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INTERIM REPORT ON THE USE OF EXPANDED SHALE AND PRECOATED LIMESTONE AS COVERSTONE FOR SEAL COATS AND SURFACE TREATMENTS

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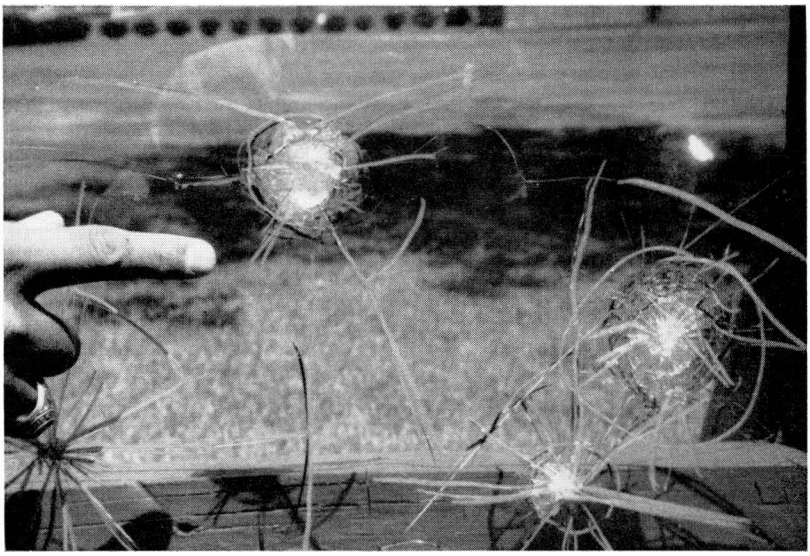

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Interim Report on the Use of Expanded Shale and Precoated Limestone as Coverstone for Seal Coats and Surface Treatments

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The recent introduction of lightweight aggregate as a coverstone for seal coats and surface treatments was prompted by predicted improved construction and service characteristics of the material. The Texas Highway Department during 1963 and 1964 accepted synthetic (lightweight) aggregate as an alternate to precoated crushed limestone as a cover material for seals and surface treatments placed in Districts 2, 8, 18, 23 and 25.

The use of seal coats with and without cover aggregate dates back many years in the maintenance programs of highways and city streets of the United States and many other countries. Construction procedures vary widely with the many different groups who are responsible for the use of this maintenance tool. Some of these are rather simple while others are quite detailed; however, as a general statement it has not been possible to eliminate the need for experience and good judgment in the successful design and construction of this type of surface.

Due to the very widespread use of this maintenance tool and the many variables that may exist with respect to its successful use, it is not surprising that errors are made, although these errors are not readily apparent at the time of construction. And, indeed, in certain instances it is not practical to eliminate potential errors in limited segments of a given road. For example, it is a well-known fact that many farm-to-market roads have numerous sharp curves for which it is not practical to make adjustments in asphalt application rates. Up grades present similar problems. Natural variations in the precise nature of the surface being repaired is another case in point. Many roads, when they finally receive a seal coat, have been patched and in some cases sections have been completely rebuilt. This presents wide variations in the demanded rate of asphalt and/or coverstone application; yet, the normal construction procedures do not take these variations into account.

The subject summary deals with laboratory tests and field evaluations effected to determine whether or not selected lightweight aggregates might be accepted as equal to precoated

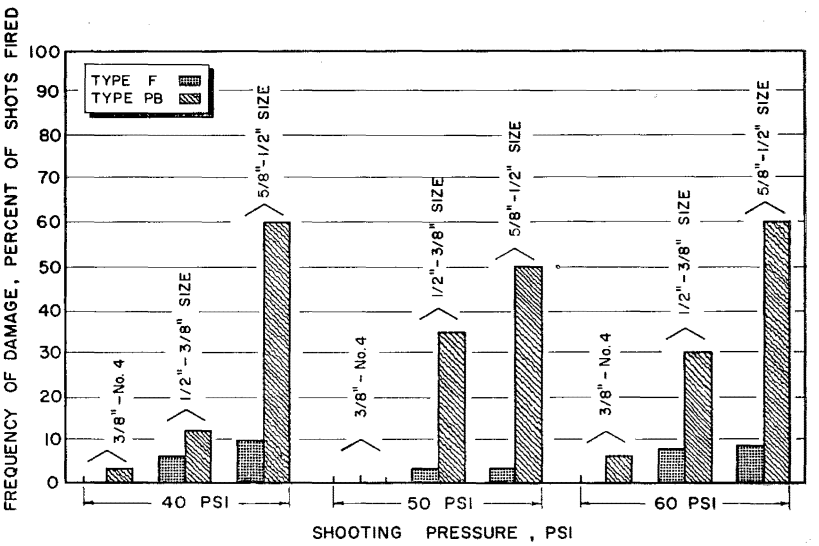

Figure 1. Comparative damage to windshields for type F and type PB aggregate shot at different pressures.

"heavy" material for coverstone in seal coat work. For the materials under study the data show that:

1. The dry loose unit weight of the expanded shale was in the range of 42 to 49 pcf.
2. Laboratory design of seal coats, preparatory to construction, results in improved over-all economy.
3. Laboratory studies and field observations showed that the lightweight material had a strong affinity for all the asphalt cements used in the project. Pavement marking materials also bonded favorably.
4. Rolling with the steel roller caused undesirable degradadation whereas the pneumatic roller seated the stone effectively with practically no damage.
5. Laboratory induced windshield damage was practically insignificant for the lightweight material; while, similar tests showed that the precoated limestone caused a high frequency of glass breakage. See Figure 1.
6. The Texas and the Louisiana modifications of the Los Angeles abrasion test were found to cause a higher loss than the ASTM standard test.
7. The weighted average loss caused by 100 cycles of rapid freezing and thawing caused losses of 6.5 and 3.1 percent for Grades 3 and 4 respectively.

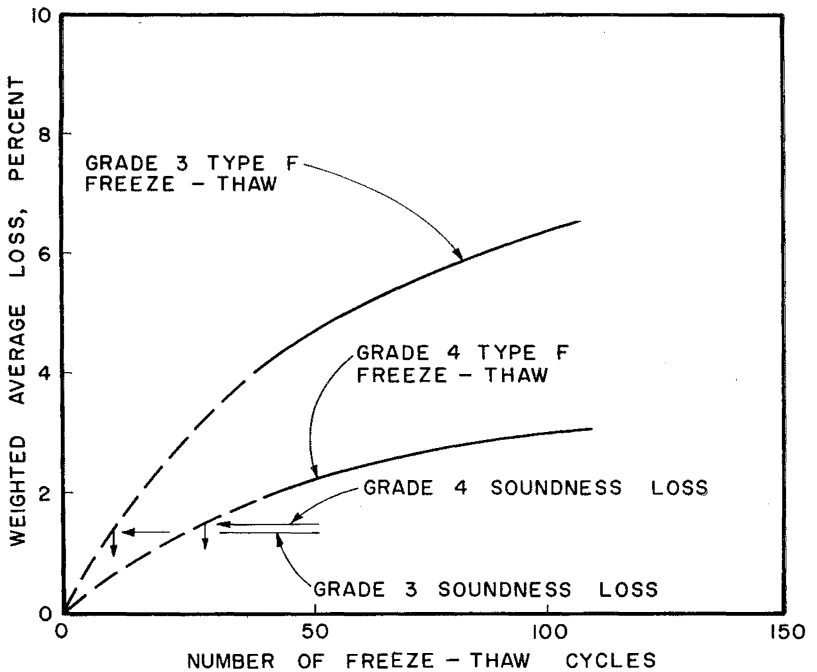

Figure 2. Comparative freeze-thaw and soundness losses.

8. For the same grades of material the maximum weighted average loss in the ASTM standard sulfate soundness test was 1.6 percent. These losses are compared in Figure 2.
9. Volume of vehicular traffic appears to have a very minor effect on the degradation of the particular lightweight material under study. With the exception of a few bridges, the material was not placed directly on rigid pavements. In isolated cases where lightweight aggregate was used as coverstone on seals for spalling bridge decks, performance has been good.
10. Under a variety of construction and service conditions the lightweight material under study has, so far, proved to be a highly successful cover aggregate for seals and surface treatments.
11. Lightweight aggregate has been favorably accepted by contractors and THD personnel throughout the area in which it was used. Loaded trucks create less damage to the road and shoulders. Equipment repairs are reduced and hand handling of the material causes less fatigue to construction personnel.

What the Future Promises

Lightweight aggregates manufactured in Texas supply a market of about 4000 cubic yards per day with a major share of these aggregates going into structural grade lightweight concrete and building blocks. A state seal program of 4000 miles per year offers a possible 25 percent increase in cover aggregate demand and this is only a small fraction of the potential for lightweight materials in bituminous pavements and stabilized bases.

Present research and field trials indicate that high quality hot-mix can be produced using large quantities of synthetic aggregates. Suitable mixes have been designed and produced for surface course, base, and patching and some of these designs have excellent service records of five years or more. Synthetic aggregates have been successfully used in combination with sandy clays as water bound bases. In such uses unit weight of the aggregate is a minor factor.

Synthetic aggregates used in seals and surface course designs offer a relatively new tool of considerable merit to the traffic engineer; this tool is color dynamics. By proper selection of raw materials and controlled burning techniques, specific and highly stable colors may be produced. Some work on colored pavements has been going on for several years but products to date have been rather expensive. Colored synthetic aggregates appear to offer a solution to this problem.