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RESEARCH UPDATE

U95-4

REHABILITATION OF U.S. ROUTE 2 IN CONCORD, VT.

References:
Work Plans 84-R-5, 84-R-6, 84-R-7, Research Report 93-4

HISTORY:

In an attempt to address a variety of problems on a segment of US Route 2 in Concord, Vermont, the Vermont Agency of Transportation initiated a rehabilitation project during the autumn of 1983. The identified cause for the deterioration of the existing pavement was a high percentage of fines in the subbase material which resulted in capillary action leading to moisture conditions in the subbase and a weakened pavement structure. This condition was exacerbated by high water tables. Another cause may have been the poor quality of the existing penetration macadam subbase. These distress conditions existed and undoubtably contributed to the failure of the pavement, but the fact that US Route 2 has an average daily traffic (ADT) of 4000 with heavy trucking usage also accelerated the decline.

Funding limitations precluded the replacement of the subbase material. The solution finally selected by the Agency included hammermilling (Bell and Flynn Process) the existing pavement to a depth of 203 mm (8 in), resurfacing with a 44 mm (1.75 in) binder course and a 38 mm (1.5 in) wearing course of bituminous concrete pavement. Edge drains were also designed to alleviate the moisture problems.

Construction did not commence until late autumn of 1983, and for that reason only the initial 44 mm binder course was constructed prior to the onset of winter and only 2.49 km (1.55 mi) of the project, which began at km 6.585(MM 4.092) and continued easterly for 6.907 km (4.292 mi) to km 13.492 (MM 8.384), was completed in 1983. The plan at that time was to place the 38 mm wearing course on the completed section and complete the remainder of the construction the following spring.

Serious problems with the new construction became apparent the following spring with severe rutting and load related cracking. Because of the problems with the initial construction, the decision was made to reconstruct all but the first 0.483 km (0.3 mi), which seemed to be less affected by the previously mentioned failures.

The new design included a 152 mm (6 in) gravel interlayer over all but the first (0.3 mi) of the project, and paving with a 76 mm (3.0 in) of plant mix base course, and a wearing surface of 38 mm (1.5 in) of bituminous concrete pavement, type III. Underdrain was also placed in the particularly wet cut areas. Finally, test sections were selected for

the placement of three experimental geotextile fabrics, MIRAFI MCF 500, TREVIRA S1115 and PETROMAT. The fabrics were designed to prevent the ingress of surface moisture through pavement cracks as they developed and expanded over time.

EXPERIMENTAL AND CONTROL TEST SECTIONS:

Evaluation of the various design features incorporated in this project will be based on performance at the test sections described below:

TEST SECTION 1A - Located at the beginning of the project, where the original rehabilitation (hammermilling) treatment was left intact.

TEST SECTION 1 - This is a control section which includes all of the revised design of the revamped 1984 project. It is located at km 11.123 (MM 6.912).

TEST SECTION 2 - This is the MIRAFI MCF 500 test section. It is located at 11.154 km (MM 6.931)

TEST SECTION 3 - This is the TREVIRA S1115 test section which begins at approximate km 11.338 (MM 7.045)

TEST SECTION 4 - This is the PETROMAT test section, which begins at approximate km 11.457 (MM 7.119).

TEST SECTION 5 - Another control section which includes all of the 1984 revised design begins at approximate km 11.578 (MM 7.194).

PERFORMANCE MONITORING:

Additional cracking and rutting data were taken on 19 May 95. The most recent MAYS data were taken on 21 Jun 95.

1993 & 1995 PAVEMENT CONDITION DATA

*** Data not available	CRACKS m/100m (ft/100 ft)	RUTTING mm (1/16 in)	MAYS mm/km (in/mi)	STRUCT. NO.
TS #1A INIT.DES.				
1993	367 (367)	1 (1)	2052 (130)	3.9
1995	781 (781)	6 (4)	2178 (138)	***
TS #1 CONTROL				
1993	511 (511)	2 (1)	1894 (120)	3.5
1995	731 (731)	8 (5)	2004 (127)	***
TS #2 MIRAFI				
1993	1531 (1531)	2 (1)	1799 (114)	3.7
1995	1653 (1653)	6 (4)	2004 (127)	***
TS #3 TREVIRA				
1993	549 (549)	2 (1)	1847 (117)	3.8
1995	733 (733)	10 (6)	2036 (129)	***
TS #4 PETROMAT				
1993	587 (587)	1 (1)	2131 (135)	4.0
1995	745 (745)	9 (6)	2036 (129)	***

*** DATA NOT AVAILABLE

TABLE IS CONTINUED ON THE FOLLOWING PAGE

1993 & 1995 PAVEMENT CONDITION DATA (CONTINUED)				
	Cracks m/100m (ft/100 ft)	Rutting mm (1/16 in)	MAYS mm/km (in/mi)	Struct.No.
TS #5 Control				
1993	945 (945)	3(2)	2131 (135)	4.1
1995	1075(1075)	11(7)	2131 (135)	***

SUMMARY AND CONCLUSIONS:

An evaluation of the data collected on 19 May 95 suggests a continuation of the performance trends which were described in Research Report 93-4. Cracking on that part of the project where the original construction was left intact (west of the Moose River), still compares well with the rest of the project. It should be noted here, however that although crack counts in this section are relatively favorable, many of the cracks are quite severe. In addition, it was also noted during the field survey that there was recurrent rutting and longitudinal cracking in the right wheelpath of the eastbound lane for the first 2.4 km (1.5 mi) of the project. Generally this failure could be associated with the construction that included the gravel interlayer over the original rehabilitation construction of 1983.

Two of the three geotextile fabrics which were installed as moisture barriers, TREVIRA S1115 and PETROMAT are performing about as well as the control sections but don't seem to offer any improvement. The test section where the MIRAFI MCF 500 fabric was installed has continued to deteriorate at unacceptable levels. After eleven years of observation it would seem reasonable to conclude that the experimental use of geotextile fabrics has not provided any measurable improvement in ride or reduction of pavement cracking.

The use of a gravel interlayer was an effective solution for the problems on Concord, US Route 2. After eleven years the rehabilitated road is functioning satisfactorily.

FOLLOW UP:

Performance monitoring will continue until the useful service life of the improvement is reached and the cost effectiveness of the project can be established.

Severe longitudinal cracking in E.B. lane at the westerly end of the project. (both photos)