

Laboratory Studies With Bituminous-Sand Mixtures

W. H. GOETZ, Research Engineer
J. M. RICE, Graduate Research Assistant
Joint Highway Research Project
Purdue University

SYNOPSIS*

The purpose of this study was to investigate by means of laboratory tests the suitability of local Indiana dune, lake, and gravel-pit waste sands for low-cost bituminous road construction. The natural surface sands occur in widespread deposits in the Kankakee Lake-Bed Basin, the Lake Michigan Dune Sand Region, and, to a lesser extent, along portions of the Wabash and White rivers in southern Indiana. Extensive granular deposits which may yield waste sands are associated with the major streams flowing through the glaciated region of the state. In the northwestern section of the state where the surface sands are widespread, neither gravel nor crushed stone is readily available. While other states lacking good aggregates have found it *necessary* to utilize such fine sands, Indiana might be able to utilize these sands as an *economical* source for secondary road materials.

Several samples of the various types of sands were obtained from the field, analyzed to ascertain their distinctive characteristics, and then mixed with a rapid-curing liquid asphalt. The mixtures were compacted into two-inch by two-inch cylindrical specimens, cured for five days, and tested in compression to determine relative strengths. To compare the water resistance of the mixtures, the compressive strength and water absorption were measured after five-days immersion in water. Calculations of density and percentage of voids were also made to observe variations in mixtures.

Similar tests were made on mixtures of representative samples of the dune, lake, and waste sands with varying amounts of asphalt and

* Reprints of the complete paper, appearing in the Association of Asphalt Paving Technologists Proceedings, 1949, may be secured from the Joint Highway Research Project, Purdue University. Since it has been printed elsewhere, we are omitting it here in the interest of economy.

limestone-dust filler. Other variables investigated were the types of filler and of asphalt, and additions of coarse sand and of mixing water.

By subjecting several of the mixtures to the Hubbard-Field Stability Test it was possible to compare the compressive strength with an established criterion for pavement mixtures. Additional testing variables investigated were the specimen height, the compactive effort, and, to a limited extent, the testing temperature.

The results indicate that, of the surface sands, the Kankakee lake sands show the most promise for use in sand-bituminous construction, while the Lake Michigan dune sands and the windblown river sands are inferior, though for different reasons. The gravel-pit waste sands may also be utilized, though their variability precludes any general conclusion.

A design chart has been prepared for the lake sand to show in general the desirable proportions of sand, mineral filler, and bituminous binder.