GEOMEMBRANE PROTECTION USING CUSHIONING GEOTEXTILES

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ABSTRACT

Geotextiles are widely used to protect geomembranes from installation and in-service damage in applications where eliminating puncturing and the control of membrane strain are critical for the long-term performance of the lining system. In lining applications, protecting the membrane from excessive point loading from the overlying drainage stone and thus minimising potential for environmental stress cracking is desirable, if the long-term performance of the liner is to be assured. This paper furthers earlier work by Hornsey et al (2012) on test methods and the use of laser scanning techniques for calculation of geomembrane strain on testing of different families of geotextiles for liner protection applications. The testing reported followed the ASTM D5514-06 test procedure which was modified to include the use of a fixed stone profile and uniform pneumatic load application. To ensure repeatable loading onto the liner, fixed stone profiles were created using fibre-reinforced resin to hold the drainage stone in a rigid arrangement, yet provide a natural stone surface pattern and texture similar to that of stone as placed on site. Using this approach, different liner and geotextile combinations where tested against the same stone profile and loading conditions, thus enabling direct comparison of damage, geomembrane strain and cushioning performance. Testing on a newly introduced range of staple fibre geotextiles are presented, the results of which are be compared with earlier work on existing geotextiles and the effect of different polymer types discussed.

Keywords: Geomembrane, Protection, Cushioning, Geotextiles, Strain, Testing

1 INTRODUCTION

In containment applications geotextiles are commonly used as cushioning and protection layers to geomembranes, to prevent damage to the geomembrane from adjacent drainage materials such as drainage stone layers. Whilst the stone layers provide good long-term drainage capacity due to their angularity and hardness they provide a source of significant potential damage to the liner both physical damage and strain induced stress cracking, something which must be prevented if the long-term integrity of the liner is to be assured.

To ensure the suitability of a geotextile to act as a protection layer, performance testing is required using the geosynthetic material layers to be installed on the project and simulating the site condition and project specific loading conditions. To generate a database of results on various geotextiles for liner protection applications, a series of tests have been undertaken enabling the relative merits of different product types to be determined for a range of conditions. The testing reported in this paper was conducted using a modified version of the ASTM D5514-06 (2011) procedure with strain measurements undertaken by the use of a laser scanning technique on a metal indicator sheet. The testing reported herein extends earlier work undertaken by Hornsey and Gallagher (2012), Hornsey and Wishaw (2012) and Hornsey (2013) with additional results generated using the same test equipment and rock profile.

2 MATERIALS AND METHODS

Testing was undertaken using a fixed stone profile and through laser scanning of a metal strain indicator sheet to determine the strain in the geomembrane using the techniques developed by Hornsey and Wishaw (2012).