

DEPARTMENT OF MATERIALS AND CONSTRUCTION

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REPORT OF COMMITTEE ON FILLERS AND CUSHION COURSES FOR BRICK AND BLOCK PAVEMENTS

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BRICK FILLER SURVEY IN OHIO

SYNOPSIS

This report summarizes a study of the changes which have taken place in the physical characteristics and conditions of the five petroleum asphalt fillers in the Brick Filler Test Road in Hocking County, Ohio, during the first four years of service.

The results indicate that after four years of service all the fillers showed an appreciable increase in softening point, decrease in ductility and penetration and increase in asphaltene content; that exuding increased with decrease of softening point and increase of 46° C. penetration.

Among the fillers used in this test road bond of filler to brick and low-exuding qualities seem incompatible.

The construction and results of tests on this test road have been previously reported to the Highway Research Board.¹ On June 28, 1939 a complete survey was made on the asphalt filled portions of this pavement. Observations were made on the pavement surface condition; also small areas of the bricks were removed, the adhesion of filler to brick was noted and samples of filler secured. The fillers were prepared for testing by cleaning and melting at the lowest possible temperature to remove water and were then decanted and strained to remove other foreign matter. The fillers were then tested according to standard procedure for brick joint fillers.

In Tables 1, 2 and 3 are shown the results of tests on the "Recovered" filler samples compared with the results of tests on the "Original" fillers as used in the construction of the pavement in 1935.

In Table 4 certain original properties of the fillers in 1935 are tabulated in relation to the behavior of the fillers after a four year service period.

¹ *Proceedings*, Highway Research Board, Vol. 15, p. 174; Vol. 16, p. 182; Vol. 17, p. 349; Vol. 18, p. 221.

RESULTS

1. After four years of service all fillers showed an appreciable increase in softening point, decrease in ductility and penetration and increase in asphaltene content. However, the magnitude of the changes in these factors did not show any consistent relationship with the type of the petroleum base.

2. Within the limits of this study, exuding increased with decrease of softening point and increase of 46°C penetration. Filler No. 6 is a satisfactory low-exuding filler.

3. Among the fillers used in this test road, bond of filler to brick and low-exuding qualities seem incompatible. Bond of filler to brick was found only in the case of Filler No. 9, the most heavily exuded filler, and even in this case the bond was not of sufficient extent to produce water-tightness. From observations on the pavement, it seems that low-exuding characteristics are more important than strong bonding characteristics. No loose brick were observed in any section which indicates that a bituminous filler may perform satisfactorily without bonding to the brick.

TABLE 1

Filler No.	Petroleum base	Softening point (R & B)			Ductility at 25°C		
		Original	Recovered	Increase	Original	Recovered	Decrease
		<i>Deg. C</i>	<i>Deg. C</i>	<i>Deg. C</i>			<i>Percent</i>
6	{65 percent Midcontinent 35 percent Asphaltic}.....	102.0	111.2	9.2	2.25	1.8	20.0
11	Asphaltic.....	86.0	99.9	13.9	3.0	2.7	10.0
10	Midcontinent.....	87.0	105.1	18.1	3.6	2.3	36.1
8	Midcontinent.....	78.4	92.3	13.9	4.3	3.5	18.6
9	Asphaltic.....	73.6	86.4	12.8	5.0	3.6	28.0

DISCUSSION

Softening Point: All fillers increased in softening point during the four years of service, Filler No. 6 being least effected and Filler No. 10 being most effected. The average increase in softening point for the five fillers was 13.6°C.

Ductility: All fillers decreased in ductility during the four years of service, Filler No. 11 being least effected and Filler No. 10 being most effected. The average decrease in ductility for the five fillers was 22.5 percent.

TABLE 2

Filler No.	Petroleum base	Penetration								
		0°C			25°C			46°C		
		Original	Recovered	Decrease	Original	Recovered	Decrease	Original	Recovered	Decrease
				<i>Percent</i>			<i>Percent</i>			<i>Percent</i>
6	{65 percent Midcontinent 35 percent Asphaltic}.....	18	13	27.8	24	20	16.7	37	30	18.9
11	Asphaltic.....	21	16	23.8	31	23	25.8	51	39	23.5
10	Midcontinent.....	17	12	29.4	26	20	23.1	48	34	29.2
8	Midcontinent.....	17	14	17.6	30	26	13.3	59	48	18.6
9	Asphaltic.....	19	13	31.6	31	27	12.9	62	51	17.7

DISCUSSION

All fillers decreased in penetration during the four years of service. Filler No. 8 seems to have been least effected and Filler No. 10 seems to have been most effected. In general, the penetrations of the asphalts decreased about 22 percent.

TABLE 3

Filler No.	Petroleum base	Percent bitumen insoluble in 86°B. naphtha		
		Original	Recovered	Increase
				<i>Percent</i>
6	{65 percent Midcontinent 35 percent Asphaltic}	31.6	40.3	27.6
11	Asphaltic	33.0	36.7	11.2
10	Midcontinent	29.0	38.8	33.8
8	Midcontinent	28.9	36.6	26.7
9	Asphaltic	28.5	37.0	29.8

DISCUSSION

From these data it was concluded that the asphaltene content of all fillers increased during the four years of service. Filler No. 11 showed the smallest increase and Filler No. 10 showed the largest increase. The average increase in asphaltene content for the five fillers was 25.8 percent.

TABLE 4
FILLER PROPERTIES VS. BEHAVIOR IN PAVEMENT

Filler No.	Petroleum base	Softening point	Ductility at 25°C	Penetration at 46°C	Behavior in pavement
6	{65 percent Midcontinent 35 percent Asphaltic}	<i>Deg. C</i> 102.0	2.25	37	Light exuding (Figure 1). No bond to brick.
11	Asphaltic	86.0	3.0	51	Medium-Light exuding (Figure 2). No bond to brick (Figure 3).
10	Midcontinent	87.0	3.6	48	Medium exuding (Figure 4). No bond to brick.
8	Midcontinent	78.4	4.3	59	Medium-Heavy exuding (Figure 5). No bond to brick.
9	Asphaltic	73.6	5.0	62	Heavy exuding (Figure 6). Strong bond to 75 percent of brick side (Figure 7).

DISCUSSION

This table compares certain properties of the fillers as determined in the laboratory at the time of the pavement construction with the appearance of the fillers after four years of service. The fillers are ranked above according to the degree of exuding. It is seen that the degree of exuding varies directly as the 46°C penetration and varies inversely as the softening point. In the above, the petroleum base source does not bear a relation to the degree of exuding. Bond of filler to brick was found only in the case of Filler No. 9 and even in the case of this filler the bond was not 100 percent.

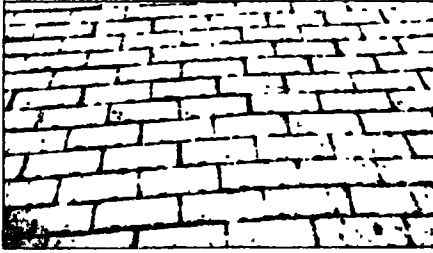


Figure 1. Light Exuding, No Bond, 65 percent Midcontinent—35 percent Asphaltic

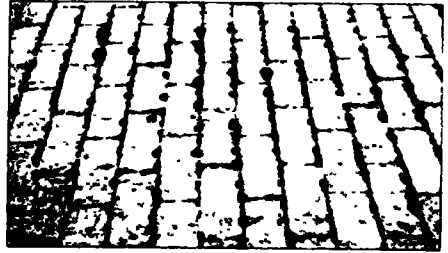


Figure 4. Medium Exuding, No Bond, Midcontinent



Figure 2. Medium-Light Exuding, Asphaltic

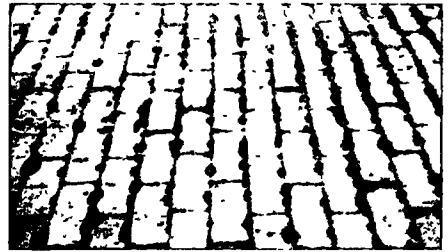


Figure 5. Medium-Heavy Exuding, No Bond, Midcontinent



Figure 3. No Bond to Brick, Asphaltic

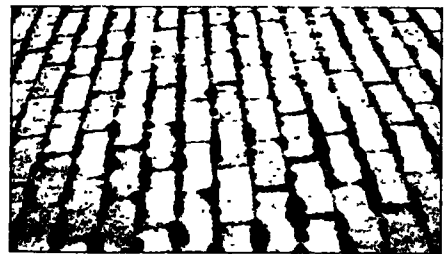


Figure 6. Heavy Exuding, Asphaltic

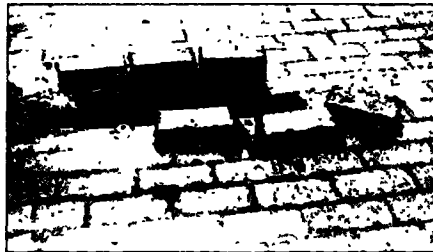


Figure 7. Strong Bond to 75 percent of Brick Side, Asphaltic