MONTANA DEPARTMENT OF TRANSPORTATION
RESEARCH PROGRAM
August 1997

EXPERIMENTAL PROJECT PROPOSAL FOR THE EVALUATION OF COLD IN-PLACE RECYCLING WITHOUT A HOT MIX ASPHALT OVERLAY

Location:	Montana 141, 19 Miles North of Avon-North, from MP 19.85 to 27.5 and Devil's Dip-North and South from MP 27.5 to 32.47 (Powell County)
Project Number:	RTF 41-1(12)19[2406] and STPP 41-1(10)28[2345]
Type of Project:	Cold In-Place Recycling without a Hot Mix Asphalt Overlay
Principal Investigator:	Construction: Mike Klette/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 two cold in-place recycle (CIPR) projects of different depths, without a hot mix asphalt (HMA) overlay. The cost analysis will be made in comparison to a mill and fill of similar structural number, which assumes a similar surface life.

CIPR has many advantages as compared to the conventional HMA overlay as long as its cost effectiveness matches or exceeds that of the comparable treatment. In a CIPR, the old pavement is reused; 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 mill and fill or 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. Additionally, the production rate is high as compared to the conventional mill and fill or overlay. If the depth of pulverization and reprocessing is adequate, reflection cracking and localized roughness should be reduced or eliminated. This assumes the distress is limited to the surfacing. Finally, a thin overlay or chip seal may only be required on many 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

These projects consist of three sections. A 91.4 mm (0.30') CIPR with an emulsified binder agent and a chip seal were placed (1996) in both the north and southbound lanes on Montana 141 from MP 19.85 to 27.49. From MP 27.51 to 32.47, a 61 mm (0.20') CIPR with an emulsified binder agent and chip seal were placed in both the north and southbound lanes in Montana 141 in 1996. Finally, a transition from 91.4 mm (0.30') to 61 mm (0.20') CIPR is located between MP 27.49 and 27.51 in both the north and southbound lanes on Montana 141.

According to the Montana Department of Transportation's (MDT) specifications, cold recycling operations are to be performed between May 15 and August 15 with the temperature 18°C (65°F) and rising. Construction on this project began on July 31, 1996 and was completed on August 13, 1996. The placement restrictions in the special provisions allow for the CIPR to be constructed under favorable curing conditions.

Quicklime (1.4%) was added to the cold recycling process to increase the stability of the mix and accelerate the evaporation of moisture and compaction requirements.

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 approximately 50 m or 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.

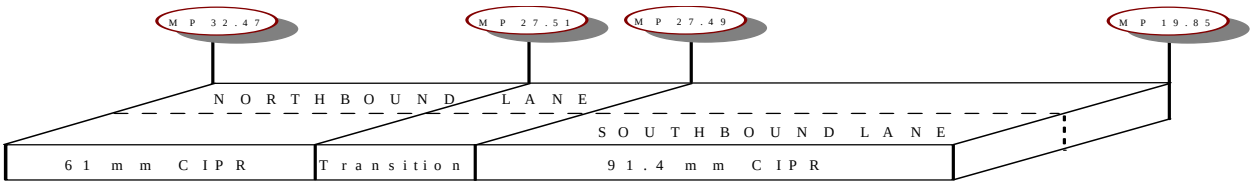

Figure 1: 19 Miles North of Avon-North

Table 1: 19 Miles North of Avon-North Layout

Location	Treatment
MP 19.85 to 27.49	91.4 mm CIPR
MP 27.49 to 27.51	Transition
MP 27.51 to 32.47	61 mm CIPR

Estimated Quantities and Costs

Table 2 shows the surfacing cost comparison which includes the cold recycle, Quicklime processing and addition, and emulsified asphalt, CMS-2P between the two CIPR treatments. These values, reported by the Great Falls District, represent the actual construction costs for the cold recycle process. Table 2 also shows the costs for a mill and fill (surfacing only, hauling charges are not included) of similar structural value as reported by the Surfacing Design Unit. It should be noted that the 0.2' CIPR is 24' wide and the 0.3' CIPR is 25' wide.

Table 2: Cost Comparisons

	91.4 mm CIPR (SN*=0.9)	61 mm CIPR (SN=0.6)	61 mm mill/fill (SN=0.9)	46 mm mill/fill (SN=0.6)
Cost/m^2 (yd^2)	$3.22 ($2.69)	$2.11 ($1.76)	$4.01 ($3.35)	$2.69 ($2.25)
Cost/km (mile)	$24,828 ($39,957)	$15,254 ($24,549)	$30,885 ($49,704)	$19,538 ($31,443)

* SN=structural number, equals thickness (ft) * 3.0 for CIPR, equals thickness (ft) * 4.0 for mill/fill

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 and Construction Bureaus.

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).

1996:	Construction	Monitored and reported by the Engineering Project Manager.
1996:	Construction Report	Due in the Research Office 30 days following completion of construction.
1997:	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.
1998:	Same as 1997	
1999:	Same as 1997	
2000:	Same as 1997	
2001:	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.