International Geosynthetics Society

CASE HISTORY ON GEOSYNTHETIC REINFORCED WALL

Prepared by Chungsik Yoo

www.geosyntheticssociety.org

CASE HISTORY ON GEOSYNTHETIC REINFORCED WALL

Prepared by Chungsik Yoo

A two-tier geosynthetic reinforced soil wall (GRS wall) section with a maximum height of 29.4 m has been constructed in Gyoung-Gi province, approximately 50 km north of Seoul, Korea (**Figure 1**). The wall was constructed in a land development site for landscaping and earthworks in 2009. The total wall section runs approximately 1,450m with variable heights between 3.1~29.4 m. The 29.4 m high wall is considered one of the highest GRS walls ever built in Korea.

Figure 1. Completed wall

A typical sectional view of the tallest section of the wall is shown in **Figure 2**. The two-tier wall had an exposed height (H) of 29.4 m with the lower and upper tier height of 14.9 m and 12.9 m, respectively. The wall was constructed to have a pre-batter angle of 4 degrees with an offset distance between the upper and the lower tiers of 2.5 m. Four different types of HDPE geogrid reinforcement, having index strengths ranging 60~160 kN/m, were installed at vertical spacings between 0.4~0.8m. For each tier, the reinforcement length ratio with respect to the respective tier height was kept constant at 1.1. The facing block, having a compressive strength of 23.5 MPa, is 450 × 330 mm in plan × 200 mm in height and has a key-type connection. A non-plastic decomposed granite soil available on site was used as backfill. The soil was compacted to 95% of its maximum unit weight (19 kN/m^3) to create the reinforced as well as retained zones. For quality control, the maximum thickness of each layer was kept at 250 mm. To further improve the mechanical properties of the compacted zone, 5~8% of cement by weight was added to the backfill soil to obtain a minimum unconfined compressive strength of 250 kPa. Laboratory tests on the as-compacted backfill yielded an effective internal friction angle of 33 degrees with a deformation modulus of 140 MPa.

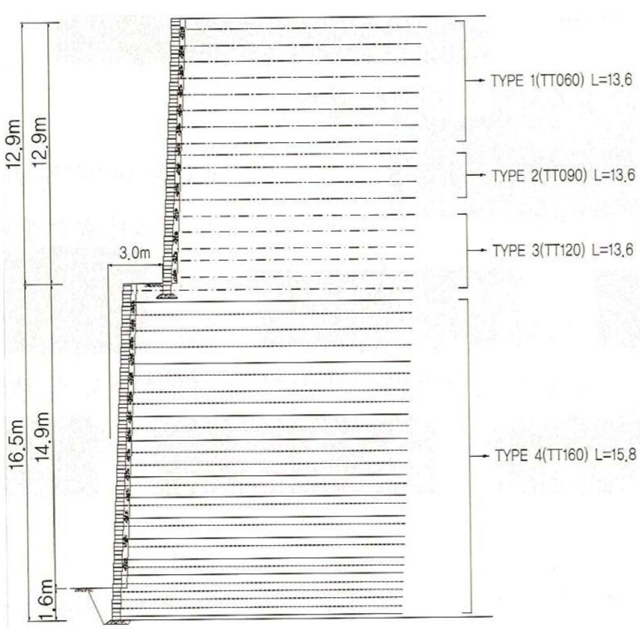

Figure 2. As-built design section

The stability calculations based on the FHWA design guideline satisfied the stability requirements as summarized in **Table 1**. In addition to the stability analysis based on the current design guildelines, a numerical analysis in conjunction with the strength reduction method using FLAC was conducted to check global stability (**Figure 3**). The results satisfied design criteria showing a minimum factor of safety of 1.9 with a maximum axial force in the reinforcement of 50.3 kN/m. The wall construction was successfully completed over a four month period and no significant deformation was reported during construction. To date, the wall is performing well.

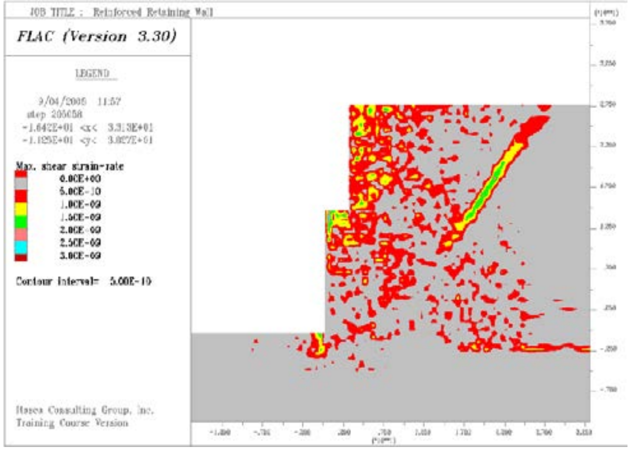

Figure 3. Results of stability analysis by FLAC

Table 1. Results of stability calculation based on FHWA design guideline

EXTERNAL STABILITY			INTERNAL STABILITY	
FS_{bsl}	FS_{ot}	FS_{bc}	FS_{to}	FS_{po}
2.06	2.67	3.93	1.04	1.5

NOTE: FS_{bsl} = Factor of safety against base sliding; FS_{ot} = Factor of safety against overturning; FS_{bc} = Factor of safety against bearing capacity; FS_{to} = Factor of safety against tensile over stress; FS_{po} = Factor of safety against pullout