

High Friction Surface Treatment

- 2022 NDACE County Roads Conference
 - Dickinson, ND
 - January 26-28, 2022
- Jana Hennessy – Mountrail County Engineer
- Matt Johnson – Upper Great Plains Transportation Institute

Outline

- Introduction
- High Friction Surface Treatment
- Mountrail County – CR 21
- Questions

What is High Friction Surface Treatment

- A High Friction Surface Treatment is a cost-effective safety countermeasure in which a polish resistant aggregate such as calcined bauxite aggregate is bonded to the pavement surface using a polymer resin binder, significantly enhancing skid resistance and reducing crashes
- Aggregate – Calcined Bauxite
 - Heat treated
 - 3 mm aggregate size
- Polymer Bonding Agent
 - Resin – 2 part epoxy
- Life Cycle
 - 7-12 years

Areas of Application

- Horizontal curves
- Steep Slopes
- Intersections
- Bridge Decks
- Cross Walks
- Demarcation
- Tunnels

Site Selection

- Crash Data – reactive approach
- Risk factors – proactive approach
- Existing pavement friction
- Benefit / Cost Analysis

Field Verification

- Site location verified
- Existing pavement needs to be in good condition
 - Pavement in poor condition needs to be removed and replaced
 - 30 day wait for HFST after placement of new pavement
- Friction testing

Application

- Installation is the key component
- Dry pavement prior to placement of HFST
- Fully automated application is desired
- Manual application only on small projects – i.e..) Bridge decks

Performance Monitoring and Replacement

- Causes of HFST Failure
 - Delamination
 - Expansion rates of asphalt versus resin
 - Applied to a wet surface
- End of Service Life
 - Replacement
 - HFST needs to be removed or covered
 - Removal – shot blast
 - Covered – HBP overlay

Durability

- Calcined Bauxite
 - Best aggregate for HFST
 - High Alumina content
 - Hard Aggregate – more durable than taconite or flint
 - Wears very well under heavy snow plowing

Costs

- Resin Binder – 50%
- Installation – 35%
- Aggregate – 15%

- Bundling is a key to lowering costs

- Average Nation Wide - \$26/SY to \$35/SY
 - Mountrail County Project - \$37.90/SY

High Friction Surface Treatment

Project: HLC-3115(057) PCN: 21875

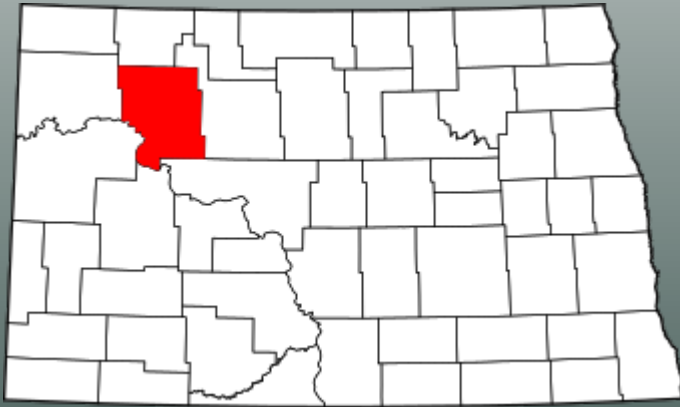
Demonstration Project: August 11, 2021

Owner: Mountrail County

Engineer: Sauber Engineering

Contractor: DeAngelo Brothers LLC

Project Location: Mountrail County Route 21 from Sanish north to ND 23



Background:

- Roadway: 9% grade ending in a stop condition at ND 23
- Traffic: 1520 ADT (700 trucks)
- Issues:
 - North facing
 - Icy conditions in winter months
 - Many accidents and a high number of near misses

HFST:

- Reason to apply: It Saves Lives
- Contractor defined it as “Sandpaper on Steroids”
- Adhesion by a 2-part epoxy (polymer resin binder)
- Aggregate is a calcined bauxite

Project Information:

- Funding: Highway Safety Improvement Program (HSIP) funds and Mountrail County Federal Aid funds
- Bid Date: February 5, 2021
- Low Bidder: DeAngelo Brothers LLC; Hazleton, PA
- Contract Amount: \$288,109.90
- Project Length: 1900 LF (68,400 SF HFST)

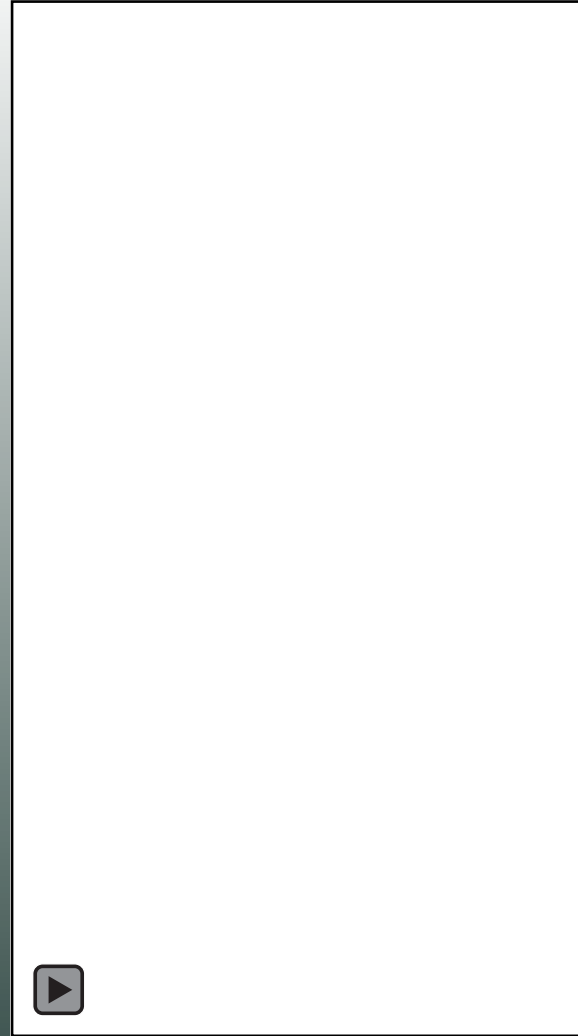
Project Information:

- Contractor started work on August 11, 2021
- Demonstration was attended by 18 people
- Sauber Engineering staff on-site
- Project completed in 4 working days

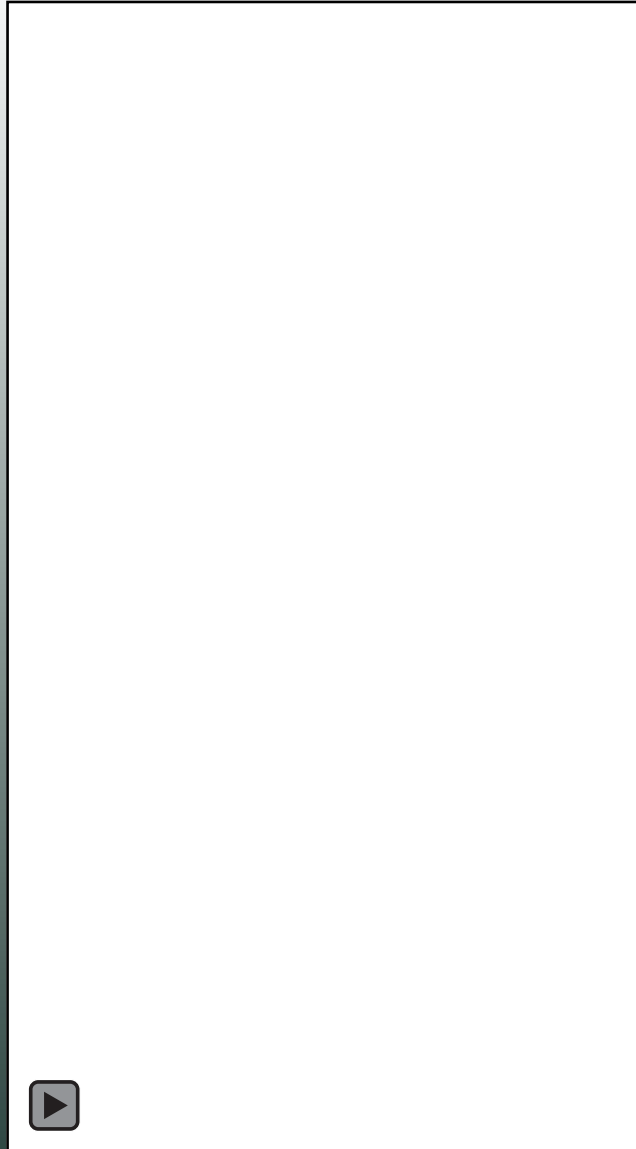
Project Specifics:

- Contractor removed all epoxy paint and symbols
- Roadway was swept prior to application
- Epoxy applied at 60 mils
- Aggregate spread at 16 #/sf with retention of 14#/sf
- No rolling of the product
- Swept after curing (approximately 2 hours to cure)

Project Demo:



Project Demo:

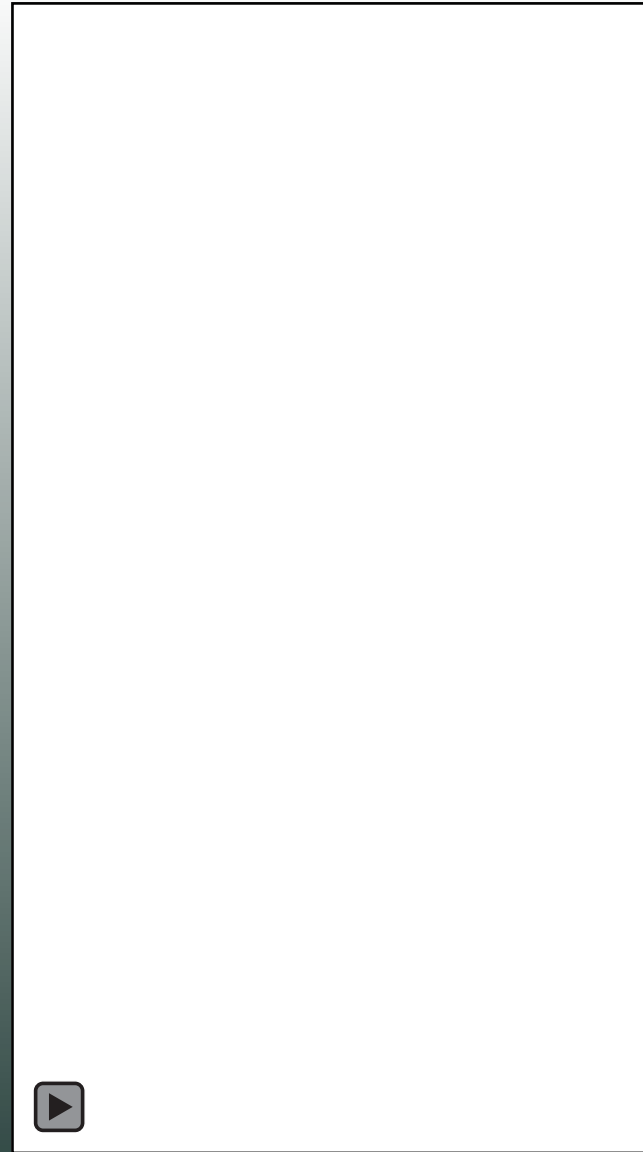


Application of the 2-part epoxy off the aluminum sheet and the aggregate is applied about 2 feet further back.

There is no rolling of the aggregate after it is placed.

Sweeping occurs after curing (approximately 2 hours on this project).

Project Demo:



John Sauber of Sauber Engineering
check out the application process.

Dynamic Friction:

Existing Surface:

Chip Sealed in 2015

Dynamic Friction of 0.42

New Surface with HFST:

Dynamic Friction of 0.97

Dynamic Friction:



Tester in use



Tester after use

Longevity:

The Dynamic Friction increased by over 2 fold on initial testing. The dynamic friction is expected to remain within 5-10 % of initial values in a 3 year period. The product is expected to perform for a period of 7 - 12 years.

Before – After Pictures:

Before



After



Team:

A big shout out to the Team:

- Mountrail County for having the vision
- Sauber Engineering for the task of designing a new project
- NDDOT for assisting in the funding of this project
- DBI – Completing the task and providing great insight into the application of High Friction Surface Treatment

Inspection Staff:



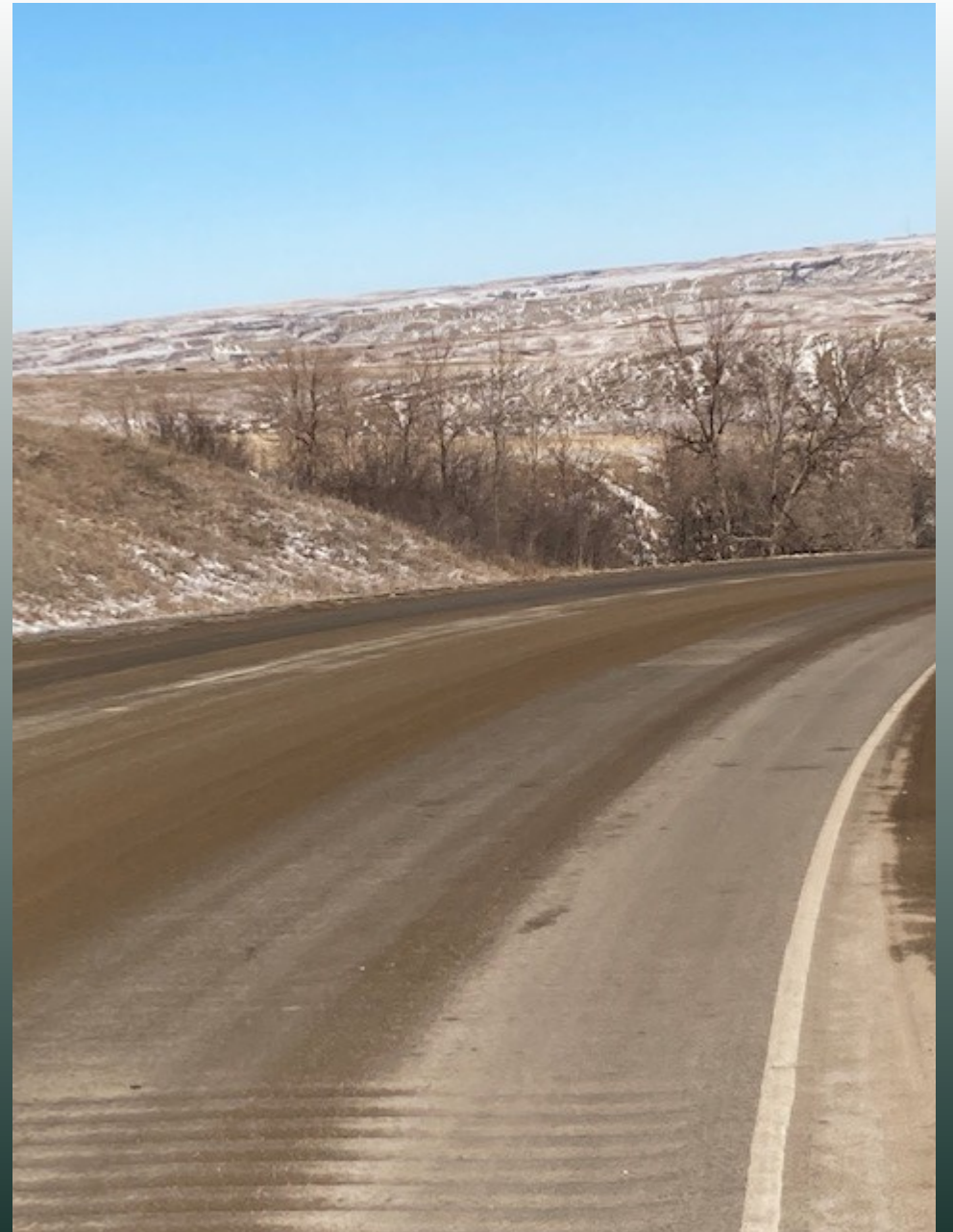
Jeff Wright

Demonstration Group:





December 9, 2021





December 9, 2021





January 4, 2022

LEADERS

Thank you to all involved in making this happen

New innovation is always due to innovative thinkers

Congrats to Mountrail County!