

ABSTRACT

Author: Ardila Quiroga, Andrea. Master of Science in Civil Engineering
Institution: Purdue University
Degree Received: December, 2019
Title: Effect of Climatic Changes on Subgrade Stiffness
Major Professor: Antonio Bobet

There is consistent research evidence that shows improvement of the engineering properties of subgrade soils treated with lime or cement. However, limited information is available on the effect of climatic changes on the subgrade stiffness. The thesis studies the effects of changes in soil moisture content and temperature on the resilient modulus of treated and untreated subgrades in Indiana. Two types of soils were tested: A-6 and A-7-6, from two locations in Indiana: Hartford City and Bloomington, respectively. When existing standards ASTM D559/559-15 and ASTM D560/560-16 for wetting/drying (WD) and freezing/thawing (FT) processes, respectively, were followed, the treated and untreated samples failed through the process of preparation due to the stringent procedures in the standards. Appropriate test conditions were investigated, as part of the research, to develop new protocols more appropriate to the field conditions in Indiana. Two new test protocols were developed and successfully applied to the treated soils. A total of 26 resilient modulus, M_R , tests were conducted following the standard AASHTO T307-99. The M_R results showed that the repeated action of WD and FT cycles reduced the stiffness of the chemically-treated soils down to values similar to or lower than those of the untreated soils. However, when the amount of chemical was doubled, with respect to the optimum, the M_R of the treated soils improved over that of the untreated soils, even after the wetting-drying cycles.