

# OFFICE MEMORANDUM



MICHIGAN  
DEPARTMENT OF STATE HIGHWAYS

May 15, 1970

LAST COPY  
DO NOT REMOVE FROM LIBRARY

To: L. T. Oehler, Engineer of Research  
Research Laboratory Section

From: A. J. Permoda

Subject: "Bisymmetric Glass Beads" for Pavement Marking from the 3M  
Company. Research Project 69 NM-243. Research Report No. R-742.

Subject project was authorized by memorandum of June 17, 1969 from G. J. McCarthy to H. H. Cooper and R. L. Greenman. This cooperative project with Traffic and Safety Division was later confirmed by R. L. Greenman's memorandum to G. J. McCarthy of June 26, 1969, and by H. H. Cooper's memo to D. E. Orne and J. E. Hobrla of July 1, 1969. It was assigned to New Materials Committee review, which was first made at the August 26, 1969 meeting.

Subject beads differ from standard beads in two points: 1) they are surface treated to encourage half-embedment in the paint and half exposure in air, and 2) they are fairly uniform in size, essentially passing the No. 40 and retained on the No. 80 sieve. Otherwise, the beads are standard as regards Index of Refraction and in not being free-flowing by laboratory tests. Because of the two special features the producer suggests a lower application rate of 4 lb per gal of paint to obtain equivalent night reflectance. At that ratio the subject beads are allegedly competitive in price with standard beads.

Per authorization, 10,000 lb of beads were obtained, and the evaluation was divided into two phases. In the first phase, about 9,000 lb were distributed to highway striping crews in Districts 3 through 7 for their observation and comments, with specific test applications outlined in R. F. Trim's memorandum to J. E. Hobrla of November 20, 1969. In the second phase, the remaining beads were retained in Lansing for local application and observation.

In the latter tests, subject beads were evaluated in one of the double yellow centerline stripes applied on 4-lane undivided roadways of South Cedar St and on Logan Ave, while the other stripe contained the different comparison beads. These included standard Department beads, and special beads graded to size as subject beads, in an effort to determine whether the surface treatment or the gradation was mainly responsible for the alleged superiority. Details of the test applications are shown in Figure 1. On the selected roadways both test lines were applied at the same time, travelling south on Cedar, and north on Logan. The stripe and bead applications were made by the District 6 crew on November 5, 1969. On the day of application, the temperature ranged from 45 to 55 F, with a sunny sky and a fair breeze.

Ratings and Discussion:

Comments from the District crews show subject beads applied and performed satisfactorily, but gave no indication of improved performance over standard bead applications.

Ratings of the Lansing test bead applications were made covering day appearance, but mostly night reflectance at 1-, 2-1/2-, and 5-month service levels by two two-man teams of project personnel from Traffic Field Services and the Research Laboratory.

The ratings are not presented in tabulated form because, except for the last rating, the right line in the direction of application tended to be brighter than the left line, including the short section of roadway on Logan, north of Willow, where the applications were supposed to be identical. Apparently, more variables than just the beads and ratios were operative. These appear to have included variable residual striping, a meandering centerline reflection crack in the blacktop surfacing and an unequal bead distribution in the two applicators. For the record, the final night ratings varied from 4 to 0, along the test lines.

Previous Evaluations:

A small amount of subject bead material was first received by the Department in 1966. These were tested in the Research Laboratory regarding physical requirements of bead specifications, while some were applied on West Saginaw St (M 43) to determine handling characteristics in regular striping equipment, which proved satisfactory.

The second evaluation was in a few transverse stripes in the 1968 Performance Tests, with results presented in Research Laboratory Report No. R-720. These indicated minor improvement in performance. However, the results of the entire tests were viewed cautiously since they had to be abbreviated due to unexpected inordinate wear from the newly permitted use of studded tires.

The third evaluation did not provide the desired reliable results, as presented above.

Recommendations:

We regret the above fruitless endeavors to evaluate subject beads. However, since this product represents the only known development in bead technology in the last 5 or 10 years, we suggest another cooperative evaluation, with special test planning to obtain meaningful results. A small amount like 500 to 1,000 pounds, would appear adequate for the evaluation.

TESTING AND RESEARCH DIVISION



---

Supervising Engineer - Materials Research  
Research Laboratory Section

AJP:sjt

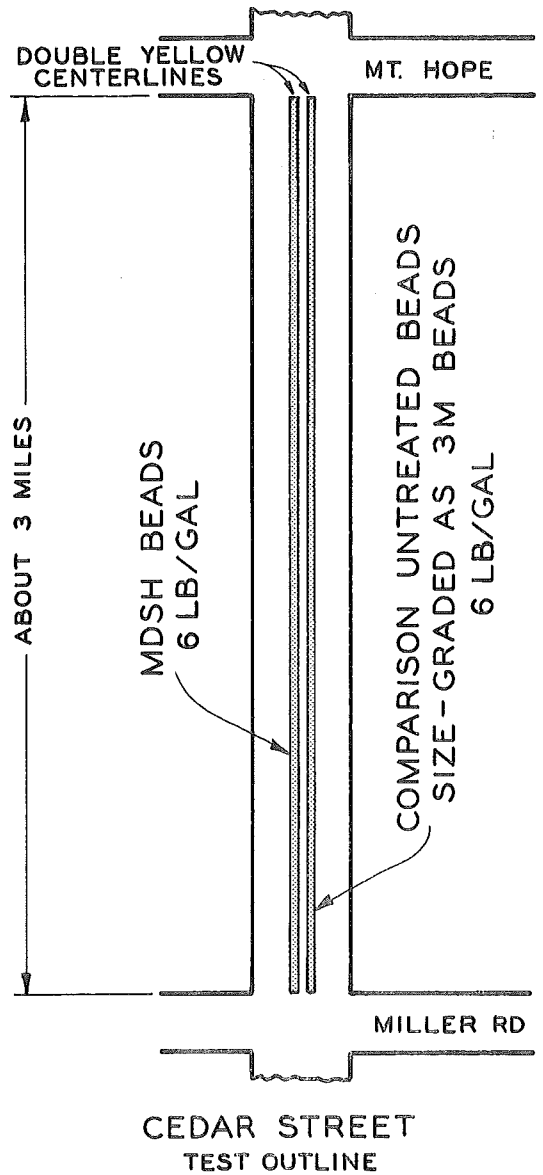
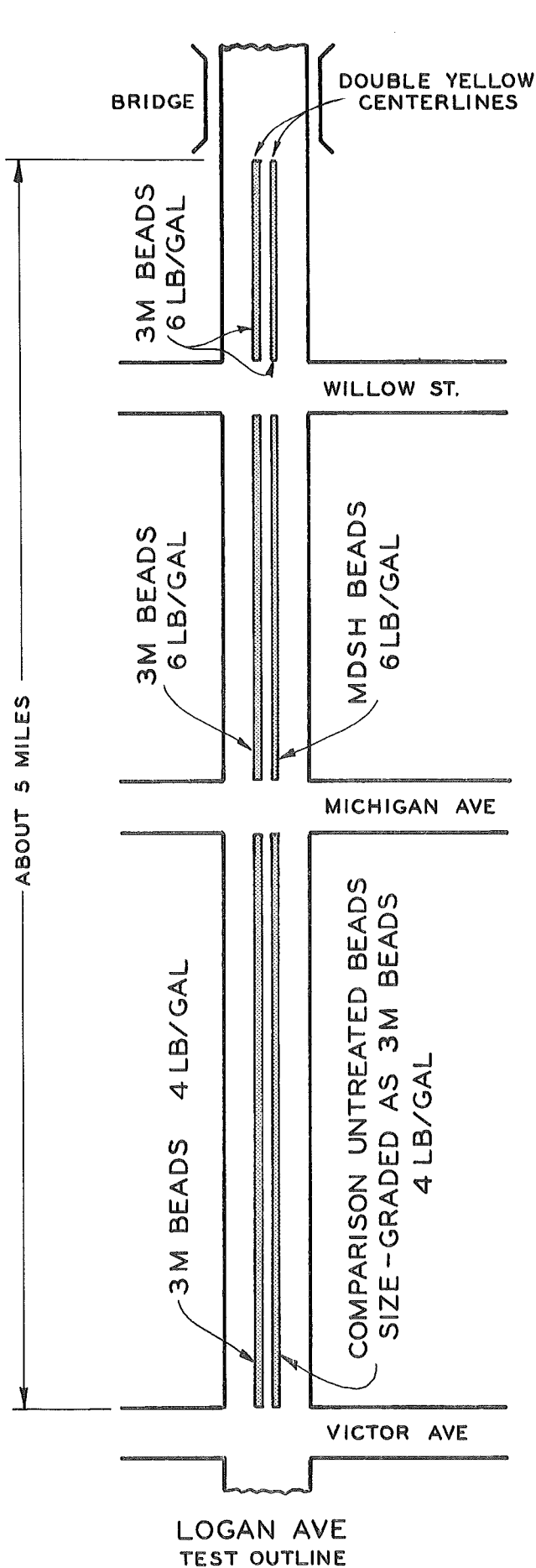


Figure 1. Test outlines of bead applications.