# EVALUATION OF FIELD APPLICABILITY AND DURABILITY PERFORMANCE OF GEOTEXTILE FABRIC FOAM WITH MANUFACTURING PARAMETERS

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## ABSTRACT

Hydraulic performance of geotextile fabric foam is strongly dependent on the filter point specifications, such as size, pattern and repeat units etc. Furthermore, stability and long-term performance of geotextile fabric foam is very important when mortar concrete is filled inside of this. This paper introduced what filter points influence long-term performance of fabric foam and relationship between these specifications and serviceability during installation periods. Besides this, engineering properties to be considered the real installation conditions were evaluated such as tensile, compressive strength through model simulations.

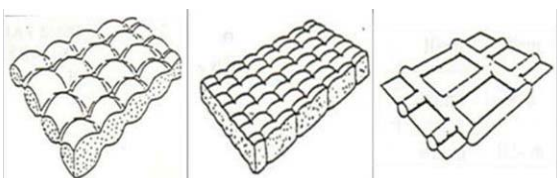
*Keywords: Hydraulic performance, geotextile fabric foam, filter point, long-term performance*

## INTRODUCTION

Fabric foam is a kind of reinforcement grid shape geosynthetics as shown in Fig. 1 which is made of double polyester fabrics and its inner side is filled with mortar or any other slurry state materials. Fabric foam has the advantage what can be installed with uniform thickness in the different gradient area as high strength mat filling by mobile materials to inside (Ling et al. 2005, Giroud 2002, Koerneret al.2001).

Properties of fabric foam are excellent grounding effect, rapid hardening, high stiffness, easy installation possibility in under water, unnecessariness of basic concrete work, excellent drainage performance etc. (Huang, 2006)

Also, fabric foam has the excellent reinforcement effect for slope stability and protection because of no seepage erosion and can be used in the construction fields of road, railway, dam, pond and reservoir, vegetation of reinforced slope etc.



(a) (b) (c)

Fig. 1 Fabric foam types.(a) filter point type (b) no filter point type (c) for landscape

In this study, fabric foam was made with pattern and size of filter point.Hydraulic properties, field applicability, shears behavior of fabric foam were reviewed through their related index tests.

## EXPERIMENTAL

Fabric foam was made by high strength polyester filament yarns of 10.5g/d strength and 115g/d modulus and composed of variable filter point size and pattern.

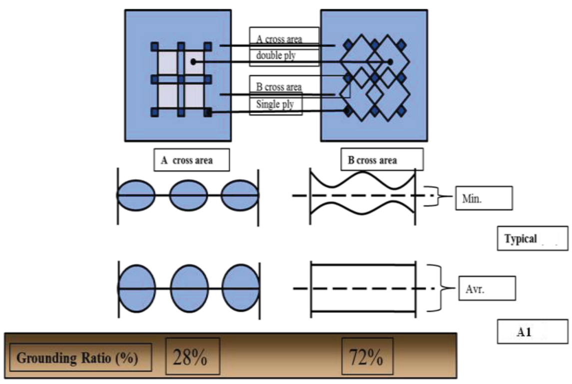



Fig. 2 Fabric foam properties with filter point pattern

In Fig. 2, fabric foam properties with filter point pattern were shown and it is seen that grounding ratio of fabric foam A1 which was made in this study was larger than that of typical type fabric foam.

Fig. 3 shows the hydraulic test of fabric foam with water content and Fig. 4 shows preparation of fabric foam blank specimen by using mortar insertion and AOS (apparent opening size) of these specimens were evaluated.

Compressive strength of all blank specimens formed by PVC pipe was evaluated with water content ration.

Remained and loss weight of mortar in fabric foam was confirmed through water, (water+cement), (water+cement+gravel) mixture conditions in the 6cm (diameter)×52cm(height) cylinder, respectively. To form the interface between mortar and fabric foam, epoxy resin binder was used and strain gauge was attached within this interface. TDS – 302 was used as data logger.

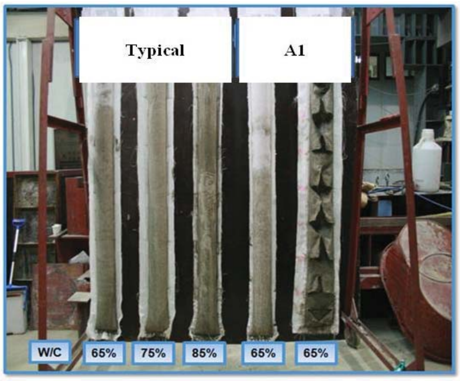



Fig. 3 Hydraulic test of fabric foam with water content

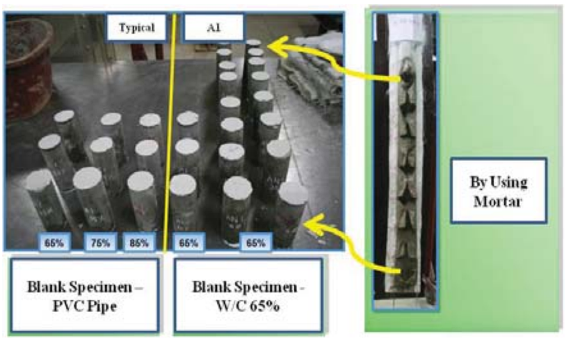



Fig. 4 Preparation of fabric foam blank specimen

## RESULTS AND DISCUSSIONS

### Hydraulic Property

In Fig. 5, mortar loss of fabric foam made in this study, A1 showed the largest in water content 85% and the smallest in water content 65%. For comparison between typical and A1, mortar loss of A1 was decreased over 50% with filter point pattern.

Figure 7 shows the filter point design pattern adopted in this study and Fig. 8 shows grounding ratio of fabric foam with filter point type and space.

Grounding ratio of fabric foam A1 type was the largest and this ratio is dependent on filter point space than filter point size. Especially grounding ratio is strongly dependent on numbers of filter point.

Figure 9 shows the AOS value of typical and A1 fabric foams and it is seen that AOS of A1 fabric foam is 0.066 $mm^2$ and decreased about 12% than that of typical fabric foam 0.0075 $mm^2$

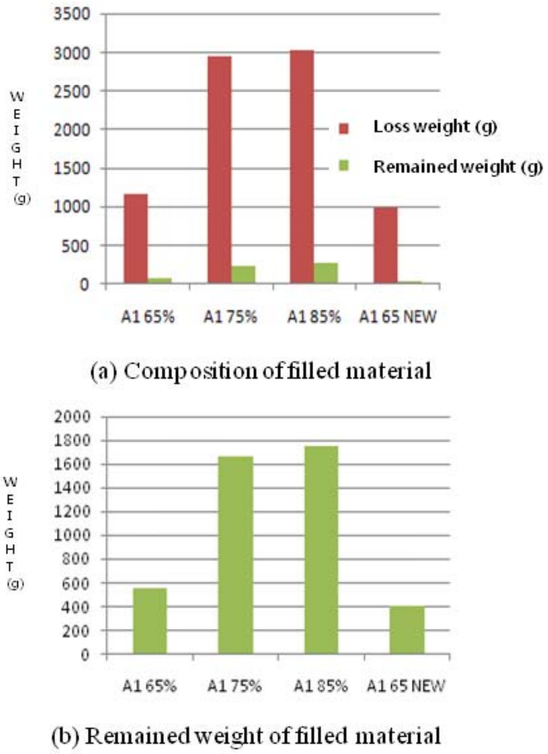



Fig. 5 Separation of filled materials of fabric foam

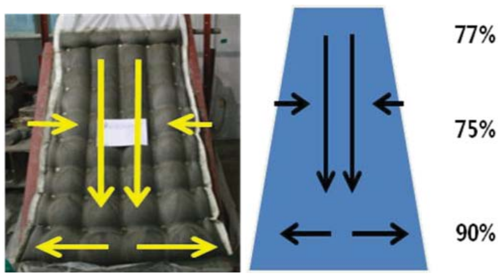



Fig. 6 Schematic of fabric foam behavior for installation

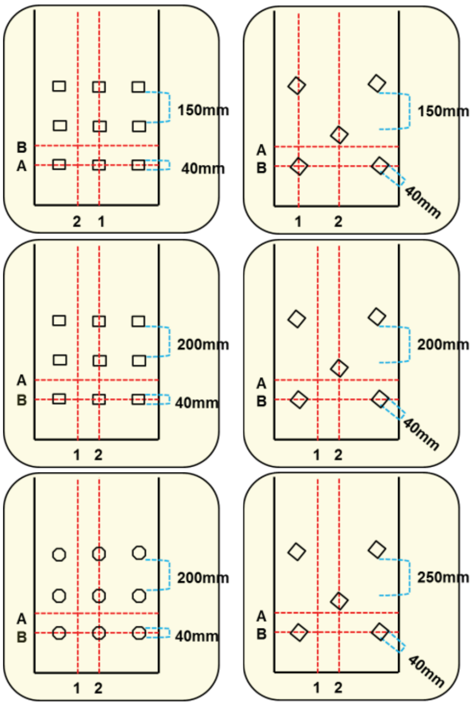



Fig. 7 Filter point design pattern to be considered in this study.

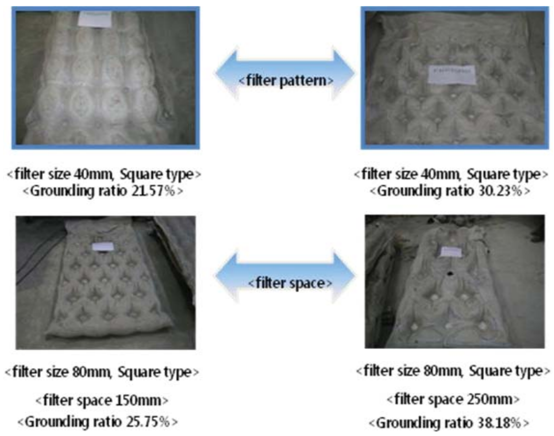



Fig. 8 Grounding ratio of fabric foam with filter pointtype and space

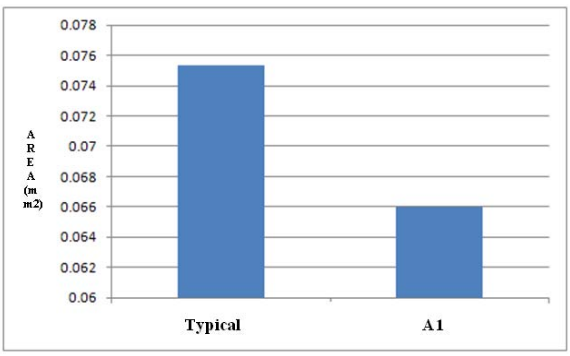



Fig.9 AOS of fabric foams

## Field Applicability byIndex Model Test

Figure 10 shows the compressive strength of A1 fabric foam with water content. Typical fabric foam shows the largest compressive strength on the mortar insertion position 30~40 ㎝ area and also shows this value in water content 75%.

Though compressive strength of A1 fabric foam is smaller than that of typical fabric foam, it is seen that A1 is more stable than typical fabric form to consider larger compressive strength increases mortar loss in the lower part of fabric foam.

For typical and A1 fabric foams compressive strength shows decrease toward the lower side of fabric foam due to mortar loss and A1 fabric foam shows this tendency on the mortar insertion position 40cm.

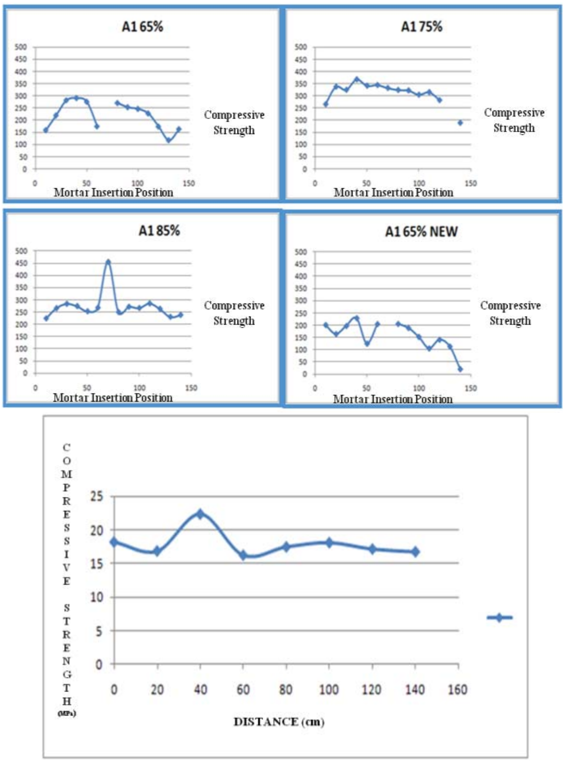



Fig. 10 Compressive strength of A1 fabric foam with water content

## Shear Fracture Behavior

Table 1 shows the strain gauge applicability to fabric foam. Strain gauge 1 and 5 is the counterpart and 2 and 6, 3 and 7, 4 and 8 is also the same case. For this case, gauge value after test is almost 2~15 times larger and it is seen that this is due to the partially uneven expansion of every filter point under the same test condition.

In general, thinner part and fore-end part of fabric foam could be easily broken than the lower part due to the force of gravity acting between forward and backward in of fabric foam.

As shown in Fig. 11, fabric foam ruptured before ground and slope failure was occurred along the shear destruction envelope line.

For this case, crack propagated about 120mm but not progressed any longer.

To avoid this phenomena, it is recommended that inter spacer should be used to reinforce the fore-end part of fabric foam because weight of mortar is added to this part and this sis cause of tensile strength decrease of fabric foam.

Table 1. Strain gauge applicability of fabric foam

| No. | Initial Gauge Value | Gauge Value after Mortar Insertion | Gauge Value after Test |
|---|---|---|---|
| **1** | 4 | 519 | 1,009 |
| **2** | 4 | 235 | 102 |
| **3** | 4 | 2,656 | 1,806 |
| **4** | 4 | 1,169 | 1,094 |
| **5** | 8 | 2,800 | 2,377 |
| **6** | 2 | 2,732 | 1,591 |
| **7** | 4 | 2,611 | 2,513 |
| **8** | 6 | 2,643 | 2,041 |

## CONCLUSIONS

Shear force between fabric foam and ground than friction force in the slope should be considered to increase the applicability to the upper side and fore-end part of fabric foam. And the increase of tensile strength on the fore-end part should be added to avoid drooping of fabric foam by soil nailing construction methods.

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