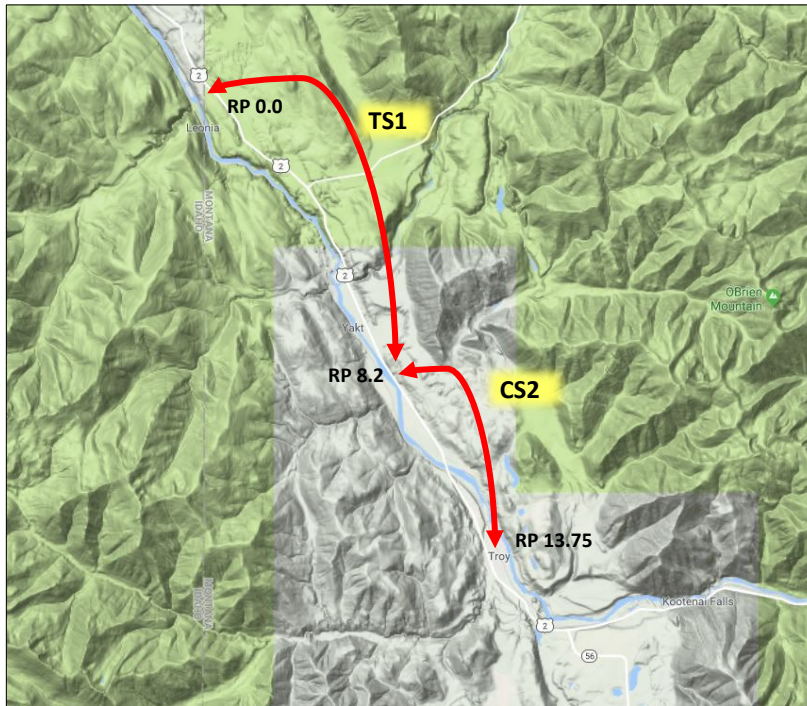


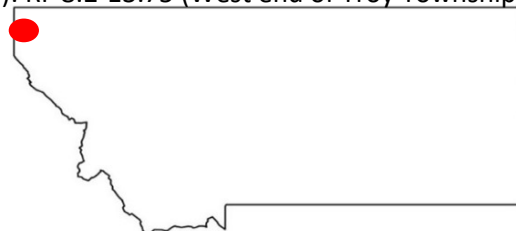
**Experimental Feature Final Report
 December 2022**

Experimental Feature:	Centerline Rumble Strip Evaluation
Location:	Missoula District, Lincoln County, US Highway 2, RP 0.0-13.75
MDT Project Name:	JCT 508 – East & West
MDT Project Number:	NH1-1(10)0[8956]
Experimental Project Number:	MT-17-04
Principle Investigator:	Chad DeAustin, Experimental Project Manager (ExPM)
Technical Contact:	Justun Juelfs, Kalispell Maintenance Chief
Construction Date:	August 2017
Date of Inspections:	April 2018, September 2018, May 2019, October 2021, August 2022

Project Map



- Centerline rumble strip (CLRS) - Test Section 1 (TS1): RF 0.0 (Idaho/Montana Border) – 8.2
- Non-centerline rumble strip - Control Section 2 (CS2): RF 8.2-13.75 (West end of Troy Township)



Feature Description & Outline

This feature was a longitudinal joint durability performance evaluation comparing a section of roadway with centerline rumble strips and a section without. A center line rumble strip is a longitudinal safety feature installed at or near the center line of a paved roadway. For this feature, the strip is a series of rectangular milled indents intended to alert distracted drivers, through vibration and sound, that their vehicles have left the travel lane.

Asphalt pavements are typically constructed with a longitudinal joint (or meet line) along the center of the road. Degradation over time may allow the entry of water, leading to early pavement deterioration. Rumble strips provide another potential reservoir to hold water and could accelerate this joint deterioration. Traffic and environmental characteristics may also affect joint performance.

This feature consists of a test section of CLRS (TS1) adjacent to a control section on non-CLRS (CS2) to compare performance. TS1 begins at reference post (RP) 0.0 on the Idaho/Montana border and runs east to the section transition CS2 at RP 8.2 which continues to RP 13.75 just on the west end of Troy. TS1 pavement treatment was a mill and fill with CS2 a standard overlay.

Evaluation Procedures & Schedule

The measure of effectiveness prevalent with this project are:

- Construction practices (constructability, construction time, cost effectiveness, etc.),
- Longitudinal joint durability comparison of CLRS and no CLRS.

In accordance with MDT's Experimental Features Procedures, the Experimental Project Manager will monitor and report on performance for 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

At the time of the nomination of this experimental feature, centerline rumble strips were not common practice in the state of Montana. Fast forward to 2022 and they are standard for non-divided highways with some districts opting for sinusoidal centerline rumble strips in certain applications.

This evaluation was focused on the durability of the centerline rumble strips and effect they could have on the degradation of the centerline joint. Over the 5 years of site visits almost no damage was noticed to the centerline rumble strips or the centerline joint. There was some

noticeable chip stripping in both the TS1 and CS2 but that is most likely due to snow removal activities. It should also be noted that this project was constructed during the first year MDT had a longitudinal joint density requirement. Of the 11 joint cores taken, only two did not meet the 91% minimum density requirement, indicating the centerline joint was well constructed and compacted.

This project is evidence that a new plant mix surfacing project with centerline rumble strips, when constructed correctly, should not experience any significantly different degradation than a plant mix surfacing project without centerline rumble strips.

As no upcoming construction will impact this road section, it was decided to continue to monitor this feature for at least 3 more years. Any changes noticed will be added to this report.

A dedicated [webpage](#) displays all reporting for the experimental feature.

Construction Documentation – March 2017 Paving Operation



← New overlay completed. Project CLRS, TS1, west end at Montana/Idaho border. RP 0.0, view east.



← Approximate RP 8.2 at transition point between TS1 with CLRS and CS2 without CLRS, view east.



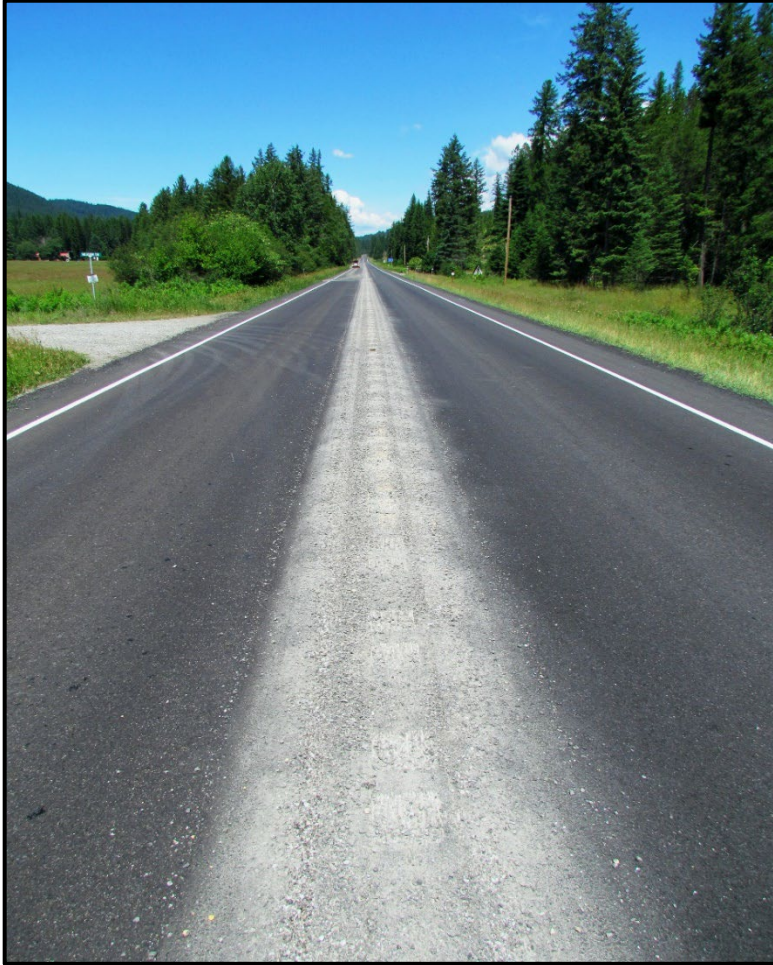
← End of CS2 near Troy city limits, approximate RP 13.75, view east. Compaction for the longitudinal joint is specified for a minimum of 91%, the average for this project was 93%.

August 2017 CLRS Operation



↙↘ Representative images of the rumble strip milling equipment in operation. Average depth of the grind was between 1/2" and 5/8" with a standard 8" rumble width.





← View of completed pass of CLRS grind operation.



← Cleaning consisted of using a broom with a fixed blade to remove millings from the roadway.



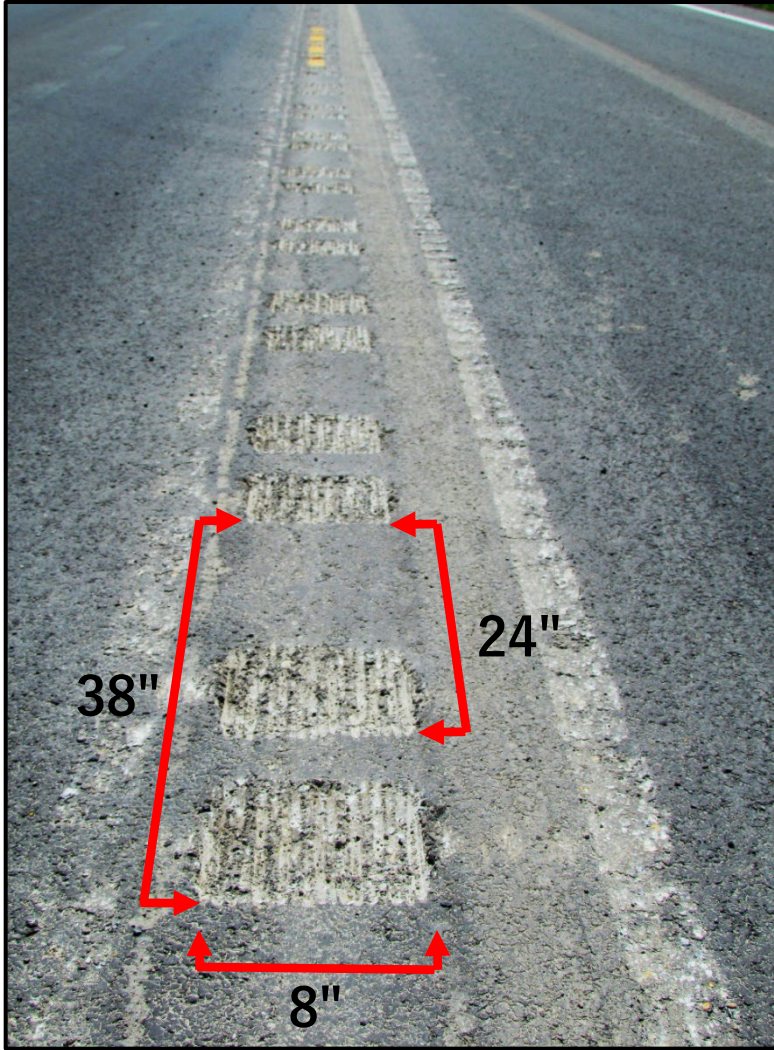
← The MDT inspector continuously monitored strip compliance during the project.



← Representative image of swept rumble strips.



← Close-up of rectangular style rumble strip prior to chip seal.



← Example of rumble strips with added dimensions.



← Additional close-up of milled rumble strip in no passing zone.



← Completed project.
Roadway has received chip seal
with a fog seal. View east at RP
0.0, start of TS1.



← Transition from TS1 to CS2
at approximate RP 8.2, view
east.



← Close-up of the CLRS after
chip seal application.

Site Inspections
Year 1 – April 2018



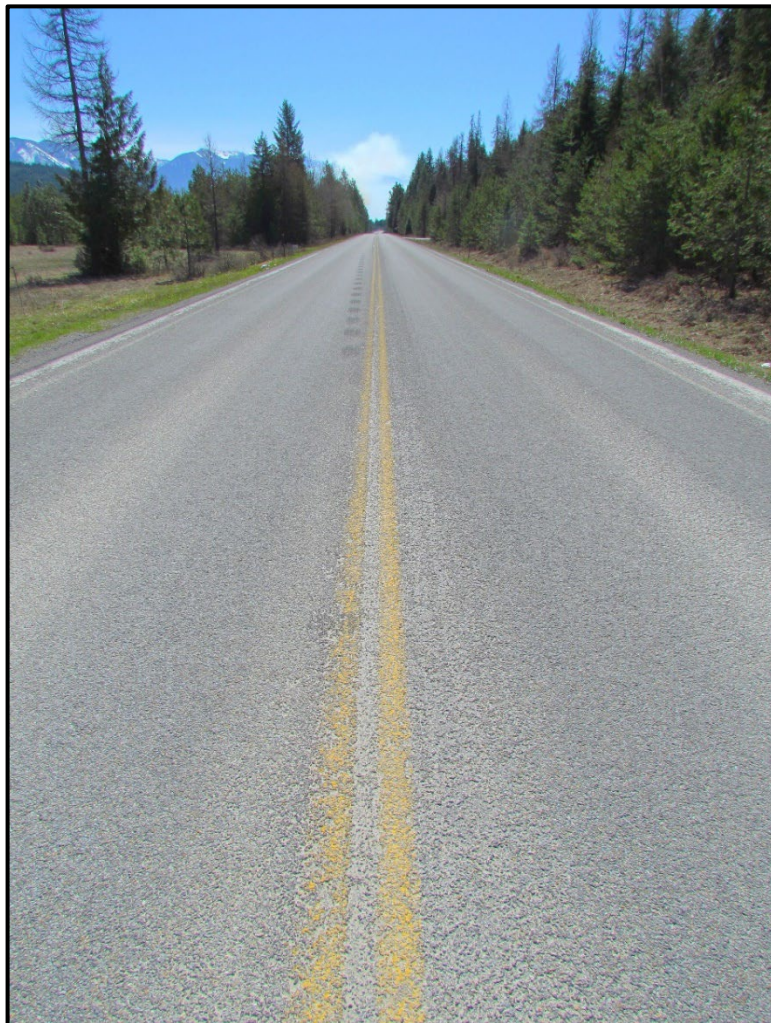
← Section TS1 at the Montana/Idaho border. The section of CLRS begins at RP 0.0, view east.



← Close-up section of CLRS. No visual distress of the TS1 paving joint was observed.



← Transition of sections TS1 & CS2, RP 8.2, view east.

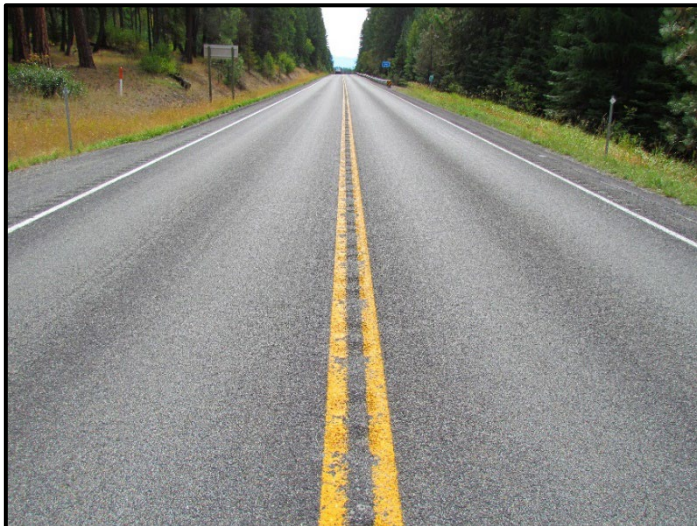


Representative view of CS2, non-CLRS, RP 12, view east. No visual distress of the CS2 paving joint was observed.

Year 1 (Additional Visit) – September 2018



← Section TS1 at the Montana/Idaho border. The section of CLRS begins at RP 0.0, view east.



← Additional image of CLRS, RP 4, view east. No visual distress of the TS1 paving joint was observed.



← Example of chip loss and striping damage assumed from snowplow activity.



← Transition of sections TS1 & CS2, RP 8.2, view east.



← Representative view of CS2, non-CLRS, RP 12.5, view east. No visual distress of the CS2 paving joint was observed.

Year 2 – May 2019



← Section TS1 at the Montana/Idaho border, view east. The section of CLRS begins at RP 0.0.



← Representative close-up of TS1 at approximate RP 0.5. No visual distress of the TS1 longitudinal joint was observed.



← Section TS1 at RP 5,
view east.



← Representative
close-up of TS1
longitudinal joint at RP
5.



← Transition of TS1 and CS2 at approximate RP 8.2, view east. No visual distress of the CS2 longitudinal joint was observed.



← Representative close-up of CS2 longitudinal joint at approximate RP 9.

Year 4 – October 2021 (No information of a 2020 visit)



← RP 0, view east. Begin TS1 at Montana/Idaho border.



← ↓ Close up photos of TS1 at varying distance at approximate RP 0.5. The longitudinal joint throughout the test section was in good condition with intermittent chip stripping.





← RP 8.2, view east. Transition of TS1 and CS2.



← ↓ Close up photos of the centerline without the rumble strips at varying distance at approximate RP 8.5. There was more chip stripping through the CS2 section compared to TS1.



Year 5 – August 2022



↑ RP 0.0, view east. Overview of TS1, centerline rumble strip section.



↑ RP 0.0, close-up view of TS1, centerline rumble strips.



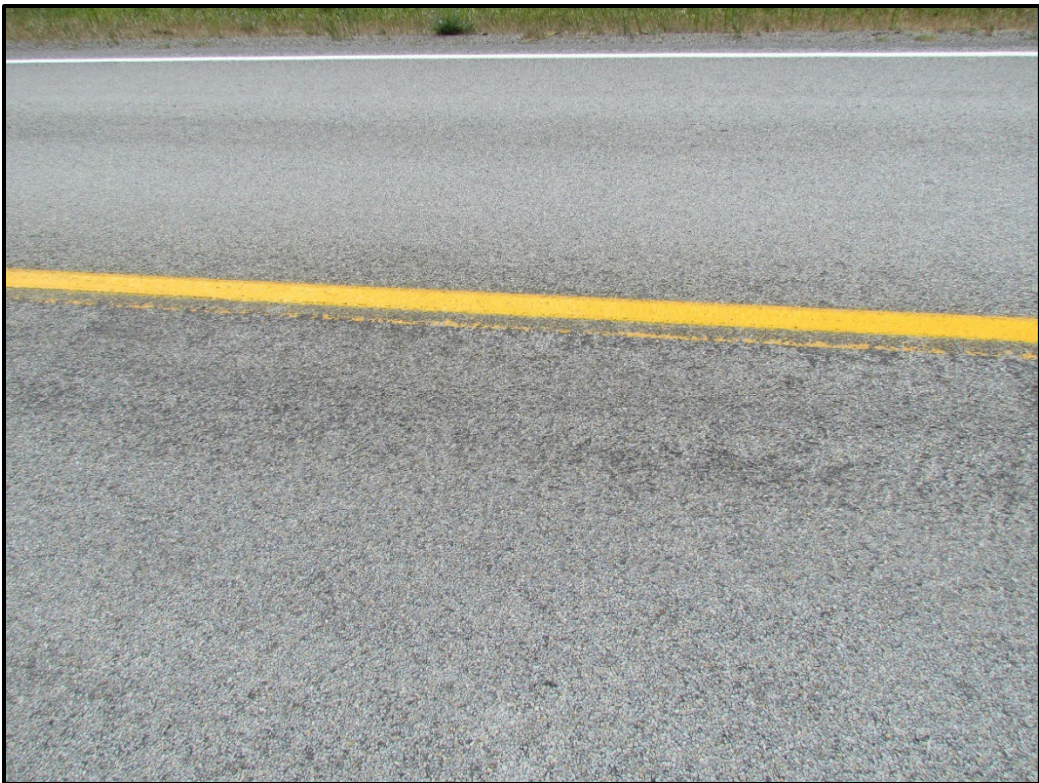
↑ RP 6.5, view east. Overview of TS1 highlighting a section of chip stripping at the centerline.



↑ RP 6.5, close-up view. Closer view of the chip stripping.



↑ RP 10.0, view west. Overview of the CS2 section highlighting an area of chip stripping.



↑ RP 10.0, close-up view of the chip stripping.

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