Montana Department of Transportation
PO Box 201001
Helena, MT 59620-1001

Memorandum

To: Kevin Christensen, PE
Construction Engineer

From: Paul Jagoda, PE
Construction Engineering Services Engineer

Date: July 26, 2007

Subject: Construction Review Report-Billings District – Lewistown – North – STPS 426-2(10)19

Please find attached a Construction Review Report for the subject project.

If you have any questions or require additional information, please contact me or Bob Weber.

PJ/JH/jh

cc:

Loran Frazier, PE	Suzy Price	Jim Walther, PE
Michael Kulbacki, FHWA	Lisa Durbin, PE	Tom Martin, PE
Bruce Barrett, DA	Geno Liva, PE	Kent Barnes, PE
Stefan Streeter, PE	Lesly Tribelhorn, PE	Paul Ferry, PE
Mike Taylor, PE	Alan Woodmansey, FHWA	Gary Neville
Tom Koski, EPM	Matt Strizich, PE	
Scott Barnes, PE	Jon Swartz	
Tom Martin, P.E.	Construction Eng. Services	

CONSTRUCTION ENGINEERING SERVICES PROJECT REVIEW REPORT	
Project Number: STPS 426-2(10)09 **Project Description:** Lewistown – North **Control Number:** 5976 **Letting Date:** March 7, 2007	**MDT District:** Billings (5) **EPM:** Tom Koski
Review Date: July 13,2007	
Review Made By: Bob Weber	**In Company With:** Bethany Bermel
Project Description: This report is a review of the traffic control and the cold in-place recycle at the Lewistown – North job STPS 426-2(10)19. This project is tied with STPP 43-1(29)0. The project is located on US 191 northwest of Lewistown between RP 19.04 and RP 26.90.	
Review Type: (See attached sheet on review report types) ☒ **Oversight** **X Subject Specific-**Cold-in-Place recycle ☐ **Training** ☐ **Investigatory** ☐ **Constructibility** ☐ **Post Construction**	

CONTRACT INFORMATION:

Contractor: Century (Subcontractor: Valentine)

Contract Amount: $ 871,833.00

Contract Time/Completion Date: 75 days

- **Contract Awarded:** April 9, 2007
- **Work Began:** June 4, 2007 Cold-in-Place recycle began 7-12-07.

Phases Inspected: Traffic Control and Cold In-Place Recycle.

Work in Progress: The Lewistown – North project is a 7.9 mile cold in-place recycle, on the two lane US highway 191. The recycle portion of the project is underway and the contractor is currently making headway at about two miles per day. Some areas were patched with plant mix prior to the recycle to ensure there was enough cover material for the milling. The overall process seems to be running smoothly and time to completion is expected to be about three weeks.

The overall process is simple. The first two trucks of the paving train contain lime and water that is added to the milled plant mix later in the milling and blending process. These trucks are followed by the milling head that is removing about 2.5 inches of surfacing. The next phase screens the material with a 1 inch screen and crushes the recycled material that does not automatically fall through the screen; this material is then added back into the mix. The emulsion is added through the pug mill at about 2.0 – 2.5 percent. The plant mix is laid on the road in a windrow, and the paver follows close behind. Finally, one break-down roller and one finish roller complete the job.

Cold in-place recycle process.

One day after paving, the new surface is shot with fog seal to prevent raveling. In the hot weather the fog seal broke quickly, but the contractor let it sit for 2 – 5 hours before placing the sand blotter. With the blotter preventing splatter on vehicles, the contractor was able to allow traffic to pass on the new pavement by the following morning.

Although Montana has done several cold in-place recycle jobs, this project is unique because it utilizes a more complicated mix design that has only been used on four other projects in Montana. (Maintenance has completed 3 projects and construction has completed one other recycle project using the CIREE emulsion process provided by SemMaterials.) SemMaterials created the mix design for the recycle product. The contract included quick lime to drive off the moisture and to reduce stripping in the recycled plant mix. Fog seal and sand

blotter was applied after the recycled pavement was compacted. The fog seal and blotter was added to the project using the change order process. This design, along with, the fog seal and blotter for finishing, appeared to be working efficiently, but some concerns about the process have come up. Considering that other projects have been successful without lime, fog seal, and blotter, their necessity was questioned on this job. SemMaterials selling point on previous projects was that with their emulsion, lime and fog seal are not necessary.

The fog seal alone brought up another point of interest. The item was added to the contract with a $22,493.75 change order at the Department's expense. The concern here is that the mix design is provided by the contractor and the contractor is also responsible for adding the correct amount of rejuvenating agent. MDT determines whether or not a fog seal is necessary, but it is MDT that ends up paying for their "insurance" when a fog seal is needed.

Once the actual construction got underway, a few more issues arose. The contractor was having problems milling up the crack seal in the existing roadway. Throughout the length of the project there are large, frequent cracks throughout the pavement and the rubbery crack seal was coming up in small chunks and passes through the screen deck of the paving train. The contractor said that normally the crack seal comes up in large strips and they are able to pull it out so it is not recycled back into the new plant mix. But in this case, due to the small size of the crack seal material it is impossible to remove or reject, and was simply incorporated back into the roadway. The concern here is that eventually the crack seal chunks will come out of the roadway surface causing voids where water can gather and chuck holes can form. The pictures below show how the crack seal created lumps on the surface of the recycled pavement.
As explained by the EPM the contractor assigned two laborers to remove the crack seal pieces on the surface. Also, additional sweeping before the chip seal is planned. These steps should help correct the issue of crack seal material on

the surface. Keep in mind this only repairs the surface and does not address crack seal pieces below the surface.

Milled up crack seal in the recycled pavement.

Another concern with this cold in-place recycle project was the actual depth of the mill and recycle. The plans on this job call for a 2.5 inch milling depth, but with so many large cracks in the existing road, it is doubtful that such a shallow milling depth will remove enough plant mix to prevent reflective cracking. On the morning of the review, the possibility of changing the milling depth to 3.5 inches was discussed. There was a general consensus that milling deeper would buy us more time before old cracks reflected back through the new surface, and that milling up more pavement would decrease the amount of crack seal material that ended up in the recycled roadway surface. But after going over the cost increase, and talking to the contractor it was decided that the milling depth increase would not be as beneficial as first thought. The contractor stated that he would have to change the size of the screen if we chose to mill at a deeper depth and that would cause them to shutdown for about a day. It was also concluded that a small 1.0 inch depth increase would not extend the life of the project by a significant amount of time, considering the magnitude of the cracks in the existing surface.

Crack in milled surface.

The above photo shows the width of the cracks after milling. The cold-in-place recycled material is placed on the milled surface.

Traffic Control: On site traffic control included flagman and pilot cars, which have managed to keep commuter wait times to a minimum. At the time of the review traffic control for commuter traffic was functioning as intended. The concern with traffic control on cold-in-place recycle projects is keeping slow moving heavy trucks off of the recycled material. Preventing traffic from driving or stopping on the recycled material is important. At the time of the review, traffic was being stopped on the previous day's placement. It was suggested that the flag stations be moved further back away from the lay down operation in order to prevent trucks from being stopped on the newer recycled material. This is intended to help reduce displacement in the new recycled material.

Erosion Control & Environmental Issues: NA

Change Orders: One change order has been completed on this project for a total price of 61,948.55. This change order included the fog seal and blotter, along with cold milling and grade D commercial plant mix. The additional milling was needed because the approaches to the bridges and railroad crossing were skewed and the large milling machine and recycle paving train would not be able to provide a smooth transition on the skewed approach sections. A smaller milling machine was used and the milled material was replaced with new grade "D" commercial plant mix.

Claims: None.

EPM Diaries: Did not review.

Questions from Project Staff: None during visit.

Issues Discussed and Resolved:

- The possibility of increasing the milling depth to 3.5 inches was brought up, but in the end, it was decided that we would continue milling at a depth of 2.5 inches. The existing cracks in the roadway are significant enough that another inch of milling would not correct the problem, and the cost of increasing the milling depth would be greater than the benefit.

Issues Discussed and Follow-up needed (note: detail the needed follow-up):

- Are lime, fog seal, and blotter necessary for cold-in place recycle projects since we have seen other jobs be successful without these treatments?
    - Is plant mix cracking an issue, and how fast will the cracks reflect through the new surface? Are we milling out enough old material to make the process a worthwhile improvement?

Areas of Good Practice/Positive Aspects: The recycled pavement placed on the job looks good and appears to be a tight mat, allowing traffic to pass on it in only 24 hours. The overall process has run smoothly and traffic has been a relative non-issue. The fog seal and blotter material application help fill in surface voids, and this gives the new section a good appearance. The application of fog seal and blotter may reduce the amount of binder needed for the chip seal.