Montana Department of Transportation
Research Programs
September 2016

CONSTRUCTION REPORT

APPLICATION OF SEAL COAT ASPHALT EMULSION (OR FOG COATING) OVER CHIP SEAL FOR IMPROVED CHIP RETENTION

Location: Mineral County, Interstate 90 (C000090)

Project Name: Taft-West

Project Number: IM 90-1(215)0

Project Description: Work Type: 183 – Resurfacing – Seal & Cover

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

Date of Documentation: August 2015 Construction-June 2016 Evaluation

Objective

Determine the effectiveness and added durability of applying a fog seal (SS1 asphalt emulsion) as a post chip seal application in an effort to reduce aggregate loss and maximize surface friction in an environment where extremes in fluctuating temperatures and numerous snow removal activities, which in the past, have minimized the performance of chip seal efficacy.

Experimental Design

The purpose of an experimental projects report is to document the phases and events of any given experimental feature to provide the reader with an understanding of the specific 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.

The project will compare a conventional chip seal procedure to a fog seal over chip seal (FSCS) application on a section of interstate 90 beginning at reference point 0.0 (Idaho border) east to approximate reference point 5.7 (Taft Area interchange). The project will use Type 2 cover material (1/2" chip).

Both east and westbound lanes will receive a chip seal with segments of both lane directions to receive the fog seal treatment (see page 12) for project diagram and location).

Evaluation Process

The project will be documented with an emphasis to report on the activities involved with the fog seal over chip seal (FSCS) application and to determine if areas of placement conformed to standard practice. Those sections (if substantial, based on a determination by District staff assigned to the project) where constructability issues may affect performance will be excluded from the evaluation.

To date there has been no report of any inconsistencies or relevant construction issues with installation of the project regarding the chip seal (CS) or FSCS sections.

Research will inspect/evaluate the project at a minimum biannual (late fall/early spring) to document performance of the enhanced chip seal as compared to the conventional CS (more if there is an incident with the project that requires formal reporting).

All information pertaining to the performance of the chip seal (including official documentation by district personnel, anecdotal, etc.) will be included in the annual and final reports.

The first full project evaluation will be conducted in the early spring of 2016. All project information will be available at: http://www.mdt.mt.gov/research/projects/seal_coat.shtml

Documentation

The main intent of the report attempts to compare the average texture of embedded chip within the residual bitumen binder (RBB) on each of the test sections and control directly after placement, (example a seen in diagram below); and subsequent long-term documentation (up to five years) to be conducted in an effort to validate the assumption of better chip retention within the FSCS sections as compare to the control (conventional chip seal sections) in an area which historically, is difficult to maintain an effective chip seal. The project area will be reviewed biannually.

Research would like to thank Messrs. John Benda and Brett Lloyd for their help in coordination and expertise to the project.

The following are images and comments representative of the general practice to the project of date, including the chip sealing and the post-emulsion seal application conducted on August 2015.

Performance to Date: June 2016

The information presented is subjective and the visual documentation represents the general condition of the project on both the control and test sites.

The project site is a high elevation, mountainous area with extreme variance in weather conditions; in addition to substantial snow removal activities necessary for this area pose severe conditions for pavement treatment performance. Traffic (2015 data) puts an average annual daily traffic (AADT) at approximately 7600 with a 30% calculated commercial load.

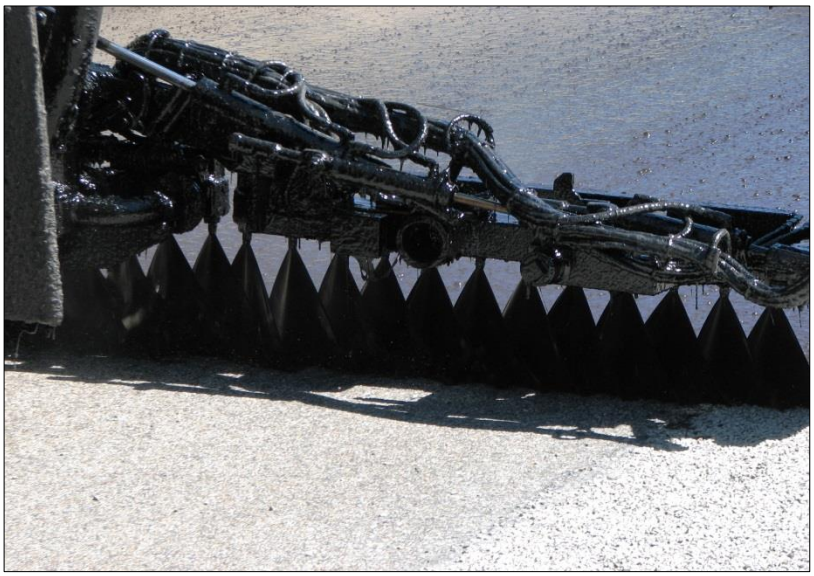
District staff reported a high rate of plow passes during the 2015-2016 winter season. Even with the additional application of emulsion to the chip seal aggregate loss was almost identical to the conventional CS sections. The FSCS portion of the project could be measured as having a slightly better performance than the CS, but that margin of performance may be minimized with the next cold weather period.

General image representation of the FSCS and CS sections of the project may be found on pages 14-17. This report mainly focuses on documented distress over the first winter season after placement.

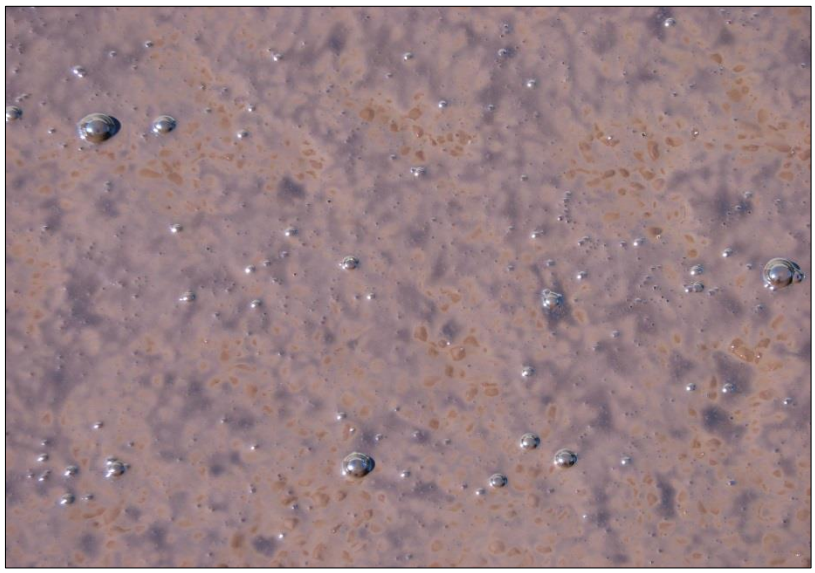
Conversely there are intact sections of CS\FSCS on the project as well. Most of the distress observed is in on the higher elevation portions of the project and where the roadways curves are present. With almost 23 lanes miles on the project it is difficult to ascertain the percentage of distress areas of pavement to those still intact.

Chip Seal Treatment – August 2015

🡄 General application of CRS-2P emulsion (50/50 diluted with water), by asphalt distributor truck. Dilution blend was done at plant.



🡄 The distributor truck spray bar appeared to have proper nozzle height and angle for correct distribution of emulsion.



🡄 Close up image of emulsion on pavement surface after application by spray.

🡸 Representative image of chip spreader applying the specified Type 2 cover material.

🡸 Several nine tire pneumatic roller are used in the compaction phase.

🡸 Compaction completed and sufficiently cured to allow excess material removal to begin.

Chip Seal: Excess Material Removal – August 2015

🡸🡻 The next three images show the various sweeping equipment used to remove excess chips after curing.

Average visual appearance of chip seal embedment on project after cure and sweeping phase completed.

Fog Seal over Chip Seal (FSCS) Application: August 2015

🡸🡻 The CSS-1 Emulsion was applied at a diluted rate of 50/50 in one pass.

🡸 Completed pass of FSCS emulsion.

Completed FSCS – August 2015

← Section of eastbound FSCS at approximate reference point 5.7/Taft Area Interchange: View west.

← Section of westbound FSCS at approximate reference point 0.0/Lookout Pass: View east.

← Extended Section of FSCS at approximate reference point 3.5; westbound passing lane.

Due to having additional emulsion on site, it was elected to continue the run an approximate 1200' east to exhaust the supply: View west.

⬅⬇ General images of the cured fog coating.

Overtime time due to topical oxidation, environmental factors and general traffic; will remove (or flake) the layer of emulsion on the exposed surface of the aggregate and resemble a conventional chip seal application.

Supplemental

Comparison of the level of residual bitumen binder within the Type 2 aggregate to the conventional chip seal and the added fog seal.

Supplemental

⬅ Example how FSCS and chip seal sections are delineated on the project.

Supplemental

- Prior to the chip seal applications the District applied a high-friction surface treatment (HFST) to bridge decks that encompassed the project limits.

  The decks received the Dayton Unitex High Surface Friction process which applies two cured layers of polymer epoxy and aggregate coatings to the pavement surface. For specific information regarding HFST deck seals go to: http://www.mdt.mt.gov/research/projects/polycarb.shtml

Site inspection: May/June 2016

The following images are representative examples of the condition of the fog seal chip seal (FSCS) on the project.

🡸 🡻 Areas west of mile point 3.4 toward the top of the pass shows sections of chip loss commonly associated with snowplow passes on or near high mountain passes.

Visually, most of the distress appears in the driving lanes.

Sections of bleeding and flushing were also observed.

← Example section of FSCS removed to the level of exposed asphalt cement (AC).

← Additional image of surface flushing on the FSCS section.

← Close-up of intact FSCS surface texture.

Although this report focuses mainly on distress of the test and control sections, it should be noted that segments of the project FS and FSCS (proportionally) appeared viable.

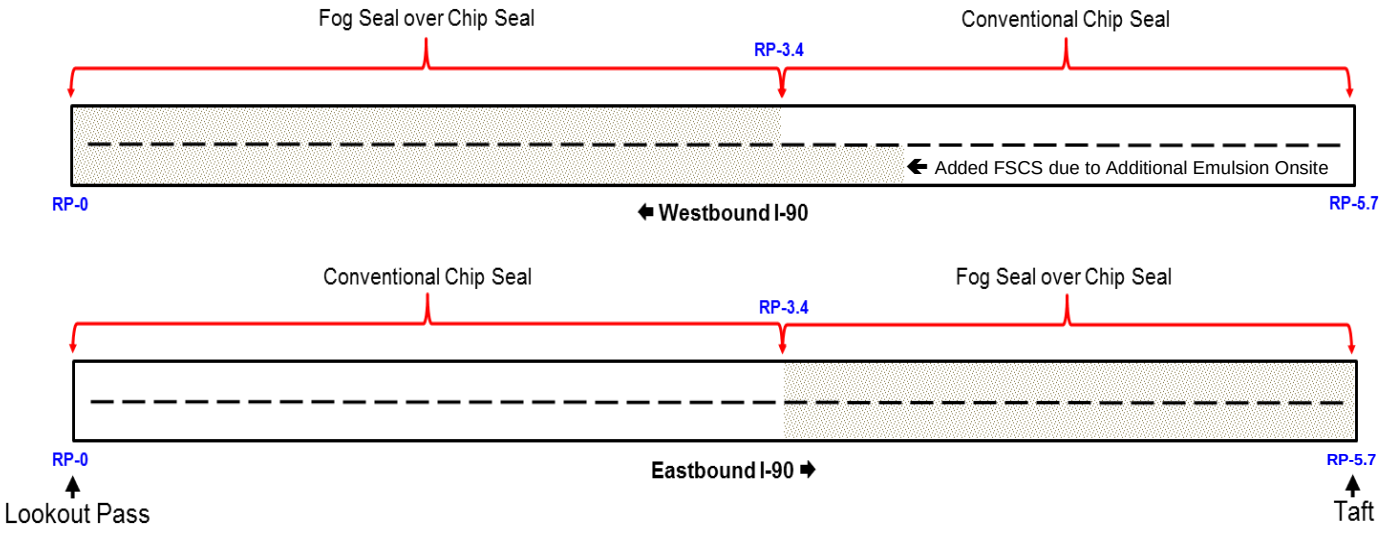
The following images are representative examples of the condition of the chip seal (CS) section on the project.

🡸 🡻 Several visual examples of CS performance throughout the project; areas where the chips are removed down to the base AC.

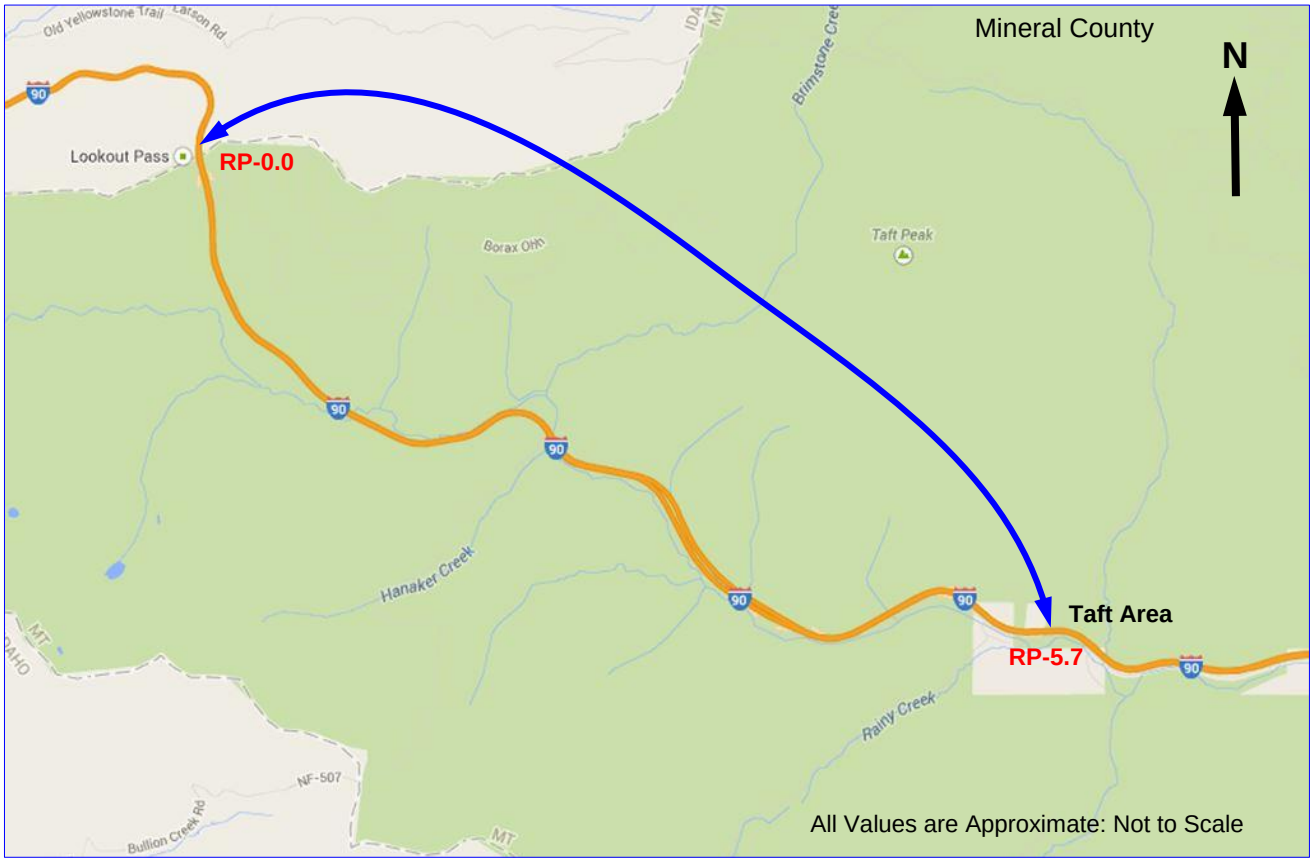
← Close-up of intact FS surface texture.

Although this report focuses mainly on distress of the test and control sections, it should be noted that segments of the project FS and FSCS (proportionally) appeared viable.

***EXPERIMENTAL LAYOUT FOR FOG SEAL/SEAL & COVER PROJECT: Taft West/ IM 90-1(215)0**



*All values are approximate: Not to scale



Graphic Representation of Project Coverage