MONTANA DEPARTMENT OF TRANSPORTATION
RESEARCH PROGRAM
October 1995

EXPERIMENTAL PROJECT PROPOSAL FOR THE EVALUATION OF COLD IN-PLACE RECYCLING WITH AND WITHOUT A HOT MIX ASPHALT OVERLAY AS COMPARED TO HOT MIX ASPHALT OVERLAYS

Location:	Montana 66, Hays-North, 10 Miles North of Hays-North, and Maintenance Overlay, from MP 15.77 to 50 (Blaine County)
Project Number:	RTF 66-2(1)16 [2694], RTF 66-2(3)26 [2925], MT 66 Maintenance Overlay (PO # 304903)
Type of Project:	Cold In-Place Recycling with and without a Hot Mix Asphalt Overlay in Comparison to Two Hot Mix Asphalt Overlays
Principal Investigator:	Construction: Gary Berg/Engineering Project Manager Annual and Final Reports: Research Management Unit

Objective

The purpose of this study is to evaluate and compare the performance and cost effectiveness of a cold in-place recycle (CIPR), CIPR with a hot mix asphalt overlay, and two hot mix asphalt (HMA) overlays.

CIPR has many advantages as compared to the conventional HMA overlay as long as its cost effectiveness matches or exceeds that of the conventional overlay. In a CIPR, the old pavement is re-used; this results in the conservation of raw materials and a decrease in waste. Both of these factors reduce the cost of CIPR as compared to the conventional overlay. Also, the pavement structure can be improved without changing the geometry and without reconstructing the shoulders. Alternatively, the profile, crown, and cross slope of the old pavement can be improved. In addition, the production rate is high as compared to the conventional HMA overlay. If the depth of pulverization and reprocessing is adequate, reflection cracking and localized roughness should be reduced or eliminated. Finally, only a thin overlay or chip seal should be required on most CIPR projects.

CIPR may not always be the most effective treatment. CIPR is not recommended for use in areas that cannot accommodate the traffic volume during construction. It is also not recommended for use in cold, damp, or sunless conditions, or early or late in the season; these conditions might inhibit the breaking and curing of the emulsion.

Although CIPR is not recommended in all instances, the conditions in this area appear well suited to a CIPR.

Experimental Design

There are three projects in this study. The first project consists of a 61 mm (0.20') grade B 85/100 plant mix bituminous surfacing (PMBS) and a chip seal placed (1995) in both the north and southbound lanes on Montana 66 from MP 15.77 to 26. The second project consists of two features. The first part of this second project consists of cold recycling 61 mm (0.20') the existing PMBS with an emulsified binder agent, overlaying it with 46 mm of grade B 85/100 PMBS, and chip sealing. This feature was placed (1996) in both the north and southbound lanes of Montana 66 from MP 26 to 35. The second part of this second project consists of cold recycling 61 mm (0.20') the existing PMBS with an emulsified binder agent and chip sealing. This feature was placed (1996) in both the north and southbound lanes on Montana 66, from MP 35 to 36. The third project consists of a 31 mm (0.10') overlay using ½" plant mix and a chip seal. The overlay material was crushed and stockpiled in 1994 under project number SMP 399(94). This feature was placed (1996) in the north and southbound lanes on Montana 66, from MP 36 to 50.

The cold recycling operations were to be performed between May 15 and August 15 with the temperature 64.4°F (18°C) and rising. The placement restrictions in the special provisions allow for the CIPR to be constructed under favorable curing conditions.

Quicklime (1.5%) was added to the cold recycling process to increase the stability of the mix and accelerate the evaporation and moisture compaction requirements. Moisture requirements were met overnight.

The pavement design is as indicated in Figure 1 and Table 1. A minimum of three monitoring stations per test section will be established. Each station will extend 150_ on either side of its nominal delineator or milepost. Within the domain of each station, the annual evaluation will include crack counts, rut measurements, international roughness indices (IRI), and traffic data. Cores will be taken periodically, or at least at the end of the formal evaluation period.

Figure 1: Hays-North, 10 Miles North of Hays-North, and Maintenance Overlay

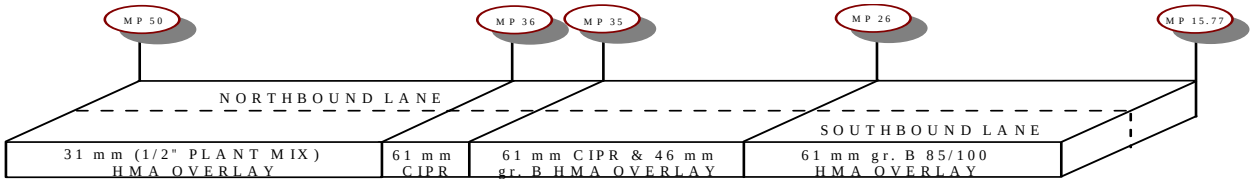

Table 1: Hays-North and 10 Miles North of Hays-North Layout

Location	Treatment
MP 15.77 to 26	61 mm HMA Overlay
MP 26 to 35	61 mm CIPR and 46 mm HMA Overlay
MP 35 to 36	61 mm CIPR
MP 36 to 50	31 mm Overlay with ½" Plant Mix

Estimated Quantities and Costs

Table 2 shows the cost comparison per mile (not including the chip seal) between the CIPR, CIPR and overlay, and the overlays. These values represent the actual total cost of construction for each section as reported for this project.

Table 2: Cost Comparisons

	61 mm HMA Overlay	61 mm CIPR 46 mm HMA Overlay	61 mm CIPR	31 mm HMA Overlay
Cost/mile	$ 71,463	$ 91,168	$ 50,978	$ 48,596

It should be emphasized that this analysis does not take into account life-cycle costs, including the potential for extended pavement life and reduced maintenance. It should also be emphasized that the costs reported for this project may not be typical of costs that would be experienced elsewhere or by other contractors.

Construction was in accordance with special provisions for CIPR as developed by the Materials Bureau.

Evaluation Schedule

Performance will be monitored by the Research Management Unit for a period of five years, in accordance with the Department's "Experimental Project Procedures." Annual reports (FHWA 1461) are required, as well as a Final Project Report (responsibility of the RMU).

1995(6) *:	Construction	Monitored and reported by the Engineering Project Manager.

1996:	Construction Report	Due in the Research Office 30 days following completion of construction.
1996(7):	June-August	Conduct visual examination of overlays. Perform crack counts, measure ruts, obtain IRI and traffic data, prepare and submit report no later than Sept. 15. Submit completed Form 1461 to FHWA prior to Sept. 30.
1997(8):	Same as 1996(7)	
1998(9):	Same as 1996(7)	
1999(2000):	Same as 1996(7)	
2000(1):	June-August	Conduct visual examination of overlays. Perform crack counts, measure ruts, obtain and analyze pavement cores and IRI and traffic data, prepare and submit report no later than Sept. 15. Complete final project report and Form 1461 prior to Sept. 30.

* Two years may be indicated for each task because the projects were not all constructed in the same year.