

EXPERIMENTAL PROJECTS CONSTRUCTION REPORT AND EVALUATION

KWIK BOND 1121 POLYESTER POLYMER CONCRETE (PPC) OVERLAY

Location: Interstate 90/Stillwater County/Billings District: Three
Decks Selected: SEP COUNTY ROAD
(100090391+00402), BERRY CREEK (100090400+03661),
BERRY CREEK (100090400+03662)

Project Name: Br Deck Rehab/Repair 11

Project Number: BH STWD (043) - CN 6837000

Experimental Project: MT-13-05

Type of Project: Bridge Deck Rehabilitation

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

Technical Contact: Jeff Olsen, Bridge Bureau; Billings District

Contractor: Meyers and Sons Construction

Date of Installation: August 2014

Date of Inspections: October 2014, September 2015

Description

This project is a bridge deck rehabilitation system using an engineered composite polyester polymer concrete (PPC) overlay system that (per manufacturer's information) can rehabilitate ride defects; seal out moisture, oxygen and chloride ions from permeating into the deck; and return traffic in two hours (based on thickness of overlay and environmental conditions) at temperatures down to 40°F.

Experimental Design

The Kwik Bond 1121 Polyester Polymer Concrete (PPC) overlay was applied on three (3) designated bridge decks for the purpose of extending the life of the deck and restoring skid integrity. Overlay thickness was on average measured at 1.25" (3.2 cm). Deck surfaces were prepped by sand and shot blasting. A High Molecular Weight Methacrylate

(HMWM) sealer was applied to the deck surface prior to the overlay application.

Evaluation Procedures

Construction Documentation: Will include general information specific to the installation events of the HMWM sealer and PPC overlay.

Post Documentation: Will entail periodic site visits/inspections of PPC overlays for inclusion into the annual and final reports; in addition, documentation will include any maintenance activities associated with the overlays.

The purpose of an experimental features report is to document the phases and events of any given project to provide the reader with 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.

Evaluation Schedule

Research will monitor and report on performance for a minimum period of five years annually. 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 will be dedicated to display all reporting from the project.

2014:	Installation/Construction Report
2015-2018:	Semi-Annual Inspections/Annual Evaluation Reports
2019:	Final Evaluation/Final Report

Project Information

MDT project staff stated the installation of the three PPC overlays followed the manufacturer's guidelines and that no construction issues were noted that may affect future performance. A Kwik Bond representative was present on site.

The PPC overlay began applications at approximately 1:30 AM. The ambient air temperature was 65° F, wind speed at 2-3 mph, relative humidity at 42%, and the deck temperature was approximately 68° F. Project began the week of August 18.

A critical element of this type of deck rehabilitation is the preparation of the surface prior to the PPC application. The contractor employs sandblasting, shotblasting, hand grinding and pressurized air for a clean and debris free deck for the overlay.

The process of paving is to perform one paving pass, relocate the slip form paver to the other prepared deck, perform another pass which allows the previous PPC application to cure (average 3-4 hours), then move back to the original deck and proceed with another pass (lanes are paved first, then shoulders). Repeating this process until the decks receive the full PPC treatment.

The three decks will be monitored for texture wear and pavement condition for a minimum of five years. If the wear documentation does not show rapid deterioration of the PPC, the five year term may be extended. If the monitoring time frame is protracted, the final report will be issued when the MDT is satisfied that the performances of the structures have been quantified.

Starting at page four (4) of the report represents the general examples of the application practice involved with the Berry Creek eastbound deck.

September 2015 Site Inspection

All three structures displayed good texture appearance since installation. No visible vehicle tire wear is apparent to date. No apparent snow plow activity has affected performance of the overlay with exception of the Sep County deck which has areas on the east end travel lane approach of assumed plow abrasion and more pronounced topical scraping of the overlay on the south side deck shoulder (see pages 12 & 13).

This abrasion or scraping of the PPC material is assume to be undulations of the polymer due to inconsistencies during the paving process (possibly due to the manual screed and floating of the material after paving) which created varying thicknesses susceptible to plow scrape.

Transverse cracks have appeared at deck joints considered to be normal and several cracks have appeared at the transition joints at pavement to deck; all minor to date.

Berry Creek Structure – East Bound: I-90/Stillwater County; Reference Point 400



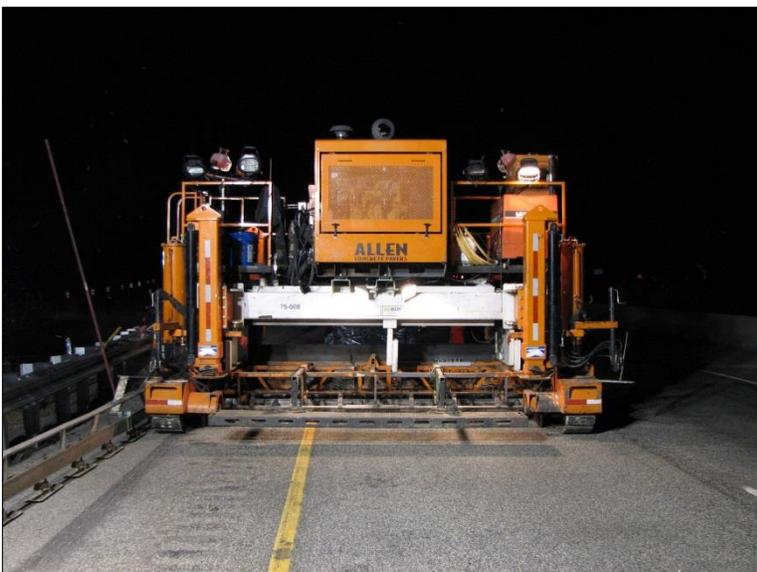
← Although difficult to see in this image, deck preparations consist of sand and metal shot blasting, hand grinding of pavement markers, air blasting, deck sweeping, and solvent spot cleaning of oil and stains.

Proper deck preparation is a critical element in the PPC process.



← A specialized mobile mixing unit is used for the PPC overlays.

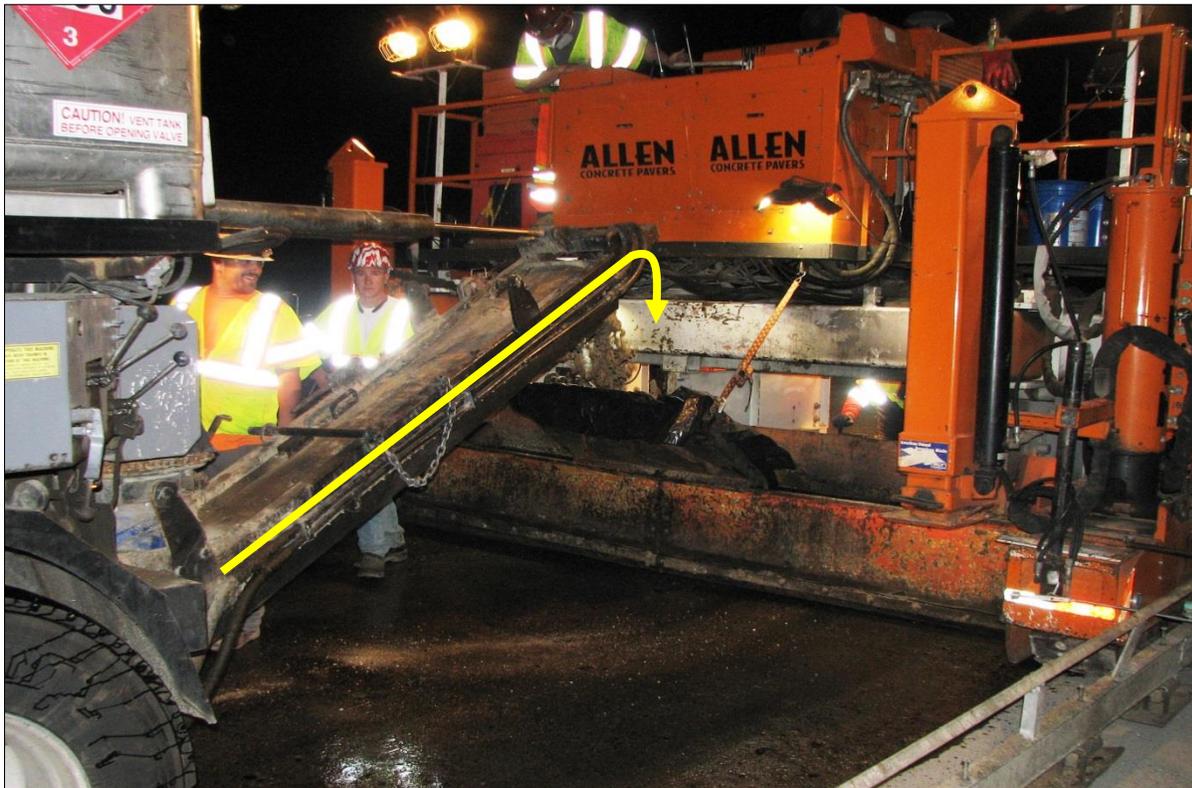
The mobile unit contains the storage bins for the blend of aggregates to be used, the polyester polymer storage tank (unsaturated polyester resin in styrene), and the PPC screw mixing auger.



← The paving unit is an Allen High Profile Two Track Polyester Slip Form specifically modified for PPC paving applications.



- ↑ During active operation, the aggregates (red arrow), are conveyed to the mixing chute (blue arrow); the styrene is injected into the aggregate blend by a fixed nozzle (white arrow).
- ↓ The styrene infused aggregates are then transported through a mixing auger screw/chute (yellow arrow) to be deposited into the paver hopper.





← Prior to the paving of the overlay, high molecular weight methacrylate (HMWM) is added to the prepared surface as a prime sealing coat.

Paving begins immediately after the HMWM is applied.



← At the beginning of the paving runs.

Note the paver initially tines the PPC as it exits out the rear of the slip form.

Based on a projects requirement, a PPC overlay may vary from 3/4" to 12" in thickness.



← The PPC is screed and floated to the desired density and texture.

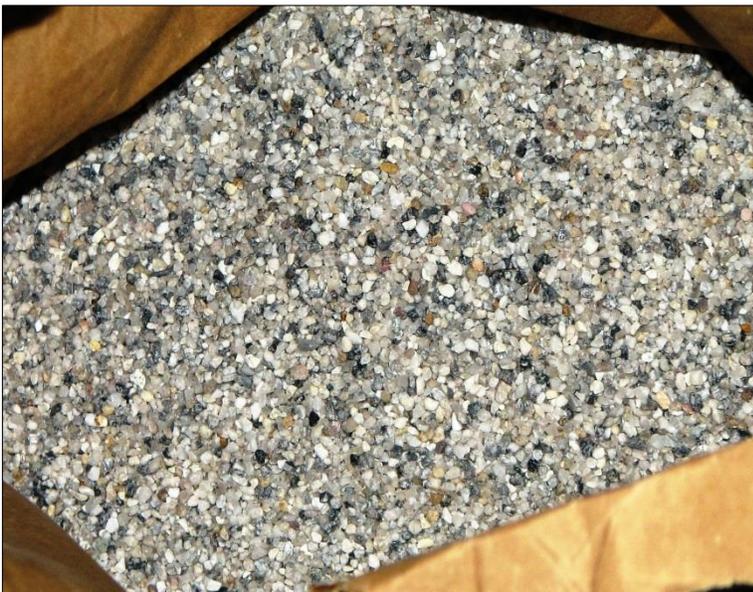


← Another image showing the workman applying a float to the PPC.



← Longitudinal tining is reapplied for mechanical texture as one of the last steps in completing the PPC run.

However, prior to tining; a layer of top sand (quartzite) is hand applied to the surface of the overlay to provide added mechanical skid resistance.



← Close-up of the Kwik Bond top sand.



← Completed PPC run with approach and edges feathered.

The edges were initially feathered for a smooth traffic transition from pavement to deck surface.

The approaches were rebuilt to insure a jointed connection with the deck overlay and pavement, (see pages 9 & 10).



← Close-up of tined surface with top sand application.



← Additional close-up of aggregate texture with added top sand prior to tining.

The Material Safety Data Sheet (MSDS) lists the types of aggregates as follows: EC Sand, EC Rock, Top Sand, A-3083 Rock, B-70 Fine Sand, B-11 Sand, B-39 Gravel, MLS Friction Aggregate; and Blend 84. All in the chemical family of Silicon Dioxide.

Post Documentation: October 2014



↑ Berry Creek Structure – Westbound I-90: View west.

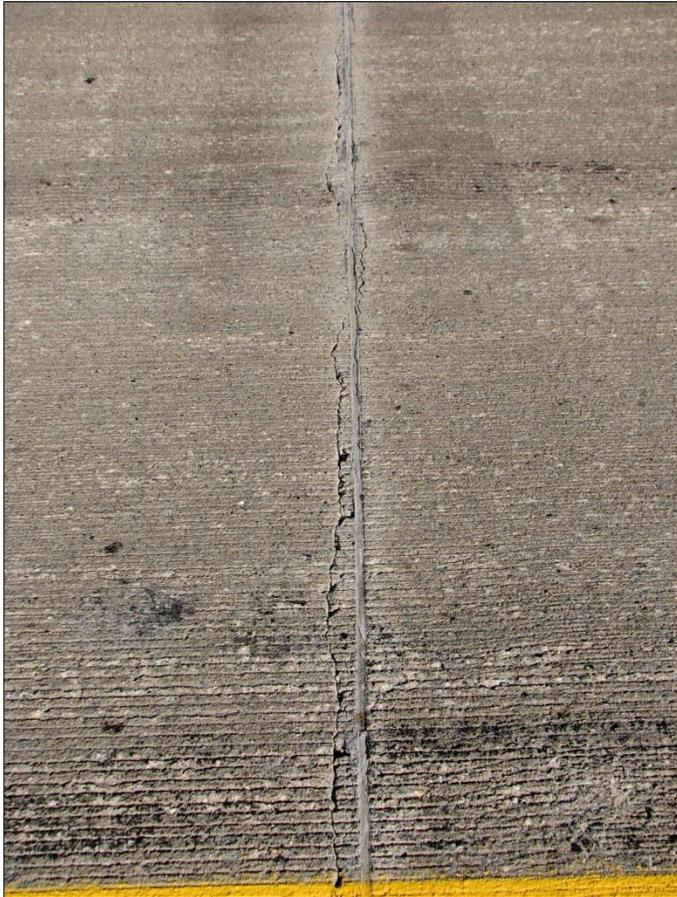
↓ Berry Creek Structure – Eastbound I-90: View west.





↑ Sep County Rd. structure: Westbound I-90: View west.

← A smooth transition was attained by rebuilding the approaches.



← Sep County Rd. structure: View of cracking along an expansion joint on the south side, east end of the westbound deck.

↓ Close-up of PPC texture in wheel path.



Site Inspection: September 2015



← Sep County Rd.: Westbound deck I-90; view west.

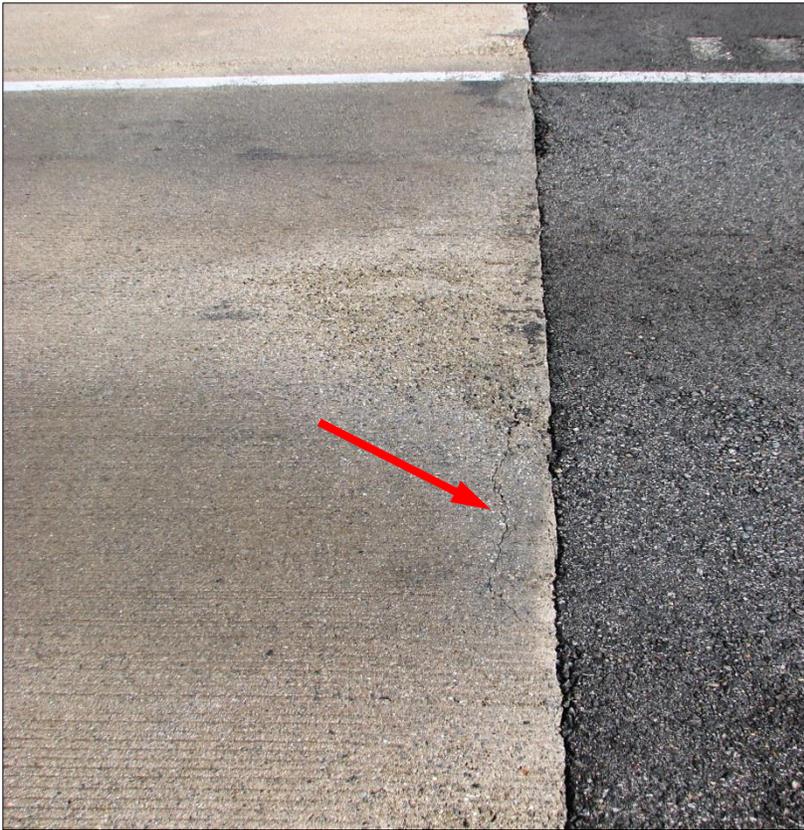


← Surface textures in both lanes appeared to be in good condition after the first year since installation.

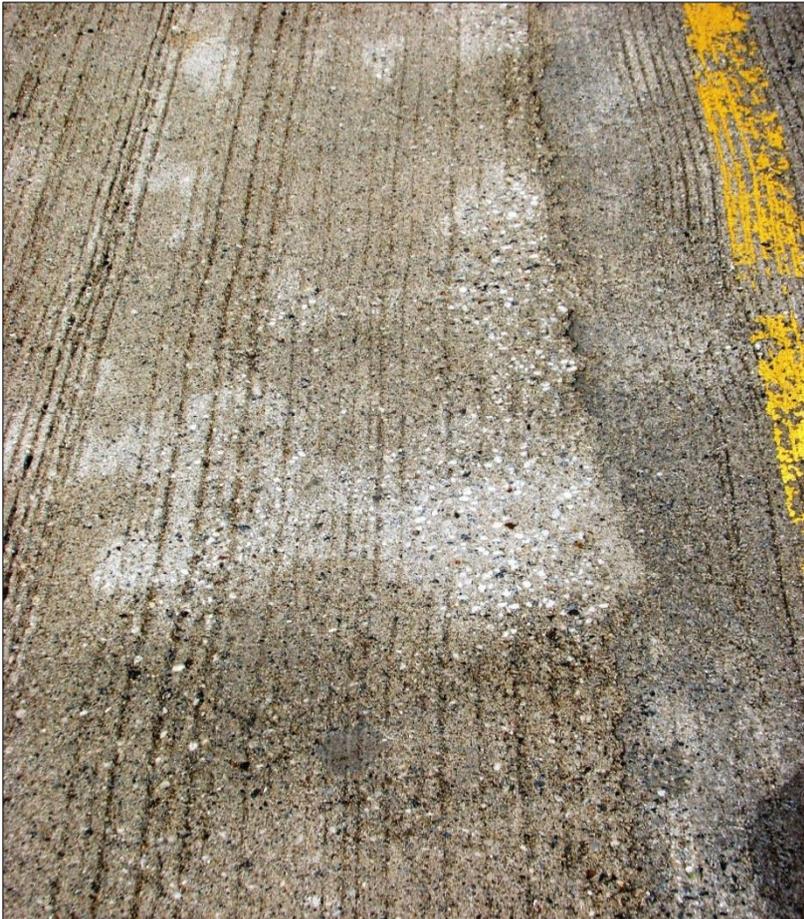
Some shearing, assuming plow scrape, of the PPC may be seen at the pavement to deck transition travel lane (Red arrow).



← Additional plow abrasion is apparent on the deck shoulder; predominately on the south side.



← Closer view of the plow scrapes on the PPC travel lane in addition to some localized cracking near the joint approach (red arrow).



← Close-up of PPC abrasion by plow passes (south deck shoulder).

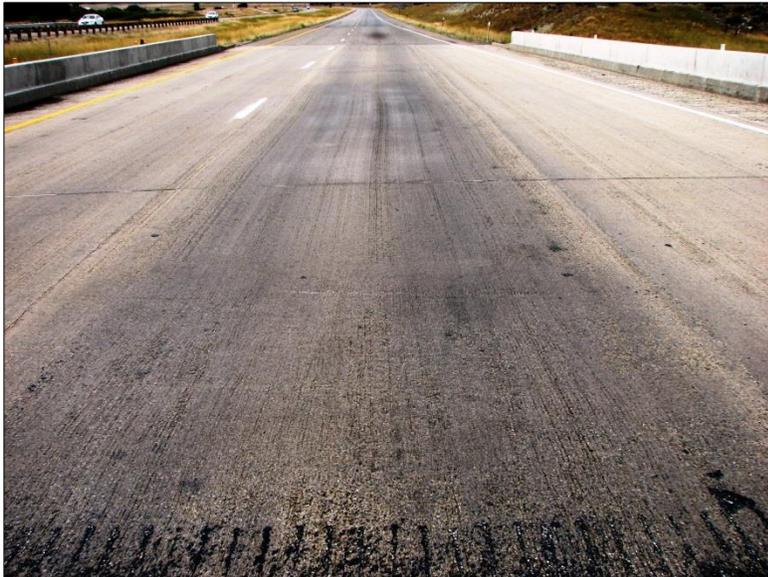
Future inspections will document if this trend continues.



← Berry Creek Structure
Westbound I-90: View west.



← Berry Creek Structure
Eastbound I-90: View west.



← Berry Creek Westbound:
Visually, Both structures
surface texture appear coarse
with tining well pronounced as
initially placed in 2014.

No evidence of plow abrasion
on any area of the two decks
as seen on the Sep County
structure.

The AC approaches have been
chipped sealed.

Supplemental



↑ Cross section close-up of the aggregate matrix in the fully cured polyester polymer overlay: Thickness represented in this image is approximately 1.25" (3.2cm).

VIDEO: The following is a short clip of the PPC paving process:

http://youtu.be/Evn2_kWx7ZQ

This report and other project information is available at:

<http://www.mdt.mt.gov/research/projects/kwikbond.shtml>

Disclaimer

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