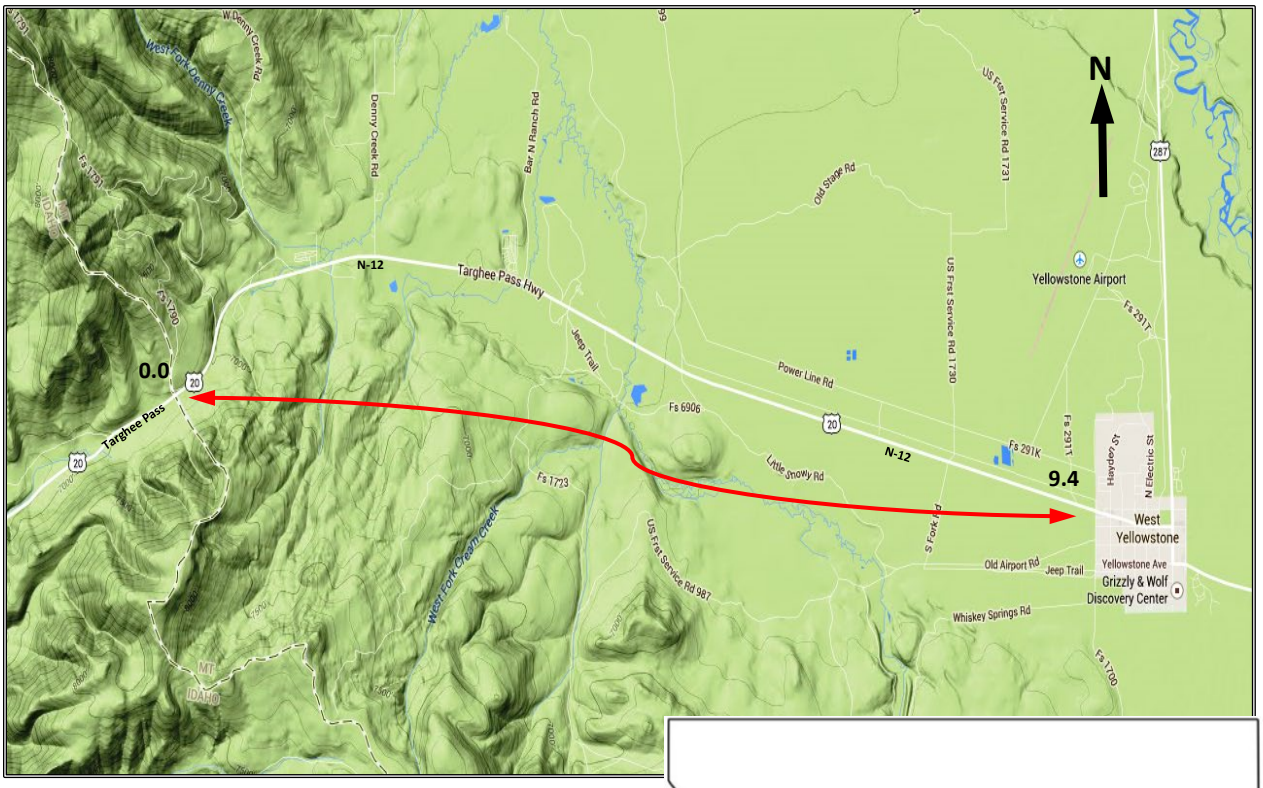
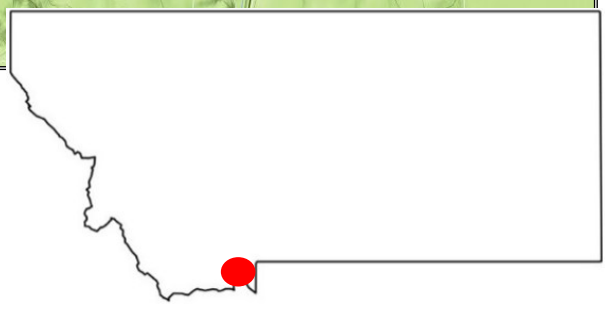
Experimental Feature Final Report
January 2023

Experimental Feature:	Fog Seal on Chip Seal Comparison
Location:	Butte District, Gallatin County MT Hwy 20, Reference Post 0.0 – 9.4
MDT Project Name:	Targhee Pass – West Yellowstone
MDT Project Number:	NH 12-1(20)0[8762]
Experimental Project Number:	MT-15-01
Principle Investigator:	Chad DeAustin, Experimental Project Manager (ExPM)
Technical Contact:	Greg Zeihen
Construction Date:	July 2017
Date of Inspections:	April 2018, October 2018, April 2019, April 2020, August 2021, May 2022

Project Map





FSCS Section – Westbound Lane Only – Chip seal CRS-2P/ Fog Seal CSS-1H
CS Section – Eastbound Lane Only – Chip Seal CRS-2P

Feature Description & Outline

The feature was proposed as a performance evaluation of a fog seal over the top of a chip seal (FSCS) with the focus being the service life and chip retention of the pavement treatment compared to that of a conventional chip seal (seal and cover).

The area selected is a high mountain (average project elevation of 6,800 ft.) section of state (secondary) highway with extreme weather conditions which maximize maintenance activities, and which has severely limited the effectiveness of past pavement preservation treatments.

A test section (WB lane) which is a chip seal with CRS-2P and covered with a fog seal of CSS-1H. The control section (EB lane) is a chip seal with CRS-2P emulsion only. MDT Type 1 chips were used for both lanes.

Evaluation Procedures & Schedule

The measures of effectiveness prevalent with this project are:

- Construction practices (constructability, construction time, cost effectiveness, etc.),
- Average texture of embedded chip within the residual bitumen binder in each section,
- Amount of chip loss over time.

In accordance with MDT's Experimental Features Procedures, the Experimental Project Manager will monitor and report on performance for a minimum of five years annually. This includes delivery of a work plan, construction report, annual reports, and final project report.

2017:	Installation/Construction Report
2018-2021:	Annual Inspections/Evaluation Reports
2022:	Final Evaluation/Final Report

Conclusion

For this feature comparison, both sections performed well causing difficulty in concluding which section performed better. Both the chip seal and fog seal on chip seal sections of this roadway continue to be in good condition. The only noticed differences were through the first few years after construction the fog seal emulsion was still evident on the test section surface.

Due to the good condition of the chip seal, it was decided to continue monitoring of the feature. There will be at least 3 more years of monitoring and any new information will be added to this report.

A dedicated webpage provides all reporting for the experimental feature.

Preconstruction Documentation – June 2017

🡸🡻 Representative images of the project pavement prior to seal and cover with fog seal.

Top image is at the west end of the project at Montana/Idaho border. Middle and bottom images are RP 2 & RP 6 respectively.

Construction Documentation – July 2017

🡸 Application of the CRS-2p emulsion.

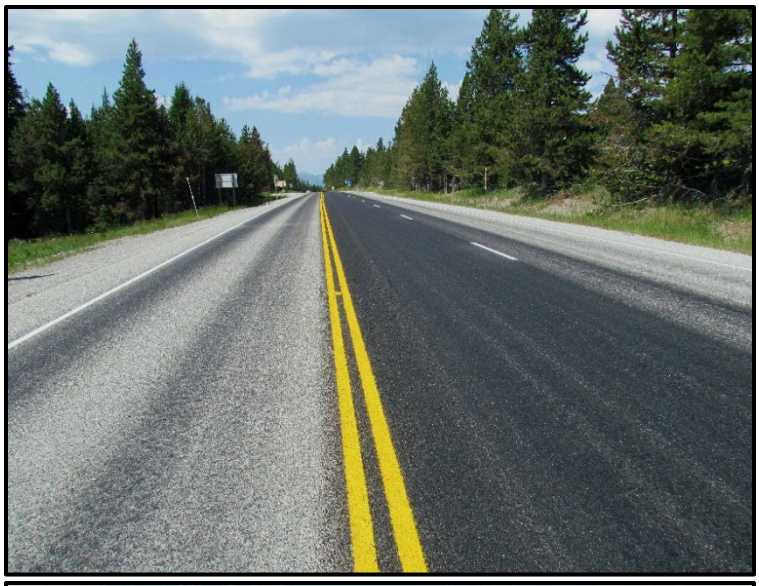
🡸 Additional view of emulsion distribution.

🡸 Placement of MDT Type 1 chips.

← Several nine-wheel pneumatic rollers were used for setting the chips.

← Representative image of chip density and texture after roller compaction.

← Close up view of seal and cover.



← The following photos were taken several days after fog seal application. CSS-1h emulsion that was factory diluted at a ratio of 50/50 emulsion and water. View west near the Montana/Idaho border.

← Approximate RP 5.0, view west.

East end of project near West Yellowstone city limits, view west.

Close-up of average texture of the seal and cover (control).

Close-up of average texture of the fog seal over seal and cover (test).

Year 1 – April 2018

🡸🡻 The following images are representative of the FSCS (right lane) and CS (left lane). View west near the Montana/Idaho state line. As seen in these photos, the fog seal application is barely visible near the top of the pass but can still be seen in the other photos, taken at slightly lower elevations.

🡸 Approximate RP 4, view west.

🡸 East end of project near West Yellowstone city limits, view west.

Representative average texture of the seal and cover (control).

Representative average texture of the fog seal on seal and cover (test).

Close-up of texture of seal and cover (CS).

Close-up of texture of fog seal on seal and cover (FSCS).

Year 1 – October 2018 (additional site visit)

⬆ Pavement conditions near RP 0.0 at Montana/Idaho Border, view east. Here the fog seal was not as visible compared to the other end of the project, seen below.

⬆ Pavement conditions near RP 9.4 at West Yellowstone city limits, view west.

⬆⬇ Comparison of the EB chip seal (above) and WB fog seal over chip seal (below) near RP 5.0, view east.

Close-up of the typical chip seal texture seen in the EB lane (control).

Close-up of the typical fog seal over chip seal texture seen in the WB lane (test).

Year 2 – April 2019

Pavement conditions near RP 0.0 at Montana/Idaho Border, view east.

Pavement conditions near RP 9.4 at West Yellowstone city limits, view west.

Representative image of the FSCS WB near RP 4.0, view east.

Representative image of the CS EB near RP 4.0, view east.

Close-up of typical fog seal over chip seal texture seen in the WB lane.

Close-up of typical chip seal texture seen in the EB lane.

Year 3 – April 2020

🡐 RP 1.0, view east.

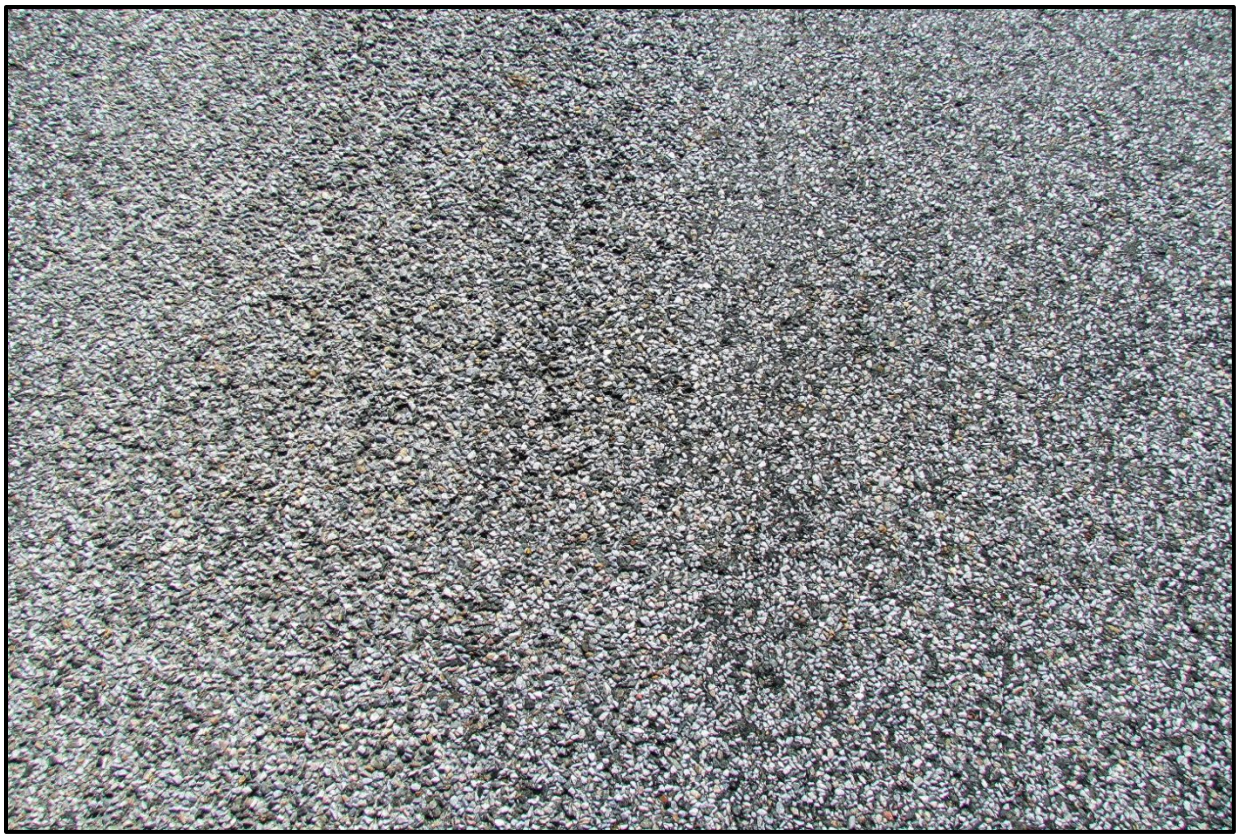
🡐🡓 These sites show the typical condition of the pavement treatments on the EB CS section and the WB FSCS section. Both sections to date have good chip retention.

🡐 RP 3.0, view east.

🡐 RP 8.0, view east.

⬆⬇ Representative images of chip condition at RP 3.0, CS section.

⬆⬇ Representative images of chip condition at RP 3.0, FSCS section.



⬆⬇ Representative images of chip condition at RP 8.0, CS section.

⬆⬇ Representative images of chip condition at RP 8.0, FSCS section.

Year 4 – August 2021

🡄 RP 9.0, view west. The left lane is the chip seal only eastbound lane with the right lane being the fog seal over chip seal westbound lane.

No change from prior years' site visits.

🡄 Typical texture of the chip seal surface (control).

🡄 Typical texture of the fog seal over chip seal surface (test).

Year 5 – May 2022

🡄 RP 0.0, view east. Lane on image left is FSCS, right is CS.

🡄 RP 6.0, view east. Lane on image left is FSCS, right is CS.

🡄 RP 9.0, view east. Lane on image left is FSCS, right is CS.

↑ RP 0.0, eastbound lane, CS section.

↑ RP 0.0, westbound lane, FSCS section.

↑ RP 6.0, eastbound lane, CS section.

↑ RP 6.0, westbound lane, FSCS section.

↑ RP 9.0, eastbound lane, CS section.

↑ RP 9.0, westbound lane, FSCS section.

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