

ANALYSIS OF A LARGE DATABASE OF GCL-GEOMEMBRANE INTERFACE SHEAR STRENGTH RESULTS

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Abstract: A database of 534 large-scale direct shear test results was assembled in this study to evaluate the interface shear strength between geosynthetic clay liners (GCLs) and geomembranes (GMs). The tests were conducted between 1992 and 2003 by a single independent laboratory using procedures consistent with current testing standards. The number of results in the database allowed quantification of the impact of GCL type, GM type, normal stress, and procedures for specimen hydration and consolidation on the shear strength of GCL-GM interfaces, as well as identification of sources of shear strength variability. The interface shear strength was found to be sensitive to the type of GCL internal reinforcement, GM polymer, and GM texturing, but not to the GM thickness or manufacturer. On average, the GCL internal shear strength was observed to be higher than the GCL-GM interface shear strength when tested using the same procedures. GCLs sheared internally show similar stress-displacement responses and friction angles to GCL-GM interfaces that incorporate a GCL with the same reinforcement type. Hydration under normal stresses below those used during shearing (followed by a consolidation period) led to higher GCL internal shear strength, but lower GCL-GM interface shear strength, than when hydration was conducted under the shearing normal stress. Such different responses are attributed to bentonite extrusion from the GCL into the interface. Good repeatability of test results was obtained using GCL and GM specimens from the same manufacturing lot, while high variability was obtained using specimens from different lots. GCL-GM interface peak shear strength variability was found to increase linearly with normal stress.

Full reference:

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