MUNICIPAL DEPARTMENT

CRACKS IN STREET ASPHALT.

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During the summer of 1899, sheet asphalt pavements to the extent of 35,000 sq.yards were laid in the city of Lafayette, Indiana. Analyses of the surface layer showed quite uniformly from 10 to 11 per cent. of bitumen soluble in carbon bisulphide. The pavements were laid under a 10-year guarantee, and it was generally supposed that a rather soft pavement would be laid, in order to prevent drying out and cracking during the 10-year period. Nevertheless during the severe cold of December 30 and 31st, 1899, when the temperature fell to 4° below zero, the pavement cracked at numerous points.

These cracks may not be a serious injury to the pavement ; under the action of traffic, the edges break down, forming a slight depression. The crack appears to close and the difference in the surface is hardly noticeable.

The cracks usually extended across the street from one gutter to the other ; two or three of them, out of a total of 17, were found to be located at points where joints had been made in the asphalt surface on account of interruptions in the work of laying. The cracks were rarely wider than 1-16 in. at the time of lowest temperature.

But that it should be repaired at the earliest opportunity in order to prevent disintegration from water will be admitted when the action of water upon sheet asphalt is shown by an experiment, the details of which are given below.

On the same day that the cracks in the sheet asphalt were located, all the other pavements in the city were carefully examined, but with the exception of two very slight markings in the asphalt block pavement, no other cracks could be found. The two fine cracks in the latter pavement closed up with increase of temperature, with no detriment to the pavement. A pronounced opening was found, however, at the junction of each of the other pavements with sheet asphalt ; such junctions occurred between sheet asphalt and asphalt block, brick, and cedar block. No cracks were to be found at junctions of cedar block with brick, of brick with asphalt block, or of brick on concrete with brick on brick. The sheet asphalt is laid on 6 in. of portland cement concrete, the asphalt block on 4 in. of concrete, and part of the brick is on concrete, and part on brick foundation.

Hair cracks were numerous also between the sheet asphalt and the brick gutters.

It would seem, therefore, as though the cracks were a defect belonging peculiarly to sheet asphalt, and information from other cities confirms this impression. It has frequently been attributed to the concrete base. It is true that the expansion and contraction of concrete may be sufficient to produce such an effect. The coefficient of expansion of concrete is known to be approximately 0.000,005,5 ; for a range of temperature of 75° F. this would mean a contraction or expansion of ½ in. in 100 ft.

The tensile strength of the concrete would resist this action. But taking the average value of the coefficient of elesticity of the concrete as 3,000,000 lb. per square inch, a contraction of ½ in. in 100 ft. would produce a tension of 1,200 lb. per square inch in the concrete ; 100 lb. per square inch is a fair allowance for the safe tensile strength in portland cement concrete. It must be remembered, however, that the assumption of 3,000,000 as the coefficient of elasticity makes no allowance for an initial set or permanent distortion which concrete takes under the action of a force, and which is variable, depending upon the thoroughness of mixing of the concrete. The contraction of the concrete base is also resisted by friction on the ground beneath.

A theoretical investigation, therefore, while it would seem to charge the damage to the concrete, cannot be considered at all conclusive. The coefficients of expansion and elasticity of sheet asphalt are unknown, and the same is true of asphalt block ; for brick, with a coefficient of expansion of about 0.000,002,7 the contraction in 100 ft. for a fall of temperature of 75° would be ¼ in., which could doubtless be taken up by the joints without showing cracks. It would seem that if the concrete contracted, the brick would move with it to a lesser extent perhaps, but accumulating the contraction to form a noticeable crack.

And one thing is certain, that, whatever the great expansion and contraction of concrete might lead one to expect, it is nevertheless the combination of sheet asphalt with a concrete base that produces a pavement especially liable to severe cracking. Expansion joints in such a pavement are worse than useless, because they are only another form of the defect which they are intended to remedy.

(Concluded next week.)