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OPERATIONAL COMPARISON OF PREMIXED AND M.S.H.D.
SPECIFICATION MATERIALS FOR REFLECTORIZED CENTERLINES

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OPERATIONAL COMPARISON OF PREMIXED AND M.S.H.D. SPECIFICATION
MATERIALS FOR REFLECTORIZED CENTERLINES

At the request of the Maintenance Division, and with their cooperation, a comprehensive study of reflectORIZED pavement marking was undertaken by the Research Laboratory with the ultimate object of developing improved specifications for materials and methods of application. The scope of the investigation includes four main objectives: (1) to determine the degree of transparency and optimum size gradation of the glass spheres necessary for maximum reflectibility and wear resistance throughout the life of the marking; (2) to find what types of paint or binder are necessary for maximum durability and reflection; (3) to establish the optimum coverage of spheres and binder per unit area from the standpoint of both efficiency and economy; and (4) to find the best method or methods of application of the materials.

This is the first progress report of the investigation, and describes tests which were originally planned to compare present Department specification materials with a commercial product consisting of premixed paint and beads. Two reflectORIZED centerline test sections were laid down; one in Grand Rapids, and the other in the Lansing area.

Because of the difficulties which arose in applying the materials, no attempt can be made to judge the performance of the two types of markings in either test section. Furthermore, it was evident from these tests that present Department machines must be modified in order to handle premixed paint and beads satisfactorily.

Materials and Methods

Materials used in the tests were as follows:

Material "A" -- "Centerlite", a premixed material manufactured by the Minnesota Mining and Manufacturing Company.

Material "B" -- Beads and paint were separate. The paint was 1947 M.S.H.D. specification. The beads were manufactured by the Prismo Safety Corporation.

Material "C" -- Beads and paint were separate. The paint was 1948 M.S.H.D. specification. The beads were manufactured by the Prismo Safety Corporation.

Both white and yellow colors of the above materials were used.

Approximately 15 gallons of Material "A" was to be applied per mile of solid line. Materials "B" and "C" were applied according to existing M.S.H.D. specifications, which provide for separate application of paint and beads at the rate of six pounds of beads per gallon of paint, and 15 gallons of paint per mile of solid line.

Grand Rapids Test

On May 18, 1948, a test section of reflectorized centerline materials was applied by the Fifth District paint crew on US-131 from the north limits of the city to the south beltline. Materials "A" and "B" were used for this test.

The application of Material "B" showed no unusual effects. However, during the application of Material "A", it was noticed that one side of the line seemed to have alternate thick and thin spots of paint (Figure 1). At that time no satisfactory explanation of this phenomenon was found. Mr. D. Crozier, of the Minnesota Mining and Manufacturing Company, was also present when this occurred but could offer no explanation.

Figure 1. Material "A". Note alternate dark and light areas on lower side of the line. Light areas have thick paint and were kept clean by traffic. Dark areas were thin and allowed dirt to accumulate.

Lansing Test

On July 7, 1948, another test section was begun on US-16 from the Lansing city limits to the junction with M-100. Materials "A" and "C" were used and were applied by the Eighth District paint crew.

In preparing the paint machine for this operation it was deemed necessary to remove the filter screens normally present in M.S.H.D. machines. After removal of these screens, it was noticed that clogging of the paint guns immediately took place when applying Material "C". The paint pipes were immediately flushed with thinner and the filter screens reinstalled.

The next attempt to run Material "C" showed that clogging had disappeared at the guns, but had reappeared at the screens. The screens were again removed and all paint pipes opened up. The opened pipes were clear with the exception of the 1-1/4 inch diameter pipes. These pipes were over half full of a hard pigment cake from which pieces had worked loose and caused the clogging. This cake seemed to have accumulated over a considerable length of time, as evidenced by the several different layers of pigment. (Figure 2.) This caking seemed to be caused by low paint velocities in the large diameter pipe. On removal of this cake by brushing and flushing the pipes with thinner, no further difficulty was experienced with Material "C", even with the filter screens removed.

Figure 2. Pigment cake removed from 1-1/4 inch paint line. Note pigment layers indicating gradual accumulation.

An unusual phenomenon was noticed during application of M.S.H.D. 20-F yellow paint, manufactured by the Franche Company, and forming the yellow paint of Material "C". The paint seemed to "pile up" in heavy spots in a uniform pattern over the line. No adjusting of pressures or cleaning appeared to change this condition. A sample was taken on a smooth concrete panel to eliminate pavement irregularities, but the condition remained (Figure 3). At present no satisfactory explanation can be offered for this phenomenon.

Figure 3. "Piling" effect on laboratory concrete panel.

After applying Material "C" all tanks and pipes were cleaned and refilled with Material "A". It was noticed during application of Material "A" that the line had an excessive quantity of beads, but very little paint on one side. The other side of the line appeared to have a normal quantity of paint and beads (Figure 4).

Figure 4. Close-up view of sample of Material "A" taken on a metal panel. Note very little paint on left side of line.

The appearance was similar to that previously noticed at Grand Rapids, but much more pronounced (Figures 1 and 5). On disconnecting all pipes and traps it was found that the traps were nearly filled with a dense bead-pigment cake and the 1-1/4 inch diameter pipe filled to 1/4 its diameter (Figure 6). The severest clogging, however, took place at the header with small, vertical down-takes leading to the guns. These small openings at the bottom of the header were completely filled with beads, nearly eliminating the flow of paint. The only paint reaching the guns was that forced through the interstices between the beads, or carried along by the beads which broke loose from the plugged areas. This explained the effects shown in Figures 1, 4 and 5.

Figure 5. Material "A" as applied to road. Conditions are identical with Figure 4. Note normal amount of paint on right side of line. On left side, line is almost gone after 3 weeks wear, due to restriction of paint flow by beads clogging pipes.

Figure 6. Note sediment of beads and paint in 1-1/4 inch pipe, 1-1/2 hours after cleaning. Material "A".

On cleaning the lines and preventing any Material "A" from entering the pipes until the time of application, it was found that a uniform line could be obtained. However, it was also found that if paint were allowed to get into the pipes before application or to stand in the pipes during delays in application, settlement would again occur. Vibration of the machine appeared to accelerate this settling. This settling is to be expected in a premixed material because of the difference in densities between the beads and paint.

It was also noticed that proper operation of all metal-to-metal valves and all threaded areas was interfered with by the beads in Material "A".

A test was conducted to determine if Material "A" could be allowed to stand in the tanks overnight. The tanks were half full. Before allowing the material to stand, it was thoroughly mixed by the air-driven agitators in the tanks. The next morning the agitators were started without appreciable difficulty. This would indicate that overnight static settling would not jam the agitators.

Conclusions

From these observations it can be concluded:

1. Use of premixed beads and paint in present M.S.H.D. machines, which were not designed for this type of material, would not be feasible.
2. Present M.S.H.D. machines could be rebuilt or a new machine designed to handle premixed materials satisfactorily.
3. The 1-1/4 inch diameter pipes should be removed and smaller lines installed to increase the paint velocity through this portion of the system, regardless of the materials used.