THE MIXING PROBLEM IN THE STABILIZATION OF SOILS FOR HIGHWAYS AND AIRPORTS

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The treatment of soil to produce a satisfactory load-bearing surface is of extraordinary economic importance. This is particularly true in the case of airport runways where extensive paved areas are required for airport operation without excessive concentration of traffic at any given point or within marked traffic lanes. On airport runways, with the exception of the ends where the ships warm up preparatory to taking off, the probability for repeated wheel contact with the same area is quite small. Stress repetitions which are great on highway slabs, are the exception rather than the rule on airport runways. Taxiways and aprons where aircraft moves with relatively slow speed, so that only a small fraction of its weight is airborne, offer stress conditions analogous to those existing in highways.

BASIC PRINCIPLES OF SOIL STABILIZATION

The term soil as employed in this paper, covers any earthlike material found in nature from highly colloidal cohesive clays to noncohesive sands and gravels, also, natural or artificial mixtures of two or more of these materials.

Experience has shown that ordinary highway traffic and even the heaviest known military aircraft with tire pressures ranging from 50 to 100 pounds per square inch can be successfully sustained by a cohesive soil in a moisture range from practically 0%, to its optimum moisture content for compaction. The latter is usually determined by the method T99-38 of the American Association of State Highway Officials, and represents the moisture content at which a certain compactive effort results in the greatest density as expressed by the dry weight of the soil in pounds per cubic foot. The compactive effort has been empirically correlated with the performance of compacting equipment normally available in the field. Stabilization of cohesive soils for highway and airport purposes can be achieved, therefore, by a treatment which conserves the normal cohesive properties but prevents absorption of moisture in excess of the optimum found for compaction. Accordingly, the problem for cohesive soils is mainly one of waterproofing.

In the case of noncohesive soils, such as sands or gravels, the addition of a cementing material is indicated. The latter may be clay, bitumen, hydraulic cement, or other materials. For any type of admixture employed, it is imperative that it be properly dispersed in the soil system. Of no less importance is the adequate compaction of the treated soil. However, this requirement is more often towards obtaining a new sales outlet than the strict purpose of assisting in the practical solution of the many outstanding problems. For a long time there existed as many laboratory and testing methods for “stabilized” soils as there were individuals or laboratories working on stabilization. For bituminous soil stabilization, the American Association for Testing Materials still recognizes 16 more or less distinct methods for testing the quality of soil-bitumen. In the case of soil-portland cement rational, set of test methods has been developed, mainly due to the efforts of the Portland Cement Association of Chicago. Other stabilizing materials, such as vinsol, still have their individual early stages, all claims for excellence of the respective materials were based upon such laboratory tests, from the results of which it was determined that stabilization of soil was a very real matter.

The proponent of each material, having his satisfaction that it would accomplish the purpose, than endeavored to place it on the market for use in actual construction. A special inducement to the contractor was the idea that he could use existing plants, continuous traveling plant mixers, proportioning plants, continuous traveling plants, cor-