Evaluation of Thin Polymer Overlays for Bridge Decks

OCTOBER 24, 2023

WJE

Agenda

- Project Objective and Background
- Research Plan:
  - Item 4.1 – Literature Review and Survey
  - Item 4.2 – Field Investigation
  - Item 4.3 – Laboratory Evaluation
  - Item 4.4 – Monitoring over 3 Years
- Findings & Conclusions
- WJE's Recommendations and Open Discussion

Project Objective

To assess the factors that influence the long-term performance (i.e., skid resistance and durability) of polymer overlay systems in Montana

Thin polymer overlays (TPOs)

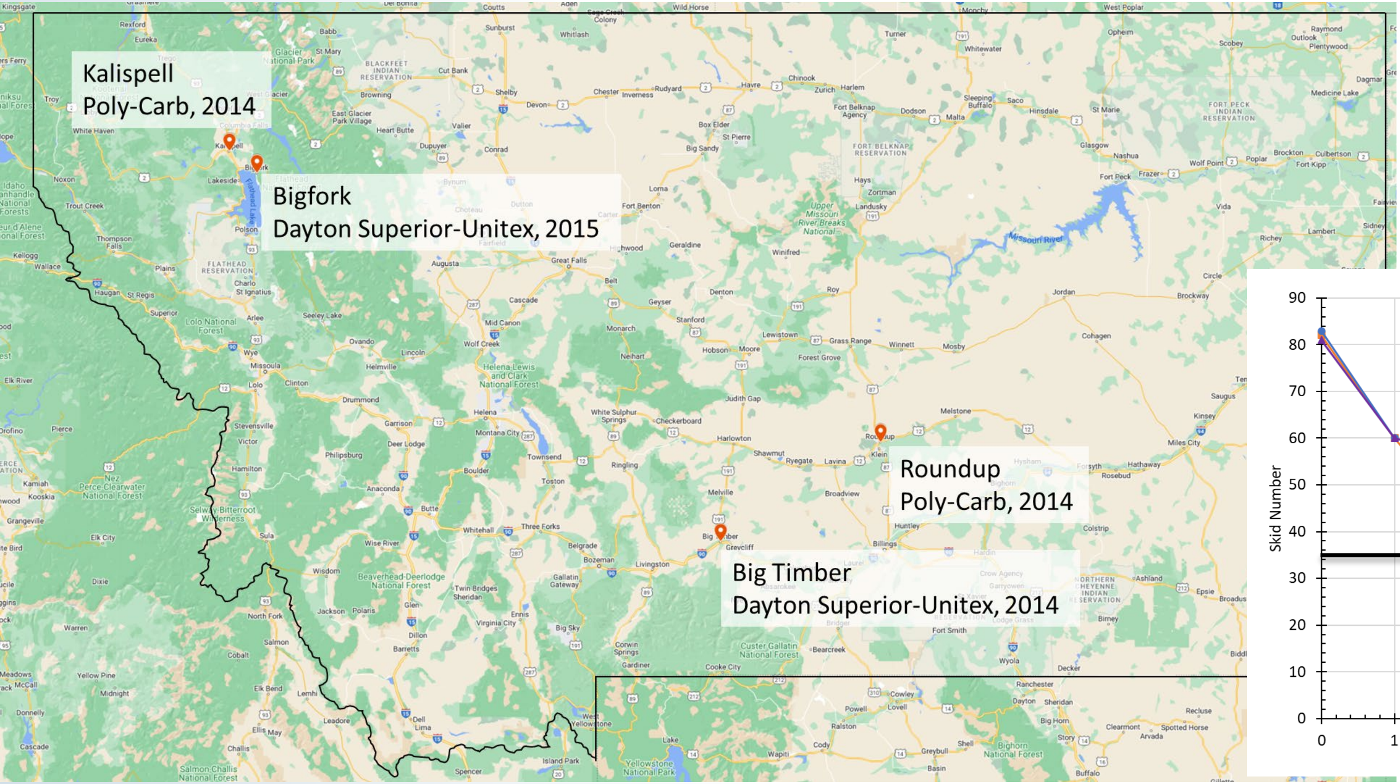
(typ. placed for chloride protection)

Multi-layer epoxy overlays (MLE overlays)

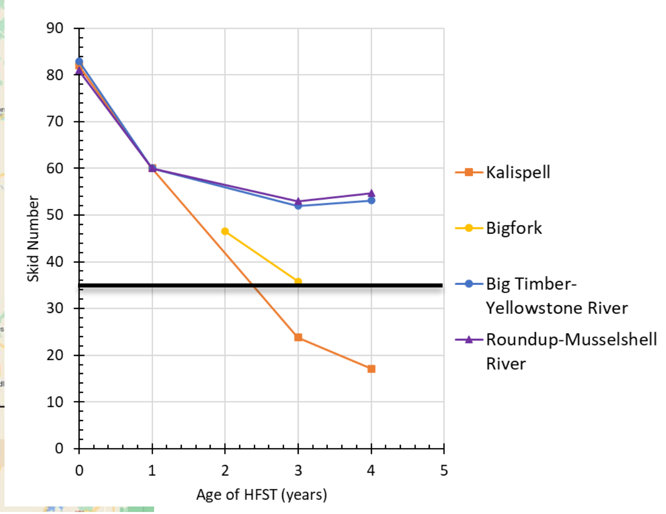
High-friction surface treatments (HFSTs)

(placed to restore/improve friction)

Project Background



- HFSTs
- 2 types of polymers
- Armorstone (basalt) aggregates



Project Administration and Budget

- Project Budget maximum was $75,000.
- Scope required lit review and survey of other states, expanded and focused bridge monitoring for a minimum of three years, review data and evaluation of options.
- Monthly progress reports, interim final reports, meetings…
- Actual expenditures totaled over $134,000:
  - Direct Expenses: $36,310 (half the budget)
  - Admin Costs: (1 hour per month for MPR = $12K), proposal, meetings, presentations, etc. – Easily over 20-25% of budget.

Scope of Work

- Item 4.1 – Literature Review and Survey
  - Commonly reported uses and problems
  - Experience of agencies with long history of use or similar conditions to Montana
- Items 4.2 and 4.4 – Field Investigation with Monitoring over 3 Years
  - Focused investigations on 4 bridge decks
  - Visual inspections of 10 other bridge decks
- Items 4.3 and 4.4 – Laboratory Evaluation
  - Petrographic examination
  - Bond strength and chloride penetrability
  - Chemical testing – composition and degradation

Literature Review & Survey

ITEM 4.1

Responding States/Provinces:	Shortened Name:
Alberta	Alberta Transportation
California	Caltrans
Colorado	CDOT
Michigan	MDOT
New York State	NYSDOT
North Carolina	NCDOT
North Dakota	ND DOT
Oregon	OregonDOT
Pennsylvania	PennDOT
South Dakota	SDDOT
Utah	UDOT
Washington	WSDOT

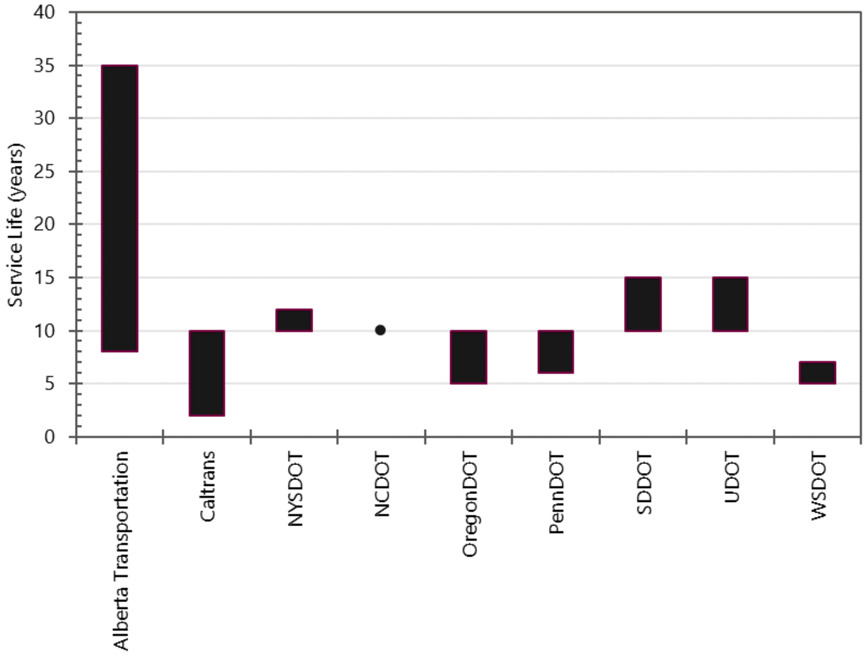
History of Development and Use

State/Province:	TPOs		HFSTs		PPC Overlays	
	Current Practice	First Use	Current Practice	First Use	Current Practice	First Use
Alberta	no longer used	1985	no longer used	--	--	--
California	in use	~1985	in use	before 2010	in use	1983
Colorado	in use	2006	--	--	experimental	2015
Michigan	in use	1990s	in use	--	--	--
New York State	in use	1990s	limited use	recently	in use	~2006
North Carolina	in use	unknown	--	--	in use	2016
North Dakota	--	--	--	--	experimental	2020
Oregon	in use	1980	--	--	in use	1975
Pennsylvania	in use	--	--	--	in use	--
South Dakota	in use	2006	in use	--	--	--
Utah	in use	before 1990	limited use	2015 to 2020	--	--
Washington	no longer used	1986	--	--	--	--

PPC = premixed polyester or premixed polymer concrete

Expected Performance of Polymer Overlays

- Service life range:
  - 10 to 20 years typical
  - But 5 to 30+ years reported
- Upper limits typically associated with thicker type of polymer overlay (PPC)
- Lower limits associated with traffic wear, studded tires, snow chains
  - Even shorter life if poor installation quality



Service life of TPOs and HFSTs reported in survey

Construction Challenges

Potential Issues:

- Inadequate surface prep. or dryness
- Ponded primer or resin-rich areas
- Inappropriate resin storage
- Poor resin mixing
- Inadequate aggregate seeding
- Inadequate QC provisions
- Calibration errors in equipment
- Bumpy surface
- Joint movement during installation/curing

Potential Consequences:

- Loss of bond within a few years
- Greater susceptibility to shrinkage, thermal-related distress, embrittlement
- Inadequate curing
- Reduced skid resistance and quick polishing of surface
- High wear from traffic/snowplow impact
- Early-age cracking

Performance Issues Reported in Literature

Potential Issues:	Mitigation Strategies:
Polishing of aggregates and/or resin	Polish-resistant aggregates
Pop-out of surface aggregates due to traffic	Thicker PPC overlay to maintain low chloride penetrability Use of high-modulus polymers to maintain skid resistance
Thermal incompatibility between polymer concrete and deck substrate	Use of polymers with low shrinkage and thermal coefficients, and low modulus
Degradation at edges and joints	Good joint construction practices Mitigation of thermal incompatibility
Polymer embrittlement from UV exposure	Minimized polymer content Use of relatively resistant polymers
Loss of bond between polymer concrete and substrate	Proper surface preparation (dry, clean, sound, and good profile) Use of polymers with good alkaline resistance Inclusion of primer in overlay system

Performance Issues Reported in Survey

1. Debonding/delamination – short-term and long-term
   - 8 respondents out of 12
2. Wear/abrasion
   - 6 respondents out of 12
3. Cracking
   - 3 respondents out of 12
4. Material Degradation
   - 1 respondent out of 12

State	Commentary
Washington	Loss of aggregates
Oregon	Rutting from studded tires
Utah	Aggregate polishing
Colorado	Snow chains in mountain passes
Michigan	Snowplow damage
North Carolina	Skid number in high-traffic areas

Skid Resistance of TPOs/HFSTs

Results are Mixed

Better than concrete control:
Tabatabai et al. 2016 (Wisconsin DOT)

Worse than concrete control:
Soltesz 2010 (Oregon DOT)

Performance depends on polymer:
Wilson & Henley 1995 (Washington DOT)

- MMA retained skid resistance better than epoxy but had less bond strength
- Utah and Wyoming have struggled with MMA and/or its placement (2012 survey for Minnesota DOT)

Best Practices for TPOs or HFSTs

Good Candidate Bridge Decks:

- Decks that do not have extensive deterioration/active corrosion
  - E.g., North Carolina does not apply to decks with NBI-58 of 5 or less
  - General cap of 5 to 10% corrosion-related distress – note this includes PPC overlays, which resist continued corrosion a little better
- Decks that need protection from studded tires, snowmobile treads, etc. – TPO used as sacrificial layer
- Decks that need protection from general chloride ingress or intrusion through static cracks, or have poor resistance to scaling or freeze-thaw distress

Best Practices for TPOs or HFSTs

Material Selection:

- Aggregates – angular, hard, non-brittle, Moh's of 6 or 7+, low absorption, low moisture content, single-sized or gap-graded
  - Prohibit use of flint rock
- Polymer – chemically durable, polish-resistant, able to accommodate thermal stresses and deck movement

Design:

- Use a primer
- Extend polymer concrete overlay 10 feet onto the approaches

Contract:

- Require a warranty

Best Practices for TPOs or HFSTs

Construction:

- Have experienced contractors, crews, engineer of record, manufacturer's representative, and DOT staff on the project
- Communicate requirements in pre-job meetings
- Incorporate QA/QC testing of materials, their handling and storage, prepared surface, batching and mixing, overlay placement, and finished overlay
  - E.g., concrete surface profile (CSP), bond strength
  - Implement weather monitoring
- Make sure deck, including patched areas, is sound, clean, and dry and has a good CSP (minimum CSP5)
- Use patch materials that are compatible with overlay materials and have low shrinkage
- Limit when construction may take place to avoid precipitation, unsuitably cold or hot weather

Best Practices for TPOs or HFSTs

Construction (cont'd):

- Broadcast surface aggregate until refusal
- Make sure joints are appropriately repaired/constructed to avoid continued deterioration
- Implement trial applications/test strips

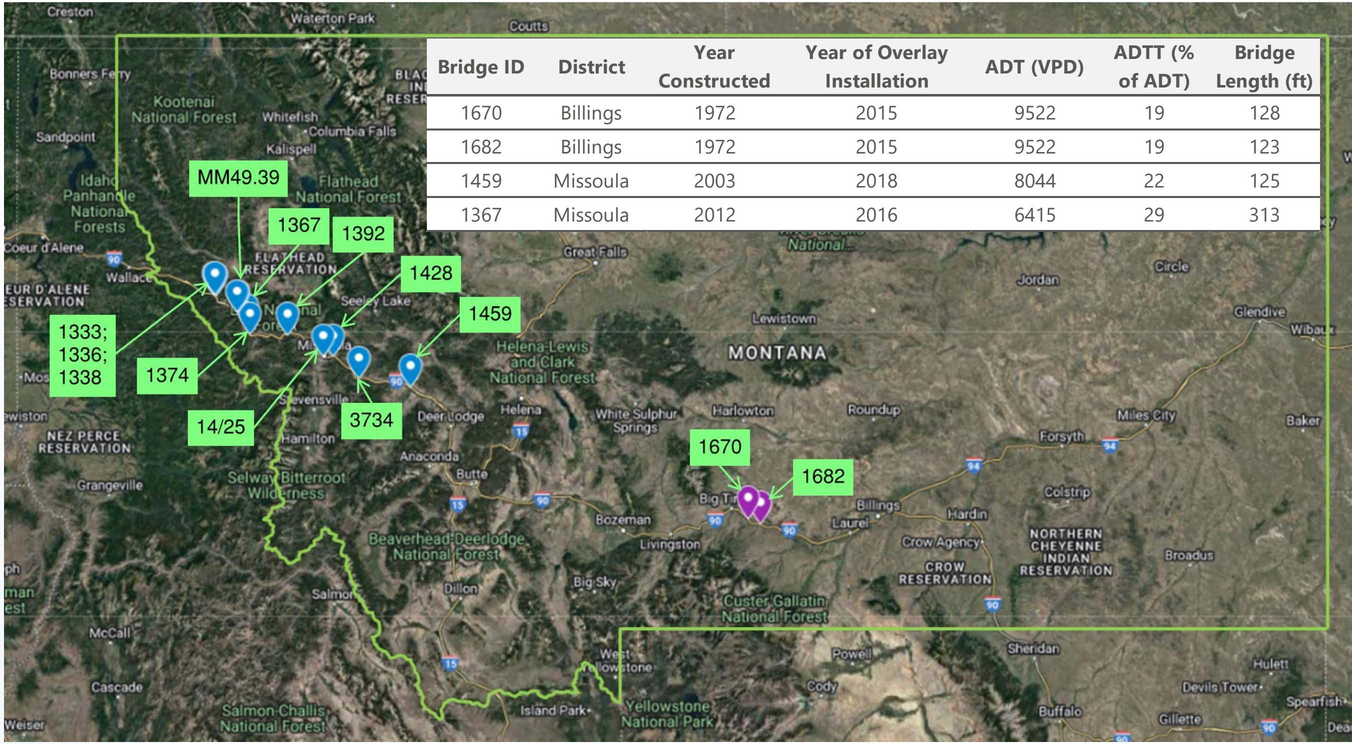
Field Investigation

ITEMS 4.2 AND 4.4

Field Investigation Overview

- 2020 to 2023
- Visual inspection of 14 bridges total
- Detailed inspections on 4 bridges
  - Sounding survey
  - Sampling for lab testing

Bridge ID	District	Year Constructed	Year of Overlay Installation	ADT (VPD)	ADTT (% of ADT)	Bridge Length (ft)
1670	Billings	1972	2015	9522	19	128
1682	Billings	1972	2015	9522	19	123
1459	Missoula	2003	2018	8044	22	125
1367	Missoula	2012	2016	6415	29	313



Bridge Information

- Decks built between 1964 and 2019/2020
- ADT between 100 vpd and 16,309 vpd
  - Mostly I-90 corridor
  - One overpass
  - One central city road
  - One on-ramp to I-90
- Truck traffic varies from 0 to 1,860 trucks per day

District	Bridge ID	Route Carried	Year Built or Reconstructed	ADT (VPD)	ADTT (% of ADT)
Billings	1670	I-90 WB	1972	9522	19
Billings	1682	I-90 WB	1972	9522	19
Missoula	1459	I-90 EB	2003	8044	22
Missoula	1367	I-90 EB	2012	6415	29
Missoula	14	Russell St NB	2019	15747	2
Missoula	25	Russell St SB	2020		
Missoula	1333	I-90 EB Ramp	1983	768	3
Missoula	1336	I-90 WB	1982	6553	27
Missoula	1338	I-90 WB	1978	6553	27
Missoula	1374	I-90 EB	2011	6415	29
Missoula	1392	I-90 EB	1964	9138	20
Missoula	1428	I-90 EB	1998	16309	11
Missoula	3734	Rock Creek Rd	1972	100	3
Missoula	MM49.39	I-90 EB	2012	6415	29

Overlay Information

Bridge ID	Year of Overlay Installation	Polymer System	Type of Aggregate
Bigfork	2015	Dayton Superior-Unitex	Armorstone
Big Timber-Yellowstone River	2014	Dayton Superior-Unitex	Armorstone
Kalispell	2014	Poly-Carb	Armorstone
Roundup-Musselshell River	2014	Poly-Carb	Armorstone
14	2020	w/ deck construction	--
25	2020		--
1333	2017	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)
1336	2017	--	--
1338	2021	--	--
1367	2016	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)
1374	2017	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux.
1392	2018	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)
1428	2018	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)
1459	2018	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)
1670	2015	Pro-Poxy Type III D.O.T.	Armorstone
1682	2015	Pro-Poxy Type III D.O.T.	Armorstone
3734	2018	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)
MM 49.39	--	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux.

Original Four

Armorstone:
- ✓ Crushed basalt
- ✓ Moh's of 8
- ✓ ABS of 0.73%

Lake Ranch Pit:
- ✓ Calcined bauxite
- ✓ Moh's of 8
- ✓ ABS of 0.8%

Overlay Information

Bridge ID and Region	HFST: Year of Installation	HFST System Description			Partial-Depth (Class A) Repairs	Full-Depth (Class B) Repairs
		Primer	Polymer	Aggregates		
1670 Billings	2015	none	Pro-Poxy Type III D.O.T.	Armorstone	HD 50 & conventional concrete	none
1682 Billings	2015	none	Pro-Poxy Type III D.O.T.	Armorstone	none	conventional concrete
1459 Missoula	2018	Pro-Poxy 45	Pro-Poxy Type III D.O.T.	Lake Ranch Pit	Sure Patch	none
1367 Missoula	2016	Pro-Poxy 45	Pro-Poxy Type III D.O.T.	Lake Ranch Pit	present; material not recorded	conventional concrete

Various PDR Materials

HD 50 = fiber-reinforced, latex-modified, fast-setting concrete (Dayton Superior)

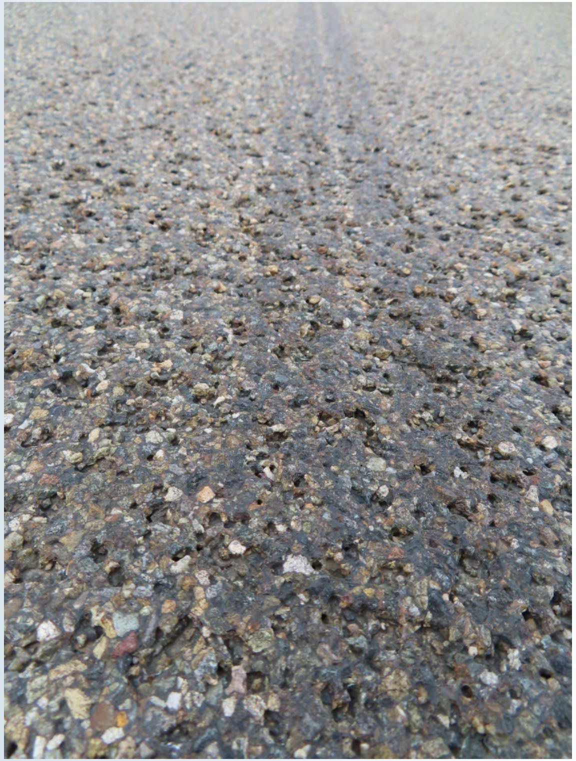
Sure Patch = epoxy repair mortar (Dayton Superior)

Distress Observed in Year 1 (2020)

- Some wear and aggregate pop-out, particularly in the wheel paths
- Polishing of wearing surface (1367)
- Reflective cracking at patch repair boundaries; continued corrosion/delams at reinforcing steel (1670)
- Small spalled areas
  - Mostly at repair areas
  - Some “popout” spalls
- Cracking at the bridge ends (1459); bents (1428);
- Transverse cracking in HFST (1367)

Additionally transverse cracking with efflorescence on deck underside

Wear and Aggregate Pop-Out (Year 1)

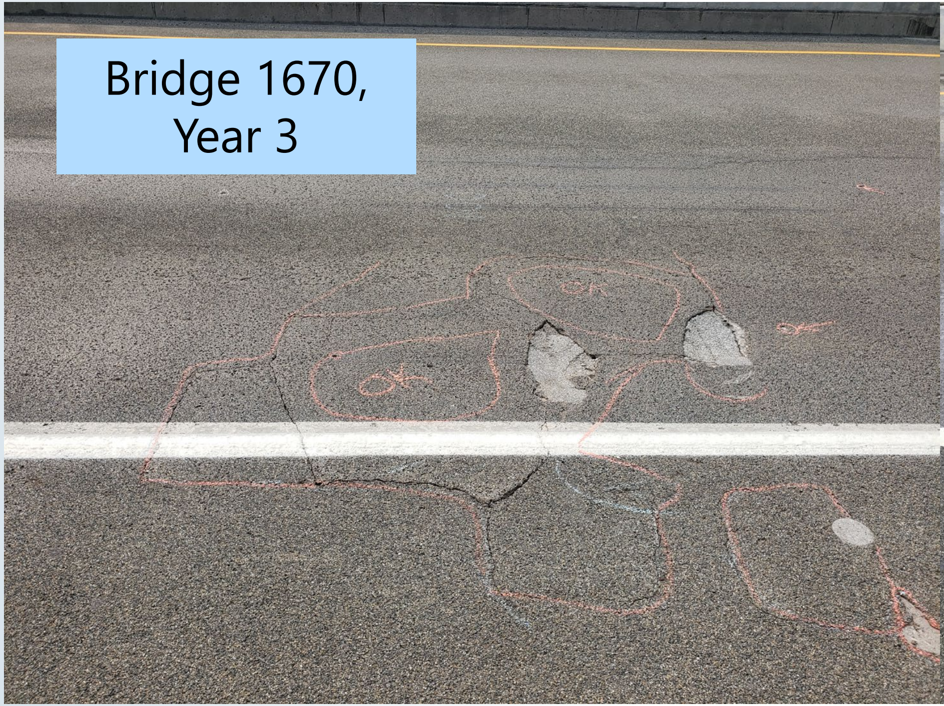


Bridge 1367

Driving lane on left
Shoulder on right

Reflective Cracking and Spalling

Bridge 1670,
Year 3

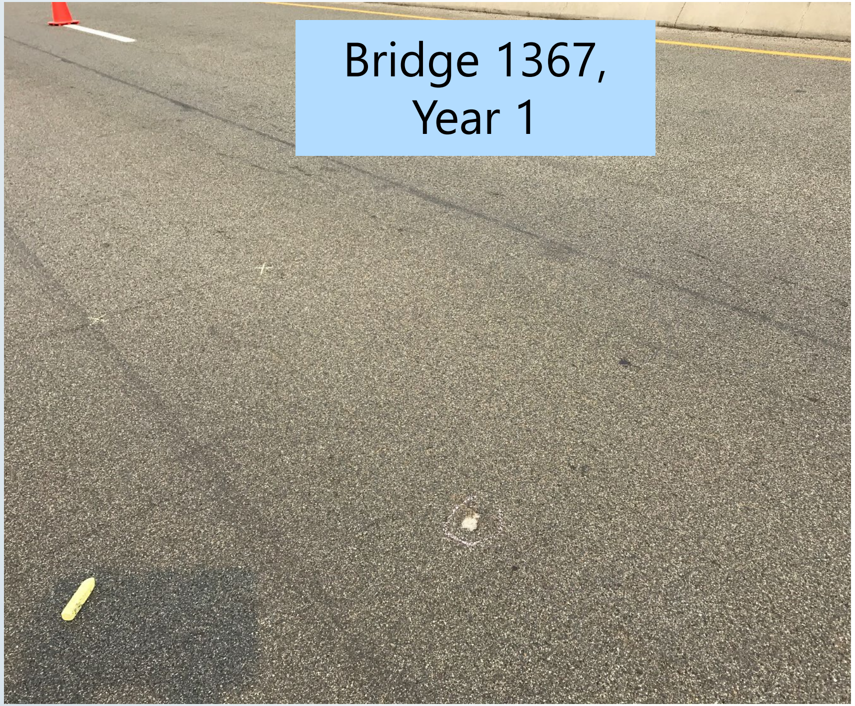


Bridge 1670,
Year 2

Cracking and Spalling

Bridge 1682,
Year 2

Pop-out Spalling in Year 1

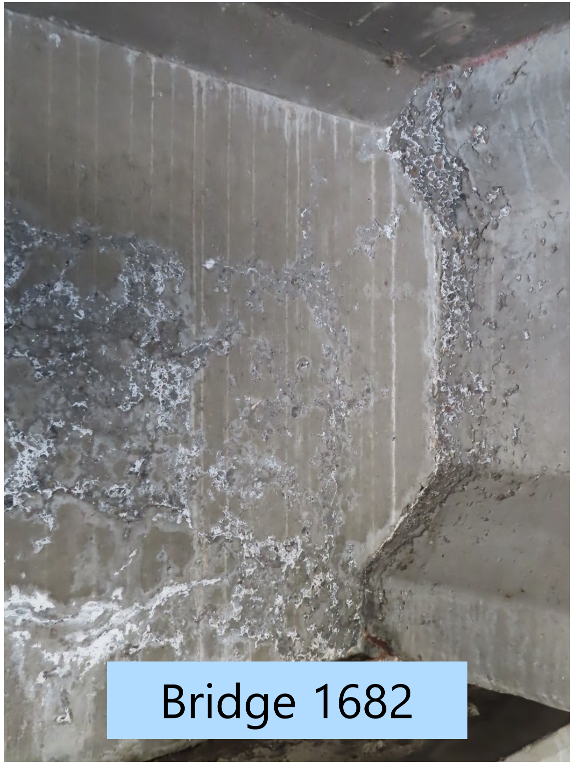


- Noted on three bridges
  - 1367
  - 1670
  - MM49.39

Cracking at Bridge Ends

Bridge 1459

Abutment Distress at Billings Bridges



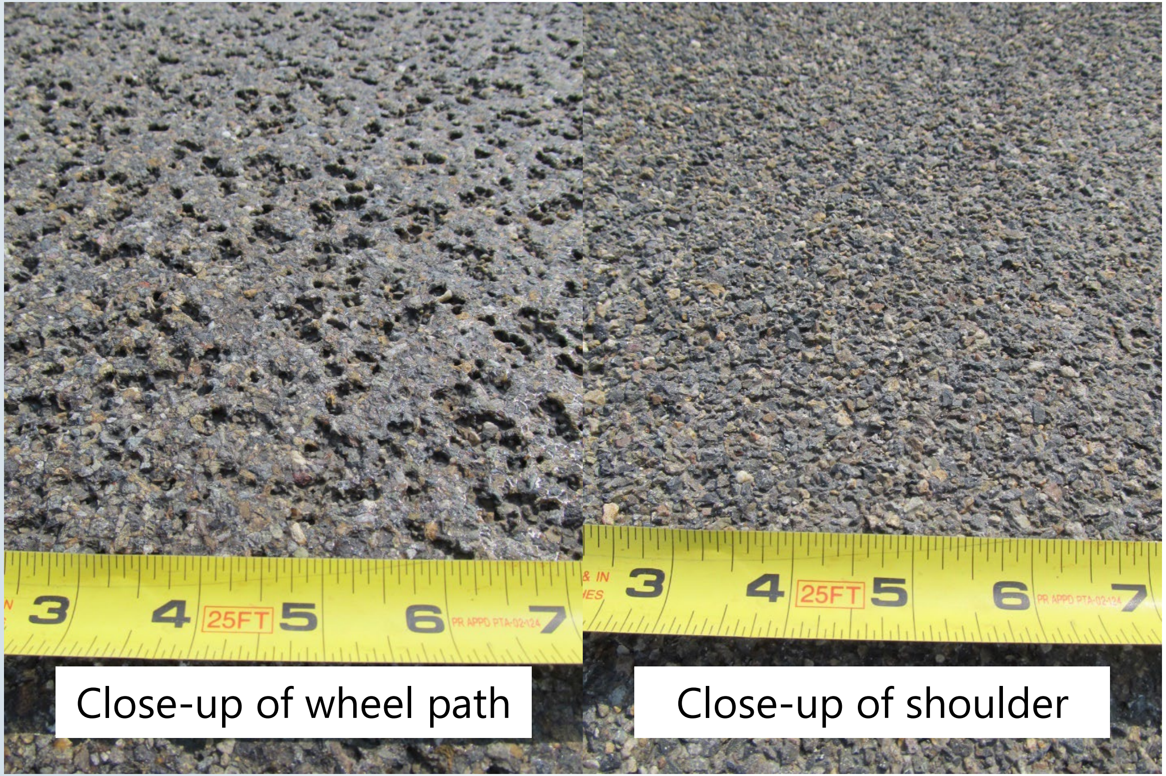
Year 2 Inspections

- Looked at 1670 and 1682 (Image from 1682)
- No significant changes noted. Small areas of debonding (pink arrows) had started to form but these delams made up a small percentage of the HFST area
- Overall, HFSTs appeared to still be performing well

Distress Observed in Year 3 (2022)

- Wear and aggregate pop-out – typically did not appear to have progressed
- Progression of delams/spalls at patch boundaries (1670, 1682); bridge end (1459)
- Increased pop-out spalls (1670; 1367)
- Increased amount of cracking observed
- Delaminations found both away from patches/cracks (1682; 3734) and at cracks (1333; 1336)
- Did not observe increase in deck underside distress (visual inspection only)

Wear & Aggregate Pop-out (Year 3)



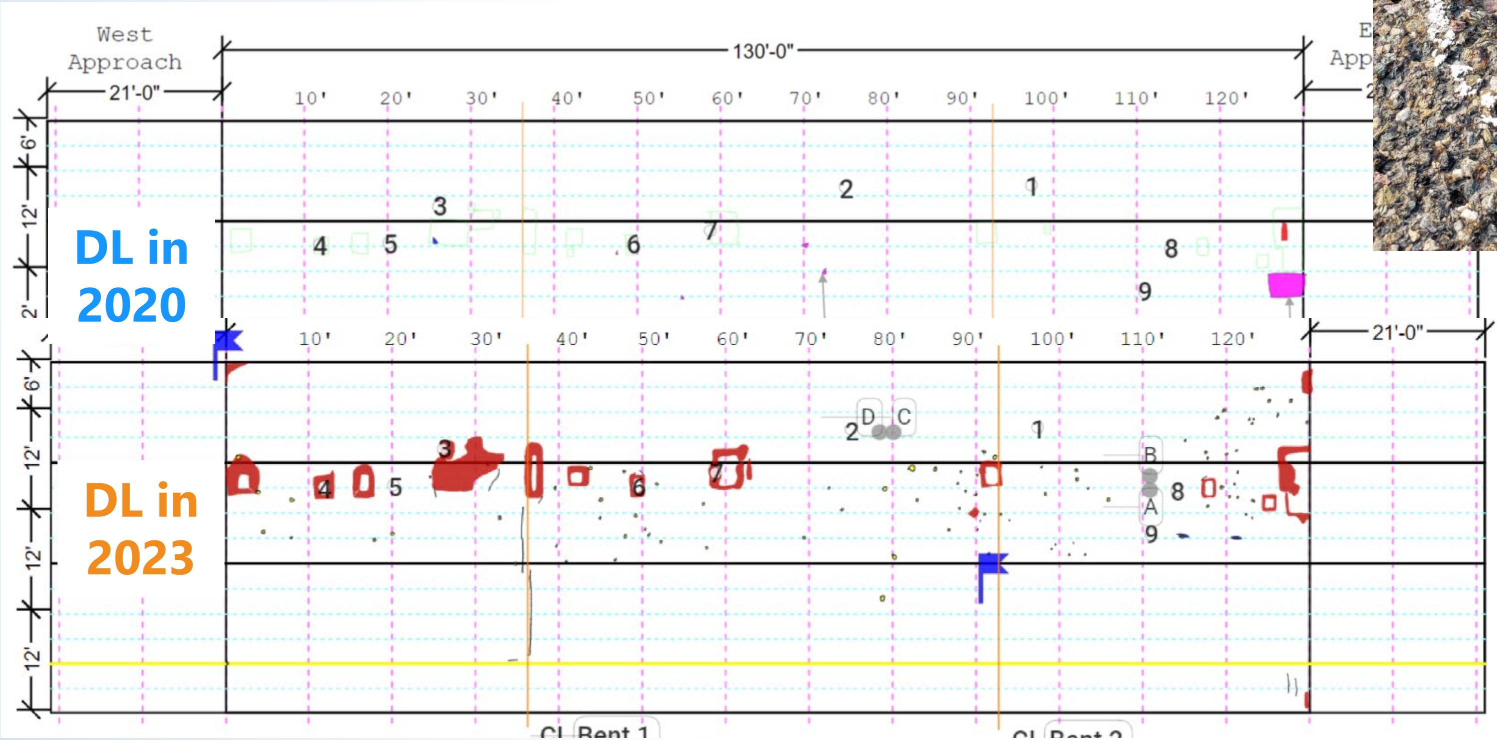
Close-up of wheel path

Close-up of shoulder

- Aggregates well-bonded to resin (Billings & Missoula)
- Entrapped air voids (Missoula); loss of agglomerations
- Wear typically did not appear to have progressed
  - 14/25 exception – brand new in 2020 vs. 2 years of age in 2022
  - Bridge 1670 some microscopic cracks in binder

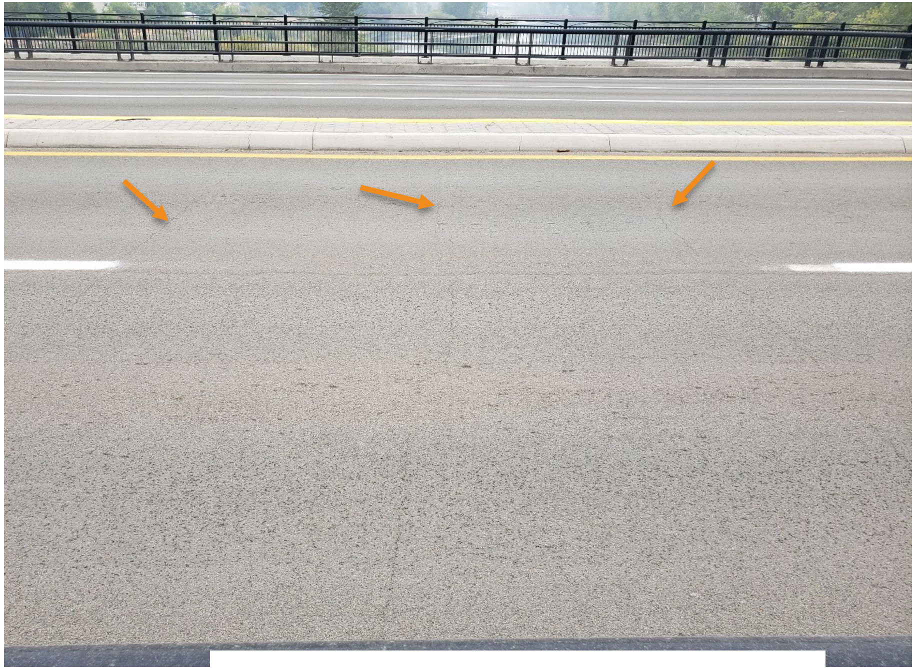
Bridge 1367

Bridge 1670 – Pop-out Spalls



Cracking (Year 3)

- Transverse cracks over bents that were not noted in 2020
  - Bridges 1670 and 1682
  - Bridge 1392
- Regularly-spaced cracks
  - Bridges 14/25 – avg. spacing 5 to 10 ft
  - Bridge 1428
- Longitudinal crack in 1459
- Above cracking may be new, or cracks may have been more visible in 2022



Transverse cracking in 14/25

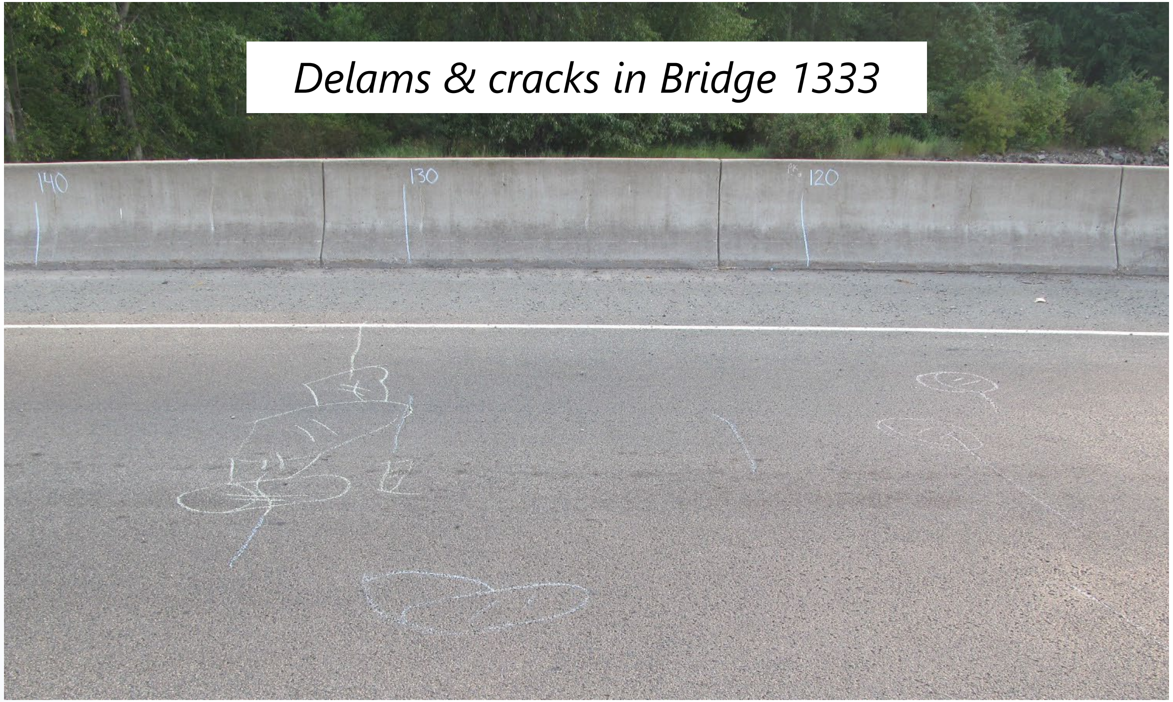
Delaminations Under Sound HFST (Year 3)

- Bridge 1682 – areas in shoulder; no patch present
- Bridge 3734 – delaminations at rebar due to active corrosion found; no cracks present

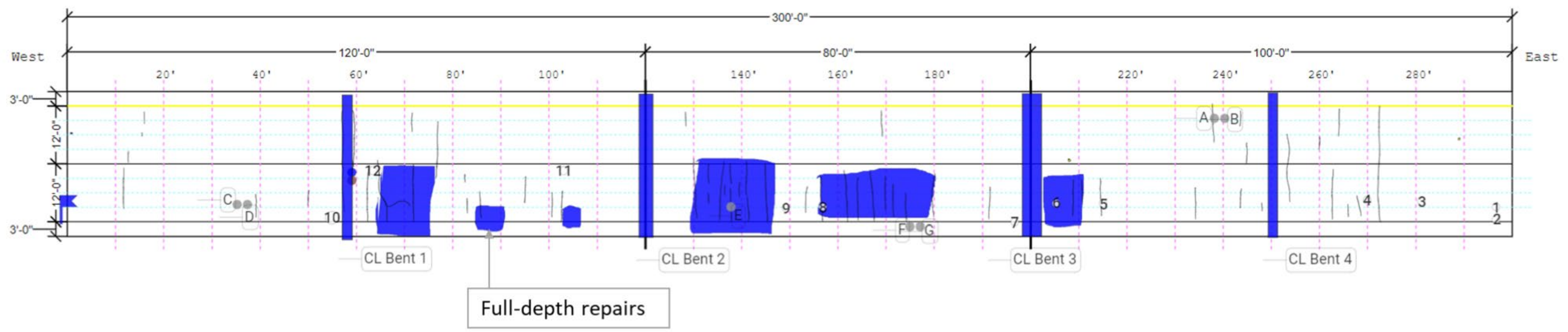
Delaminated area identified on Bridge 3734

Delaminations at Cracks (Year 3)

- Bridges 1333 & 1336



Cracks in HFST on Bridge 1367

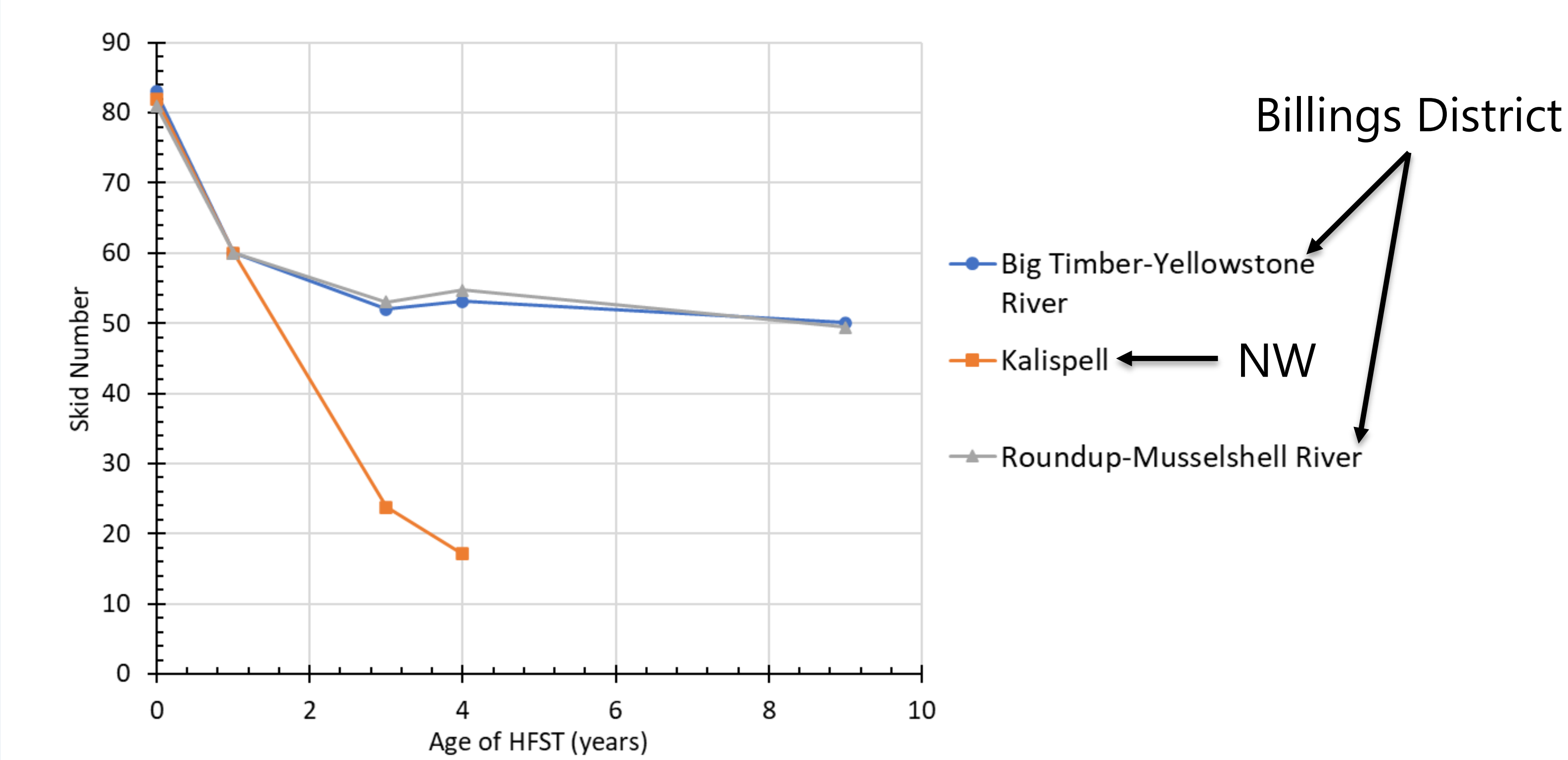


- Black lines represent cracks observed in HFST in 2022
- Blue areas represent Full Depth Repairs observed on underside in 2020
- No delaminations found in 2022

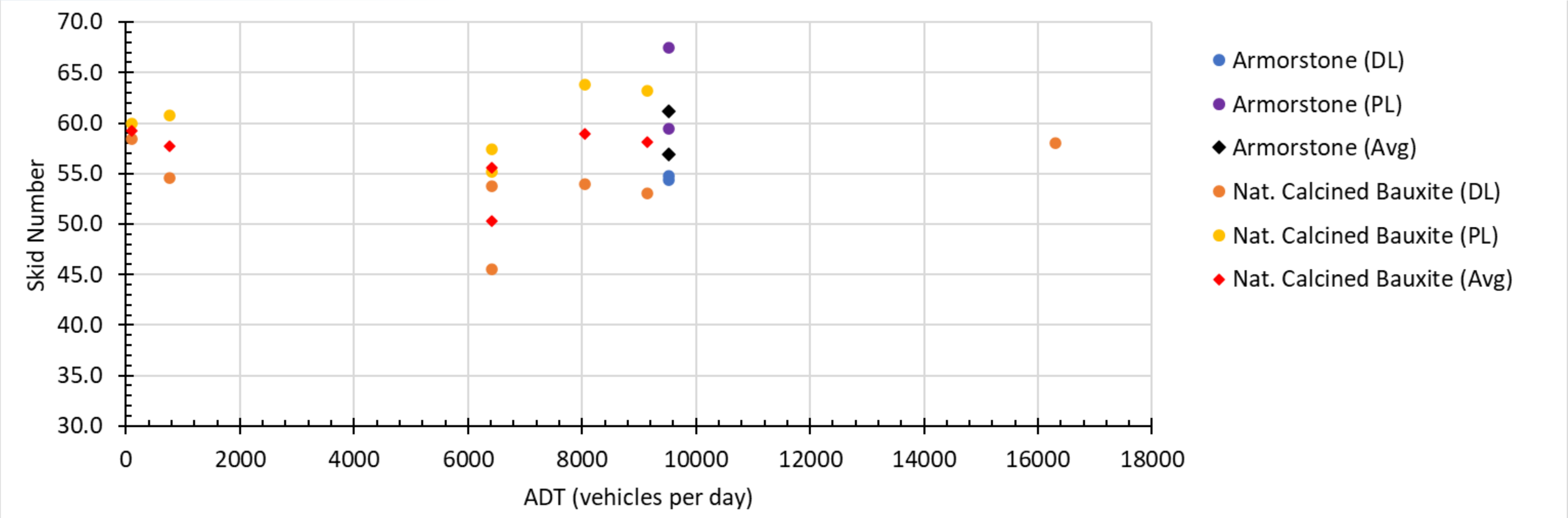
Skid Resistance Testing - Data

Bridge ID	Year of Overlay Installation	Polymer System	Type of Aggregate	Skid Numbers							
				2014	2015	2016	2017	2018	2019	2020	2023
Big Timber-Yellowstone River	2014	Dayton Superior-Unitex	Armorstone	83	60	no test	52	53.1	--	--	50.1
Roundup-Musselshell River	2014	Poly-Carb	Armorstone	81	60	no test	53	54.7	--	--	49.4
1333	2017	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)	na	na	na	--	--	--	57.7	46.9
1367	2016	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)	na	na	--	--	--	--	55.6	50.1
1374	2017	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux.	na	na	na	--	57	50.6	50.4	46.8
1392	2018	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)	na	na	na	na	--	--	58.1	57.1
1428	2018	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)	na	na	na	na	--	--	58	34.1
1459	2018	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)	na	na	na	na	--	--	58.9	50.1
1670	2015	Pro-Poxy Type III D.O.T.	Armorstone	na	--	--	--	--	--	61.2	56.1
1682	2015	Pro-Poxy Type III D.O.T.	Armorstone	na	--	--	--	--	--	56.9	55
3734	2018	Pro-Poxy Type III D.O.T.	Nat. Calc. Baux. (Lake Ranch Pit)	na	na	na	na	--	--	59.2	64.3

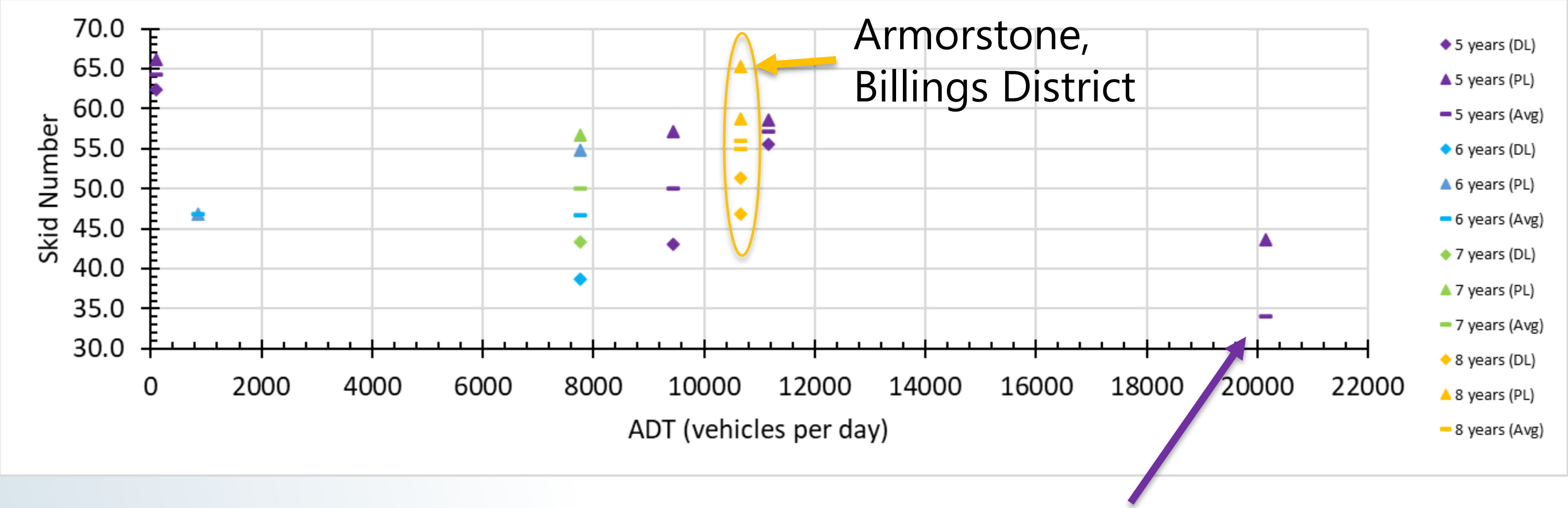
Performance of Oldest HFSTs



Influence of Traffic Counts – 2020 Data



Influence of Traffic Counts – 2023 Data



Bridge 1428 – jumped from 16,309 vpd with 11% truck traffic in 2020 to 20,157 vpd with 12% truck traffic in 2023

Summary of Abrasion/Wear Observed

- Visibly apparent in HFSTs > 1 year old
- Characterized by aggregate fracture and loss of aggregate agglomerations
- Correlates with amount of traffic (shoulder vs. passing lane vs. driving lane) but no strong correlation with ADT or ADTT between bridges
- Adequate skid resistance demonstrated for HFSTs of 8 or 9 years of age, even on interstate routes
- Bridge 1428 DL was exception – skid number < 30 at 5 years of age

Summary of HFST Distress 2020 - 2022

Overall: HFSTs are of good quality and generally in good condition

- Pop-out (1- or 2-inch diameter) Spalls
  - Occasional occurrence (1670, 1682, 1367, 3734, MM49.39)
  - Greatly increased from 2020 to 2022 in Bridge 1670; not representative
  - Cause unknown
- Transverse Cracking
  - Visible for HFSTs > 1 year old; appeared to develop progressively
  - Located over bents (active cracks)
  - Regularly-spaced cracking in HFSTs

Summary of HFST Distress 2020 - 2022

- Reflective Cracking at Patch Repairs
  - Problematic at Billings bridges – likely due to use of polymeric patch materials (as observed by district staff)
  - Not an issue for Missoula bridges except Bridge 1367
    - Coincided with locations of full depth deck repairs
- Delaminations and Unsound Areas
  - Present around cracked patch perimeters
  - Adjacent to/along cracks visible in HFSTs
  - Areas without cracking in HFSTs – due to ongoing deck corrosion
  - Not caused by disbondment of HFSTs
- Edge Damage to HFSTs (from snowplow/traffic impacts)

Laboratory Evaluation

ITEMS 4.3 & 4.4

Overview of Laboratory Evaluation

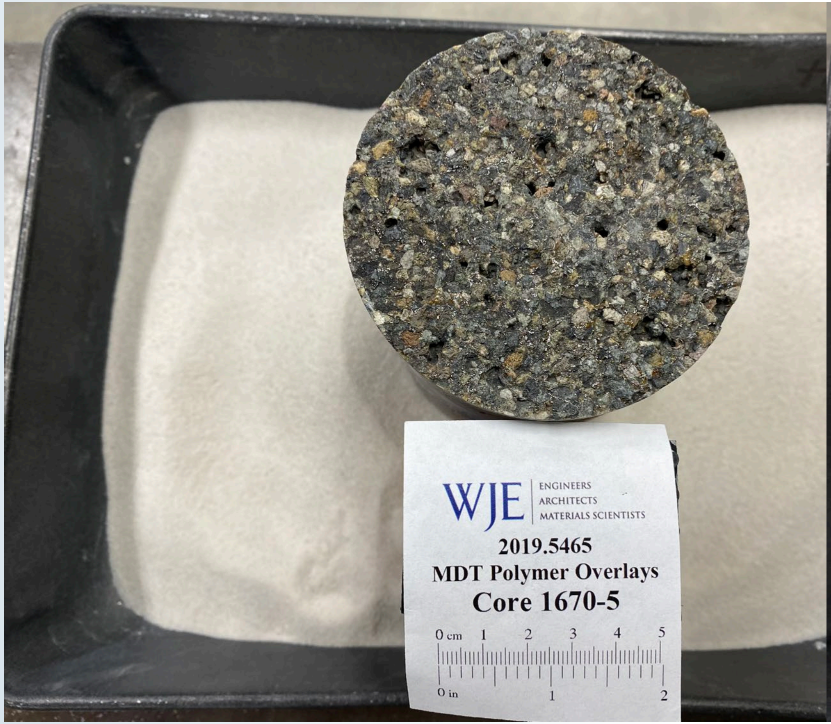
- Petrography (ASTM C856)
- Rapid Chloride Penetrability (ASTM C1202)
- Rapid Chloride Migration (AASHTO T 357)
- Bond Strength (ASTM C1583)
- Pavement Texture (Modified ASTM E965)
- Chemical Testing (Various methods to assess composition & degradation)

Bridge ID	2020 Inspection		2022 Inspection	
	Date Cored	No. of Cores	Date Cored	No. of Cores
1670	8/28/2020	9	9/12/2022	4
1682	8/28/2020	9	9/12/2022	5
1459	8/26/2020	10	9/13/2022	8
1367	8/24/2020	12	9/15/2022	7

Laboratory Testing of Cores

Bridge ID	Date Cored	No. of Cores
1670	8/28/2020	9
1682	8/28/2020	9
1459	8/26/2020	10
1367	8/24/2020	12

Modified ASTM E965 for Pavement Roughness



Pavement Macrotexture Depth ASTM E965

Bridge ID	MTD in DL (in.)		MTD in SH (in.)	
	2020	2022	2020	2022
1670	0.089	0.057	0.141	0.14
1682	0.073	0.073	0.126	0.128
1459	0.085	0.062	0.14	0.231
1367	0.089	0.046	0.126	0.112
Average MTD	**0.085**	**0.061**	**0.133**	**0.153**
Standard Deviation	0.019	0.012	0.02	0.05
No. of Datapoints	17	11	11	8
Maximum MTD	0.127	0.081	0.16	0.234
Minimum MTD	0.049	0.046	0.096	0.095

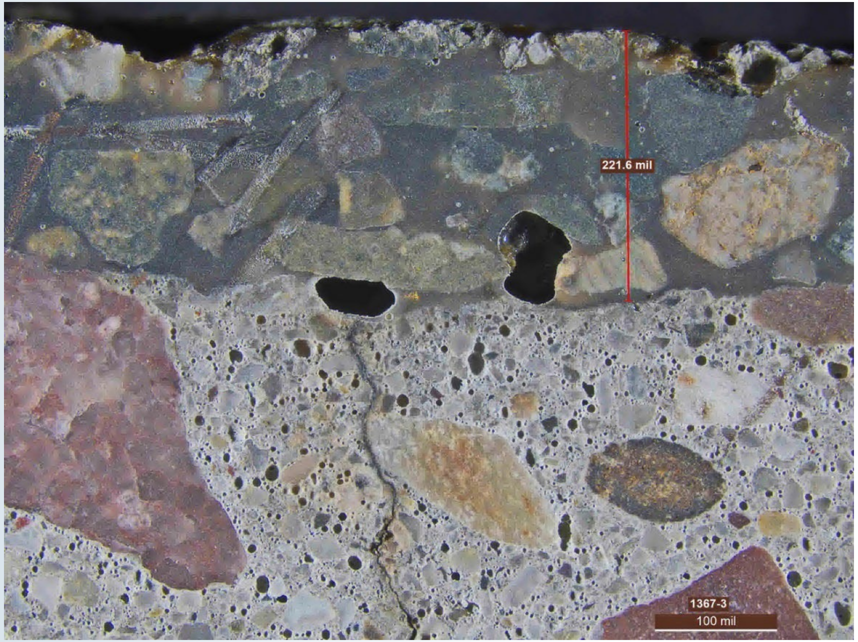
Based on 2 side-by-side cores

DL = Driving Lane; SH = Shoulder
Passing Lane had average MTD of 0.108 inches in 2020 (2 cores from 1459)

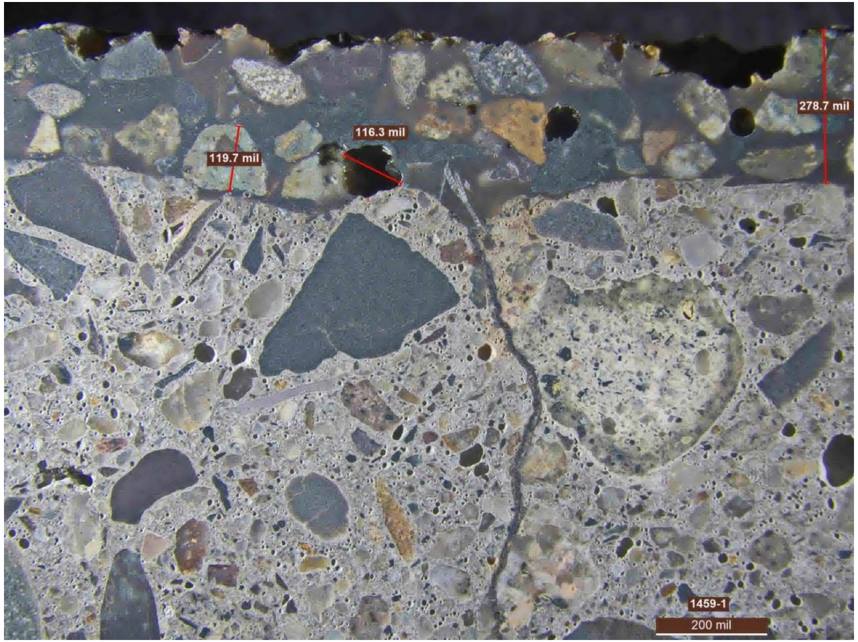
Petrography (ASTM C856)

- Sand-resin polymer overlay 0.2 to 0.3 inches thick
- HFST performing well or satisfactorily; no major cracks or other forms of distress
- Vertical (hairline or thicker) cracks observed in the substrate generally did not appear to be reflected in HFST
- Resin/polymer binder was polished, smooth, clear and amber-colored; <u>somewhat brittle</u> on top surface due to exposure to traffic & weathering. Binder below top surface appeared milky, less transparent, and less brittle when prodded with a steel pick
- Fractures or microcracks were frequently observed on exposed sand particles on top surface
- Sand-resin bond of HFST was generally tight
- Substrate concrete roughened or prepared to a CSP estimated at 3 to 4 (Core 1367-3) or 5 to 6 (Cores 1367-5 & 1670-8). Microcracks/bruising appeared infrequent.

Petrography (ASTM C856)

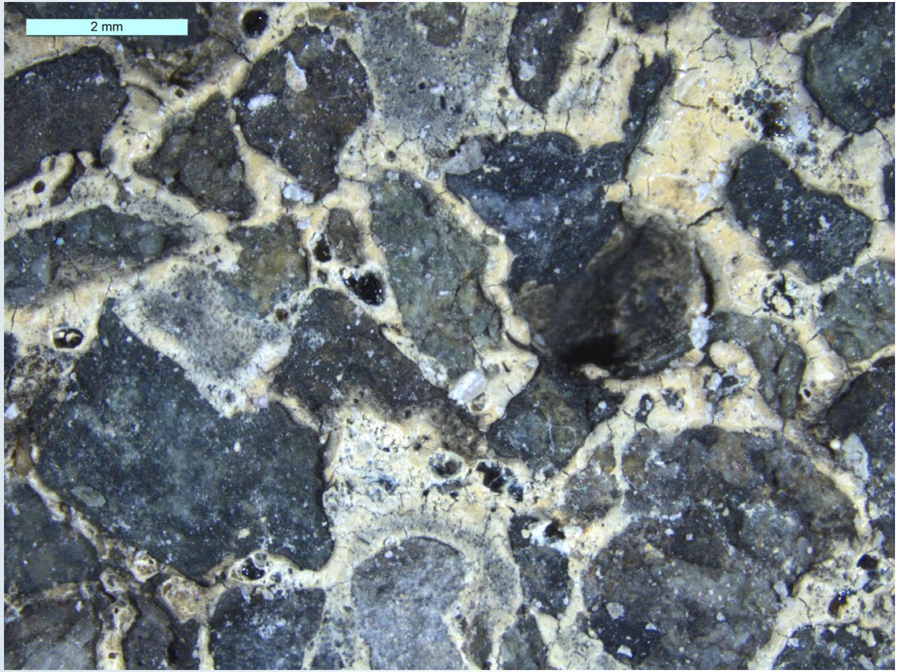


Core 1367-3

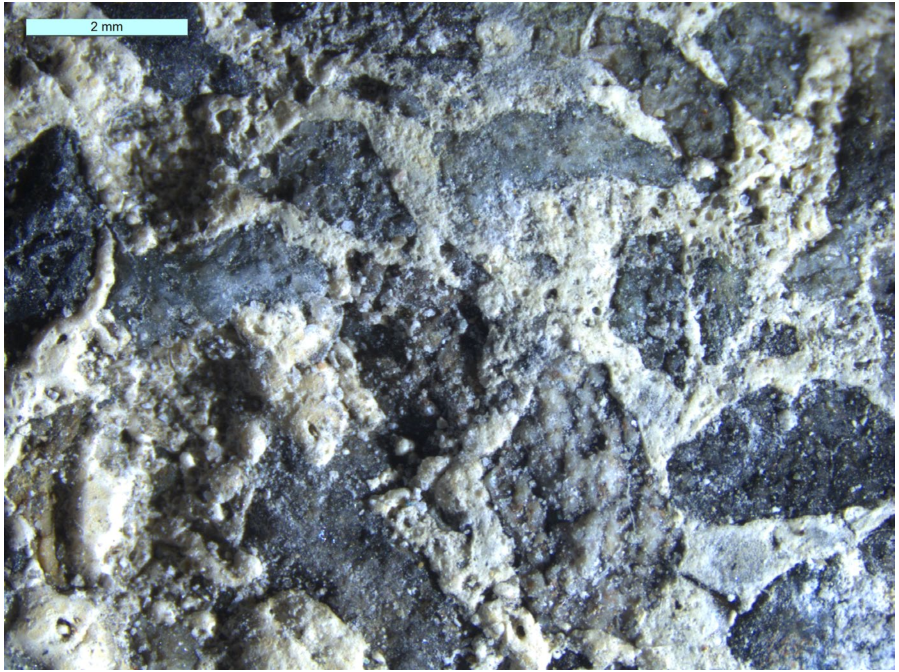


Core 1459-1

Some More Magnified Images



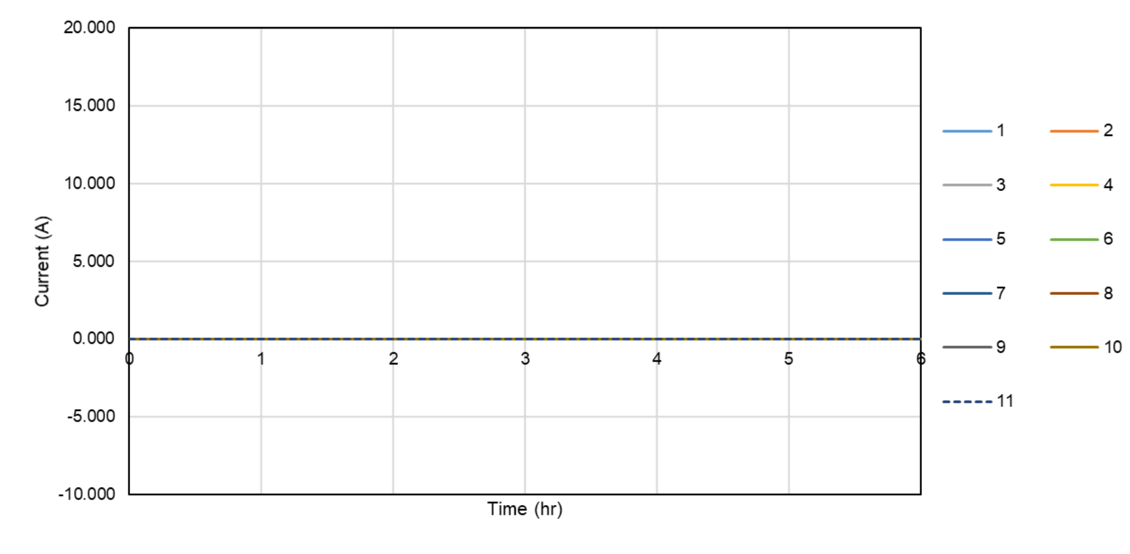
Core 1367-11 (DL, Wheel Path)



Core 1670-5 (DL, Wheel Path)

Rapid Chloride Penetrability (ASTM C1202)

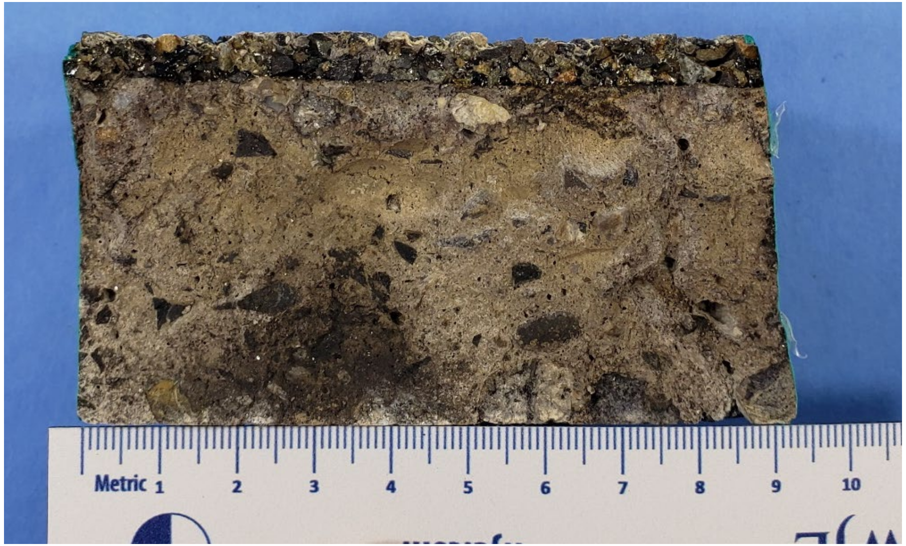
- Selected 11 cores with intact HFST
- Charges passed = 0 Coulombs for all cores tested



Rapid Migration Testing (AASHTO T 357)

- Results were inconclusive, likely due to pre-existing chloride contamination, potentially carbonation as well

Core 1367-2



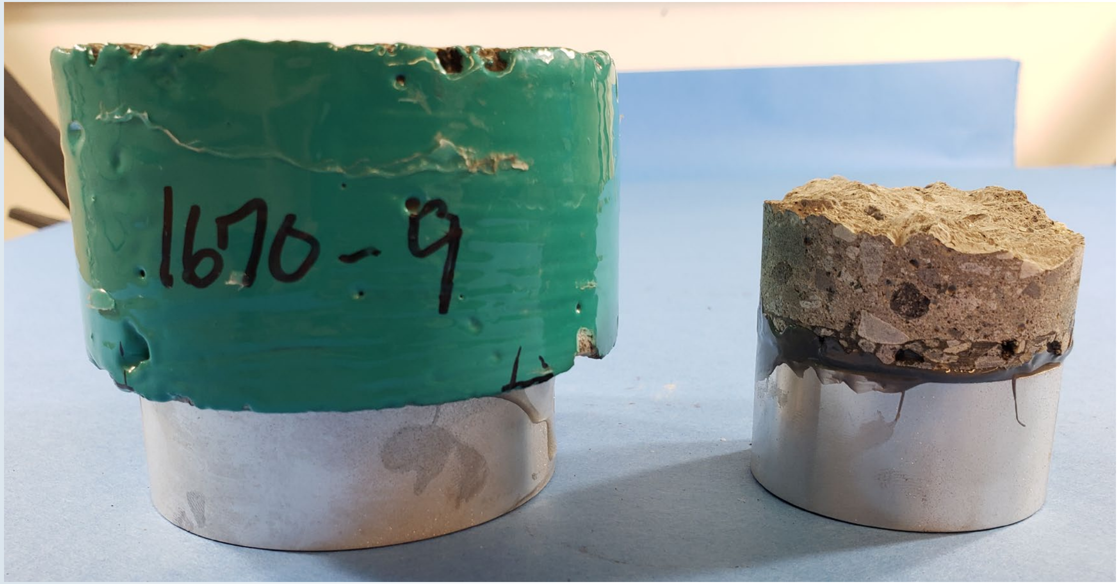
Core 1670-1

Bond Strength (ASTM C1583)

- Typically at least 400 psi except Bridge 1367, which varied from 268 psi to 394 psi
- Failure occurred in substrate for all cores tested except 1367-12, where about 15% of area failed at interface between HFST and deck

Bridge ID	Avg. Bond Strength	No. of Cores Tested
1670	459 psi	2
1682	481 psi	2
1459	422 psi	3
1367	329 psi	4

Bond Strength (ASTM C1583)

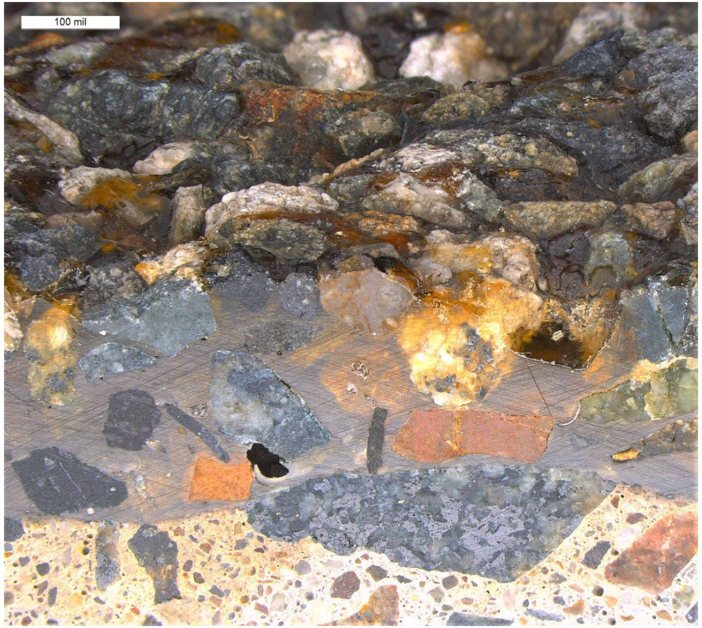


Core 1670-9

Core 1367-12

Chemical Testing

- Done to assess composition and degradation behavior
  - Fourier Transform Infrared (FTIR) Spectroscopy
  - Thermogravimetric Analysis (TGA) and Differential Scanning Calorimetry (DSC)
- One core tested per bridge
  - 1670-8, 1682-7, 1459-9, 1367-4
- Appeared well cured and cross-linked. Found slight difference in crosslinking density in one of the samples
- Resin will embrittle with time and aging



Key Points from Laboratory Evaluation

- HFSTs are performing well from a bond and chloride protection viewpoint
  - Petrographic examination indicated good surface prep and bond and that HFST is performing well; cracks rarely reflected through overlay
  - No charge passed in ASTM C1202 testing
  - Bond strengths of at least 400 psi typical (excluding Bridge 1367, which had average of 329 psi)
- Observable and measurable difference in wear between driving and shoulder lanes
  - Fracture of sand particles observed in petrographic examination
  - Embrittlement of the binder resin noted (UV) but not unusual

Conclusions & Recommendations

Conclusions

- HFSTs performing well for 5 to 8 years
- Wear in Travel Lane more than Passing Lane and Shoulder
- Bond is good which is key to performance
- Less suitable for decks having existing distress
- Deck patching can affect performance
- HFST (TPOs) have high electrical resistance and should provide some protection against deicer ingress and slow existing corrosion somewhat
- Wear results in polishing and loss of aggregate agglomerations
- Wear not influenced greatly by ADT/ADTT of different bridges
- Some damage by plows and at approach joints

Recommendations

- Focus use of HFST/TPOs on newer decks with no or only limited deicer contamination.
- Ensure repair materials are compatible with overlay and have low shrinkage.
- Improve compaction of the overlay to minimize popouts.
- Consider additional thickness for travel lanes.
- Research if additional layers can be applied to aged overlays (drive lanes)
- Transverse cracks tend to reflect if they are moving. Use primer to fill and seal cracks prior to placing overlay.
- Modify details at approach joint. Grind deck and thicken overlay and ensure smooth transition.

Recommendations

- Micromilling might be advantageous to remove chloride laden concrete.
- Have contactors document patching locations (as-builts).
- Continue monitoring program for HFSTs.
- Some states are able to get warranty on overlay.

Disclaimer

- Note that the research is limited to the materials investigated (Dayton Superior Pro-Poxy III) and other polymer formulations and aggregate or changes in formulation can affect performance.

Evaluation of Thin Polymer Overlays for Bridge Decks

OCTOBER 24, 2023

WJE