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SYNTHETIC AGGREGATE SEAL COATS— CURRENT TEXAS HIGHWAY DEPARTMENT PRACTICES

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Synthetic Aggregate Seal Coats—Current Texas Highway Department Practices

by

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This summary report describes initial work under Research Study 2-6-71-83, "Synthetic Aggregates for Seal Coats—An Exploratory Study," which involved a review of current Texas Highway Department design and construction practices together with a definition of the problems associated with the use of synthetic aggregate for seal coats.

Personal visits, questionnaires and a review of available literature were utilized to identify current synthetic aggregate seal coat design and construction practices utilized by the Texas Highway Department. Problems associated with the performance of seal coats utilizing synthetic aggregates for coverstone are defined in the main report. Poor performance associated with wet aggregates and degradation of aggregates is mainly responsible for poor results observed in the field. Suggested solutions of these problems are presented including: control of aggregate quantities, rolling practices, design for traffic density, traffic control, and construction timing relative to existing environmental conditions.

Implementation Statement

Information obtained indicates that alteration of certain construction techniques and design methods will offer a better opportunity for synthetic aggregate seal coats to be placed successfully. Most of the suggested construction practices are utilized on a limited basis throughout the state. Increased awareness and conformity to these practices should increase the probability of success of the construction project.

Additional information to be collected during the remainder of this project will afford the opportunity to more accurately define the limits under which these improved construction and design practices need to be practiced.

Summary

Information collected from personal visits to Texas Highway Department district offices, field observations, and detailed questionnaires indicates that many problems associated with poor performance of synthetic aggregate seal coats can be traced, in large measure, to moisture present in aggregates and degradation of the aggregate during construction and in the first week of service.

Certain design and construction techniques can be utilized to reduce some of these problems and thus increase the proba-

bility of constructing a satisfactory surface. These items are summarized below:

1. Avoid construction, if rainfall is likely during construction or within 24 hours after construction.

2. Control traffic speed or preferably detour traffic around the freshly sealed surface if rainfall is likely and construction must proceed.

3. Limit lightweight aggregate usage to conditions such that a sufficient bond will be established between the aggregate and asphalt prior to allowing high speed traffic on the facility. Traffic control during and for a short period after construction should be practiced to allow development of adequate bond between the asphalt and stone.

4. The use of steel wheel rollers should be avoided.

5. Aggregate quantities utilized should be at a minimum. Excess aggregate on the roadway which is not removed by brooming will degrade under traffic and is a factor in dislodging loosely attached material.

6. The possibility of using maximum asphalt quantities to provide deeper embedment together with the use of harder asphalts should be considered.

7. The use of synthetic aggregate seal coats on high traffic volume roads and in certain urban areas where traffic turning movements are expected should be discouraged until sufficient information has been developed to justify the use of such material under these conditions.

8. For an aggregate of fixed quality, a reduction in the average particle size improves the resistance to degradation during construction and early service life. Dislodgement of the aggregate is also minimized.

The Texas Highway Department in cooperation with researchers of the Texas Transportation Institute have made detailed studies of Texas' experience with synthetic aggregate used as coverstone for seal coats and surface treatments and based on these studies have made several suggestions which are expected to result in improved performance.

Early use of synthetic (lightweight) aggregate coverstone dates from 1961 in Texas and to date many thousands of miles of highways have been "skid proofed" with this material; however, for various reasons problems have been in evidence on a limited number of jobs. A summary of the problems and the associated suggested corrective measures follows.

Aggregate degradation or the manufacture of fines during transporting, handling, construction and service under traffic has been a problem for certain materials and conditions. A reduction in the amount of degradation has been brought about by:

a) Improved quality control at the point of manufacture,

b) Better definition of the physical requirements of the aggregate for this service,

c) Restricted use of plus 5/8-inch material,

d) Improved construction controls,

e) Minimal application rates of coverstone, and

f) Use of pneumatic rollers only.

Other problems associated with poor performance of synthetic aggregate as coverstone include:

a) Use of wet aggregate under environmental conditions that do not allow establishment of adequate bond before the surface is released to traffic,

b) Rainfall within 24 to 36 hours after application of the cover aggregate, and

c) Release of the newly placed material to high speed traffic or traffic involving cornering, acceleration, etc.

The study shows that the above listed problems can be greatly minimized by selected corrective measures. For example, wet materials can often be used by delaying construction starting time until the air temperature rises and the humidity drops. Increased wind velocity is also desirable. By maintaining contact with local weather forecasters the engineer can minimize the possibility of hindrance from rain. And the use of pilot cars for traffic control greatly reduces damage to newly placed coverstone, whether synthetic or natural aggregates are used. Under severe conditions complete removal of traffic may be advised for such time as is required for adequate bond to develop between the stone and the binder.

Of all the factors listed above aggregate degradation under traffic immediately after the surface is released to service probably causes the most spectacular distress, and as has been pointed out, use of an excess of coverstone is a major contributing factor. For aggregate sized predominantly between the 1/2-inch and the No. 4 sieves a cover rate of 1:130 (cubic yard per square yards) or less is necessary to avoid stacking. For aggregates of low crushing strength stacking must be eliminated if at all practical. Stacking occurs when the rate of application is such as to produce coverage greater than one stone deep on the surface.

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