DISCUSSION OF REPORT OF COMMITTEE ON CHARACTER AND USE OF ROAD MATERIALS

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As indicated in the report, we have made a rather extensive investigation of aluminate cement in our laboratory, and since the original results were published we have broken a number of six month cylinders These gave the strengths shown in Table I, the 24 hour strengths being included for comparison The cylinders were cured in moist air

TABLE I

Mix	Slump	Strength	
		Pounds per square inch	
		24 Hours	6 Months
	In inches		
1 1½ 3	1	5,731	6,127
1 1½ 3	4	5,052	6,019
1 1½ 3	6	4,523	5,224
1 2 4	1	4,537	5,682
1 2 4	4	4,187	4,967
1 2 4	6	3,222	4,728
1 3 6	4	1,157	2,056
1 4 8	4	456	862

The 1 4 8 and 1 3 6 mixes attained their maximum strength for the six month period at three days, and the 1 2 4 mixes at five and six days A peak at the end of a few days seems to be characteristic of all plotted compression tests of both concrete and mortar

In the majority of cases in our investigation the fracture has been through the aggregate, even at very early periods, so that it is entirely possible that with very strong aggregates the compressive strength of the concrete would be higher

Due to the high cost of aluminate cement the possibility of mixing it with Portland cement has been mentioned Lloyd F Rader, a fellow at the University of Michigan, made an investigation of such mixtures and found that, for various reasons, they do not seem to be practicable The possible proportions for mixing are limited because of the danger of flash set, and within these limits the saving is very small There is considerable danger of not getting a uniform mixture, with resulting chances of flash sets in certain portions of the mix, and the maintenance cost of the concrete might be high

Mr. Rader also investigated the bond between fresh aluminate cement concrete and old Portland cement concrete. The results indicate that a good bond is easily obtained and that the strength of the bond will be increased by painting the concrete with neat aluminate cement. The complete results of Mr. Rader's investigations will be published in the Proceedings of the 1925 Michigan Conference on Highway Engineering.

During the past season a considerable amount of aluminate cement has been used in patching concrete pavements in Michigan. In one case a carload of this cement was used in patching two miles of pavement the work being done last June. The original pavement had a uniform thickness of seven inches and was badly broken at the edges. The patches were made of a 1:2:3½ mix, 10 inches thick at the edge and tapering to 8 inches one foot from the edge. Moist earth was used for curing as soon as the concrete was hard enough to permit it. Traffic was allowed upon the patches at the end of two days. The traffic averages about 4,000 vehicles per day, including many heavy trucks, some loaded with iron castings.

At the end of five months about 20 to 25 per cent of the patches had failed. Disintegration seemed to begin at the surface and finally the whole patch would be cracked and shattered. See Figure 1.

Figure 1—Typical failure of aluminate cement patch

An interesting point in this connection is that the failures were mainly confined to small patches, containing less than 25 square feet, the largest patches all being in excellent condition.

Before the patching was completed the aluminate cement was used up and in the remaining patches 2 per cent of calcium chloride was used in

the mix, traffic being turned on in four to six days All of these patches are in first-class condition after five months use

A careful survey has just been made of a series of 26 patches on another road nearly 100 miles from the one mentioned above One of these patches contains about 1,200 square feet and is in perfect condition Of the remaining 25 patches, 12 are in good condition, 5 are slightly cracked or disintegrated, 4 are in rather poor condition, and 4 are in very bad condition

The size of each patch was measured but in this case there seems to be no relation between size and condition, as the average size of the 12 best patches (excluding the one very large piece) and the 4 worst patches happens to be exactly the same (18 feet square) The range in size is from 4 to 50 square feet These patches were put in six months ago and carry a traffic of about 5,000 vehicles daily I understand that the mix used in these patches was about 1 2½ 5, with about a 2-inch slump After two to four hours they were covered with a 4-inch layer of earth, which was kept soaked until the patches were opened to traffic, 2 days after laying The average traffic is from 4,000 to 5,000 vehicles daily, approximately 10 per cent being busses and trucks

The large patch referred to is part of an intersection, Portland cement being used in another part laid at the same time When this concrete was 24 hours old, and had been wet more than 20 hours, the aluminate part was still warm, though the Portland part, of course, was quite cold No earth was used on this patch

It has been stated that the best results are obtained when no earth or other covering is applied, thus giving every opportunity for the dissipation of the heat This seems to be borne out, to some extent at least, in the case of these patches A more detailed record might show that the failures were mainly due to the use of an earth covering, and that no failures occurred where the concrete was cured by sprinkling only The advantages of using aluminate cement in patching are sufficiently important so that careful observations should be made regarding this point

Chairman Brosseau The next report is that of the Committee on Highway Traffic Analysis