

CONNECTICUT'S NEW DENSE-GRADED BASE COURSE *

By William M. Pearson, *Calcium Chloride Institute Field Engineer*

A type of base course that has been successfully used in other parts of the country is now being used in New England. This is in accordance with recent findings of the AASHO Test Road that pavement designs must be upgraded, particularly in the base course layer. This new base consists almost exclusively of crushed stones, and from the results thus far, it shows many advantages both for the owner and for the contractor.

The first New England experience was on Route 32 in Mansfield, Conn. This was followed by another State project on the widening of a section of Route 5A in North Haven, Conn. The results of these two jobs have prompted the State to consider adopting the base into its standard design.

Calcium Chloride Gives Moisture Control

The basic requirement of the base is to start with a high quality material, either crushed stone or crushed gravel, that has a uniformly dense gradation of 100% passing the 2" sieve down to a range of 3-12% passing the #200 sieve. Once the material has been selected and checked for gradation, it is run through a mixer, preferably a pug mill, where water and calcium chloride are added to it.

The water is in the amount to bring the material to the optimum moisture for compaction, and the calcium chloride is necessary to maintain uniform moisture contents while the base is placed, rolled, and cured. For the crushed trap rock used on the two Connecticut jobs, optimum moisture was found to be about 7.4%. The required amount of calcium chloride ranges between 7 and 10 pounds per ton of stone, depending on weather conditions and the haul distance.

Stone Spreader Used

Once the stone has had the water and calcium chloride mixed into it, it is taken to the job and spread out on the sub-base with a stone spreader. On Route 32, a dozer-pushed Blaw-Knox stone spreader was used. Initial compaction was obtained by a 3-wheel steel roller of 10 tons minimum, and further compaction was gained by a rubber tire roller of the type frequently used on bituminous pavements. The base was allowed to cure out for

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three or four days, and was then topped with subsequent layers of asphaltic courses.

On Route 5A, a Jersey spreader was used, and the roller was a steel tandem. No rubber tire roller was used on that job, additional compaction being derived from the more than 20,000 vehicles per day that use the road.

Base Exceeds AASHO Requirements

For the owner's benefit, the base provides very high densities and high stability. On the Mansfield project where a sizeable number of density readings were taken, all of them exceeded 100% of AASHO method T-180, with the maximum being 106.6%. Of additional importance is the base's low tendency to frost susceptibility due to the low amount of fines and the residual calcium chloride.

This type of base is advantageous to the contractor for a number of reasons. The material can be rapidly laid with a minimum amount of equipment. In North Haven where one 6" lift was used, 20 tons of base material were put through the spreader in 50 seconds. On a job in Tennessee, the contractor took advantage of ideal conditions to place a maximum of 18,000 tons per day, and averaged 12,000. This job was described in the July issue of Roads and Streets. On the other hand, a Massachusetts city recently completed a job that required only 1,400 tons of stone. The only equipment that the contractor needs is a stone spreader and two rollers.

Traffic Won't Harm Base

Traffic can be allowed to run over the base as soon as it is rolled. The North Haven project disrupted 14 cross streets and more than 125 driveways. These were allowed almost constant access despite the fact that some portions of the base were not topped for a week. In Mansfield, the base was opened to traffic within 10 or 15 minutes after the stone went through the spreader. Due to the construction schedule, one stretch was left open to traffic for almost two weeks before topping, yet elevations held to $\frac{1}{4}$ " deviation from the design in spite of the fact that much of it was on a steep grade with a truck climbing lane.

Curing is natural, and no special procedures or compounds are required.

Since the mix is cold, being basically just wet stone, there are no critical times or temperatures between mixing and placing.

Proper Mixing Important

One item that is critical is the mixing. It is absolutely necessary that the three items, stone, water, and calcium chloride, be thoroughly blended.

Otherwise, drying will be sporadic, causing variable densities and some surface raveling. This problem can be completely eliminated by the use of a good pug mill, either permanent or portable, for the mixing operation. A large, in-place pugmill is preferred.

One additional piece of equipment that may prove handy is the old reliable water wagon. This is recommended, not for the use of the dense graded base, but for the sub-base which is also important. If the sub-base is very dry, the use of a water wagon prior to laying the dense graded base will assure that the sub-base does not absorb all of the water in the lower portions of the material placed upon it. Use normal care to obtain a uniform water spread.

As for the base, if the proper amounts of water and calcium chloride are introduced through the pug mill and thoroughly mixed into the stone, there will be no need of the water wagon on top of it, and any such use will only result in flushing some of the fines out of the surface, thereby destroying the tight mosaic pattern that should appear.

If the base is left open to traffic for such a long time that excessive drying results, a light application of calcium chloride should be used to maintain enough surface moisture to keep it tight. A water wagon will not help here because the base is so tight that most of the water will run off and not be absorbed.

The dense-graded aggregate base — using calcium chloride for moisture control — can become an important type of base construction in New England. Several states have expressed an interest in this construction method, hoping to gain the same advantages enjoyed in other areas where crushed limestone and calcium chloride are widely used in base construction.