구속하중에서의 지오네트 투수거동 평가

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Evaluation of Transmissivity of Geonets under Confined Loading

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1. Introduction

In the roll-over region the thickness of the geonet will decrease significantly, and this will affect to the in-plane flow rate. For the tri-planar also large transmissivity reduction will be occurred at the point which its main strand is crushed. In cases of tri-planar there is no roll-over phenomenon, so a magnificence of the thickness reduction is less compare to the bi-planar geonet and same as for the transmissivity. In this study, the relation between normal pressure and transmissivity of geonet was estimated.

2. Experimental

Two types of geonet drainage materials, bi-planar(; sample A) and tri-planar(; sample B) type, were obtained from commercially produced lots. To determine the performance limit normal pressure transmissivity(; in-plane flow rate tests) under various normal pressures were conducted in accordance with ASTM D4716. The short-term flow test which had a 15 minutes loading time was carried out for each geonet sample at various normal stresses up to 2,000 kPa (max.) for 1.0 hydraulic gradient. The water temperature normally ranged from 22 to 23℃.

3. Results and Discussion

Figure 1 shows the results of the transmissivity test. In the case of sample A, the transmissivity decreased dramatically above 500 kPa, also below $X10^{-3}$ from this pressure. From this result, it is expected that the roll-over phenomenon start at above 500kPa for the sample A, so the flow channel's dimension decreased significantly and this decrease will affect the flow capacity of the sample A. However, because of the geometry (tri-planar structure), the transmissivity of the sample B decreased gradually until 1,200 kPa. Above 1,200 kPa, the transmissivity dropped down a lot. But the transmissivity was still above X10-3 until normal pressure was 1,800 kPa. So, according to these results we can expect that geometrical type of geonets will significantly affect on its flow capacity especially in a high applied normal pressure. Through analyzing *Figure 1*, 500 kPa and 1,200 kPa were determined as performance limit normal pressure for sample A and B, respectively. *Figure 2* shows design curves for sample A. Considering the designing life time as 35 years), then the designing normal pressure can be determined as around 170 kPa.

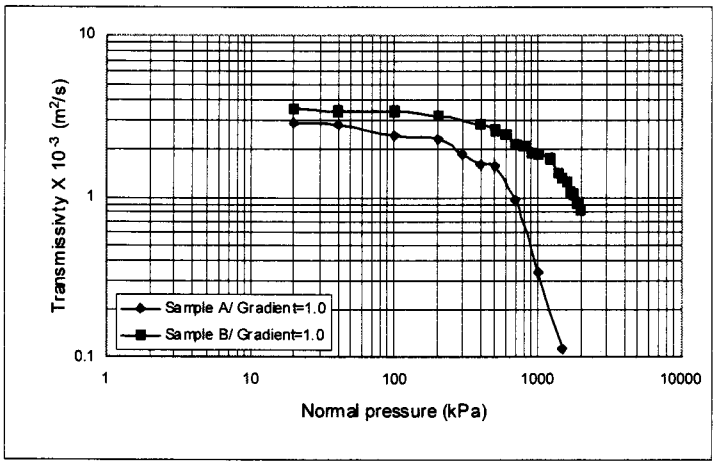

Figure 1. Transmissivity of geonets with normal pressure

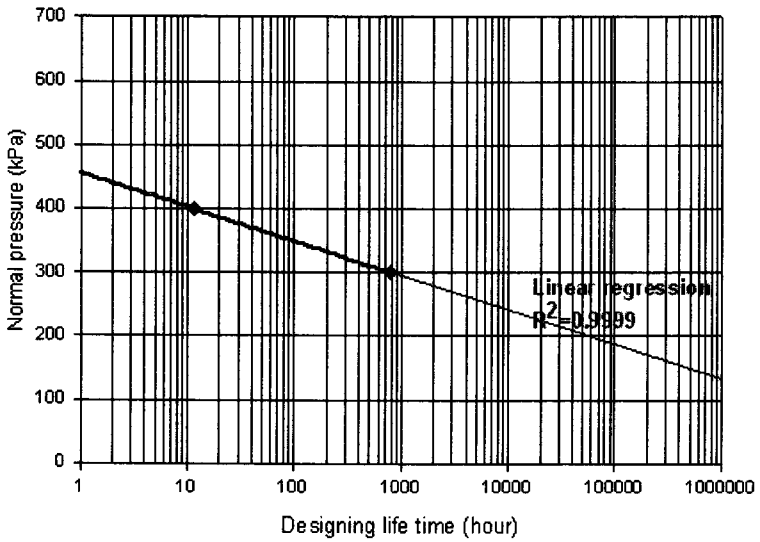

Figure 2. Design curves for evaluating designing normal pressures for sample A.

4. Conclusion

From the transmissivity test for two types of geonets, bi-planar and tri-planar geonet, the performance limit normal pressures were determined as 500 kP and 1,200 kPa, respectively. However, in the case of tri-planar had more smooth decrease in transmissivity compare to bi-planar geonet which had more severe drops in transmissivity at 500 kPa.

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Reference

ASTM D 4716-04 (2004), "Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head," ASTM, Philadelphia, PA, USA.