

Jersey State Highway Department, along the lines the views indicate, the Inspector and Engineer would be looking for another job as soon as the experiment was finished. If a bituminous filler does not fill the joints and properly adhere to the surface thereof, something is wrong. The pictures shown where the asphalt was picked up by the tires of the machines are quite good proof that this bituminous material was never properly applied. It was evidently applied at too low a temperature, also in excess of what was needed. It certainly would be foolish to try and draw conclusions from any experiment that was not properly performed.

A sand asphalt mixture is very difficult to keep uniform in composition and to apply properly. To secure the required adhesion and installation, it must be kept hot, which produces a thin liquid mixture out of which the sand settles easily and quickly. Consequently, it must be kept constantly agitated and applied very rapidly while hot and thin, or the joints will not be filled and excess material will accumulate on the surface as shown in the pictures. To avoid this segregation, we use a bituminous mastic that has the consistency required for a definite use and the composition of which is not affected to any great extent by the temperature needed for its proper application.

It is also strange how the surplus material that collected on the surface could be forced to the surface by expansion of the bricks if the joints were not filled. If the bricks were of the lug type, then the lugs would have to be crushed by the expansion before any pressure could be applied to the bitumen in the joints. It is much easier and more reasonable to assume that the bitumen did not have the required temperature or was not properly applied than to account for these abnormal conditions in any other manner.

MR. BLANCHARD: How are you going to fill the joints if it is found that many of them are only a sixty-fourth of an inch wide? If separators or strips of metal or wood are used, uniform widths of joints may be obtained and they may be properly filled. The query naturally arises, why increase the cost of laying when the use of wire cut lug brick results in joints of uniform width?

## REMOVAL OF ICE FROM PAVEMENTS

B. C. TINEY, *Project Chairman*

*Maintenance Engineer, Michigan State Highway Department*

The formation of ice on streets and highways creates a very serious traffic hazard, particularly at such locations as steep hills, sharp curves, and approaches to railroad crossings and traffic signals.

Various forms of treatment to relieve this condition have been attempted. The removal of ice by mechanical means has not been found to be practicable. The thawing of ice by the use of sodium chloride and calcium chloride has been effective, but has sometimes resulted in scaling the surfaces of cement concrete pavements.

The most common practice has been to spread sand, gravel, or cinders on icy surfaces to reduce slippery conditions. The use of a limited amount of calcium chloride, combined with these materials tends to slightly thaw the surface of the ice and imbed the material. Untreated material is apt to be quickly thrown off the road surface by wind and traffic.

The purpose of the contemplated investigation is to develop information relative to the most effective and economical materials and methods which may be used in dealing with the problem of icy road surfaces. The proper quantities of materials, or combinations of materials, together with the damaging effects of chemical thawing agents on cement concrete pavements, will be studied. Both field and laboratory experiments will be conducted in a number of locations.

## DISCUSSION

ON

### REMOVAL OF ICE FROM PAVEMENTS

MR A H BLANCHARD. The report on the removal of ice from pavements is exceedingly interesting. Based on extensive automobile travel during winter months, my conclusions are that ice naturally disappears from surfaces in this order: bituminous pavements, first, brick pavements, second, and concrete pavements, third. This pavement characteristic should be thoroughly investigated, as it makes considerable difference in the measures to be employed in the removal of ice if such facts can be ascertained.

MR M H ULMAN, *Pennsylvania Department of Highways*. We have used calcium chloride on the basis of 35 per cent solution mixed with cinders to alleviate icy conditions. The mixture is prepared as follows:

An approximate thirty-five (35) per cent solution of calcium chloride is prepared by adding one hundred (100) pounds of flaked calcium chloride to thirteen (13) gallons of water. The total volume prepared in this manner will approximate nineteen (19) gallons, so it is necessary to use a container of sufficient size. After the solution has been thoroughly stirred until it is of uniform concentration it is poured by means of buckets over the cinder piles and thoroughly incorporated, avoiding an

excess to prevent waste. The mixture of cinders and calcium chloride is then spread over the ice.

The preparation causes some melting of the ice and the cinders are consequently embedded in the ice. This furnishes a non-skid surface.

We have found on basis of our observations that sodium chloride has a detrimental effect on concrete, in that considerable scaling is apparent in areas where it has been used. This is particularly true around switches from which the ice has been removed by sodium chloride, and also in front of ice-cream stands where it has been the customary practice to empty the salt or brine solution from the ice-cream freezers. We, therefore, have issued an order in Pennsylvania that sodium chloride or rock salt could not be used by Public Service Companies in thawing switches and also that there shall be no emptying of rock salt or sodium chloride brine from ice-cream freezers or other sources on our pavements.

MR W H ROOT, *Iowa State Highway Commission*, In reply to a question concerning possible damage by scaling. We have never had any scaling where we applied calcium chloride for ice removal. However, Mr Tiney told me at the committee meeting that Michigan had had scaling where they applied calcium chloride at approaches to intersections which were protected by stop and go lights and where it had probably been applied 50 or 100 times during the winter. Those were the only places reported where they have had scaling with calcium chloride.