Connecticut State Report

Northeast Pavement Preservation Partnership
September 18 – 21, 2023

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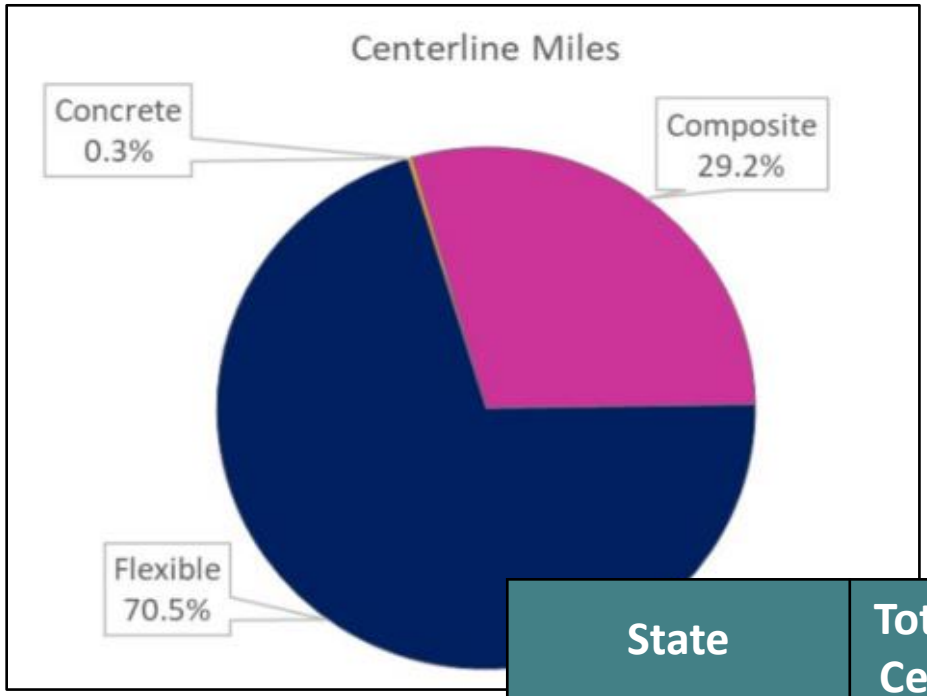
Presentation Overview

- **Roadway Network Overview**
- **Pavement Preservation Program**
  - Funding History
  - Treatment Types
  - Past, Present, and Future Programs
- **New Treatments and Technologies**
  - Thin Friction Wearing Course
  - Microsurfacing for Rumble Strips
  - Emulsion Chip Seal for Shoulders
  - Mastic Patching
  - Uniform Placement & Compaction

Roadway Network

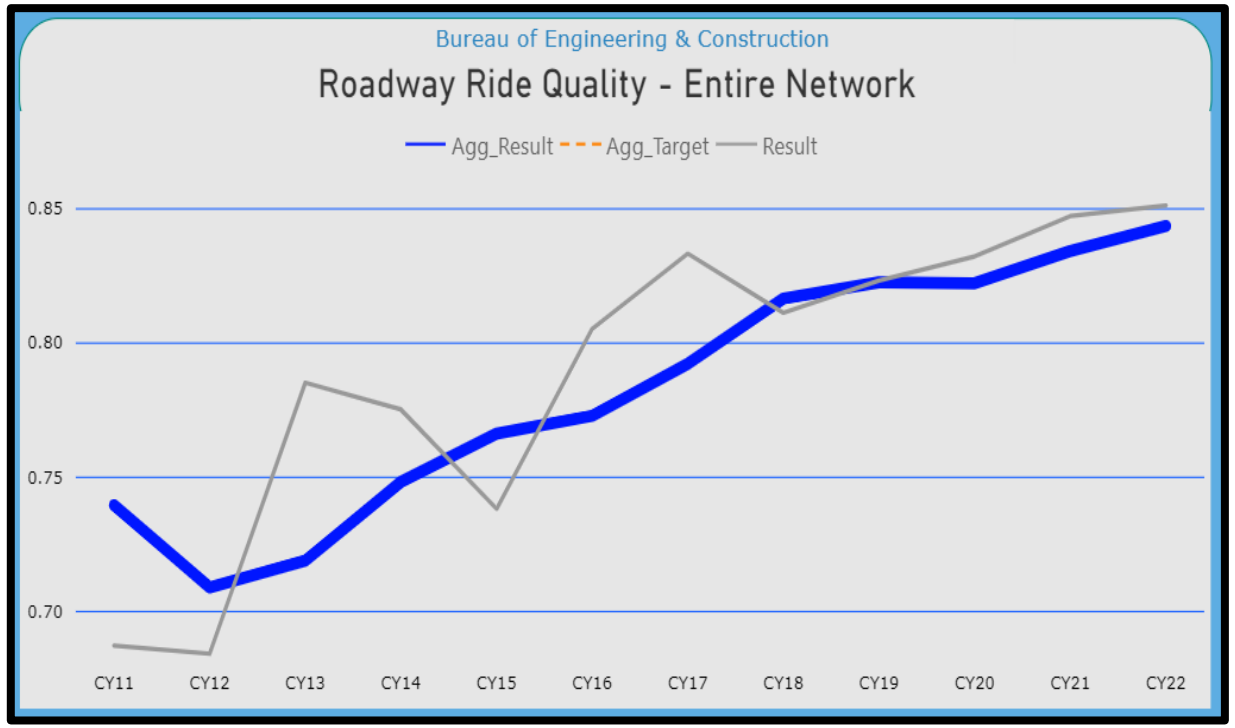
- **State-maintained Roads (2020):**
  - 3,716 centerline miles (plus 464 miles of ramps)
    - NHS: 1,406 centerline miles
    - Non-NHS: 2,310 centerline miles
  - 10,305 lane miles
- **Town-maintained Roads (2020):**
  - 17,446 centerline miles
  - ~ 35,300 lane miles

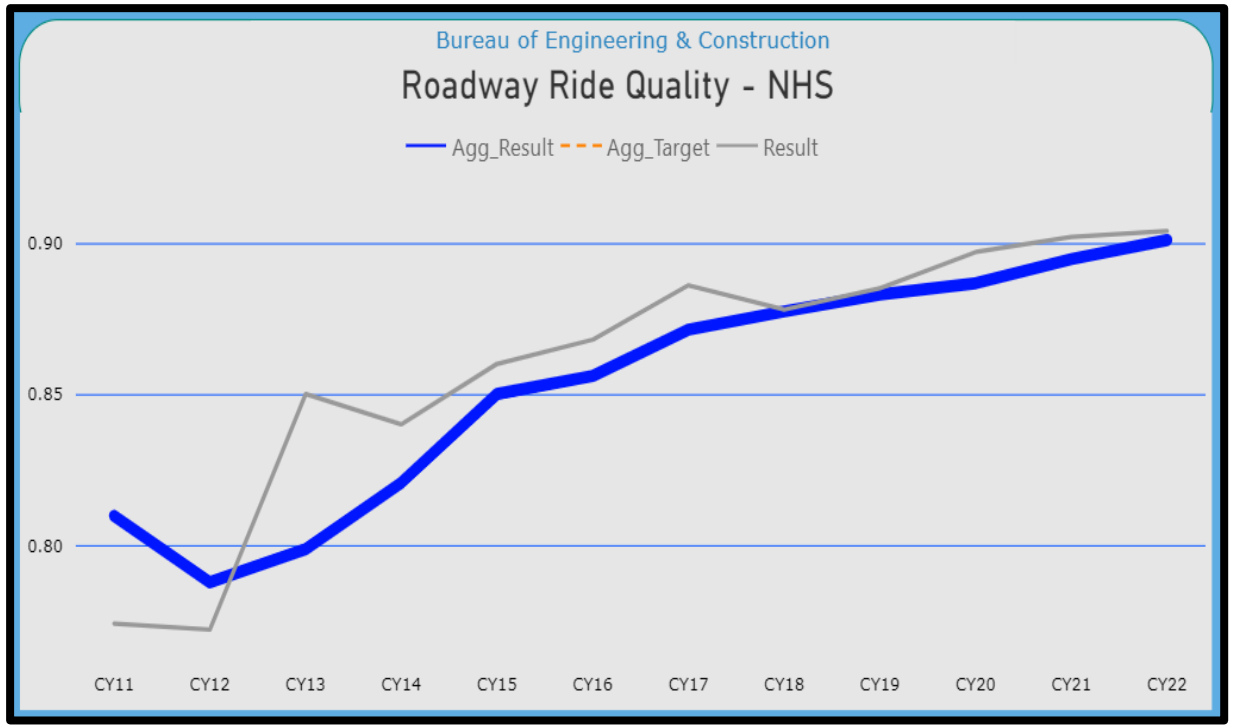
Pavement Types on CT State-maintained Roads (2020)



State	Total Roadway Network Centerline Miles (2020)
Connecticut	21,575
Rhode Island	6,025
Vermont	14,248
Massachusetts	36,815
New York	114,205
Pennsylvania	120,845

Performance Condition Trends





https://portal.ct.gov/DOT/Performance-Measures/Performance-Measures

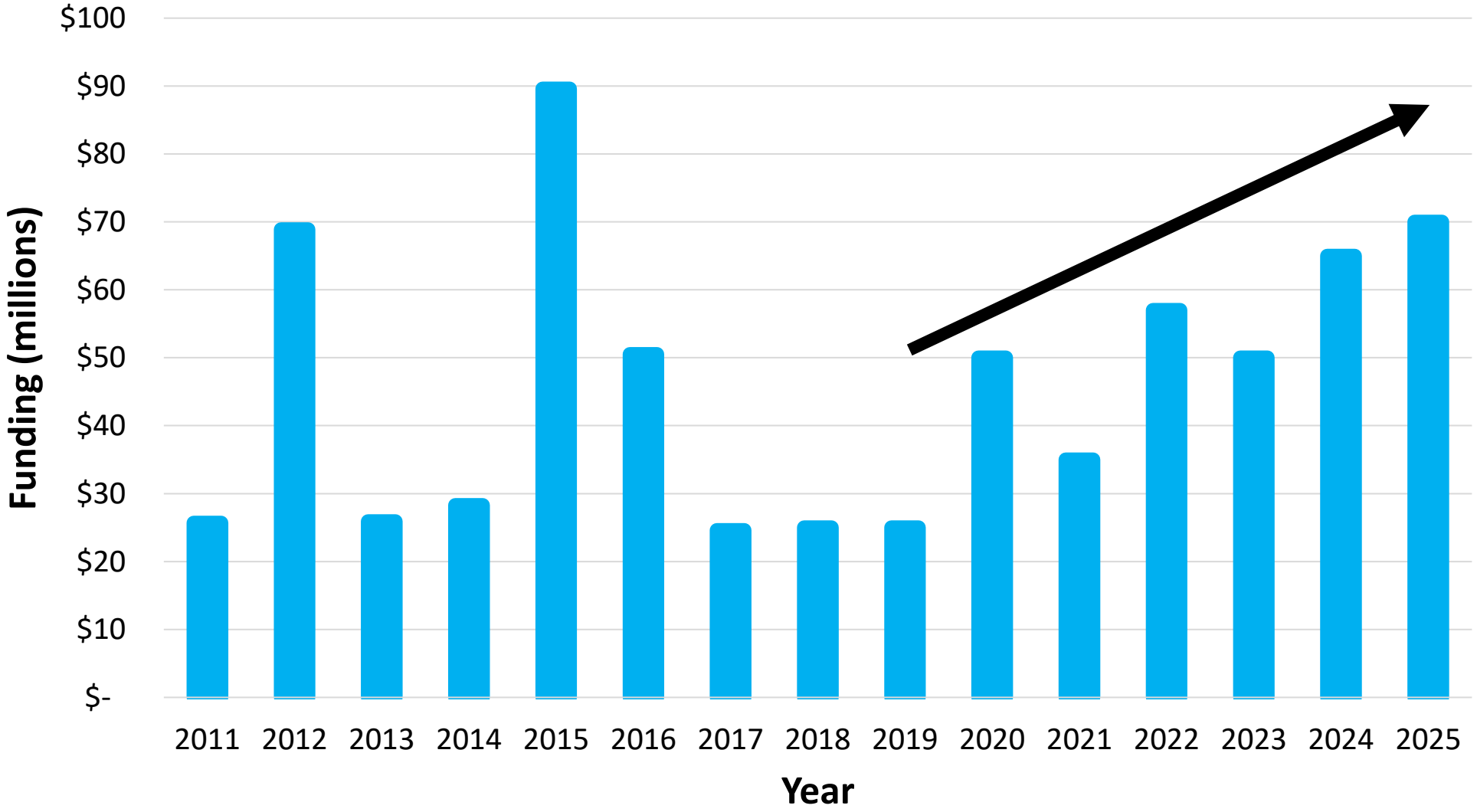
2023 Annual Highway Report (2020 data):

TABLE 4: OVERALL HIGHWAY PERFORMANCE RANKING TRENDS, 2018-2020

State	Year			Change in Rank	
	2018	2019	2020	2019-2020	2018-2020
Alabama	19	28	15	13	4
Alaska	49	48	50	-2	-1
Arizona	23	29	30	-1	-7
Arkansas	9	17	13	4	-4
California	43	45	47	-2	-4
Colorado	38	37	43	-6	-5
Connecticut	35	31	5	26	30

in the rankings or in some cases losses. Part of Connecticut's large jump is due to other categorical improvements including smoother Interstate highway pavement and lower fatality rates in all three categories. The state still has room for improvement; the urbanized area congestion is in the bottom 10 of all states. Still, considering its location, Connecticut spends a modest amount of resources for a high-quality roadway system.

Pavement Preservation Funding



Maintenance-driven resurfacing program:

- Separate from our preservation program
- ~$80M annually
- Some projects do fall into “preservation” category due to condition
- Most projects resurface sections in poor condition

Preservation Treatments

- **“Work-horse” Treatments**
  - Asphalt Rubber Chip Seal: *7-10 years*
  - Ultra Thin Bonded PMA: *10-12 years*
  - Mill and Overlay PMA: *12-15 years*
  - Thin Friction Wearing Course: *8-10 years* ***(new)***

- **Supplementary Treatments**
  - Crack Sealing and Filling: *2-5 years*
  - Variable Depth Patching
  - Mastic Patching ***(new)***
  - Microsurfacing for Rumble Strips ***(new)***

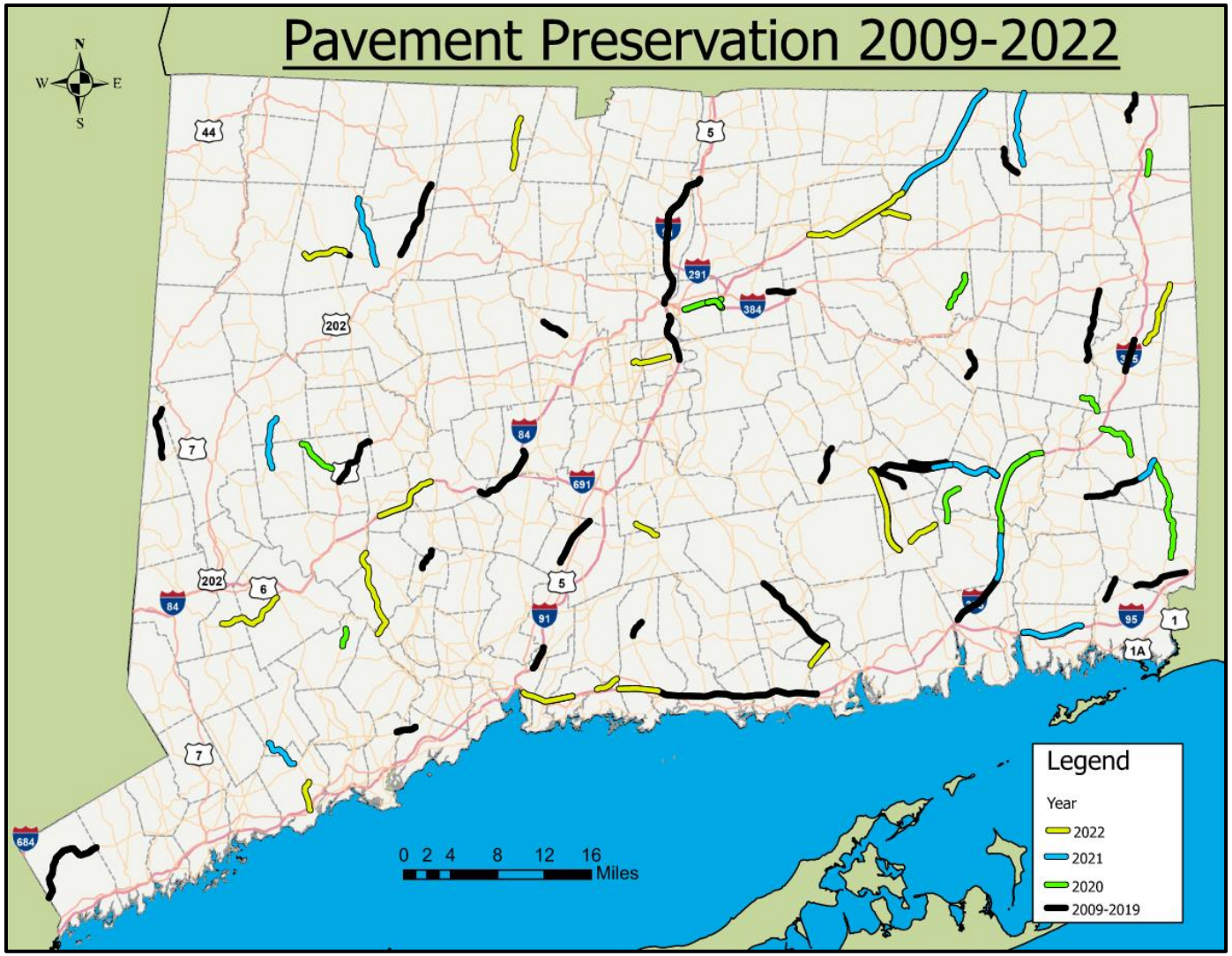
Prep work for other treatments

  - Emulsified Asphalt Fog Seal: *3-5 years*
  - Emulsified Chip Seal: *5-7 years* ***(new)***

Shoulder work for other treatments

2009-2022 Preservation Program History

Treatment	Centerline Miles
Chip Seal	123
Ultra Thin Bonded	307
Mill and Overlay	391
Total	**821**

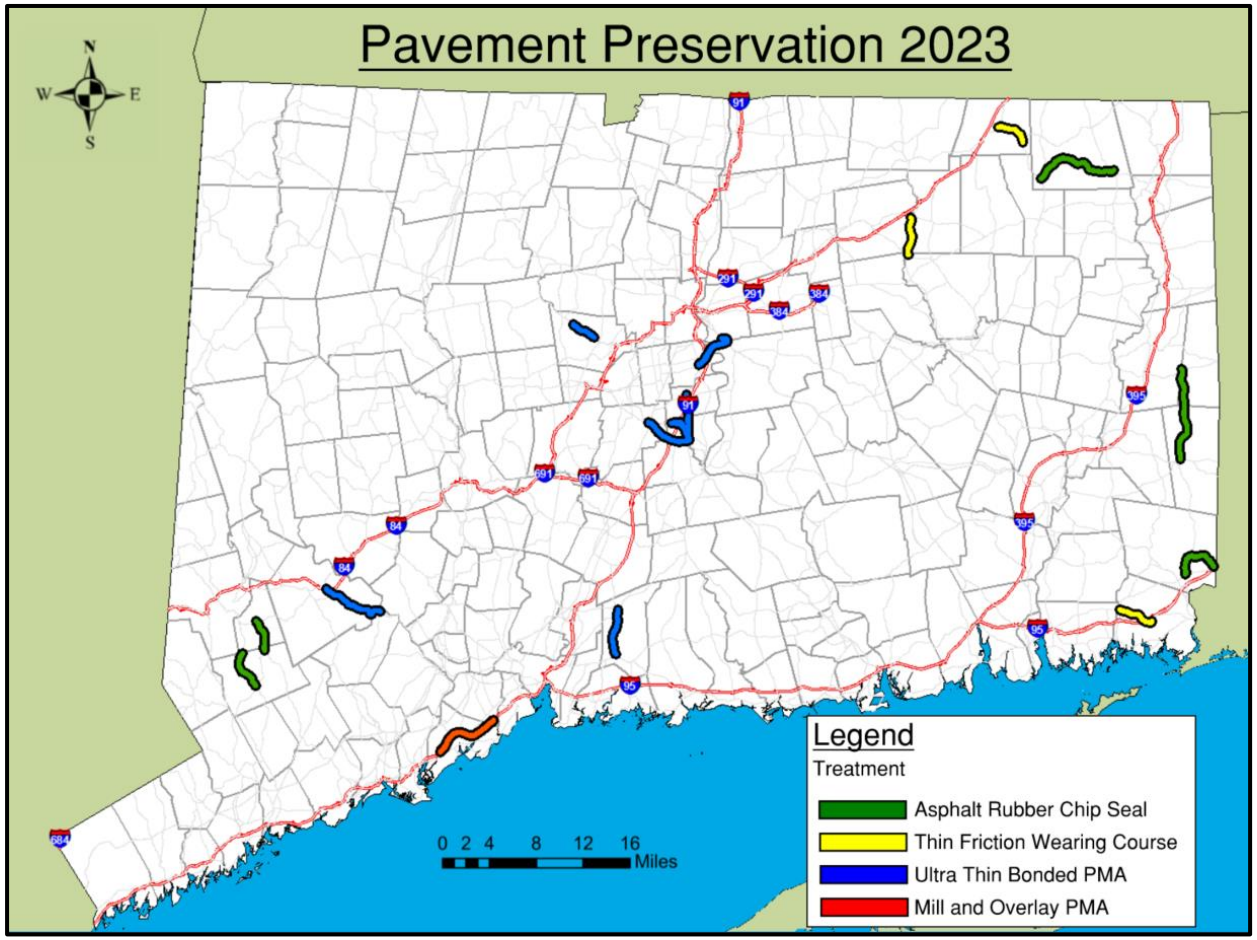


2023 Preservation Program *(currently in construction)*

Treatment	Centerline Miles	Lane Miles	# of Contracts
Asphalt Rubber Chip Seal	27	52	2
Thin Friction Wearing Course	10	19	1
Ultra Thin Bonded PMA	32	79	2
Mill and Overlay PMA	12	38	1
Total	**81**	**188**	**6**

Program Cost: ~$50M

- First year with a TFWC contract
- Challenges with first year in construction

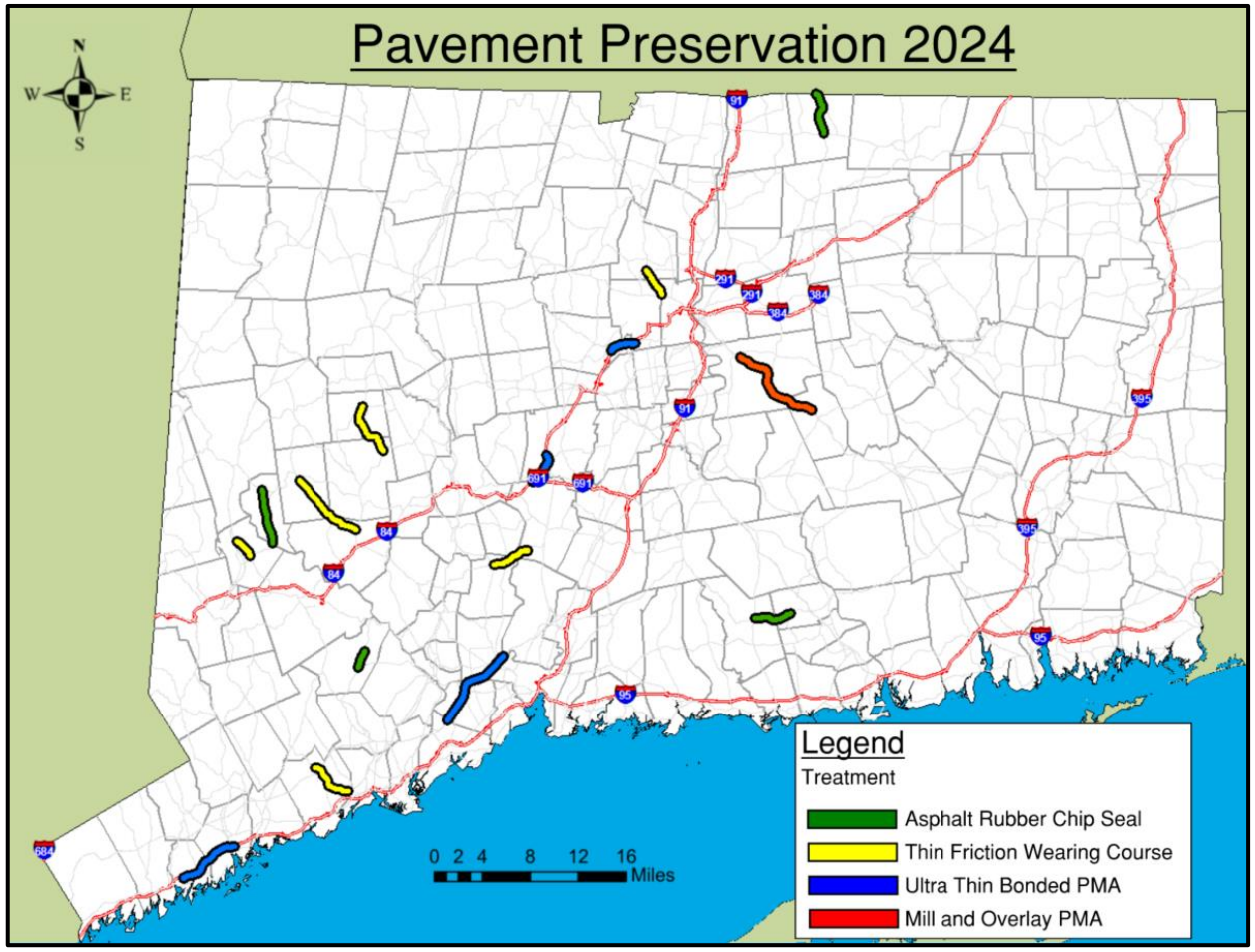


2024 Preservation Program *(currently in design)*

Treatment	Centerline Miles	Lane Miles	# of Contracts
Asphalt Rubber Chip Seal	13	26	2
Thin Friction Wearing Course	23	50	2
Ultra Thin Bonded PMA	18	97	2
Mill and Overlay PMA	8	40	1
Total	**62**	**213**	**7**

Program Cost: ~$65M

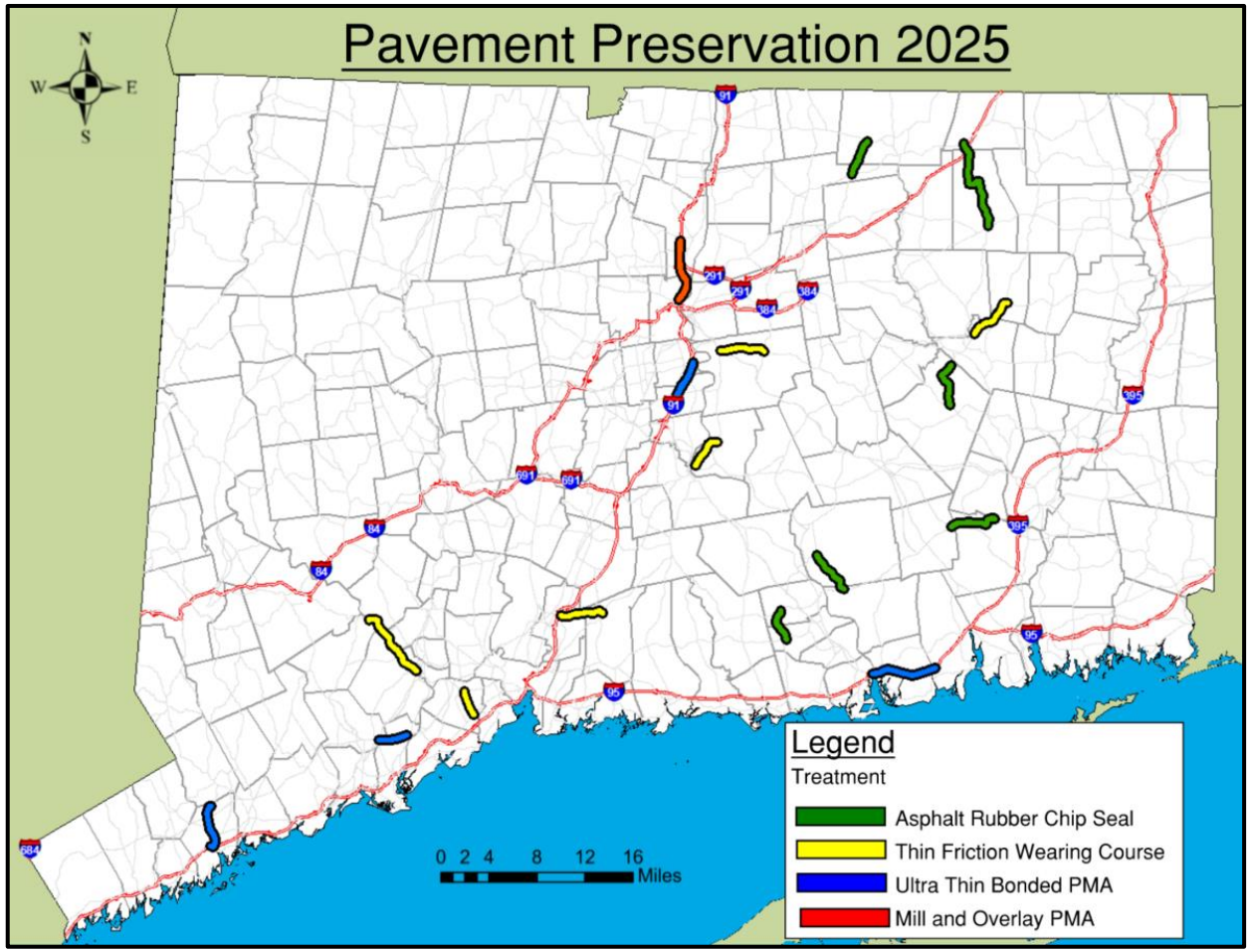
- Ramping up TFWC treatment
- Increased total # of contracts
- Maintained application of other treatments



2025 Preservation Program Look Ahead *(tentative figures)*

Treatment	Centerline Miles	Lane Miles	# of Contracts
Asphalt Rubber Chip Seal	28	55	2
Thin Friction Wearing Course	24	66	2
Ultra Thin Bonded PMA	31	89	2
Mill, Overlay, and UTBO	11	45	1
Total	**94**	**255**	**7**

Program Cost: ~$70M



- Expanding TFWC treatment further
- TFWC proving useful for filling in program gaps where ARCS/UTBO are not an ideal treatment
- Consistent funding

New Treatments & Technologies

1. Thin Friction Wearing Course
2. Microsurfacing for Rumble Strips
3. Emulsion Chip Seal for Shoulders
4. Hot Pour Mastic Patching
5. Uniform Placement & Compaction

Thin Friction Wearing Course (Item #0406164A)

- **Materials**
  - Asphalt Binder: PG 64E-22 w/ SBS polymer at 6%
  - Aggregate: Traffic Level 3
  - Stabilizing Fibers
  - Non-Tracking Tack Coat: 0.06 – 0.08 gal/SY (milled surface)
    0.04 – 0.06 gal/SY (non-milled)
  - Mix placed at 3/4 in. (reduced from prior 1 in. design thickness)
- **Targeted roads**
  - Secondary roadways
  - Surface age: 6-10 years
  - ADT: 10,000 – 20,000
  - Pavement type: Flexible or composite (only flexible for now)
- **Purpose**
  - Similar to UTBO mix, but can be placed without a spray paver
  - Fills in program gaps where ARCS or UTBO do not fit criteria

Table 2: TFWC Master Range for Gradation

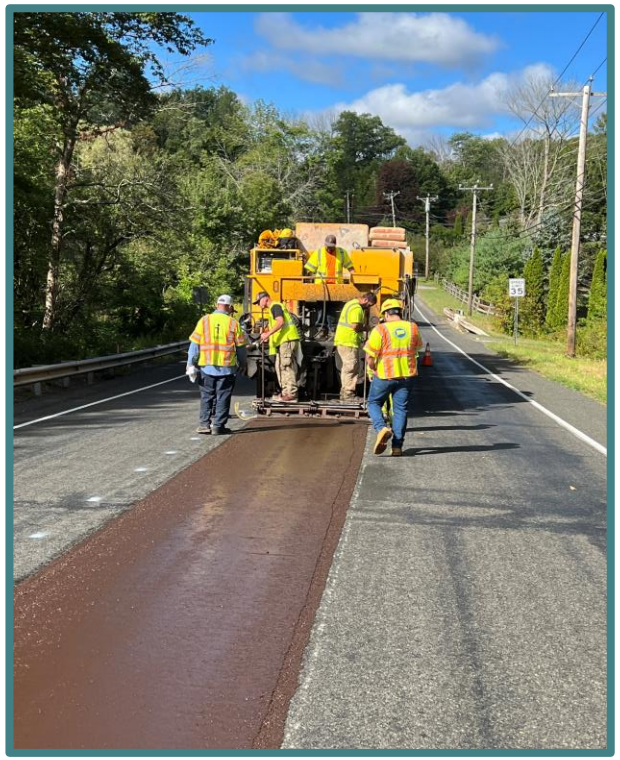
Sieve Size	Percent Passing
1/2 inch	100
3/8 inch	92-100
No. 4	35-50
No. 8	24-36
No. 30	8-20
No. 50	5-12
No. 200	3-7

Table 3: TFWC Mixture Design Criteria (JMF)

Criteria	Target Value (%)
Percent Binder (Pb)	6.0 min.
Air Voids (AV) @ 50 gyrations in Superpave compactor	5.0 +/- 1.0
Voids in Mineral Aggregate (VMA)	18.0 min.

Microsurfacing for Rut Filling (Item #0406901A)

- **Materials**
  - Emulsified asphalt: quick setting, 3% polymer modified)
  - Mineral filler: Portland cement, hydrated lime, limestone dust, fly ash, or other approved filler
  - Aggregate: 100% crushed stone
  - Tack Coat: 0.05 – 0.15 gal/SY
- **Application**
  - Rate: 20 – 40 lbs./SY
  - Dimensions: 2 – 6 ft. width, 0.375 – 0.625 in. depth
- **Purpose**
  - Used to fill rumble strips prior to ARCS and UTBO treatment (straight overlay), limited cases
  - May expand use in future programs



Sieve Size	Type III % Passing
3/8”	100
No. 4	70 – 90
No. 8	45 – 70
No. 16	28 – 50
No. 30	19 – 34
No. 50	12 – 25
No. 100	7 – 18
No. 200	5 – 15

Table 5: Mix Design Proportion Requirements

Component Material	Limit
Residual Asphalt	5.5 % - 10.5% (by dry weight of aggregates)
Polymer Modifier	3% polymer solids min. (by weight of residual asphalt)
Mineral Filler	0% - 3% (by dry weight of aggregates)
Additives	As required
Water	As required to ensure proper mix consistency

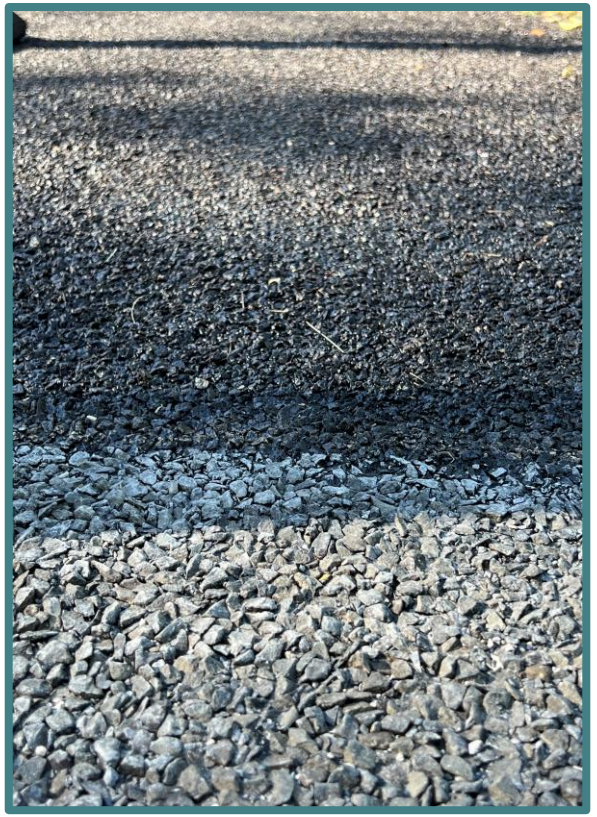
Emulsified Chip Seal (Item #0406134A)

- **Materials**
  - Asphalt Emulsion: CRS-2P or HFRS-2P
  - Cover Aggregate: 90% fractured face, 1/4” stone

- **Application**

	Application Rate	Width Range
Emulsion Distributor	0.3 – 0.45 gal/SY	14 in. – 16 ft.
Aggregate Spreader	15 – 20 lbs./SY	**4.5ft.** – 18 ft.

- **Purpose**
  - Used on shoulders of ARCS routes identified as bike routes
  - Smaller aggregate size fills in gaps to create a smoother riding surface for bikers (1/4 in. slightly smaller than 3/8 in.)
  - Emulsified asphalt fog seal applied afterwards
  - First tried fog seal with crumb rubber, then with black beauty, but did not work as well



Gradation of Cover Aggregate

Sieve Size	% Passing
1/2 inch	100
1/4 inch	85 – 100
1/8 inch	0 – 15
No. 200	0 – 2

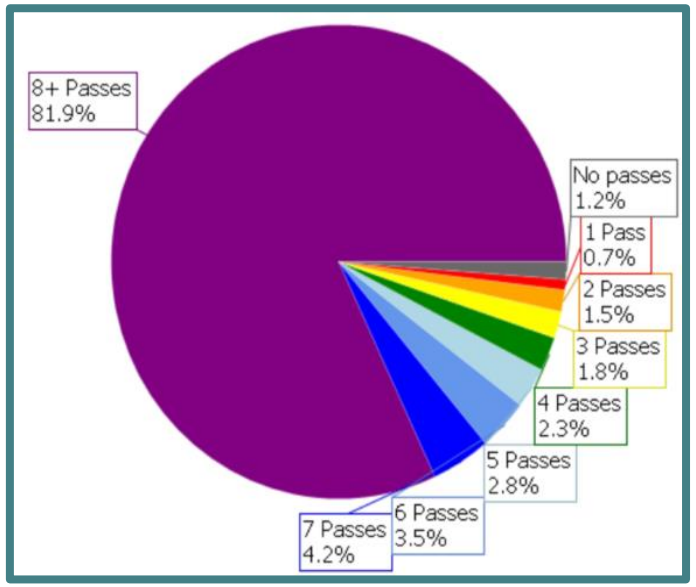
Hot Pour Mastic Patching (Items #0406122/0406123A)

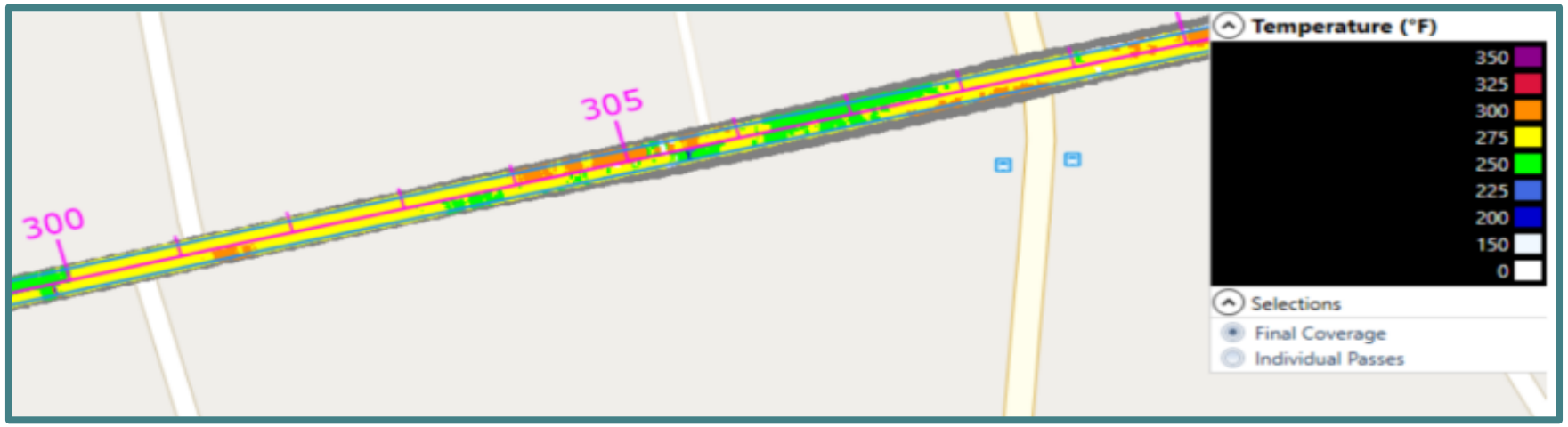
- **Materials**
  - Polymer modified asphalt mastic (hot-applied, aggregate filled)
- **Patch *maximum* dimensions**
  - 12 ft. long, 24 in. wide, 2 in. deep
- **Purpose**
  - *Where it's used*: asphalt or concrete, on milled or non-milled surface, target composite pavements
  - *Why it's used*: effectively mitigates reflective cracking from underlying concrete transverse and longitudinal joints, flexible material allows for joint movement
  - Overlayed with UTBO/TFWC or a dense graded mix

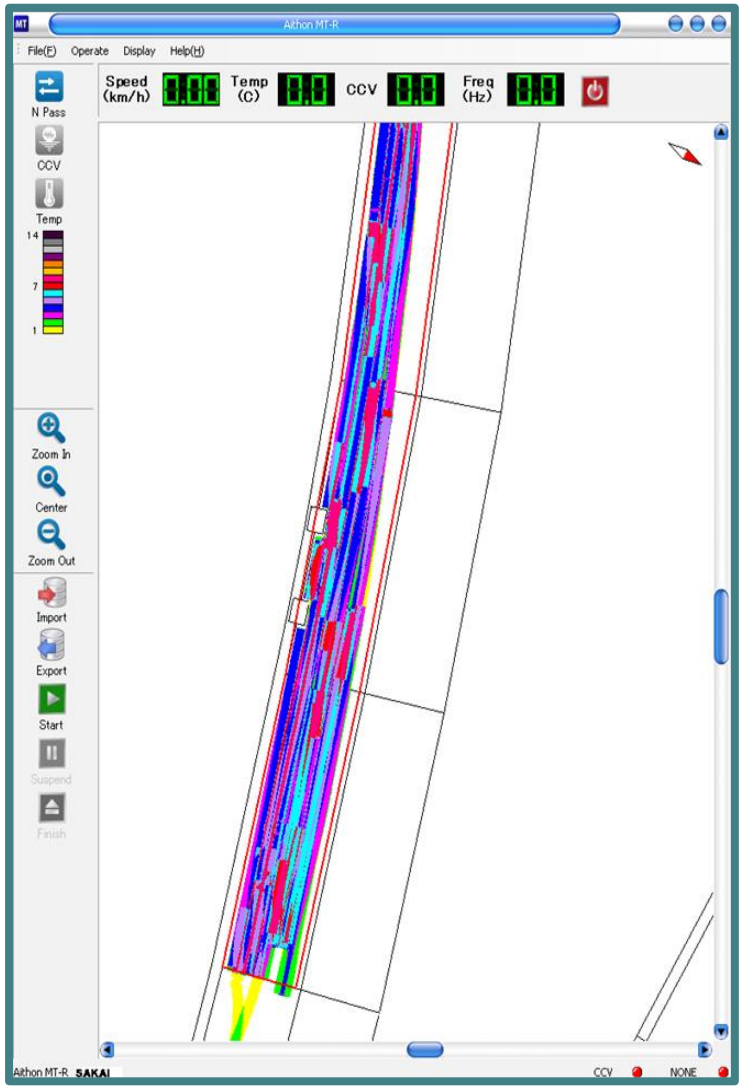
Property	Requirement
Color	Black
Softening Point (ASTM D36)	200°F min.
Flexibility @ 32°F (ASTM D5329)	Pass
Adhesion @ 77°F (ASTM D5329)	25 psi min.
Mastic Resilience (ASTM D8260)	50% min.
Mastic Stability @ 70°F (ASTM D8260)	40.0 mm max.
Effects of Rapid Deformation @ -7°C (ASTM D2794)	Pass, 3 specimens, 8 N-m (no cracking, chipping, or separation)
Crack Bridging @ -7°C (ASTM C1305)	Pass, 3 cycles
Specific Gravity (ASTM D792)	1.70-2.0
Minimum Application Temperature	370°F
Maximum Application Temperature	400°F

Uniform Placement & Compaction

- **Items:**
  - TFWC: 0406606A (paver), 0406607A (roller)
  - UTBO: 0406608A (paver), 0406609A (roller)
- **Purpose**
  - Used to track speeds, # of passes, and temps.
  - GPS to collect data and Veta to analyze it
  - UTBO: max. paver speed of 85 ft/min, 3 rollers/3 passes min.
  - 10% payment withholding until spec is met







Thank you

- Questions?
- Contact information:

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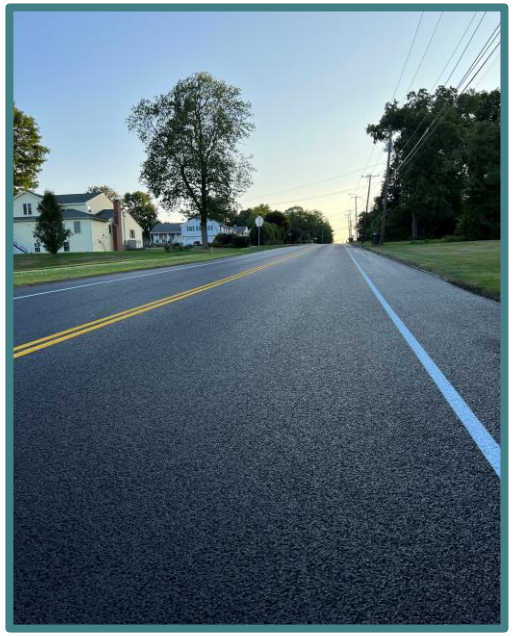
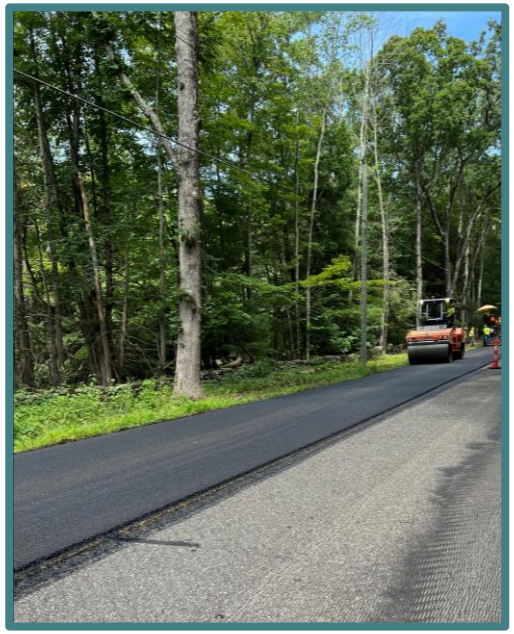
Ultra-Thin Bonded Overlay

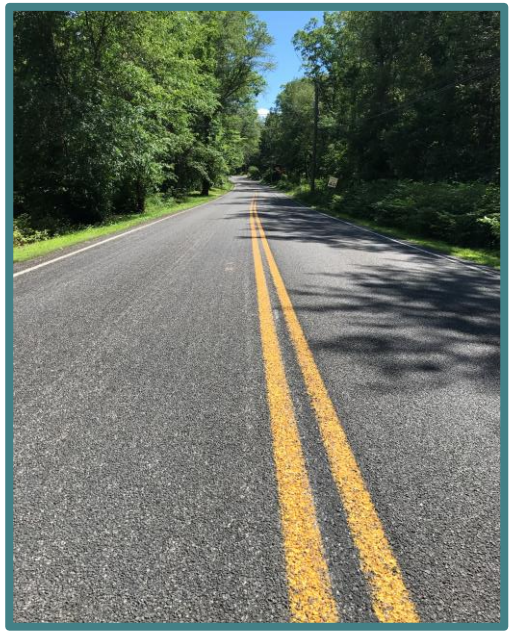


Thin Friction Wearing Course



Mill and Overlay

Asphalt Rubber Chip Seal



References

- CTDOT Pavement Design Unit specifications, pictures, and maps
- https://portal.ct.gov/dot/it/-/media/DOT/documents/dpolicy/publicroad/PublicRoadMileage_Final.pdf
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