

FINAL REPORT

SUITABILITY OF CALCIUM CHLORIDE STABILIZED BASE

by

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July 1972

Project 68-1

JHR 72-49

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### Introduction

In June 1968 tests on calcium chloride stabilized base were begun at the request of the Research Division of the Connecticut State Highway Department. The tests were limited to measurements of grain size distribution, permeability and frost heave. An Interim report was submitted on the first results obtained. No attempt has been made to study the behavior of calcium chloride stabilized base in the field.

### Samples and Tests

In May of 1968 a sample of calcium chloride stabilized base was obtained from New Haven Trap Rock located on Route 80 in North Branford. The test results from this sample were the subject of "Interim Report on Suitability of Calcium Chloride Stabilized Base Material" by R. Long and K. Healy, Civil Engineering Department, University of Connecticut, June 12, 1968.

The grain size analysis for this sample is shown in Figure I. The curve shown is for the material passing the No. 4 sieve and was obtained from wet sieving. The particles passing the No. 200 sieve could not be analyzed with the hydrometer because the calcium chloride caused the particles in this size range to flocculate.

The permeability of the sample from New Haven Trap Rock was measured. Because of the diameter of the permeameter, only the

particles passing the one-inch sieve were used. The material was compacted in a falling head permeameter and tested under an average hydraulic gradient of 4. The permeability was found to be  $2.0 \times 10^{-5}$  ft/min, a value about the same order of magnitude as that of a sandy silt. The calcium chloride stabilized base should not be considered free draining and during wet periods of the year will probably remain saturated.

Frost heave tests were also run on this sample. To fit the stabilized base into the cylinders the larger particles (larger than No. 4 sieve) had to be removed. Under these conditions the calcium chloride stabilized base showed a moderate amount of frost heave (about 2 mm per day).

Another sample of calcium chloride stabilized base was obtained from the Balf Co. in Newington during October 1969. When contacting the Balf Co. it was learned that calcium chloride stabilized base was being prepared only on days when the stabilized base was to be used and transported immediately to the construction site. The base material was being mixed from five hoppers, each hopper containing a different gradation. The grain size analysis run on the sample obtained from the Balf Co. is shown in Figure II. Also shown in this figure are the size gradation limits required by Article M.02.09 - Subarticle M.02.9-3 - Gradation" of the Standard Specifications for Roads, Bridges and Incidental Construction of the State of Connecticut, State Highway Department, 1969. Figure II shows that the sample from Balf Co. has size gradation within the limits

of the specifications. Wet sieving was used to determine the curve.

The susceptibility of a granular material to frost heave is related to the per cent finer than 0.02 mm. For material whose uniformity coefficient,  $C_u$ , is greater than 5 ( $C_u = \frac{D_{60}}{D_{10}}$ ), more than 3 per cent finer than 0.02 mm indicates frost susceptibility.

As a rule of thumb, a material having less than 7 per cent passing the No. 200 sieve will have less than 3 per cent finer than 0.02 mm and will probably not be susceptible to frost heave. The sample obtained from Balf Co. had only 4 per cent finer than the No. 200 and is probably not susceptible to frost heave. Because of the difficulty encountered in attempting to run frost heave tests on 6-inch diameter specimens and the small amount of fines, this sample was not subjected to freezing tests.

#### Conclusions

If the calcium chloride stabilized base is held within the size gradation of current specifications and if the base course material is permeable and well drained, it will probably not cause pavement distress.

The effect of low permeability will have to be evaluated with respect to the permeability of soils in the pavement foundation. The permeability requirements of pavement foundations will be studied under Project 67-3, "Moisture Under Pavements".

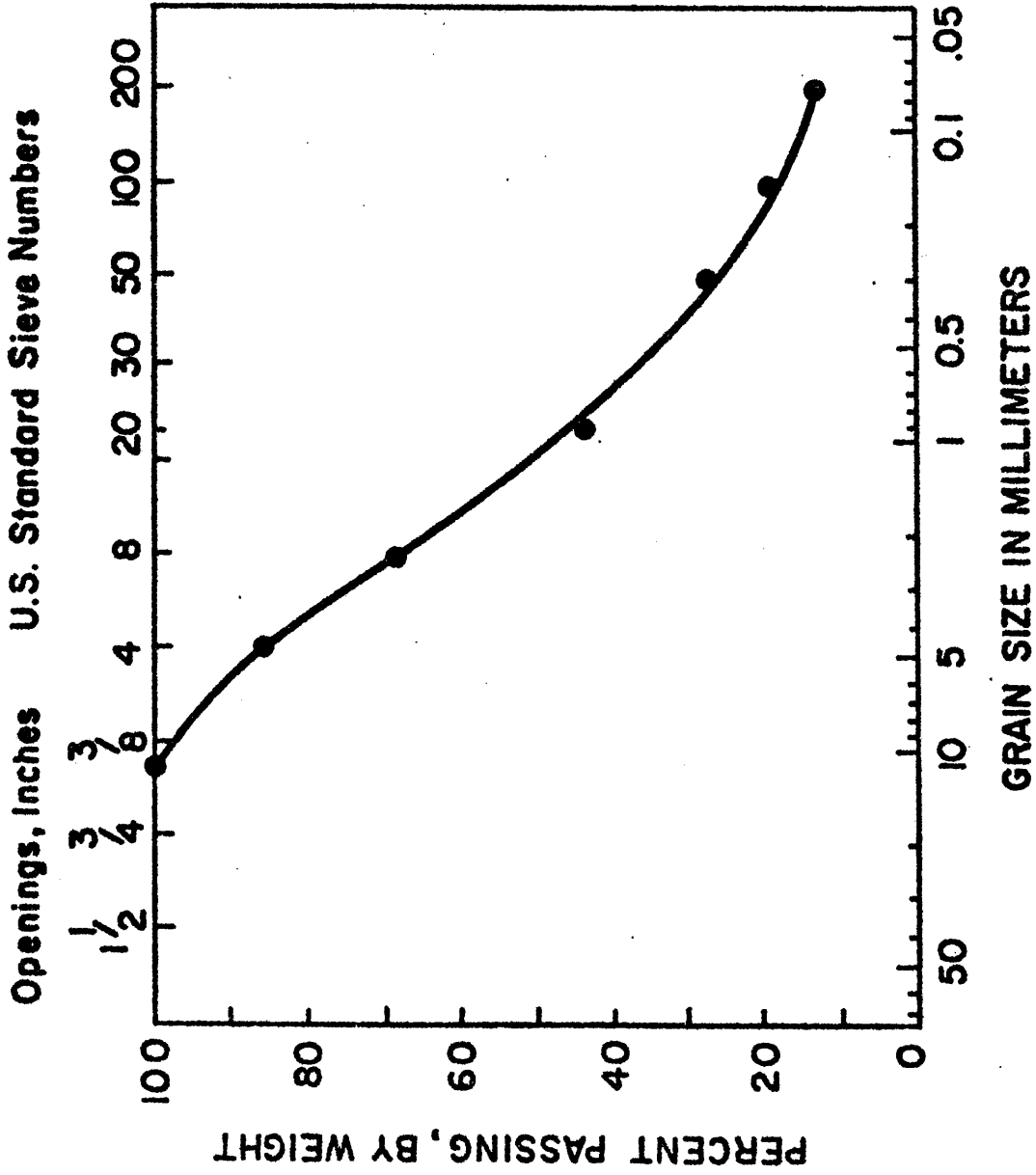


FIGURE -- 1

Size Distribution of Particles Finer than No. 4 Sieve in  
 Sample Obtained from New Haven Trap Rock, May 1968

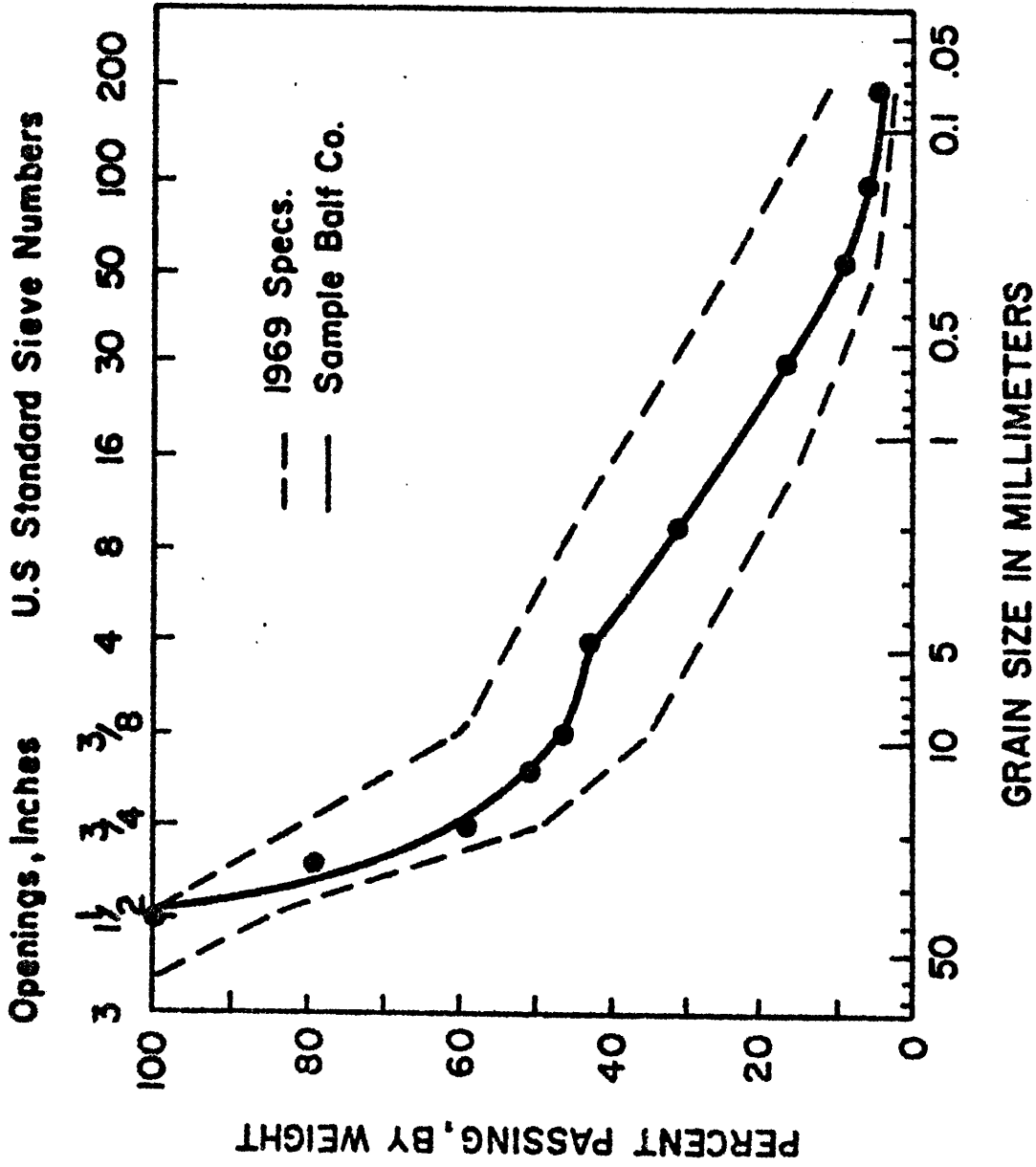


FIGURE - 2

Particle Size Distribution in Sample from Balf Co. Obtained in Oct. 1969