

# Application and outlook of geosynthetics – reinforced earth wall in Korea

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**ABSTRACT:** Geosynthetics-reinforced earth wall, which was introduced in Korea in 1986, has become an alternative method of the conventional concrete retaining walls, because of economic benefit and easy construction. Recently, as geosynthetics-reinforced earth walls become popularized, more than 1,500,000m<sup>2</sup> geosynthetic reinforcements are used in each year in the country, and studies are actively carried out to improve design and construction method. Geosynthetics-reinforced earth walls are expected to be more popularized in future.

## 1 INTRODUCTION

Geosynthetics are mostly used as reinforcement, filter, and drainage in Korea. Among them, more than 40% of geosynthetics are used for earth reinforcement. Geosynthetics such as geomembrane, silt protector, plastic drain board are increasingly used recently, as preparation of sites for waste landfill, industrial complex along coast increases.

The use of geogrid is rapidly increasing because it is effective as a material for reinforcement in soft ground and reinforced earth wall. In Korea, especially, geogrid-reinforced earth walls are gradually replacing conventional concrete retaining walls for reasons of economy, expediency of construction, and aesthetics.

## 2 APPLICATION OF GEOSYNTHETICS-REINFORCED EARTH WALL IN KOREA

The Reinforced earth wall was introduced in Korea by National Construction Laboratory Institute, Ministry of Construction and Transportation in 1980. The Institute performed a pilot test of reinforced earth wall in the national highway using galvanized steel strip as reinforcement. Since then, several field tests using the same reinforcement until 1985 (Cho et al., 1985). The result of field tests revealed that reinforced earth wall with galvanized steel strip has problems related to zinc plating technology, backfill material selection, and construction management. Therefore, the wall was not popularized.

Strip-type geosynthetics was introduced as reinforcement and became popularized in the country in 1986, because it solved the corrosion problem of reinforcement. Block-type reinforced earth wall using high-strength geogrid as reinforcement was first introduced in 1994. At present, panel-type reinforced earth wall using strip of geosynthetics and block-type reinforced earth wall using geogrid are widely used in the country. Table 1 shows the kind and approximate amount of reinforcement in reinforced earth walls constructed in Korea since 1980.

Table 1. Approximate amount of reinforcement used in reinforced earth wall (Cho & Shin, 1999) (unit: m<sup>2</sup>)

Year	Galvanized Steel (facing area)	Strip-type Geosynthetics (facing area)	Geogrid (reinforcement area)
1980 - 1985	3,600		
1986 - 1990	1,200	39,486	
1991 - 1993	5,552	75,855	
1994		19,240	500,000
1995		37,573	700,000
1996		22,622	1,100,000
1997		65,027	1,100,000
1998		80,000	1,500,000
Total		339,803	4,900,000

## 3 RESEARCH AND DEVELOPMENT

Since geosynthetics-reinforced earth wall was introduced in Korea, its number has rapidly increased. However, still exists a few problems, related to design and construction method of the wall. Studies

have been continued to solve the problems. The followings are main research subjects.

- Evaluation of selection criteria of backfill material : In our country the design guideline for reinforced earth wall requires that backfill materials should be composed of those whose grain size is smaller than 19mm in diameter, in consideration of compaction efficiency and possible damage of geosynthetic reinforcement during compaction. However, in most construction sites, it is difficult to obtain the backfill material which satisfies this condition. To solve this problem, modification of selection criteria of backfill material is being considered, which will make it possible to use materials of wider range in size as backfill. Accompanying with this, a study is carried out to develop geosynthetic reinforcement that is more durable during construction.

- Minimizing horizontal deformation of facing : Two methods are studied to minimize horizontal deformation of facing, caused by backfill compaction. One method includes the separation-type reinforced earth wall in which facing blocks and reinforced earth body are built up separately (Fig. 1). The other considers installation of compressible drainage material at the back of block facing (Fig. 2).

- Development of a tensioning equipment for strip-type geosynthetic reinforcement : In case of the panel-type reinforced earth wall which employs strip-type geosynthetic reinforcement, mechanical tensioning of reinforcement is needed during installation, in order to strengthen and to prevent deformation of earth structure. Studies are being conducted to develop a tensioning equipment and to prepare for the construction method suitable for the equipment.

- Environment-friendly facing block : The facing block of hardened earth, made mainly of soils like clay and silt, is being tested for its applicability in the reinforced earth wall. And also a facing block system on which vegetation can be applicable is being developed.

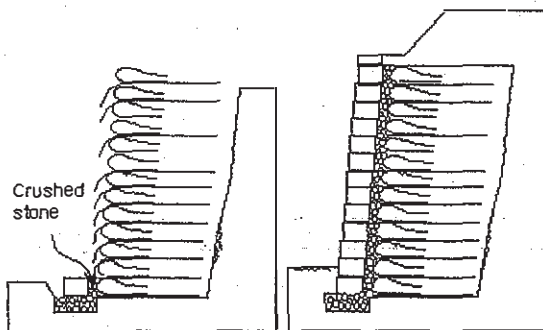


Figure 1. Concept of separation-type reinforced earth wall (Kim et al., 2001)

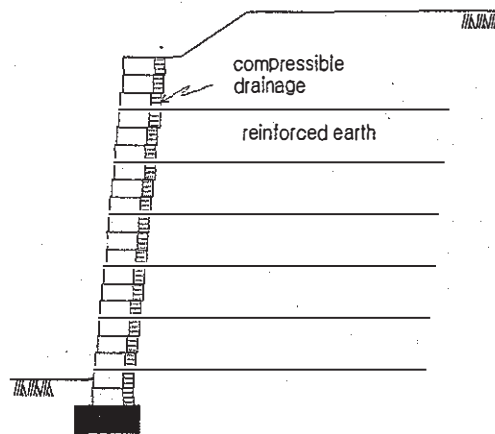


Figure 2. Concept of reinforced earth wall using compressible drain material (Kim et al., 2001)

#### 4 FUTURE PROSPECT

Our country is small but thickly populated, and 70% of the country is mountainous area. Therefore, a number of retaining walls have been constructed to make effective use of the land. Recently, geosynthetics-reinforced earth walls are gradually replacing conventional concrete retaining walls because of low cost, easy construction, flexible structure, and effective use of land.

It is expected that this trend will continue in future. And along with this trend, studies will be focused more on development of better geosynthetic reinforcement in durability and resistibility to installation damage and on improvement of design and construction method.

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