GRADING OF PAVING ASPHALTS BY VISCOSITY AT 140 F VERSUS PENETRATION AT 77 F

Introduction

During the past five years, a strong movement has been underway to change the system of "grading" asphalts from arbitrary penetration units at 77 F to absolute viscosity units at a test temperature of 140 F. It is argued that 140 F represents a critical service temperature in asphalt pavements and that its use would tend to minimize viscosity differences at higher and lower temperatures among asphalts of different temperature-susceptibility relationships. Asphalts are also fluid enough at this temperature to permit quick viscosity tests using capillary viscometers.

The opposing view held by many is that abandonment of the penetration value at 77 F will result in the loss of many years of accumulated field experience; that the critical performance characteristics of an asphalt may not be related to the critical service temperature of 140 F; and that the ramifications of these factors have not been fully explored.

The symposium held at the 69th annual meeting was an attempt to bring forth all the issues for a thorough review and discussion. Participants were selected to insure that both sides of the argument would be fully represented. Although the program was well balanced from this standpoint, there did arise considerable confusion because the question proved to be much more involved than anticipated, especially when each side endeavored to relate its system for grading asphalt to the behavior characteristics of asphalt-aggregate paving mixtures during various stages of mixing, compacting, and service life.

Five formal presentations were made by individuals recognized as knowledgeable in this area. Hawthorne favored the adoption of the grading of asphalt by viscosity at 140 F and expressed the view that this system would substantially eliminate variations in the handling characteristics of paving asphalts in the field, particularly during construction operations. Welborn, in a more philosophical treatment of the subject, also favored the use of a viscosity measurement in fundamental units at 140 F for grading asphalts because absolute viscosities provide a sounder basis for future research directed toward the development of optimum specifications.

McLeod opposed the proposed change in the system for grading asphalt citing as his main tenet that the adoption of grading by viscosity at 140 F would in effect wipe out all past experience relating asphalt con-

sistency to long-term pavement performance. He suggests that absolute viscosity measurements at 77 F would both provide the fundamental units desired and retain the records of past experience. Chaffin, in reporting on experience gained by the Texas Highway Department with viscosity grading at 140 F, stated that there was no particular gain in using 140 F and that 77 F would be a better choice of temperature for determining absolute viscosities for grading purposes. He also expressed concern over the possible sacrifice of durability to achieve no apparent benefits.

Santucci and Schmidt demonstrated quite convincingly that there is a better relationship between viscosity at 140 F after aging in the rolling thin film oven and setting qualities of paving asphalts. Although this approach does not meet the argument directly, it does suggest the need to examine the question as to the state of aging of the asphalt at time of testing. Aging the asphalt prior to testing to simulate its state in a hot-mix after discharge from the pug-mill may prove to be necessary in order to correlate asphalt properties with behavior characteristics of the asphalt in service.

The symposium served a useful purpose even though it raised more questions than it answered. It certainly did bring forcibly to the attention of all segments of the asphalt industry that careful re-examination should be given to the question of how best to achieve the goal of utilizing absolute measurements of asphalt viscosity in an effective grading system.

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