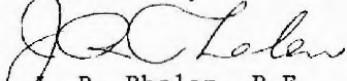



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RESEARCH UPDATE

NUMBER 88-1

CARBON BLACK MODIFIED PAVEMENT

REFERENCE

Research Investigation P85-4, Work Plan 86-R-8

HISTORY

A 3500'± section of Route 7 paved in 1979, Court Street in Middlebury, developed distress in the form of rutting and shoving shortly after placement. By June of 1985, rutting in the wheelpaths averaged 10/16" with maximum values of 1-11/16". An investigation completed in July 1985 (P85-4) concluded that the pavement distress was the result of a number of factors, but that the major cause was due to instability of the plant mixed base course. Corrective action, in the form of complete removal and replacement of all bituminous courses in the area of the School Street intersection, was recommended. In 1986, a decision was made to reconstruct the School Street intersection and a similar area at the intersection of Charles Avenue.

Modifications in the standard paving procedures and materials were specified in an attempt to determine what would be required to rehabilitate the entire project in future years. The modified construction was carried out under project number MIDDLEBURY F019-3(39)S in August and early September, 1986. The procedures and materials specified were as follows.

Experimented Feature - Use of carbon black modified mix at Charles Avenue with control section at School Street.

Construction Area - 600'± at each location.

Pavement Removal - Remove existing pavement courses in 25' steps with full removal over mid-section.

Asphalt Grade - AC 20 in all mixes.

Application Rate of Modifier - Add carbon black (MICROFIL 8 by Cabot Corp.) at the rate of 25#/ton, reduce bitumen content by 15#/ton to accommodate the addition of the carbon black.

Pavement Typical - Substitute two 2-1/2" courses of Type I for the standard plant mixed base course - complete replacement with 1-3/4" Type II and 1-1/4" Type III.

Mix Design - Substitute 75 blow Marshall test criteria for the standard 50 blow requirement.

Stability Requirements - Increase from the standard 1000 lb. to 1500 lb. for Type I and 1800 lb. for Types II and III.

Aggregate - If crushed gravel is used, increase requirement for fractured faces from 50% to 100% of all material coarser than the #4 sieve.

Special Requirements - Keep traffic off individual bituminous courses until the mat has cooled to the ambient temperature.

There were no significant problems encountered during the production of the experimental and control mixes or during their placement. The stabilities of the control mixes averaged 2355 lbs. for Type I, 2353 lbs. for Type II and 2540 lbs. for Type III. The mixes with carbon black added produced stabilities averaging an additional 1150 lbs. for Type I, 1014 lbs. for Type II and 592 lbs. for Type III. In general, the traffic was not allowed on the new pavement courses until the surface temperature had dropped to 100°F± and interior temperatures were in the 115°F to 125°F range.

STATUS

The test sections were examined for signs of distress or rutting on October 27, 1987, after one year of service. A single diagonal crack was noted in the pavement modified with carbon black. Rut measurements taken in the same section averaged 2/16" at four of twelve locations where not more than 1-1/2" of pavement had been milled off. Where 3" or more of the pavement had been replaced five of fourteen locations disclosed an average rut depth of 1/16" with the remaining nine free of rutting. On the control section, two of four locations disclosed 1/16" ruts where only 1-1/2" of the pavement had been replaced. Where 3" or more of the pavement had been replaced, thirteen of eighteen locations disclosed a measureable rut depth with the values averaging 1/16".

SUMMARY

Preliminary observations and field measurements made through the first year of service suggest that both the carbon black modified and the control pavement have sufficient strength to resist the rutting and deformation experienced earlier at the same locations. The performance of both mixes in areas where only 1-1/4" to 1-1/2" of pavement was replaced suggests full depth removal may not be necessary on the remaining 2300'± of distressed pavement on Route 7. At least one more year of evaluation is recommended prior to making a decision on the procedures to be followed for reconstruction of the remainder of the project.

PROJECTION

A complete detailed initial report will follow. Field monitoring will continue on the project.

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