

Improving the Strength Characteristics of Soil Using Cotton Fibers

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Abstract : Clayey soil contains clay minerals with traces of metal oxides and organic matter, which exhibits properties like low drainage, high plasticity, and shrinkage. To overcome these issues, various soil reinforcement techniques are used to elevate the stiffness, water tightness, and bearing capacity of the soil. Such techniques include cementation, bituminization, freezing, fiber inclusion, geo-synthetics, nailing, etc. Reinforcement of soil with fibers has been a cost-effective solution to soil improvement problems. An experimental study was undertaken involving the inclusion of cotton waste fibers in clayey soil as reinforcement with different fiber contents (1%, 1.5%, 2%, and 2.5% by weight) and analyzing its effects on the unconfined compressive strength of the soil. Two categories of soil were taken, comprising of natural clay and clay mixed with 5% sodium bentonite by weight. The soil specimens were subjected to proctor compaction and unconfined compression tests. The validated outcome shows that fiber inclusion has a strikingly positive impact on the compressive strength and axial strain at failure of the soil. Based on the commendatory results procured, compressive strength was found to be directly proportional to the fiber content, with the effect being more pronounced at lower water content.

Keywords : bentonite clay, clay, cotton fibers, unconfined compressive strength

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