

ASPHALT ANSWERS

by Prithvi S. (Ken) Kandhal, P.E.

Restricted Zone in Superpave Specification

When a mix satisfies the Superpave volumetric and fine aggregate angularity criteria, the restricted zone criteria appear to be redundant as a requirement to assure adequate rut resistance, according to tentative conclusions from National Cooperative Highway Research Program (NCHRP) Project 9-14, "Investigation of Restricted Zone in the Superpave Aggregate Gradation Specification." This project is being conducted by the National Center for Asphalt Technology (NCAT).

The findings appear to bear out the contention of some highway agencies and suppliers who say it is possible to produce hot-mix asphalt mixes that perform well with aggregate gradations that fall within the restricted zone.

In the NCHRP 9-14 study, NCAT researchers compared five 9.5-mm NMAS (nominal maximum aggregate size) gradations. Three of the gradations violated the restricted zone, and the two control gradations fell outside of the restricted zone.

The performance of the mixes with various factor-level combinations meeting all volumetric requirements was evaluated on the basis of performance-related mechanical tests. Because the primary purpose of the restricted zone is to avoid rut-prone mixes, the mixes in the study were evaluated for their rutting potential. Two different types of tests

accomplished this: empirical and fundamental. For the empirical test, the Asphalt Pavement Analyzer, which is a loaded wheel tester, was used. The Superpave shear tester and the repeated load confined creep test were used as fundamental tests. Part 1 of the study tested the performance of the 9.5-mm mix and one compactive effort (N design = 100 gyrations). Part 2 involved the same 9.5-mm NMAS mix but two additional compactive efforts (N design = 75 and N design = 125 gyrations).

Parts 1 and 2 have been completed, and results of the three mechanical tests used for evaluation showed similar trends in terms of permanent deformation. In these tests, the gradations violating the restricted zone did not necessarily result in higher rut depths compared to the gradations complying with the restricted zone. Part 3 of the project is currently under way. It involves a 19-mm NMAS mix and two compaction levels (N design = 75 and 100 gyrations).

It is expected that Part 3 also will most likely indicate the redundancy of the restricted zone as seen in Parts 1 and 2. The entire project is scheduled for completion by March 31, 2001. ^{RB}

Kandhal is associate director of the National Center for Asphalt Technology at Auburn University. You may contact him in care of the editor.