

MATERIALS & RESEARCH DIVISION

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November 17, 1994

RESEARCH UPDATE

Number U94-13

COLD IN PLACE RECYCLED BITUMINOUS PAVEMENT, IRASBURG, VT 14
(INITIAL REPORT)

PURPOSE: The Agency of Transportation is evaluating different types of paving techniques from the perspective of life cycle cost effectiveness. This report covers the first project done with the cold in place recycled (CIR) method, and is part of the ongoing Pavement Performance and Annualized Cost Study.

PROJECT: Irasburg, HMA 2843, on VT 14, beginning at MM 0.0 (Albany/Irasburg Town Line) and extending north 2.325 miles to MM 2.325.

CONSTRUCTION: Construction was carried out in June 1988 by Gorman Brothers, Inc. of Albany NY and was overseen by Agency maintenance personnel. The project was divided into two experimental areas. For the first 1.15 mile (MM 0.0 to 1.15) the old pavement was cut to a depth of 4", pulverized, screened and, after an addition of 2% asphalt emulsion (AE), was compacted in place. From MM 1.15 to MM 2.325, the same procedure was used, except the cut was 3" and 3% asphalt emulsion was added. An emulsion chip seal was then applied over the CIR surface by District 9 maintenance personnel. Problems with stone loss and raveling of the chip seal necessitated the application of a 3/4" bituminous concrete overlay during the fall of 1988.

EVALUATION: Initially, one test site (Test Site 1.8) was located on VT 14 at MM 1.80. The site was surveyed before and after construction, as well as during each succeeding year, for pavement cracking and wheel rutting. On Test Site 1.8 the crack count and rut readings were as follows (first 1988 readings are preconstruction information):

	1988	1988*	1989	1990	1991	1992	1993	1994
Cracks ft/100 ft	649	0	0	0	40	110	294	538
Ruts (1/16")	5	unk	2	3	4	4	4	5

*Postconstruction Information

During the 1994 survey, it was noted that approximately 119 of the 538 ft/100 ft in this test site were reflective. This accounts for 22% of the total number of cracks appearing since 1988.

In addition to these surveys, the Pavement Management Division measured the roughness of the road annually. The results of these readings are listed below (1988 readings are preconstruction).

MM	CIR	Roughness (in/mi)						
		1988	1989	1990	1991	1992	1993	1994
0.00 - 1.15	4"	219	117	136	160	165	131	153
1.15 - 2.30	3"	299	146	145	149	174	155	197

From the roughness values it would appear that the ride of the 4" CIR with 2% AE is more stable than the 3" CIR with 3% AE. It is unknown why the 1993 MAYS averages are much lower than those in 1992 or 1994.

Late in the summer of 1994, prior to a resurfacing operation by the Agency, 4 additional test sites were identified. Three were set up in the 3" cut area (MM 1.2, 1.7, and 1.9), and the fourth in the 4" cut area (MM 0.8). The results from a survey performed when these sites were established are as follows:

TS	CIR Depth	Cracks (ft/100 lft)	Ruts (1/16")
0.8	4"	194	2
1.2	3"	271	2
1.7	3"	307	4
1.9	3"	207	4

Although there is an absence of preconstruction information, the area of the 4 inch cut did have fewer cracks and less rutting than the 3 inch area. Unfortunately, the "sample population" is small, and due to the fact the majority of the test sites are in the 3 inch area, little else can be determined.

CORES: Cores were extracted in March 1993 and tested at the Agency's central laboratory. Four cores were tested with the following results:

MM	PAVT DEPTH	CIR DEPTH	% VOIDS	UNIT WEIGHT
.693	3/8"-5/8"	4"	10.0	141.1
.693*	3/4"	4"	12.0	138.3
2.62	3/4"	3"	10.2	139.7
2.62*	3/4"	3.25"	8.8	139.9

*Core Taken in Wheel Path

The data indicate that the CIR and the pavement depth are relatively uniform throughout the project and the compaction of the reclaimed pavement was adequate.

COST: The unit cost of the 3" CIR with 3% AE was \$3.49/yd², with the 4" CIR with 2% AE being \$3.44/yd². For comparison, Gorman Brothers has used the CIR method on 3 more recent projects which came to \$3.67/yd², \$3.07/yd², and \$2.12/yd² including the cost of the AE.

SUMMARY: The experimental cold in place recycle treatment on VT 14 shows promise, since the recycled layer had good densities and was resistant to rutting. However, areas of weakness were evident, as drainage and base problems, combined with a thin overlay design (3/4"), resulted in the need for partial retreatment after 6 years. District maintenance personnel resurfaced the road from MM 1.15 to MM 2.3, leaving the 4" CIR with 2% AE untouched. When the 4" CIR with 2% AE area is retreated a final report with cost/benefit analysis will be issued.