

## The hilly road broadened project at Cingjing Veterans Farm, Taiwan



### **Introduction**

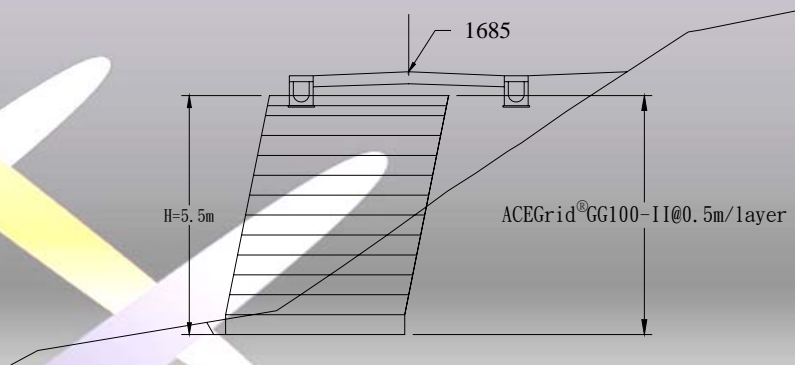
Chingjing Veterans Farm on Tai-21st Highway in Ren-ai Township of Nantou county is one of the most famous scenic spots in central Taiwan. Bunch of tourists come here for vacation so there is a calling to the local hotel industry to get resort land plans into gear. The following case study is the reinforced structures for the road construction and slope protection requested by the resort owner. This project started from August, 2006 and the total construction period took about six months. 900 liner-meter long reinforced slope was inclusive and ACEGrid<sup>®</sup> GG100-II was mainly applied to the road broadened reinforcement. Unique stairway construction makes the reinforced structure successfully be practiced in a slender hilly location where is usually not allowed to entrance of excavators and heavy-duty machinery requested by traditional construction. The reinforced structure with vegetated surface becomes a landscape and successful ecological engineering example.

### **Design**

The planned route was on the steep slope under the existing road. Designer thought the job site was on the slopland and belonged to filling structure. If traditional reinforced concrete structures were used, contractor would have the difficulty of heavy machine operation on the limited hinterland. Furthermore the construction period would be delayed and the construction cost would have been increased. Also, the waste soil from certain excavation area would become additional issue to deal with. In view of above concerns, designer decided to build reinforced structure because its construction machine size is not limited, construction progress is rapid and it also can solve the soil disposal problem. Through the stability analysis – modes of normal, storm and earthquake, ACEGrid<sup>®</sup> GG 100-II was recommended as the reinforced material and PE soil bags were utilized to build up the surface.

### **Construction**

The contractor used two excavators to build the reinforced structure, one roller to compact



**Cross section of design drawing**

backfill soil until the relative density achieved 95% and two trucks to carry the backfill which is from in-situ kataclastic shale by turns. The total facing area of the structure was 8,300 m<sup>2</sup>, which applied the quantity over 100,000 m<sup>2</sup> of ACEGrid<sup>®</sup>. The construction period for the reinforced structure took about six months. The average construction area was 85 m<sup>2</sup> per day and required about 860 m<sup>2</sup> of ACEGrid<sup>®</sup> averagely. The slope heights ranged from 5 to 8 meters, so the stairway construction method was applicable perfectly to fit in with the slope variation.

### Performance

As a result of the reinforced structure overwhelmingly against traditional construction manners, the construction duration is shortened efficiently and construction costs are reduced remarkably. The vegetation reinforced structure courtesy of the wrap-around method appears an integral part of the landscape.



**During construction**



**After construction**

<p><b>Specification</b> : ACEGrid<sup>®</sup> GG100-II  <b>Quantity</b> : 100,000m<sup>2</sup>  <b>Owner</b> : Private  <b>Designer</b> : Chern Good Consulting Engineers  <b>Contractor</b> : HongXiang Engineering Company</p>
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