

THESIS

**LABORATORY INVESTIGATIONS OF VARIOUS GEOMEMBRANE
MATERIALS FOR CANAL LINING**

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ABSTRACT

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Conservation of water supplies is becoming increasingly important all over the world. The demand for this vital commodity continues to rise rapidly as new sources of supply become scarcer. Water can be saved and used more efficiently through lining of canals. On a project scale geomembranes as canal lining materials are introduced first time in Pakistan in FESS Canal Lining Project with the overall objectives of searching for more cost- effective ways of lining the existing unlined canals. This study was conducted to test the physical and mechanical properties of various geomembrane materials under laboratory conditions. Different geomembrane materials including materials used in FESS Project for the production and experimental lining were selected for the study and those tests were conducted for the study whose apparatus were available in Engineer's geosynthetic laboratory. Physical properties were measured by the straight- forward methods of thickness and stiffness tests. The mechanical properties were evaluated by applying loads to geomembranes and measuring the response. Results obtained through testing of various geomembrane materials were compared with the specifications laid out for geomembrane canal linings under FESS Project conditions.

Through the laboratory testing of various geomembrane materials, it has been concluded that thickness is not indicative of field performance but its measurement leads to calculation of some other geomembrane parameters. Polypropylene materials are more flexible than the polyethylene materials. Puncture resistance tests are important to check the integrity of the geomembrane materials. A useful relationship was observed between thickness and puncture resistance of geomembranes. Index tests were fast and easy to perform but they are generally not useful in predicting the ability of a geomembrane to withstand the installation stresses and the stresses prevailing under service conditions. Performance tests, on the other hand, attempt to simulate in the laboratory the conditions and stresses that a geomembrane will experience in actual field applications. These tests can assist in the drawing up of better material-neutral specifications than the index tests. Testing of the mechanical behavior of geomembranes, particularly their behavior under tensile testing is of crucial significance for designing of water proofing system. Geomembrane seams are tested for continuity and mechanical strength. The results of the study have led to formulate recommendations for selection of suitable type and specifications for the geomembranes used for canal lining.

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