

Commonwealth of Pennsylvania
Department of Transportation

SPECIFICATION FOR GLASS BEADS

September 24, 2015

1. **SCOPE.** This specification covers coated glass beads for application with traffic paint, epoxy or other pavement marking materials to improve the night visibility of the lines.
2. **GENERAL REQUIREMENTS.** Glass beads shall conform to AASHTO M247, except as follows:

2.1 Gradation. Glass beads shall have the following percent beads passing the specified sieve:

Sieve No.	Glass Beads Passing the Specified Sieve (%)				
	Type A	Type B	Type C	Type D	Type E
10	—	100	—	—	—
12	—	95-100	100	—	—
14	—	80-95	95-100	—	100
16	100	10-40	80-95	100	—
18	—	0-5	10-40	—	65-80
20	—	0-2	0-5	95-100	—
25	—	—	0-2	65-90	—
30	75-95	—	—	—	30-50
35	—	—	—	10-45	—
50	15-35	—	—	0-10	0-5
100	0-2	—	—	0-5	—

2.2 Roundness. Provide glass beads with a minimum of 75% true spheres overall, a minimum of 70% true spheres per sieve, and no more than 3% angulars overall. Type E beads must meet a minimum of 80% true spheres for all sieve fractions when measured by AASHTO T346.

3. **Coating.** Supply Type A, B, D and E glass beads with coatings to enhance moisture resistance, embedment and adherence with the binder. Supply Type C glass beads with coatings to enhance embedment and adherence. Coatings shall be evaluated to referee methods in AASHTO T346.
4. **Color-Clarity.** Beads shall be colorless/clear and visually free of carbon residue and/or inclusions containing no greater than 0.004% carbon by weight when measured by ASTM D4239 combustion infrared.
5. **Refractive Index.** Minimum 1.51 by oil immersion or equivalent method premeasured by AASHTO T346.

6. **Air Inclusions.** <5% by visual inspection.
7. **Hardness.** All beads above the 30 sieve shall exhibit an average hardness of C70.5 when measured using the Rockwell C scale method with a minimum sample of 100 glass beads.
8. **Crushing Strength.** Beads above the 30 sieve shall exhibit an average crushing strength of not less than 60,000 psi when measured with L/D² method with a minimum sample of 100 glass beads.
9. **Chemical Resistance.** Chemical resistance to hydrochloric acid, water, calcium and other chlorides and sodium sulfides tested as outlined in sections 4.3.6 to 4.3.9 of TT-B Federal Spec. 1325C.
10. **Performance Properties.** The Department will also benchmark bead performance properties using methods referenced in NCHRP Report 743 to ensure continued quality and retroreflectivity in markings.
11. **Recycled Postconsumer Glass.** Recycled postconsumer glass shall be incorporated into glass used for beads at a minimum of 2% for direct melt processes up to a maximum of 100% by weight for non-direct melt production. Type E beads shall contain a minimum of 50% of direct melt glass.
12. **PACKAGING FOR DEPARTMENT PURCHASES.** Glass beads shall be furnished in 50-pound (22.68 kg), moisture-proof bags or in 2,000-pound (907.2 kg), moisture-resistant, reusable cardboard boxes, whichever the Department designates conforming to AASHTO M247 packaging and marking requirements. Each skid shall have 2,000 pounds (907.2 kg) of glass beads and the entire skid shall be shrink-wrapped
 - 12.1 **50-pound Bags.** Paper for the 50-pound (22.68 kg) bags to be pinch bottom open-mouth type constructed of four layers of 50# natural Kraft paper with a 0.008" high-density polyethylene liner to retard moisture.
 - 12.2 **2,000-pound Boxes.** Cardboard boxes for beads ordered in bulk shall be rectangular or square and hold 2,000 pounds (907.2 kg) each. They shall be constructed from a one or two-piece outer container with either a cardboard inner liner or laminated layer for added strength. A polyethylene liner is required for moisture-resistance in addition to the inner liner. A corrugated slip-sheet shall be inserted inside the polyethylene liner to hold the liner in place for bead removal. Boxes shall not be wax coated so that they are acceptable for recycling.



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