Preparation and Placement of Glassphalt

Material: Recycled Glass

Issue: *Glassphalt has been used since the early 1970's as an alternative to conventional hot-mix bituminous asphalt pavement. In order to meet roadway pavement standards, glassphalt must be properly mixed and placed, requiring some modifications to generally accepted asphalt procedures. For a discussion of the general issues and economics of glassphalt, see the* Recycled Glass in Asphalt *Best Practice*

Best Practice: Glassphalt is basically the same as conventional hot-mix asphalt, except that some percentage of the natural aggregate is replaced with crushed glass. The glass must be properly cleaned and crushed, and combined with the natural aggregate, preserving agents, and bitumen in their specified proportions. The glassphalt is then placed and compacted. This best practice briefly describes protocols for the preparation and placement of glassphalt meeting the requirements for medium traffic specified by The Asphalt Institute.

The glass should contain less than 2% by weight of metal, plastic, or other miscellaneous debris such as paper and food residue. Previous studies have found that 2% of debris on a weight basis is equivalent to about 10% to 15% debris content obtained using a two-dimensional visual inspection method. This inspection method is relatively easy to perform in the field and should be considered for glassphalt applications. Details of the visual inspection method are in the *Visual Inspection for Recycled Glass Construction Aggregate* Best Practice.

Acceptable gradations for the glass within the asphalt will be determined by the purpose of the glass aggregate in the mix. For surface course, glass aggregate graded to 3/8-inch and finer is recommended. Particles larger than 3/8-inch have a tendency to align themselves parallel to the road surface during placement and can lower the skid resistance. For traffic conditions above 40mph, glassphalt with glass particles larger than 1/2-inch can have a skid resistance 5% lower than that of conventional asphalt [(1)]. Larger particles also more easily strip out of the surface. If the glassphalt is intended for a base coarse, particles up to 3/4-inch in size may be used. Glass in larger sizes than 3/4-inch can contain entire bottlenecks, which can be a safety hazard. Larger glass pieces are also more difficult to screen for contaminants.

Once reduced to the desired size, the glass aggregate is blended with the natural aggregate to obtain a uniform glass/natural aggregate mix prior to mixing with the other asphalt components. The proportion of the components can follow the Marshall Mix Design Method for conventional asphalt, as specified by the Asphalt Institute. Mixes containing 20% or less by weight of glass are recommended in order to meet the Marshal property requirements for medium traffic (40mph or less).[1] These properties include stability, flow, percent air voids, and percent voids in mineral aggregate.

All types of asphalt paving face the possibility that the bonding of the asphalt to the aggregate will deteriorate under adverse conditions, particularly water exposure. Weakening the bond will cause the aggregate to

"strip" from the asphalt, increasing the potential for premature failure. The smooth surfaces of glass result in a higher stripping potential than natural aggregate. This is especially true when the glass particles are larger than 3/8-inch in size. Experience suggests that stripping may not be a problem when particles are smaller than 3/8-inch, or when the glass content is less than 10% by weight. However, an anti-stripping agent should be used anyway, especially in surface course glassphalt. Hydrated lime and calcium hydroxide are successful anti-stripping agents when 1% by weight is added to the mix. Manufacturers' instructions should be consulted when using specific brands.

The aggregate, glass and anti-stripping agent should be mixed so the glass and anti-stripping agent are uniformly distributed. This mixture is then combined with the sand and asphalt in the same manner as with ordinary hot mix asphalt.

Glassphalt can be installed using the same equipment and procedures as conventional asphalt. Because glass holds heat longer than natural aggregate, glassphalt cools slower than conventional asphalt. Consequently, glassphalt should be allowed to cool longer before beginning compaction. A 24-hour waiting period is recommended before traffic is allowed on the new glassphalt.

Implementation: Before a decision is made to use glass in asphalt, operational issues and modifications to customary procedures should be completely understood. Pilot projects in glassphalt have often yielded unsatisfying results because inadequate provisions were made for the proper handling of the material and incomplete planning was done to capture the relevant data.

Benefits: Under the right economic circumstances, and with proper technical expertise, specification roads, especially those designed for medium traffic, can be made using glass as a portion of the fine or coarse aggregate in asphalt. The economics of glassphalt are a local issue and generally rely on recognition of the value of waste diversion.

Application Sites: Glass suppliers, asphalt plants, paving sites, and testing laboratories.

Contact: For more information about this Best Practice, contact CWC, (206) 443-7746, e-mail info@cwc.org.

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