CREEP OF GEOTEXTILES USING TIME-TEMPERATURE SUPERIMPOSITION METHODS

Jorge G. Zornberg, M.ASCE[1] ; Brett R. Byler[2] ; and Justin W. Knudsen[3]

Abstract: A temperature-accelerated tensile testing program was conducted in this study to characterize a woven polypropylene geotextile regarding its long-term stress–strain response, creep failure, and tensile strength remaining after sustained creep loading. Specimens were tested in a load frame that allowed control of multistage load paths. Consistent with current standards for rapid loading of geotextiles, roller-type grips capable of accommodating wide-width (200 − mm) specimens were used in this study. The test program included: (i) Rapid loading tensile tests at room and elevated temperatures; (ii) conventional and temperature-accelerated creep tests; and (iii) rapid loading tensile tests conducted after sustained creep loading. Creep strain data for periods beyond 100 years were collected at various load levels using 8 − h long tests involving the stepped isothermal method. The creep–failure curve, traditionally defined as time to rupture for sustained creep loading at various load levels, was defined in this study as the deviation of the creep curve from linear behavior in a semilogarithmic scale. A new approach was implemented to quantify and reference the residual tensile strength obtained from rapid loading at elevated temperatures of specimens that had been subjected to sustained creep. In spite of the significant slope in the creep-failure curve of the geosynthetic tested in this study, the residual tensile strength exceeds 90% of the ultimate tensile strength. An alternative to the current design approach, which involves use of creep-failure curves to define creep reduction factors is proposed. This involves use of creep-induced tensile strength loss, creep failure, and creep strains in the design of reinforced soil structures.

Full reference:

Zornberg, J.G., Byler, B.R., and Knudsen, J. (2004). “Creep of Geotextiles using Time-Temperature Superposition Methods.” *Journal of Geotechnical and Geoenvironmental Engineering*, ASCE, November, Vol. 130, No. 11, pp. 1158-1168.

Link to file*:

http://dx.doi.org/10.1061/(ASCE)1090-0241(2004)130:11(1158)