foundation soil to 17-18 MPa at the top of the reinforced layer. Serravalle Highway Specifications were prescribing a value of the elastic modulus of 15 MPa minimum.

CONCLUSIONS

TENAX LBO 301 SAMP bi-oriented geogrid and TENAX TNT 500 geocomposite, which have been widely and successfully used in the past, have once again confirmed their technical and economical effectiveness. The use of TENAX geosynthetics allowed for the following advantages:

- Significant reduction of the manpower involved;
- Substantial improvement of the quality of the structure;
- More square metres of base reinforcement and drainage carried out per unit of time: a team of four workers installed 200 m of base reinforcement per day (4000 m^2 per day)
- High and predictable flow rate capacity at a lower price than a gravel layer;
- Higher elasticity modulus of the base reached with quicker installation;
- Reduction of the thickness of the base: from 1.50 m required for a traditional road subbase to 0.60 m required for the geosynthetics stabilized base.

At the same time, the TENAX geosynthetics solution allowed to reduce the environmental impact that the much greater quantity of gravel required by a more traditional solution, would have caused.