

FOG SEAL CHIP RETENTION COMPARED TO CHIP SEAL

Location: Targhee Pass-West Yellowstone Gallatin County: State Highway 20 (N-12) – Reference Point 0.0-9.4: Butte District

Project Name: Targhee Pass-West Yellowstone

Project Number: NH 12-1(20)0: UPN 8762000

Experimental Project No. MT-15-01

Type of Project: Fog Seal on Chip Seal (FSCS)

Principal Investigator: Craig Abernathy: Experimental Project Manager (ExPM)

Technical Contact: Greg Zeihen P.E.: Pavement Research Engineer Specialist

Date of Construction: July 2017

Date of Inspection: April/October 2018, April 2019 & 2020

Description

The project was nominated to compare whether the performance of a fog seal over the top of a chip seal (FSCS) will extend the service life (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 6800 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. Average annual daily traffic (AADT), for all vehicles is approximately 3833.

Experimental Design

The Project is located on State Secondary Highway 20 (N-12) from the Montana/Idaho border to West Yellowstone, starting at reference point (RP) 0.0 and ending approximately at RP 9.4.

-FSCS Section (Test): Westbound Lane Only – Chip seal CRS-2P/ Fog Seal CSS-1H

-CS Section (Control): Eastbound Only – Chip Seal CRS-2P

-Type 1 Chips Used

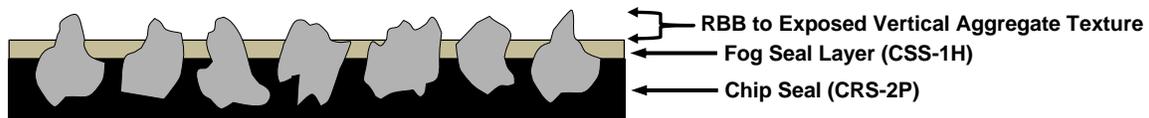
The FSCS (test section) encompasses the westbound lane of the project length, with the eastbound lane as the conventional chip seal (CS) control section. See page 19 for an overview of the project.

Evaluation Procedures

The purpose of an experimental features report is to document the phases and events of any given project to gain the reader an understanding of the general activities required to install or incorporate the research element into an active construction or maintenance project. This report also establishes a baseline for defining performance for any given feature under actual service conditions to determine its relative merits.

One of the objectives of the project will attempt to show the average texture of embedded chip within the residual bitumen binder (RBB) on the FSCS sections as compared to the conventional CS control. The level of objective relief (the visual appearance of the ratio of binder to the exposed vertical area of the aggregate, as seen in diagram below) of the CS as compared to the level of an additional binder layer for an enhanced embedment of chip, may show the FSCS creates a tighter bond with the aggregate. The level of texture is not an indicator of friction coefficient. The second objective is to ascertain the level of chip loss between the sections over time.

Research will document the installation phases for best practice and any construction concerns germane to the performance of the project test and control sections. Semi-annual inspections will report on seal integrity and any other measurable outcomes. Additional site inspections may supplement the semi-annual visits based on need.



Construction Documentation: Will include information specific to the installation events of the FSCS and conventional seal and cover sections.

Post Documentation: Will entail semi-annual inspections of the seals durability based on visual distress.

Evaluation Schedule

Research will monitor performance for a minimum period of five years annually, with every year up to ten years (informally if project requires additional quantitative data). This is in accordance with the Department's Experimental Project Procedures. Delivery of a construction/installation report, interim, annual or semi-annual reports is required as well as a final project report (responsibility of Research). A web page with all project information is located at: http://www.mdt.mt.gov/research/projects/seal_coat.shtml

2017: Installation/Construction Report

2018-2021: Semi-Annual Inspections/ Annual Evaluation Reports

2022: Final Evaluation/Final Report

Analysis to date:

Both lane treatments display good condition since installation in 2017. At the Montana/Idaho border sections of the pavement has visible structural distress (i.e., pop-outs, heaving and cracking) not associated with the seal treatments. During a complete drive through of the project chip retention on each treatment appears good with no visual indication of appreciable aggregate loss to date. Minimum voids detected. Some indication of minor flushing (or bleeding) in the (WB) fog sealed lane; more prevalent in the east portion of the project. The next site inspection will be in the spring of 2021.

The following is a general representation of the CS/FSCS application and ongoing inspection.

Pre-pavement Documentation – June 2017



↙↘ Representative images of the project pavement prior to seal and cover with fog seal.

Top image is approximate location of west end of project on Targhee pass. Middle and bottom images are reference points 2 & 6 respectively.



Chip Seal Application – July 2017



← Application of emulsion CRS-2P.



← Additional view of oil dispersion.



← Placement of Type 1 chips.



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



← Representative image of chips density and texture after roller pass.



← Close-up of seal & cover.

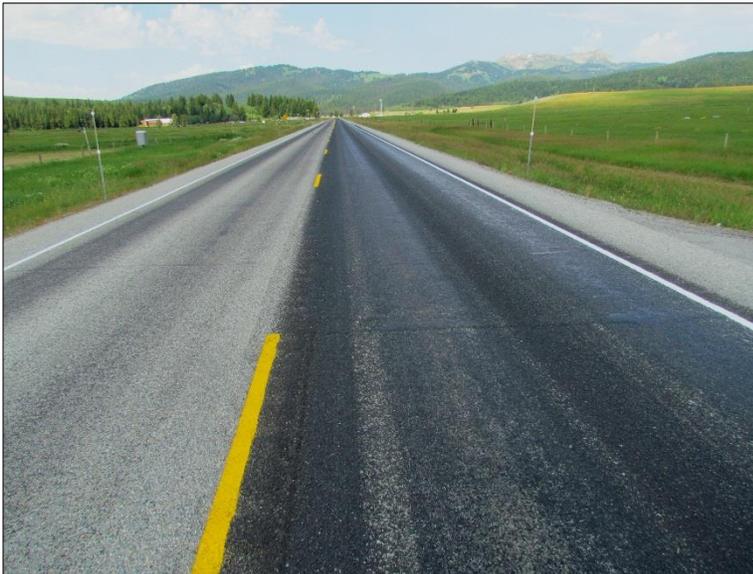
Post FSCS Application – July 2017



↙ The following images were taken several days after the FSCS installation.

Emulsion CSS-1H; factory dilution of 50/50.

View west near the Idaho/Montana state line at approximate RF 0.0



↙ Approximately midway through project; view west.



↙ East end of project near West Yellowstone limits; view west.



↑ Close-up of average texture seal & cover (CS).

↓ Close-up of average texture fog seal (CSS-1H) chip seal (FSCS).



April 2018 Site Inspection



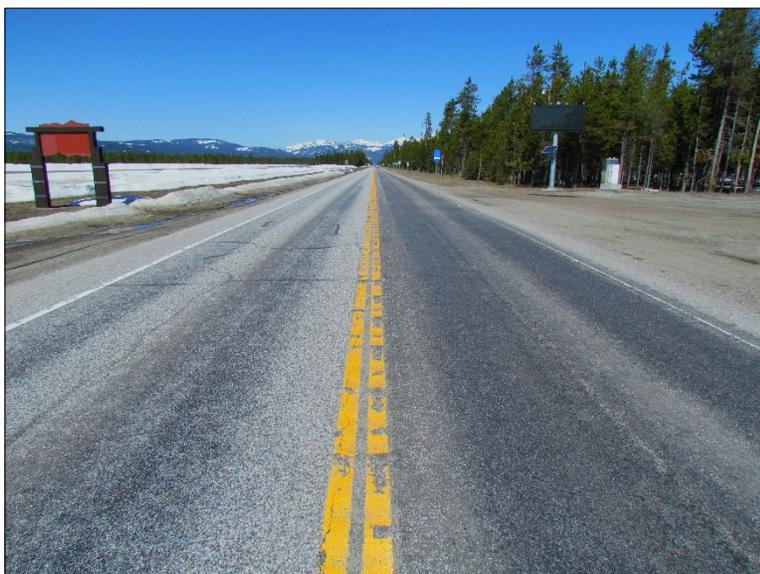
↙ The following images are representative of the FSCS/CS installation.

Emulsion CSS-1H; factory dilution of 50/50.

View west near the Idaho/Montana state line.



↙ Approximately midway through project at RP 4; view west.



↙ East end of project near West Yellowstone limits; view west.



↑ Representative average texture seal & cover (CS).

↓ Representative average texture fog seal (CSS-1H) chip seal (FSCS).





↑ Close-up of average texture seal & cover (CS).

↓ Close-up of average texture fog seal (CSS-1H) chip seal (FSCS).





↑ Transverse view of texture detail between CS and FSCS; approximate RP 5.

October 2018 Site Inspection



↑ RP 0.0 at Montana and Idaho border; view east.

↓ RP 9.4 West Yellowstone City limit; view west.





RP 5: General comparison of the eastbound chip seal lane and westbound fog seal lane; view east.





↑ Close-up of typical chip seal texture seen the eastbound lane.

↓ Close-up of typical fog seal texture as seen in the westbound lane.

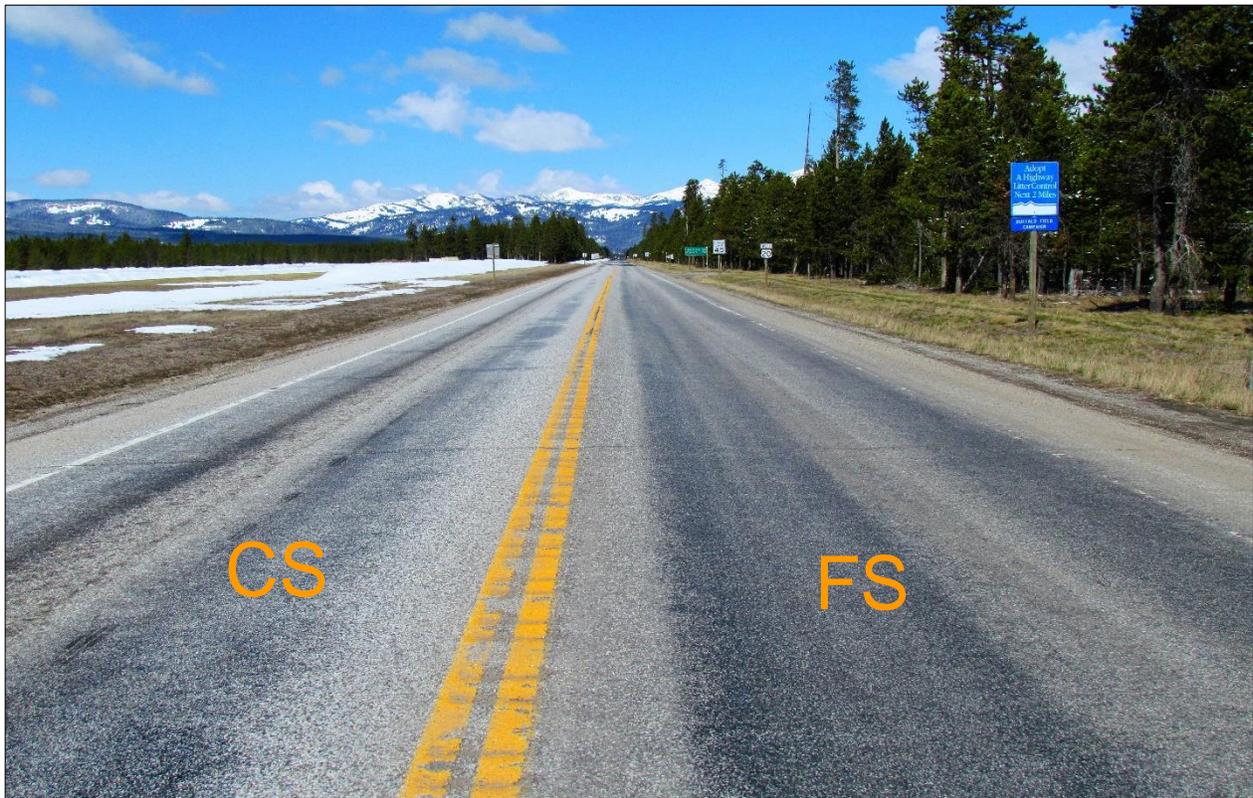


April 2019 Site Inspection



↑ At project start near the **Idaho/Montana** border, approximate RF 0.0, view east.

↓ End of project at **West Yellowstone** city limits, approximate RF 9.4; view west.





↑ Representative image of the FSCS westbound near RP 4; view east.

↓ Representative image of the CS eastbound near RP 4; view east.





↑ Close-up of typical fog seal texture seen the westbound lane.

↓ Close-up of typical chip seal texture as seen in the eastbound lane.



April 2020 Site Inspection



← Reference point 1: View east.

The sites represented here show the general condition of the pavement treatments on the eastbound CS section (CRS-2P) and the westbound FSCS section (CRS-2P/CSS-1H).

Both sections to date have good chip retention.



← Reference point 3: View east.



← Reference point 8: View east.

Reference Point 3: Eastbound CRS-2P Chip Seal Section



↕ Representative images of chip condition at RP 3 CS project section.



Reference Point 3: Westbound CRS-2P/CSS-1H Fog Seal-Chip Seal Section



↑↓ Representative images of chip condition at RP 3 FSCS project section.



Reference Point 8: Westbound CRS-2P Chip Seal Section



↑↓ Representative images of chip condition at RP 8 CS project section.



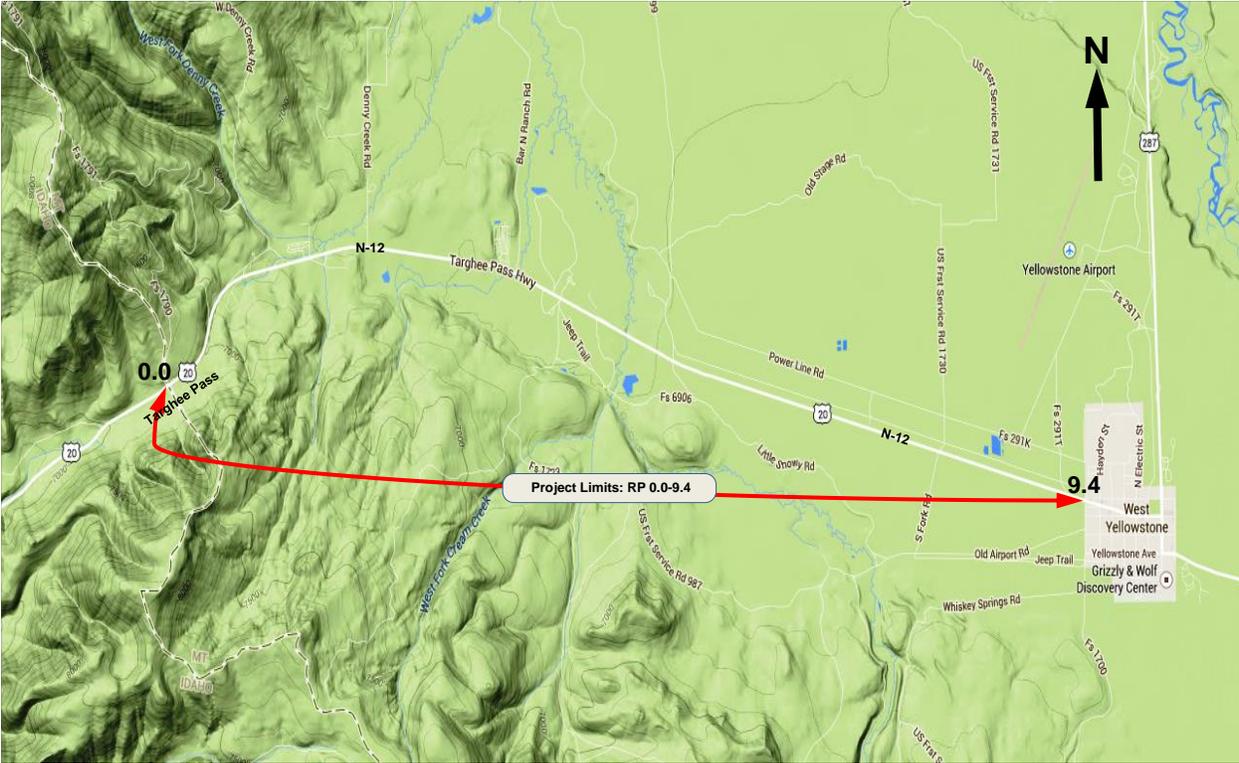
Reference Point 8: Westbound CRS-2P/CSS-1H Fog Seal-Chip Seal Section



↑↓ Representative images of chip condition at RP 8 FSCS project section.



***Targhee Pass Project Layout: Gallatin County-Montana, U.S. 20/N-12; RP 0-9.4**



- FSCS Section: Westbound Lane Only – Chip seal CRS-2P/ Fog Seal CSS-1H
- CS Section: Eastbound Only – Chip Seal CRS-2P
- Type 1 Chip (Both Sections)

***Note:** All Values are Approximate; Not to Scale

Disclaimer

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