

OFFICE MEMORANDUM

DATE: July 2, 1976

TO: L. T. Oehler
Engineer of Research

FROM: A. J. Permoda

SUBJECT: "Snow-Glow" Glass Beads for Pavement Markings From Snowfast Company of Italy.
Research Project 72 NM-332. Research Report No. R-1015.

The subject glass beads allegedly impart improved night visibility in the rain to beaded pavement markings. The bead is described by the producer as a catadioptric element, a composite consisting of a round glass core with a refractive index of about 1.5 to which is cemented a single layer of microspheres of rather high refractive index. The ratio of microspheres to core diameter is given as 1 to 20-30. The beads are described as initially having poor reflectorization, until the microspheres are dislodged from the dome of the core by traffic. The physical make-up of these beads is similar to 3M's "Scotchrock" beads which were first used by the Department more than a decade ago as the colored part of the bead complement on experimental blue and yellow edgelines.

Snow-Glow glass beads were introduced to the American market by the Italian-Swiss producer at the January 1972 HRB meeting of Committee A2G02. The producer stated that a major part of his business was supplying the mid-European market with preformed plastic (glue-on type) pavement markings containing standard glass beads; and that subject special glass beads were a recent development. Subject beads would be available, first for experimental evaluation in drop-on application in traffic paints, and subsequently as reflectorizing elements in preformed plastic markings.

We received about 10 lb of the 20 mil diameter size glass beads for evaluation in the summer of 1972, which was too late for evaluation in our 1972 performance tests. However, we decided on preliminary evaluation in Laboratory area tests scheduled to include newly available plastic beads. These were applied on August 30, 1972 in front of the Laboratory entrance by our applicator using regular-dry white traffic paint as the binder. The four sets of beaded paint stripes, in duplicate stripes, had the Snow-Glow beads, standard specification beads for comparison, polyester, and polystyrene beads. Beaded preformed plastic tapes in Optical and Glow grades each formed 1/2 of the fifth test set after receipt. Application date was November 14, 1973 and this group formed our Phase 1 tests (Fig. 1).

Night visibility ratings (dry) for the beads-on-paint stripes are listed below covering the first 14 months of exposure:

Rating Date	Snow-Glow Beads	MDSHT Beads	Polyester Beads	Polystyrene Beads
January 11, 1973	4	6	5	4
June 4, 1973	4-1/2	5-1/2	5	4-1/2
November 1, 1973	3-1/2	6	5	4-1/2

A review of the above shows that the ratings of the Snow-Glow beaded stripes were noticeably lower than those of the MDSHT beaded (comparison) stripes during the rating period. The ratings also show a slight improvement in ratings of the Snow-Glow beaded stripes with some exposure; 4-1/2 on June 4, 1973 against a 4 rating on January 11, 1973. This was later verified in laboratory tests using the wear-track as a substitute for vehicular traffic; with the dislodgement of the microspheres off the dome of the core beads shown in Figures 2 and 3. Results on the subsequently added tape stripe shown in Figure 1 were similar to those obtained on the beads-on-paint stripes.

Phase 2 tests consisted of applying some of the 10 lb of Snow-Glow beads, received previously, in an added group of test stripes, supplemental to the 1973 Performance Tests. Results were given in that project report, MDSHT Research Report R-900. Reported night visibility data (dry weather) for the standard comparison beaded stripes at periodic intervals covering a period of 2 to 219 days of service were: 7.8, 6.5, 4.9, 4.9, 3.9, and 2.0; comparative ratings for the Snow-Glow beaded white paint were: 3.5, 3.2, 2.8, 3.0, 2.8, and 1.1. A review of the above shows that the Snow-Glow beaded stripes initially had less than 50 percent as much brightness as standard beaded stripes, 3.5 vs. 7.8; and that brightness never did increase with service exposure as alleged -- a steady decrease from the initial 3.5 value to 1.1 at 219 days. The standard beaded test stripes also showed a progressive decrease in brightness with service exposure, from an initial value of 7.8 to 2.0 at 219 days, but this is considered as normal for our low-cost specification beads, due to loss of beads via traffic wear.

Phase 3 tests consisted of road service exposure of 200 ft total of "Snowfast" preformed Optical grade 4-in. plastic tape in the skip areas of existing lane striping on northbound US 27 at the north outskirts of St. Johns. A crew of two producer representatives cemented, with epoxy glue and their application equipment, 18 10-ft stripes and one 20-ft stripe on October 17, 1974 on their swing from Indiana and other cooperative test sites. The crew described the beaded Snowfast tape as being somewhat different than that furnished for the Phase 1 tests. A microscopic examination showed a mixture of standard, plus silvered and unsilvered compo-

site beads; with silvered Snow-Glow beads comprising 50 percent of the bead complement. These markings were of the Optical grade, having a narrow double thickness ridge cemented laterally every 36 in.

Durability and night visibility inspections were made when rating our usual paint stripe performance in that area. Night visibility ratings (dry weather) never did show acceptable brightness over a period of one year and were similar to results presented for the Phase 2 tests. Night visibility ratings in the rain were made several times and these showed only marginal improvement over our adjoining lane stripes; and this improvement must have been partially due to the greater thickness of the test plastic markings. After one year of service, a little less than 50 percent of the original test markings remained (Fig. 4) with the loss being attributed to snow plowing and lateral traffic from area businesses; with the chilly fall weather during application possibly also contributing in affecting poor bonding with the epoxy adhesive.

Conclusions and Recommendations

Our exploratory tests showed that subject beads, when dropped on paint type markings and as reflectorizing elements in plastic-tape markings, have poor initial night visibility ratings as claimed by their producer; and continue to have poor night visibility ratings after exposure to traffic, contrary to allegations by the producer. Regarding the former observation, subject beads behave differently than 3M's Scotchrock beads, a prototype similar development, which have excellent initial night visibility.

Subject beads did not show appreciably better night visibility in the rain, over standard beaded markings.

Because of the above, we recommend discontinuance of evaluations and interest in the subject beads.

Reference to AASHTO's SPEL summary of December 1975 showed that in addition to Indiana, Nebraska and Wisconsin were evaluating the subject beads. Explanations indicate that Nebraska's evaluation results were "pending," while Wisconsin has "accepted" the beads. We have addressed an inquiry to them regarding the latter.

TESTING AND RESEARCH DIVISION



Supervisor - Materials Research Unit

AJP:bf

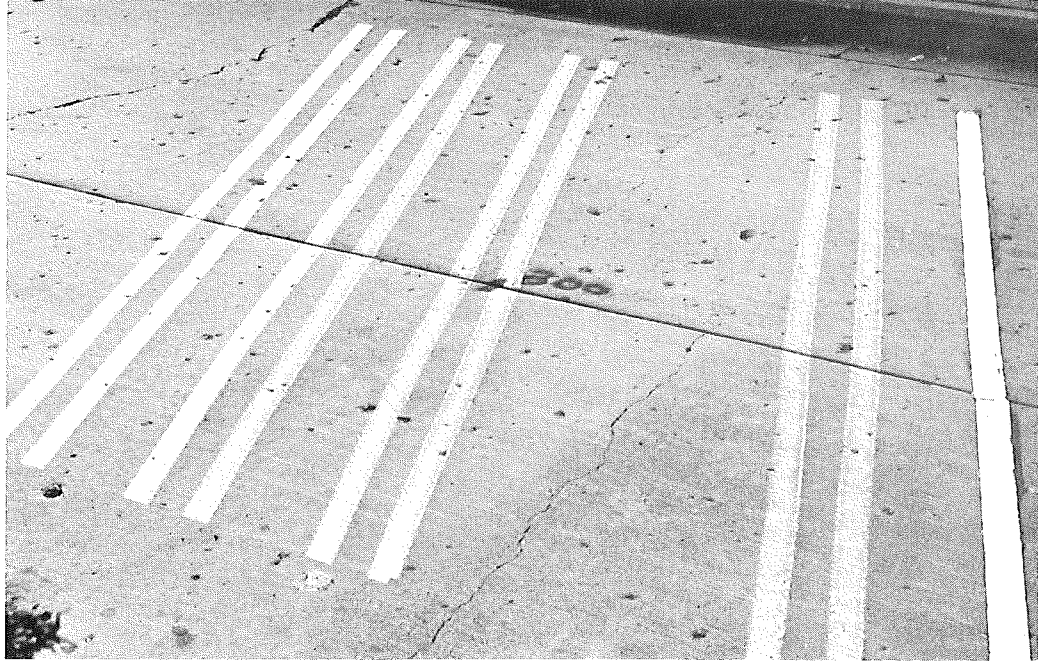


Figure 1. Test exploratory stripes in front of the Highway Research Laboratory. Four sets on left were beads-on-paint type containing Snow-Glow (left), MDSHT control, polyester, and polystyrene beads. The single white stripe on the right was the preformed tape type-Optical grade (far end) and Glow grade (near end). The tape type, when the photo was taken, was applied 1-1/4 years after the others.

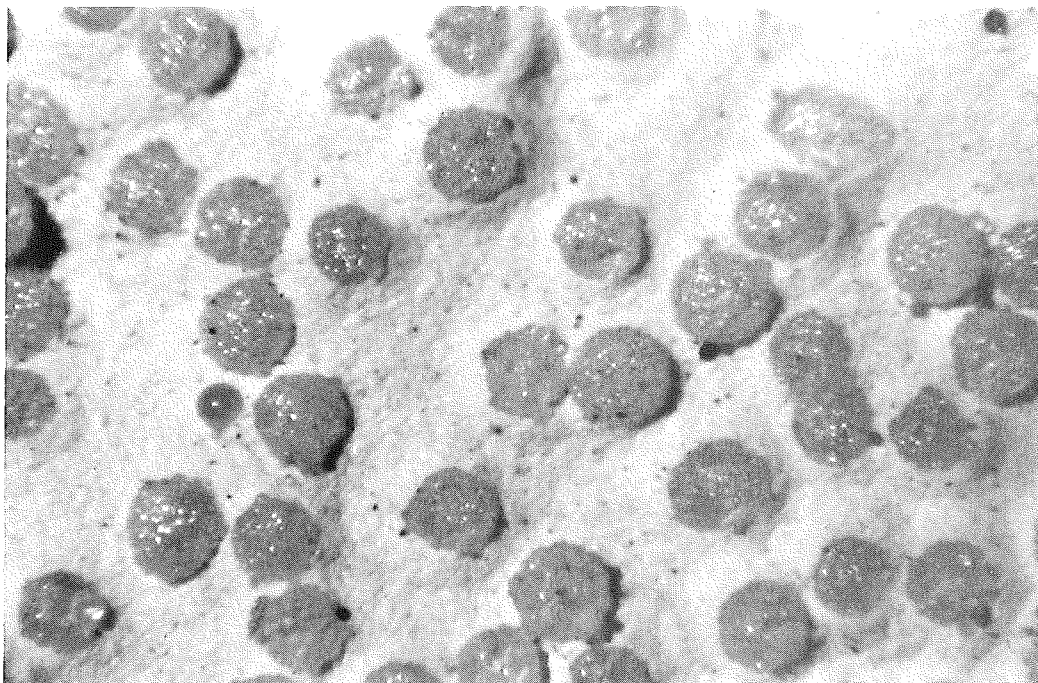
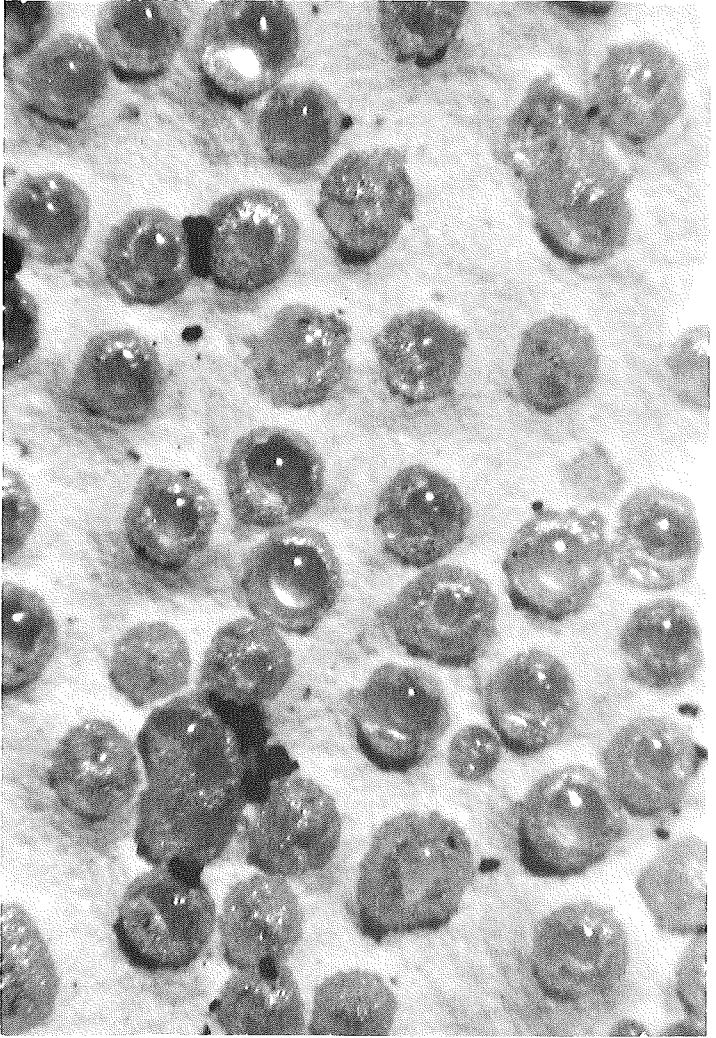


Figure 2. Appearance of Snow-Glow beads (Phases 1 and 2 tests) dropped on paint before exposure to traffic.



▶ Figure 3. The same beads after exposure to traffic on the wear track show dislodgement of microspheres off the dome of the cores, as claimed by the producer.

▶ Figure 4. Appearance of Snowfast preformed markings after over 13 months service on northbound US 27 in north St. Johns. The test 10-ft markings laid down in skip areas of broken centerline (Note: one marking just below transverse road joint showed about 50 per-cent loss during test period).

