ROAD STABILIZATION*

INTRODUCTION

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The word "stabilization" in connection with road work has been used rather loosely, but fortunately it conveys a definite idea without much need for special definition. A stabilized fill, subgrade, road surface or road base is one that will stay put, and stabilizing is the process by which it has been made that way.

There may be some confusion when the term is applied to different processes by which stability is achieved in the different parts of the road, and it should be properly qualified as necessary. Thus, sometimes the term "stabilized road" has been used to mean a surface of particular composition treated with a particular stabilizing medium. This is, of course, only one case, and it should be emphasized that for clearness more particularization is essential.

Two of the biggest problems in highway engineering have been the surfacing at costs within the bounds of possibility of secondary or intermediate type roads and of low type land service roads. In the former case much difficulty has been encountered in the past due to lack of durability of the comparatively inexpensive surfacings that must be used on a large mileage of these roads. As it is now realized that much of this trouble was caused by bad subgrade behavior, the development of processes by which these subgrades can be stabilized is of great importance; to say nothing of the benefits of the newer types of stabilized surfaces which can serve the traffic on many of these roads very satisfactorily.

Although the problem of all-weather surfaces for land service roads at practicable costs has not been generally solved, the advent of the stabilized surface types has at least furnished a start in that direction and it is to be hoped that continued research will develop toward cheaper as well as toward more expensive construction. One thing that we may well urge upon the thought of everyone concerned with the development of these processes is that while it is comparatively easy to develop high quality expensively, a very great need will be filled if inexpensive methods can be developed. There are thousands of miles of roads that should be lifted out of the mud but for which large sums will never become available.

In spite of the fact that the physico-chemistry involved in the study of soil phenomena is highly technical, the basic theory of soil stabilization can be simply stated and application in the field is not unduly complicated.

Of basic importance is the principle that there is a direct relation between moisture content, density and degree of compaction of soil. It has been found that each soil has an optimum moisture content for the method of compaction used. If this is used with adequate compaction methods maximum density will be produced, which means least settlement or volume change, or in other words maximum stability.

Road soils can be provided with enough abrasive resistance and shear strength to bear traffic by means of properly graded mixtures when in a damp condition; much of the stability being furnished by the adhesive power of the thin films of moisture surrounding each particle of soil or aggregate. The problems arise as atmospheric conditions vary. In rainy weather the mixture must resist penetration of water and provide stability by interlock of particles. In dry weather means must be found for retaining the adhesive power of the moisture films. For resisting penetration of water original compaction at optimum moisture content has been found effective. To provide mechanical interlock the soil and aggregate particles must be suitably graded. For retaining adhesive films several treatments have been used. Calcium chloride is used to obstruct evaporation and to absorb moisture from the air. Sodium chloride restrains evaporation and causes

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crystalline deposition on the particle surfaces Oils asphalts tars and portland cement have been used to replace moisture films with insoluble adhesive films

Stabilized courses for surfaces designed for maximum resistance to penetration of water from above are of course dense and fine textured and are susceptible to rise of water through them by capillarity There is no harm in this if the surface is open and offers no restriction to the evaporation of the capillary water when it reaches the top but it was early found that if a water tight cover is placed on such a course trouble will result when the capillary water comes up beneath this lid and finds no place to go On that account base courses require different design of mixtures than do surfaces and hence stage construction without revamping of mixtures is not feasible with some stabilization processes

The requisite for good subgrades is minimum susceptibility to volume changes Since it is not always possible to have in place or to use initially non expansive soils the utility of stabilization for subgrades lies in those cases where expansive soils must be used They can often be so changed by processing that they will stay put under adverse conditions

Several books might be written about what is already known about the technology of soil stabilization even though it is still in its infancy But as the large amount of research now in progress begins to draw to a head it will doubtless be found that many complicated phenomena can be more simply explained and more easily applied to practical purposes