LOAD TRANSFER PLATFORM WITH PVA UNIAXIAL GEOGRIDS – COSTA VERDE PROJECT

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The Costa Verde Road Project contemplates the current extension of the Costa Verde road to generate faster access to the airport through access ramps with heights of up to 20m average height.

The main issue of the project relies on the non-controlled foundation material that was dumped in the sea since 1960 to gain coast area and on which the walls would be grounded. This paper provides a description of the design criteria for the MSE walls and platform and an insight into the construction particularities of both elements.
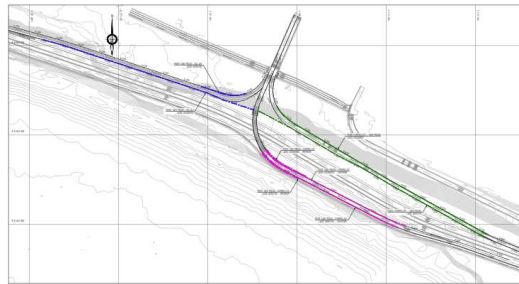

Figure 1. Ramps Access Costa Verde Project

In order to support the transmitted loads of the MSE walls, the project considers 20m depth piles with 1m of diameter and separations of 3m between piles with what is guaranteed that the ramps are based on a competent stratum. Moreover, a load transfer platform (LTP) composed of geogrids is placed between the MSE walls and the piles with the main purpose of acting as a rigid beam (J.G Collins 2004), distributing the applied loads to certain rigid elements and ensuring the reduction of differential settlements.

This LTP it is made of 3 layer of PVA (Polyvinyl alcohol) geogrid reinforcements to provide greater stiffness by developing higher resistance at lower deformations in comparison to other type of polymers. likewise, the PVA polymer has a longer duration in alkaline areas.
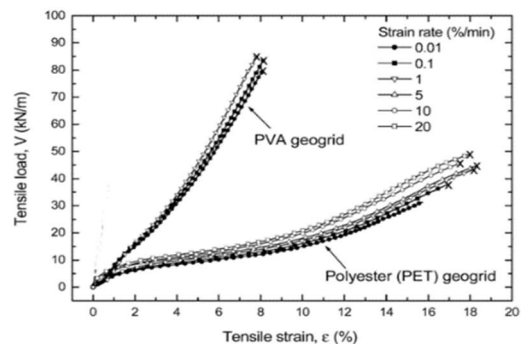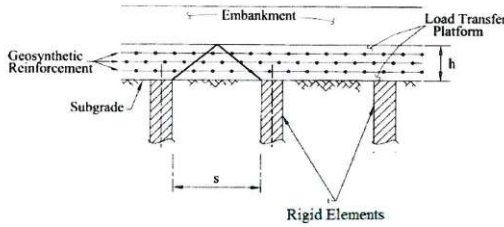

Figure 2. Tensile Load vs Tensile Strain

Figure 3. Scheme of Load Transfer Platform (J.G Collins, 2004)

The extension of the project is 3km and contemplates 3 viaducts: Chorrillos-San Miguel, San Miguel-Callao y San Miguel-Chorrillos with 130,000m2 asphalt, 10,000m2 sidewalks and 18,000m2 MSE Wall.

Methodology

To calculate the type of Geogrid needed in the load transfer platform, the beam methodology was used. This methodology of J Collin (J.G Collins 2004), is based on the assumption that the geogrid reinforcement creates a rigid beam that distributes the loads applied to specific rigid elements, ensuring the reduction of differential settlements.
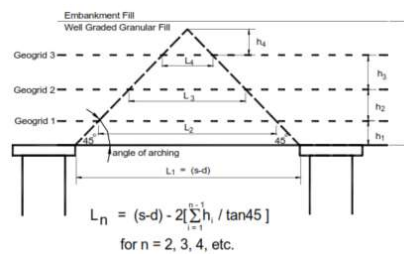
$$W_{Tn} = [A_n + A_{n+1}]h_n \gamma / 2A_n$$

A $\quad$ = Area at reinforcement layer n or n+1
W_{Tn} = Vertical distributed load acting on each reinforcement

$$T_{rpn} = W_{rpn} \Omega D / 2$$

D $\quad$ = Design span for tensioned membrane
Ω $\quad$ = Dimensionless factor from tensioned membrane theory

Figure 4. Load transfer platform design Collin method

Conclusion

The beam methodology shown by J. Collins for the calculation of the pressures at each level of the reinforcements was the most appropriate to determine the stresses at each level, and the use of PVA geogrids was the most adequate geosynthetic to reduce deformations, because they can generate great resistance to low deformations.