

elaborated a little is the matter of the increase in cracking with increase in the age of the pavement. We find, as Pennsylvania does, that the greatest increase in cracking occurs perhaps from the first to the second year, really in the first year. Mr. Hogentogler explained that he did not mean that the percentages shown in his curve represented all cases, but there is a variable distance from the origin of the curve to the point at which the greatest percentage of cracking occurs. Cracking progresses quite rapidly for the first few years and then falls off, but the time at which the falling off occurs may vary from one to three or four years from the time when the first crack takes place. Another speaker also spoke about the variation in cracking to be observed on gravel and crushed stone aggregate, and we find that to be true as well, except that it is a very difficult thing for us to say what is a gravel and what is a crushed stone aggregate, because of the fact that a large number of our gravels are composed of anywhere from 20 to 60 per cent of crushed material. I think that that should be kept in mind in the interpretation of results.

STUDY OF PAVEMENT REINFORCEMENT, MICHIGAN STATE HIGHWAY DEPARTMENT

SUMMARY OF REPORT

BY V. R. BURTON

Michigan State Highway Department Lansing Michigan

Information derived from general pavement survey carried on for determining influence of subbase, subgrade, drainage, reinforcement and pavement cross-section.

Conclusions as to the effect of reinforcement are based on a limited number of comparisons in which steel was used only in sections laid on questionable subgrade.

Transverse cracks

1. Were considerably reduced by $\frac{1}{2}$ " bar reinforcement (30 lbs per sq ft each way)
2. Were slightly reduced by three $\frac{3}{4}$ " longitudinal bars (25 lb) and $\frac{1}{2}$ " transverse rods (60 lb)
3. Were reduced more by eight $\frac{1}{2}$ " longitudinal rods (30 longitudinal, 61 lb total) than by six $\frac{3}{4}$ " bars (50 longitudinal, 130 lb total)
4. Were reduced more by reinforcement in short slabs than in long slabs
5. Were of less width in reinforced sections than in adjoining plain sections

Longitudinal cracks

- 6 Were eliminated by $\frac{1}{2}$ " transverse bars (60 lb to 85 lb. total).
Corner cracks
7. Were caused by $\frac{3}{4}$ " edge bars in bond when slab length exceeded 200 feet

Relative cracking in plain and reinforced sections is shown in Table 10, while corner cracks occurring in various slab lengths with single and double $\frac{3}{4}$ " edge bars are shown in Table 11.

W. W. Mack: On account of the size of Delaware, the conditions encountered there may be comparable to those that may be found in some of the counties of the larger States. As Mr. Hogentagler has said, there are favorable subgrade conditions there which apparently seem to throw other conditions out of line. There being practically no local materials whatever in the State of Delaware, no attempt has been made to use inferior local aggregates. Materials have been of a very high grade. We have used a $1\frac{1}{2}$ -minute mix, and have secured a uniform grade of concrete. This has reduced the number of cracks in a marked degree.

EFFECT OF REINFORCEMENT IN CONCRETE ROADS IN DELAWARE

SUMMARY OF REPORT

BY W. W. MACK

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Because of favorable soil, traffic or climatic conditions, certain Delaware highways have developed exceptionally few defects. This condition is illustrated by a plain concrete road in Delaware County, $2\frac{1}{2}$ miles long, with an average slab length of 595 feet, which, after one year of use, has but four transverse and no longitudinal cracks.

Sections reinforced with mesh (15 to 25 lbs per 100 sq. ft.) and bars (81 to 185 lbs. per 100 sq. ft.) in some cases contained more cracks than adjoining plain concrete slabs. With 185-pound bar reinforcement cracking was more than double that in the adjacent plain slabs.

Maintenance costs per mile, pavement slab only, for the year 1924 on several roads were as follows:

- A. Coleman du Pont road, Sussex County, 5-7-5 section, 14 feet wide, 15 miles long, and reinforced with mesh 15 to 25 lbs per 100 sq. ft.—\$19 73.
- B. Plain concrete pavement, 5 miles long, of same age and design and adjoining A—\$20 60