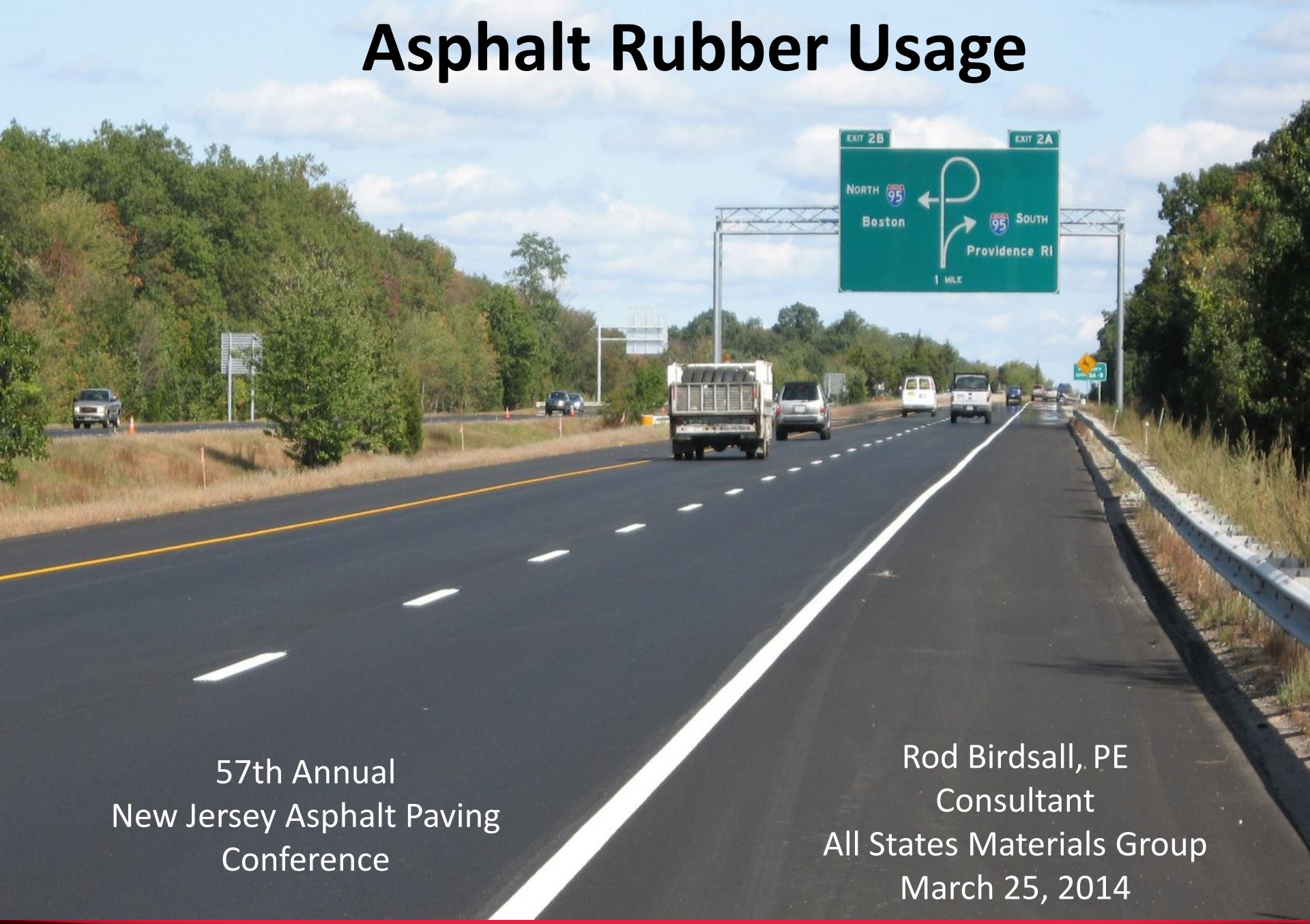
Asphalt Rubber Usage

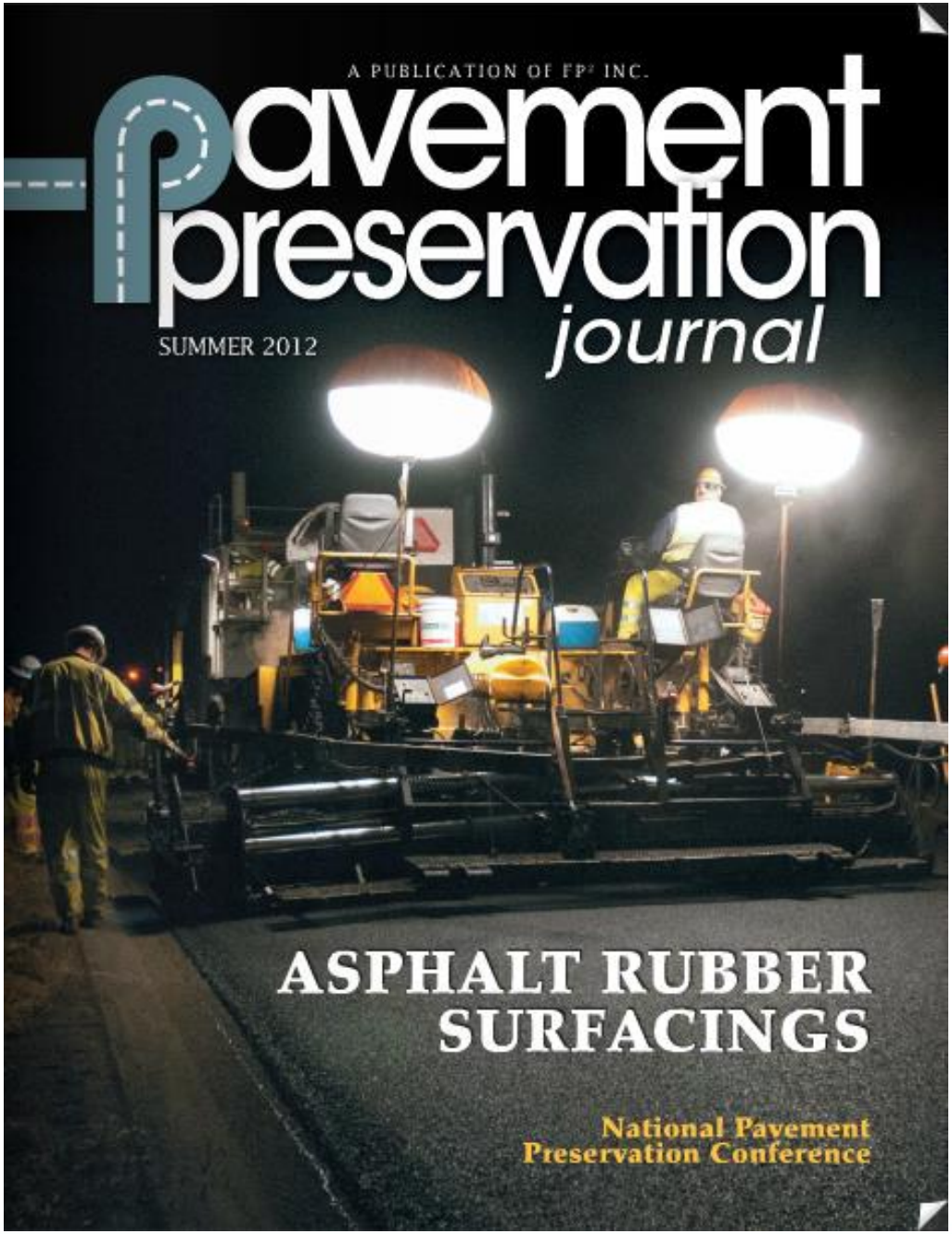


57th Annual
New Jersey Asphalt Paving
Conference

Rod Birdsall, PE
Consultant
All States Materials Group
March 25, 2014

Outline of Presentation

- Pavement Preservation
- AR Binder
- AR Binder Quality Control
- AR Mix Types and Applications
- AR Mix Performance Data
- AR Mixture Quality Control
- SAM/SAMI Applications
- Summary


A PUBLICATION OF FP² INC.
pavement preservation journal
SUMMER 2012
ASPHALT RUBBER SURFACINGS
National Pavement Preservation Conference

Pavement Issues in the Northeast

- **Cracking**
  - Reflective
  - Thermal
  - Fatigue
- **Short Paving Season**
- **Night Work/ Limited Hours**

Goals:

Find the best Long Term, Economical Solution

Performance Specifications not Recipes

All States Asphalt Experience with Asphalt Rubber

- 1995
  - Purchased Blending Equipment
  - Purchased Spraying Equipment to do AR SAM and SAMI
- 1997
  - First AR supplied for AR Mixes
- 2007
  - Purchased First Portable Blending Equipment
- 2013
  - Added Rubber Blending Capabilities to Terminal

ASTM D-6114, Type II Requirements

% Crumb Rubber	15 Minimum
Apparent Viscosity cP @ 175 C	1500- 5000
Penetration @ 25 C, 100g, 5 sec	25-75
Penetration @ 4 C, 200g, 60 sec	15 Minimum
Softening Point, C	54.4 Minimum
Resilience, 25C, %	20
Flash Point, C Minimum	232.2
Penetration Retention, 4 C; % Original	75 Minimum

AR Binder: ASTM D6114, Type II (Wet Process)

- **15-20% Crumb Rubber**
  - Typically 30-40 Mesh
  - Processed from Scrap Tires
- **Performance Graded Asphalt**
  - PG58-28 (or) PG 64-22
  - Blend of the two to meet spec requirements
- **On Site blending or at a facility or terminal**
- **Reaction process**
  - Elevate Temperature
  - Mix for 1 hour
    - Rubber particles swell, Suspension in Asphalt
- **Warm Mix Additive**
- **QC Plan**

Rubberized AC Products

Asphalt-Rubber Binder

Terminal Blend Binder

Asphalt Binder Comparisons

Criteria	AR	TB	PG
% Crumb Rubber	15+	3-15 Typically: 5-10	N/A
Specification	ASTM D-6114	Local	AASHTO M320
cP@375 F	1500-5000	500-	100-
Softening Pt. F	140+	125+	115- Typical
ALF Cycles	300,000+	100,000	100,000

Why Asphalt Rubber?

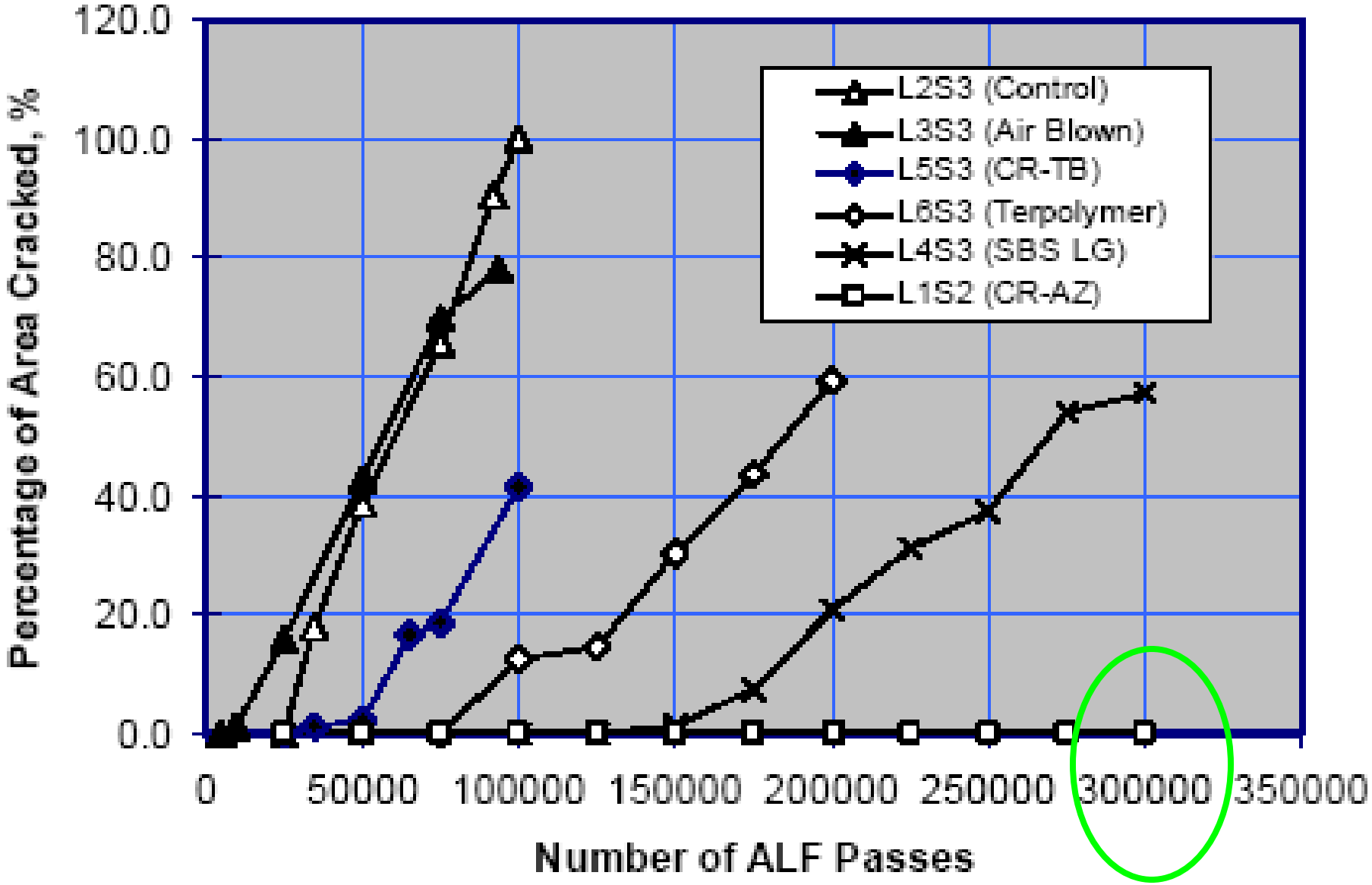
Rubber contains polymers which…

- **Raises softening point of binder to above 140º F.**
  - Resistance to rutting and shoving
  - Resistance to asphalt migration and drain-down
- **Increases low temperature flexibility of residue.**
  - Resistance to **thermal and fatigue cracking (Major issues and selection concerns in the Northeast)**

Why Asphalt Rubber?

- **Increases high temperature viscosity**.
  - Thicker film coatings on aggregate particles
  - Higher asphalt content mixes / applications
  - More asphalt = greater resistance to oxidation
  - Increased long term durability
  - Top PG Grading above 80
- **Beneficially Utilizes Tires**

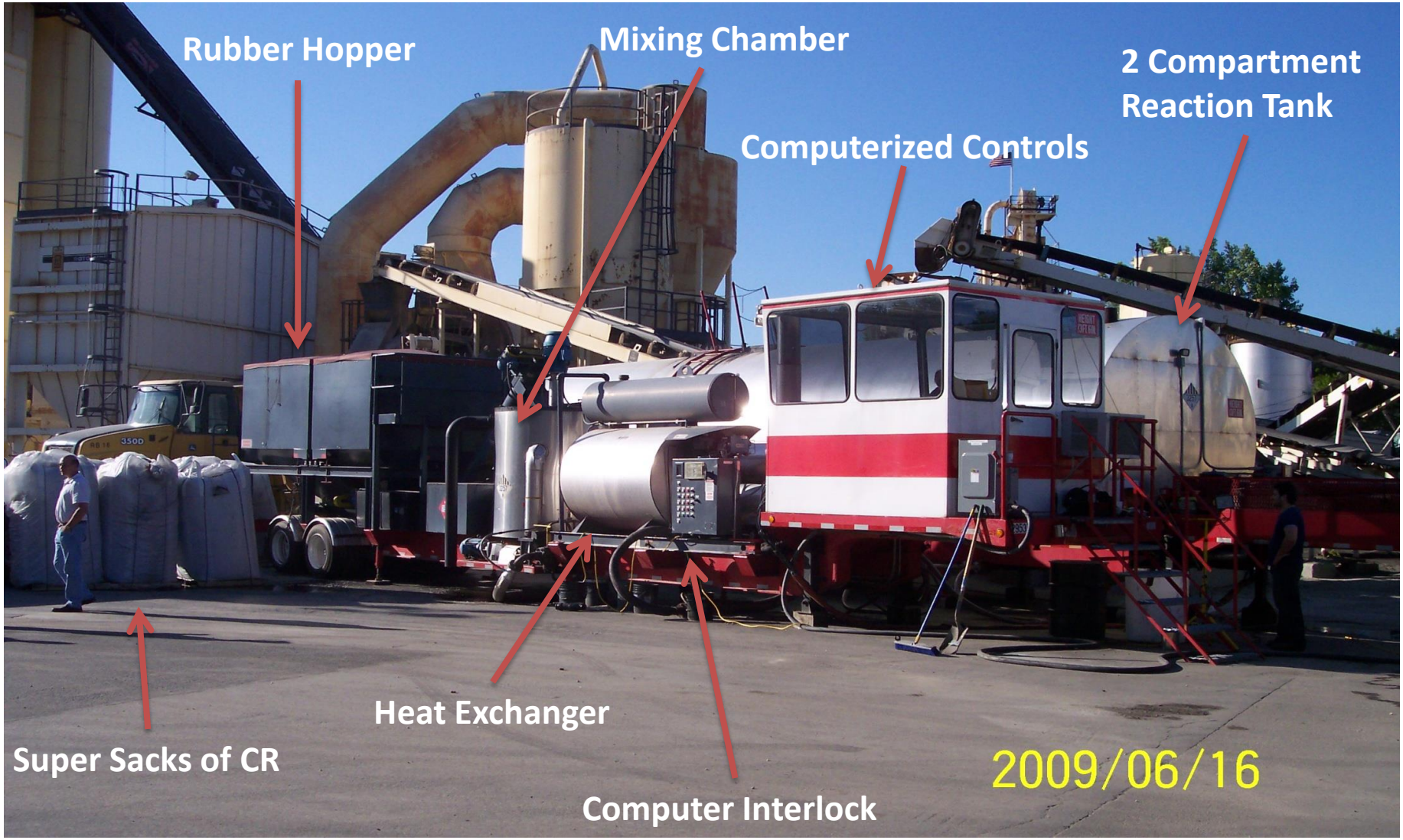

Two ALF's with
12 Pavement Lanes Constructed in
the Summer and Fall of 2002



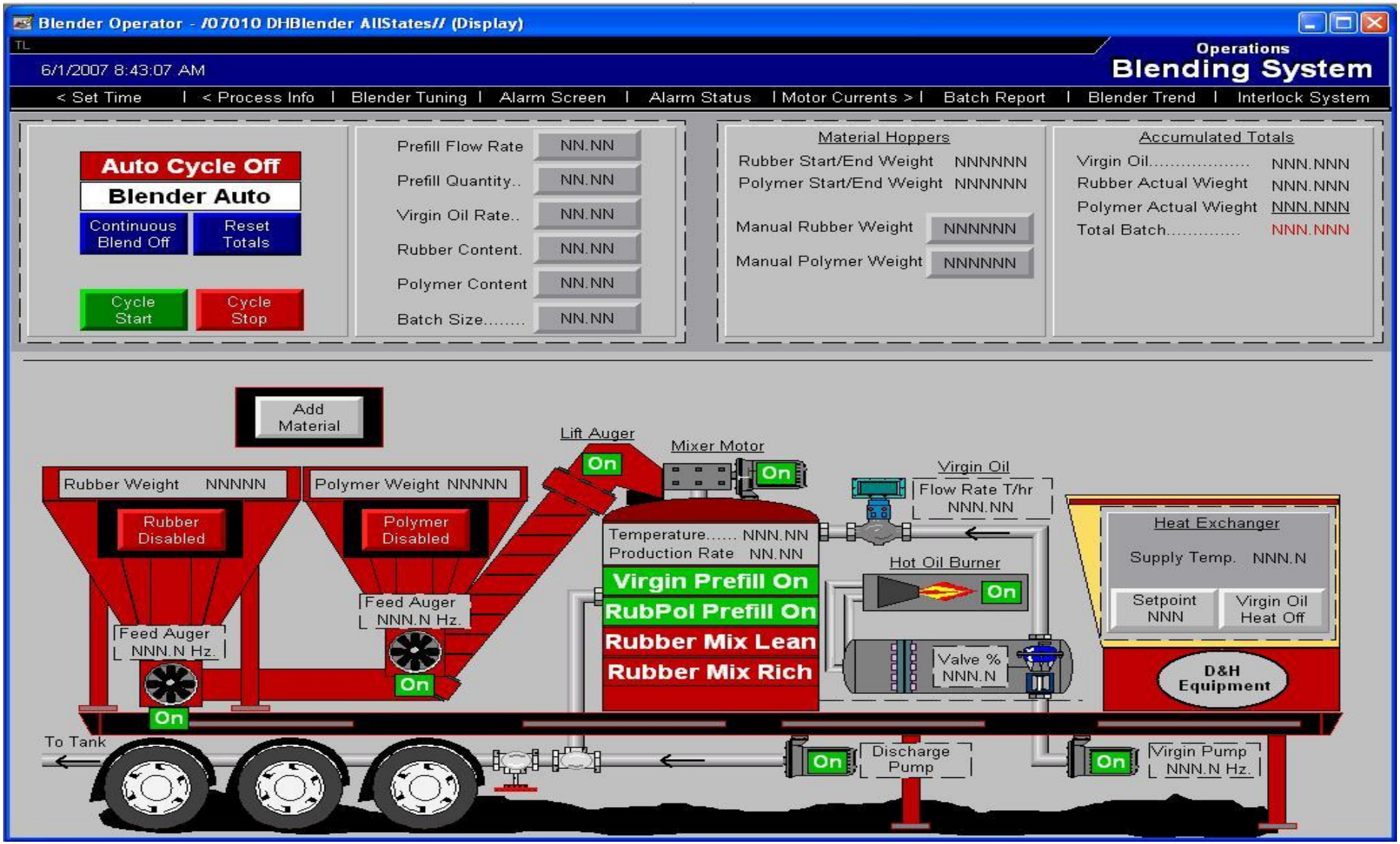
Percentage of Area Cracked vs. ALF Wheel Load Passes

Lane 1	Lane 2	Lane 3	Lane 4	Lane 5	Lane 6
CR-AZ	Control	Air Blown	SBS LG	CR-TB	TP
300,000	100,000	100,000	300,000	100,000	200,000

Asphalt Rubber Binder – Blending



Asphalt Rubber Binder – Blending



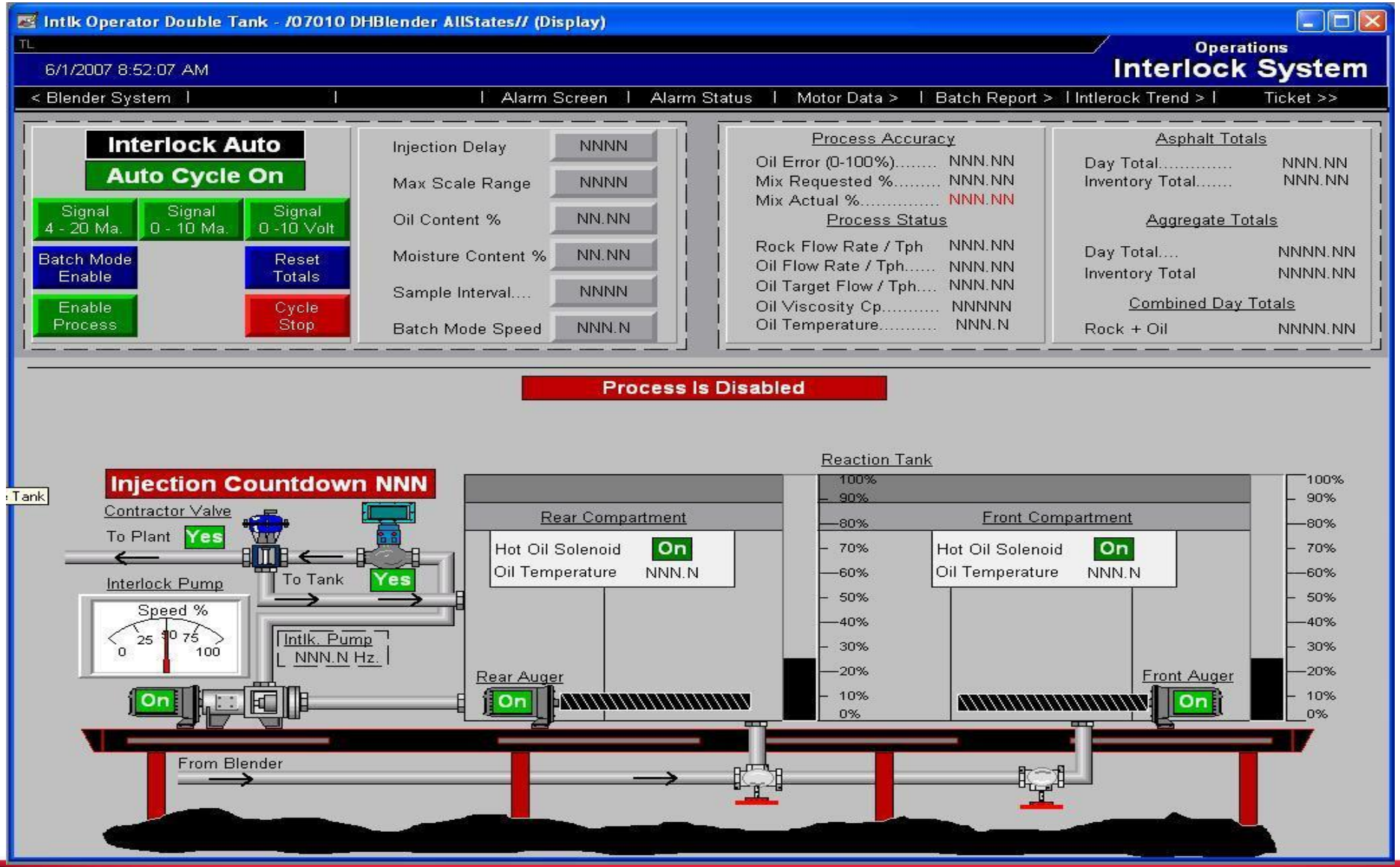
Close Print Clear

Blender Batch Report

SSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSSS

			Material Usage				Rubber Accuracy			Polymer Accuracy		
tch #	Start Time	End Time	Rub/Tons	Poly/Tons	Oil/Tons	Size/Tons	Request %	Actual %	Accuracy %	Request %	Actual %	Accuracy %
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN
NNN	NN : NN	NN : NN	NNNN.NN	NNNN.NN	NNNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN	NN.NN	NNN.NN	NNN.NN

Asphalt Rubber Binder – Reaction



Close

Print Clear

Interlock System Sampling Report

sssssssssssssssssssssssssssssssssssssssssssssssssssssssssss

Time	Rock/Tph	Oil/Tph	Rock Total	Oil Total	Oil Temp	Oil Visc	Mix %	Oil Error %	Accuracy %
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN
NN:NN	NNN.NN	NNN.NN	NNNN.NN	NNNN.NN	NNN.N	NNNNNN	NNNN.NN	NNN.NNN	NNNN.NN

Deerfield, MA Asphalt Terminal

AR Binder QC Plan Requirements

- Certify grade of PG asphalt used
- Verify crumb rubber source and gradation
- Establish proper blend ratios to meet AR binder specification
- Establish minimum reaction time of blend
- Establish automation requirements for field blending
- Establish protocol for field control of AR binder properties
- Establish frequency of required tests for both the field and samples sent to lab for specification compliance
- Require a one quart sample be retained for each lot or batch produced
- Establish minimum requirements for proportioning and blending recordation and printouts
- Establish protocol for non-compliance of AR Binder

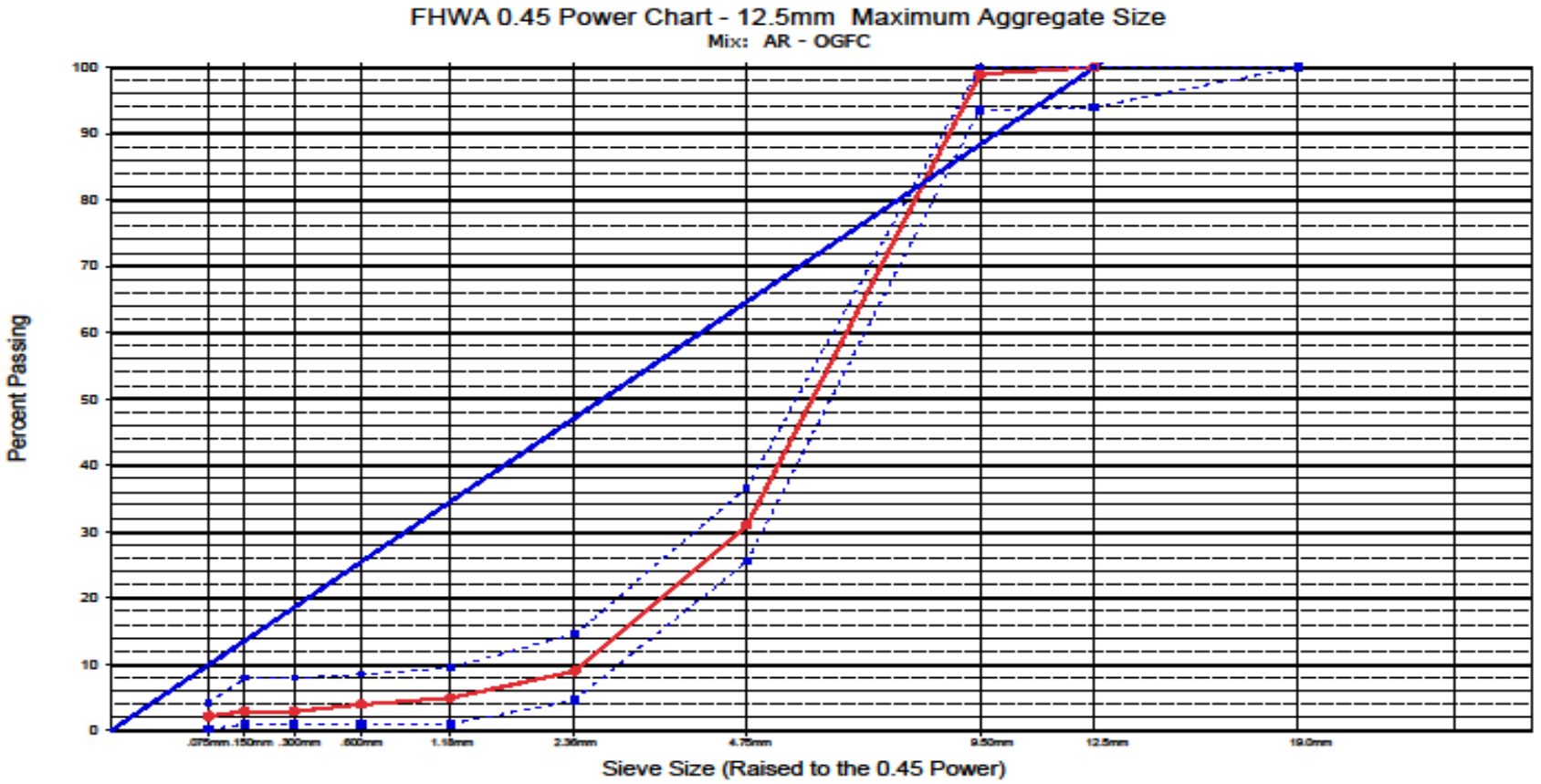
Why AR in Mixes & Pavement Preservation

- **Higher binder contents (Thicker Films)** lead to longer treatment life
- **Better Fatigue Resistance** to Reflective and Thermal Cracking
- **Reduced Rutting** potential
- **Longer Service Life of Treatment**
  - **Keep Crews off the Road**
  - Less Driver Inconvenience due to Construction Delays
- **Better Long term Durability**
- **Lower Equivalent Annual Costs**
- **Reduced Noise levels** especially with AR OGFC
  - ***Green" Process – Reuses Scrap Tires***
  - ***Reduced Emissions with WMA additive***

AR-OGFC Asphalt Rubber Mixes

AR-OGFC Mix Design

- 100% P ½” Sieve, 90+% P 3/8” (9.5 mm)
- 8% Minimum Binder content
- **No** RAP or RAS
- 50 Gyrations
- 15% Minimum Air Voids
- Verify Stone on Stone Contact
- 30% Maximum Cantabro loss
- 0.3% Maximum Drain down
- Require WMA chemical/wax additive



AR-OGFC Gradation Band

I-78 NJ – AR OGFC

NJDOT I-78 – Pavement History

- **MP 30.9 to 42.7 (I-287 East)**
- **Consists of mostly 3 travel lanes 12 feet wide plus shoulders**
- **Initial construction of Bituminous Concrete in 1965**
- **Last Rehab in 1999**
  - Mill 4 inches
  - Pave 4 inches, 2 lifts of Superpave w/ PG76-22
- **77,270 AADT with 30% trucks, 28% heavy trucks (**each way)
- **SDI prior to AR OGFC = 2.5 (0=failed, 5 = new pavement)**
- **Average IRI before paving = 70 inches/mile average**
- **9.5mm AR OGFC, placed 1 1/4 inch compacted**
  - Pavement Preservation Treatment
  - 8.5% Design Binder content using ASTM D-6114 AR

I-78 – Surface Preparations

- Longitudinal Joint - Microsurfacing

I-78 Mix Production – AR OGFC

Stavola 6-ton Batch Plant – Bound Brook, NJ

I-78 – AR OGFC Placement

I-78 NJ – AR OGFC (June, 2013)

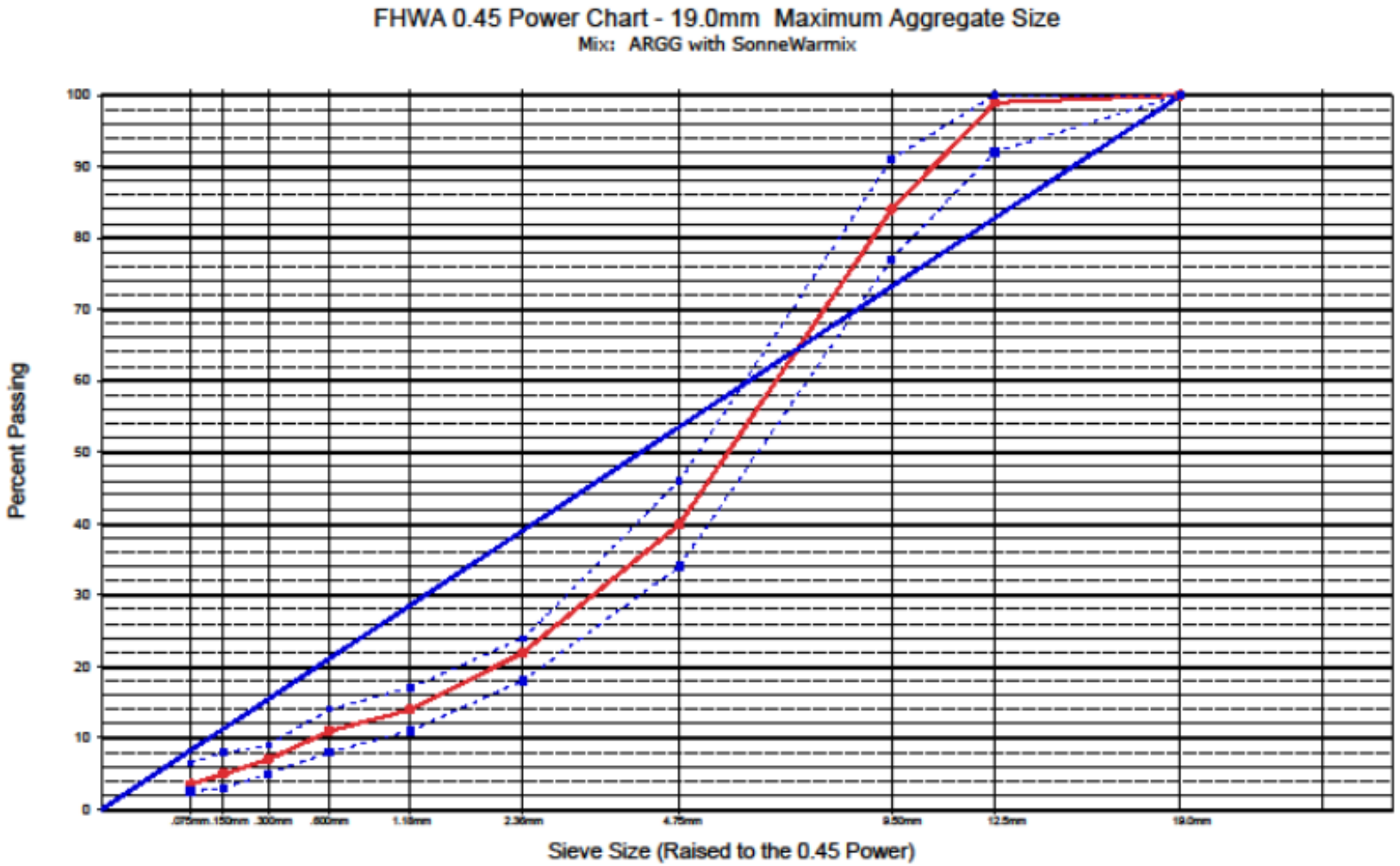
Garden State Parkway

ARGG Mixes

ARGG Mix Design Criteria

- 12.5 mm mix
- Minimum 7.5 Binder content
- 0-10% RAP
- 0-5% RAS (new tabs only)
- 75 Gyrations
- 18-23% VMA
- 3-6% Air Voids
- 0.3% Drain down, max.
- Wax/Chemical Warm Mix additive
  - MassDOT- 280 F max if pavement temperature is 64+ F
    - 290 – 325 F if temperature is 40 – 64 F

ARGG Gradation Band



MassDOT- ARGG, I-295, August 2008

MassDOT- ARGG, I-295, September 2013

I-95 Attleboro “Before”

massDOT Massachusetts Department of Transportation Highway Division

- I-95 Attleboro (2008)
- 4.57± miles (37.56 lane miles)
- 3 lanes + Breakdown lane & Shoulder
- Distress
  - Ravelling & Weathering OGFC
  - Delamination & Thermoplastic
  - Longitudinal Joints & Plow Damage
- Rehab
  - Micromill & 1.25” ARGG Thin Overlay
- Bid $3,022,045.35
  - Clearing & Grubbing
  - Frames/Grates (lockdowns)
  - Guardrail repairs & Safety items
  - Traffic Control, Striping, etc.
- Cost $82.6K/lane mile

Pre-Construction Ride Statistics								
ROUTE	FROM	TO	LIRI	RIRI	AVG IRI	COMMENTS	COLLECTION YEAR	PROJECT #
0095N	0.00	4.57	74.65	85.84	80.25	No Bridge	2008	54309

I-95 Attleboro

massDOT
Massachusetts Department of Transportation
Highway Division

Ride Statistics

ROUTE	FROM	TO	LIRI	RIRI	AVG IRI	COMMENTS	COLLECTION YEAR	PROJECT #
0095N	0.00	4.57	74.65	85.84	80.25	Before	2008	54309
0095N	0.00	4.57	40.57	56.07	48.32	After	2009	54309

I-95 Attleboro “After”

Ride Quality Improvement

ROUTE	FROM	TO	LIRI	% REDUCED	RIRI	% REDUCED	AVG IRI	% REDUCED
0095N	0.00	4.57	34.09	45.7%	29.77	34.7%	31.93	**39.8%**

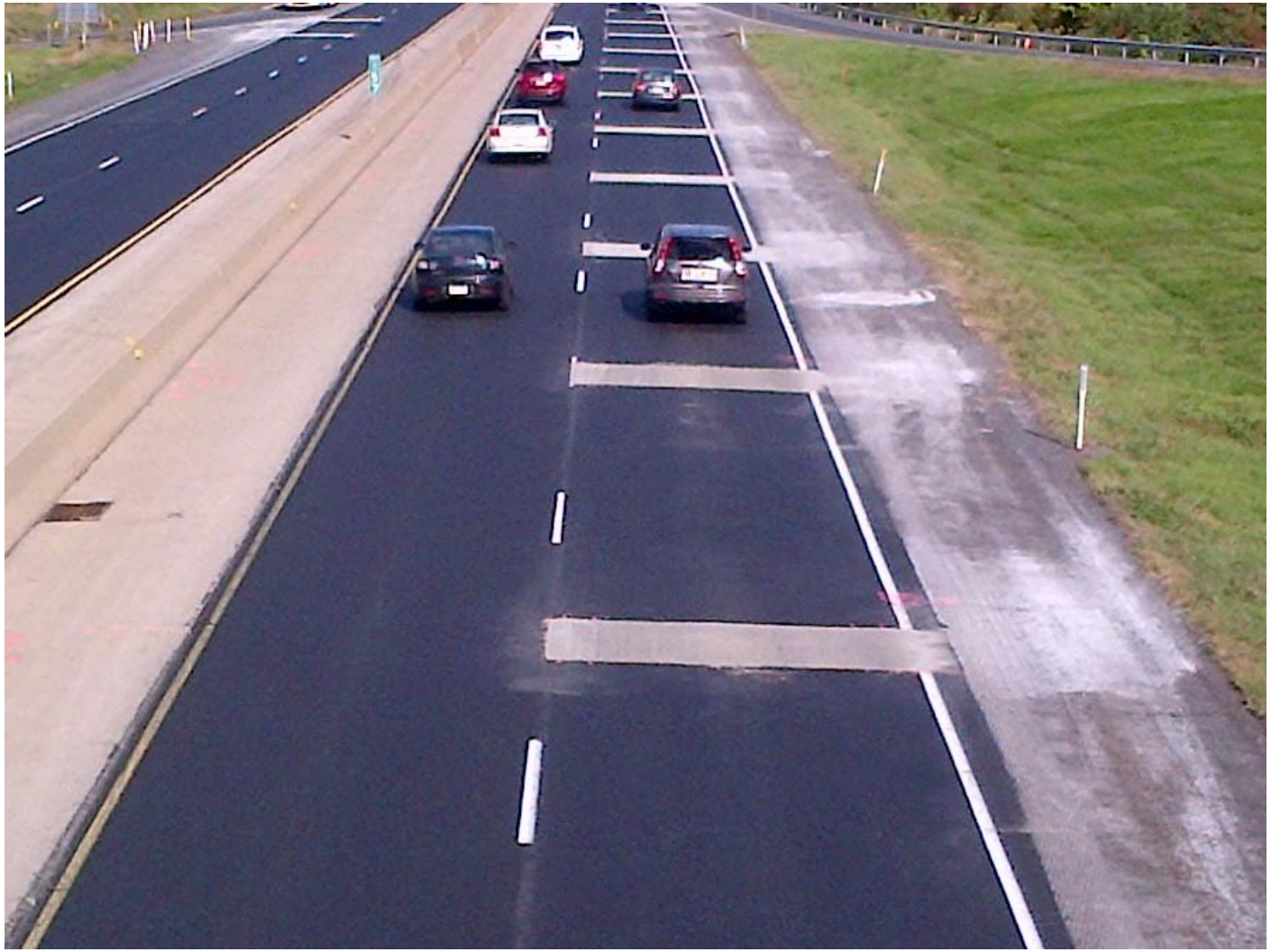
PennDOT I-78 – September, 2012 Pre-Existing

Project Scope

- Mill off existing bituminous pavement (3.0 - 3.5”)
  - Identify spall repairs (PCC) & mark out
  - FWD at all PCC spall repair locations
  - Identify full depth PCC repairs & mark out
  - 1.5” milling of bituminous shoulders - outside
- Tack Coat & Leveling Course
  - 12.5mm AR GGFC w/ WMA (variable 1.5 - 2.0”)
    - 2 – 12 foot lanes
  - 9.5mm Superpave PG76-22 WMA control
  - SRL-L Aggregate for leveling
  - Full depth PCC repairs to elevation of leveling
- Final Wearing Course to elevation of median
  - 12.5mm AR GGFC w/ WMA (1.5” depth)
  - 9.5mm Superpave PG76-22 WMA Control

Notch Wedge Joint

Concrete Repairs after Leveling




URGENT MESSAGE
WHEN FLASHING
TRAVELER INFO
TUNE RADIO TO
1630 AM

PennDOT I-78 Control- September, 2013

PennDOT I-78 September, 2013

AR Bonded Wearing Course

Bonded Wearing Course (BWC) - Definition

BWC is a polymer emulsion (applied at 0.20 gallons per square yard) sprayed immediately before placement of the hot mix overlay (3/4"). Followed by rolling.

- Efficient/fast operation
- Used on roads with sound foundation
- Good ride and aesthetically pleasing

Spray Paver AR BWC Application

Placing and Compacting AR Bonded Wearing Course

MassDOT- AR BWC, I-295, June, 2013 (2008)

AR Mix Performance Criteria

- Warm Mix
- Overlay Tester
- Hamburg or APA
- In Place Air Voids
- IRI
- Crack Mapping
- Monitor Noise

Why Use WMA?

- Environmentally Sound
- Reduces green house gas emissions
- Reduces energy use
- Reduces opacity and odor
- Improves workability
- Reduces binder aging
- Reduces paving temperatures
- Offers the potential to increase the % of RAP used in mix
- Offers the potential to extend the paving season

Amherst, MA- ARGG

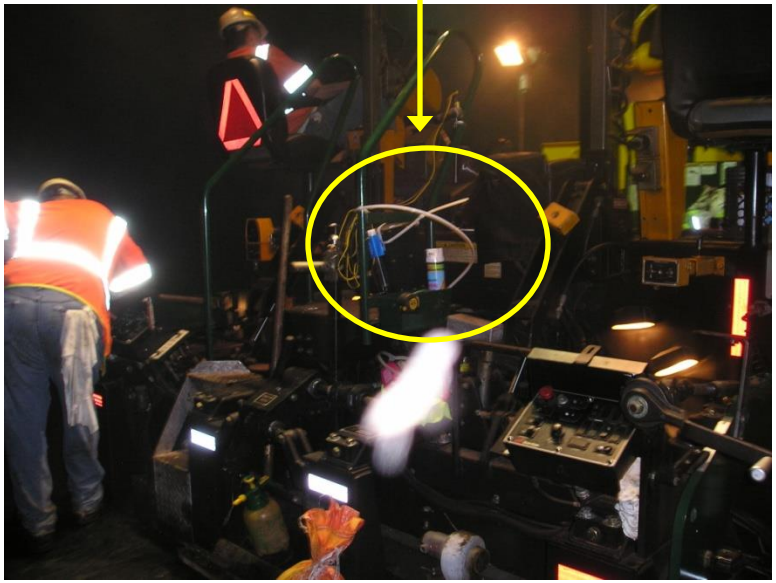
Amherst, MA – ARGG WMA

ECOBIT™ with SonneWarmix™

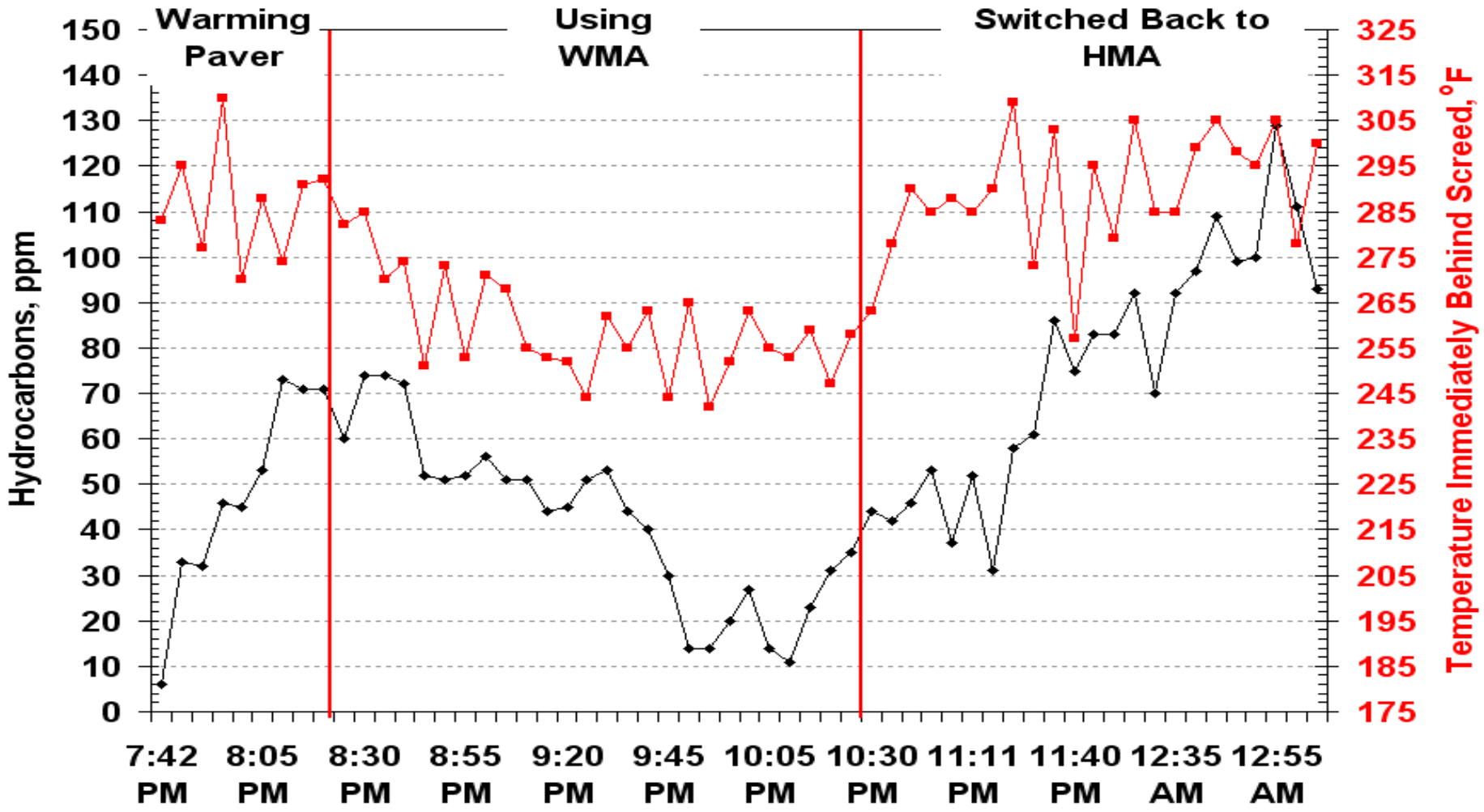
I-78 (Somerset County, NJ) – AR OGFC with WMA

Emissions Testing

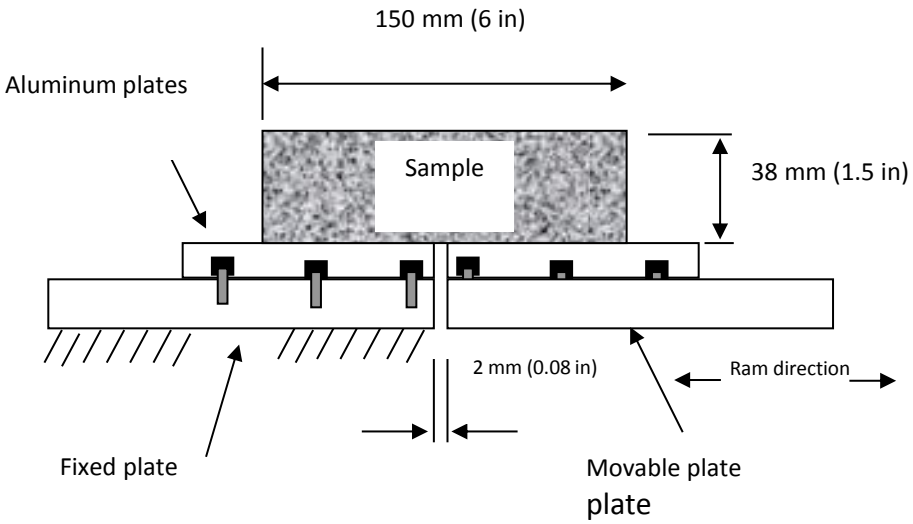
- Looked at quantifying emission reduction at paver with and without WMA
- Used portable emissions tester mounted to railing on back of paver (where workers would stand)

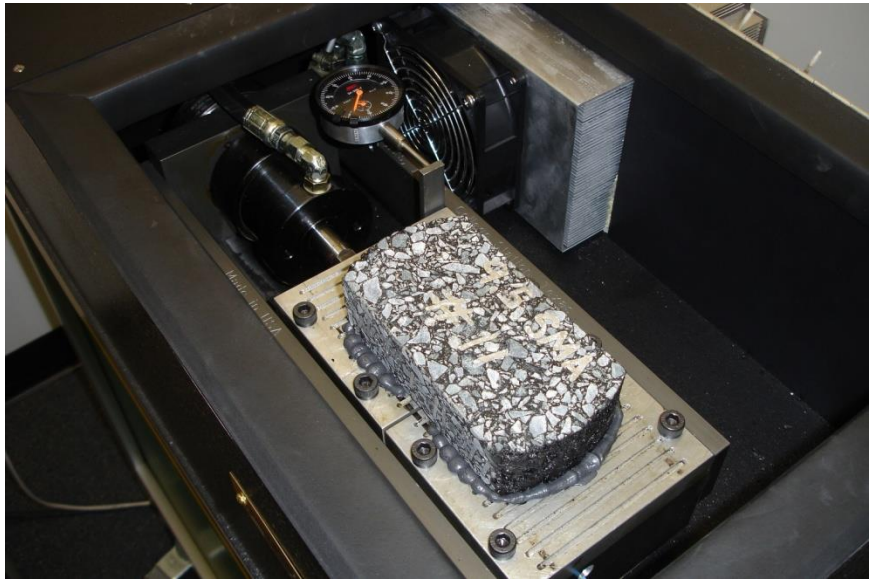


I-78 AR OGFC – Typical Emissions at Paver



Overlay Tester



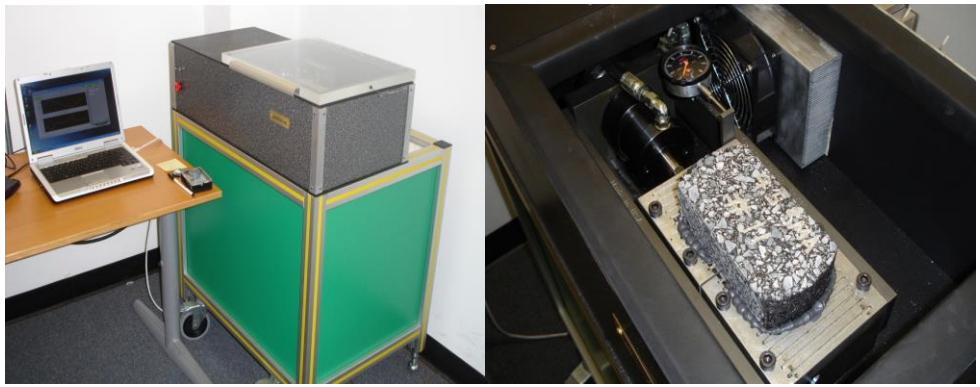


- Sample size: 6’’ long by 3’’ wide by 1.5’’ high
- Loading: Continuously triangular displacement 5 sec loading and 5 sec unloading
- Definition of failure
  - Discontinuity in Load vs Displacement curve

Typical Preservation Overlay Mixes

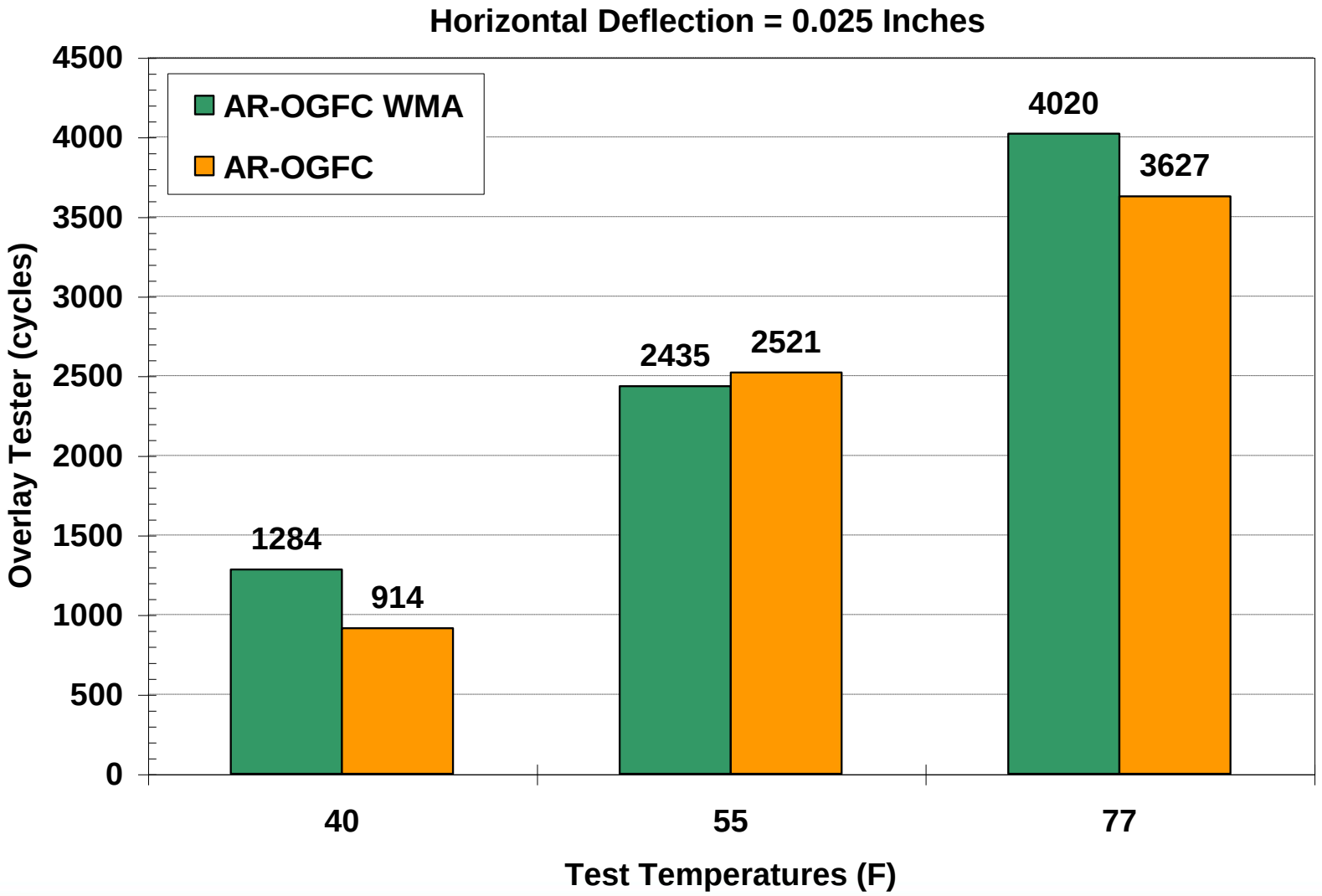
Surface Course Mixes

59ºF, 0.025" Horizontal Deflection



Overlay Tester Cracking Results

NJ I78, 2009



Maine DOT I-295 Hamburg Results

Typical Mix After Less Than 6,000 Passes

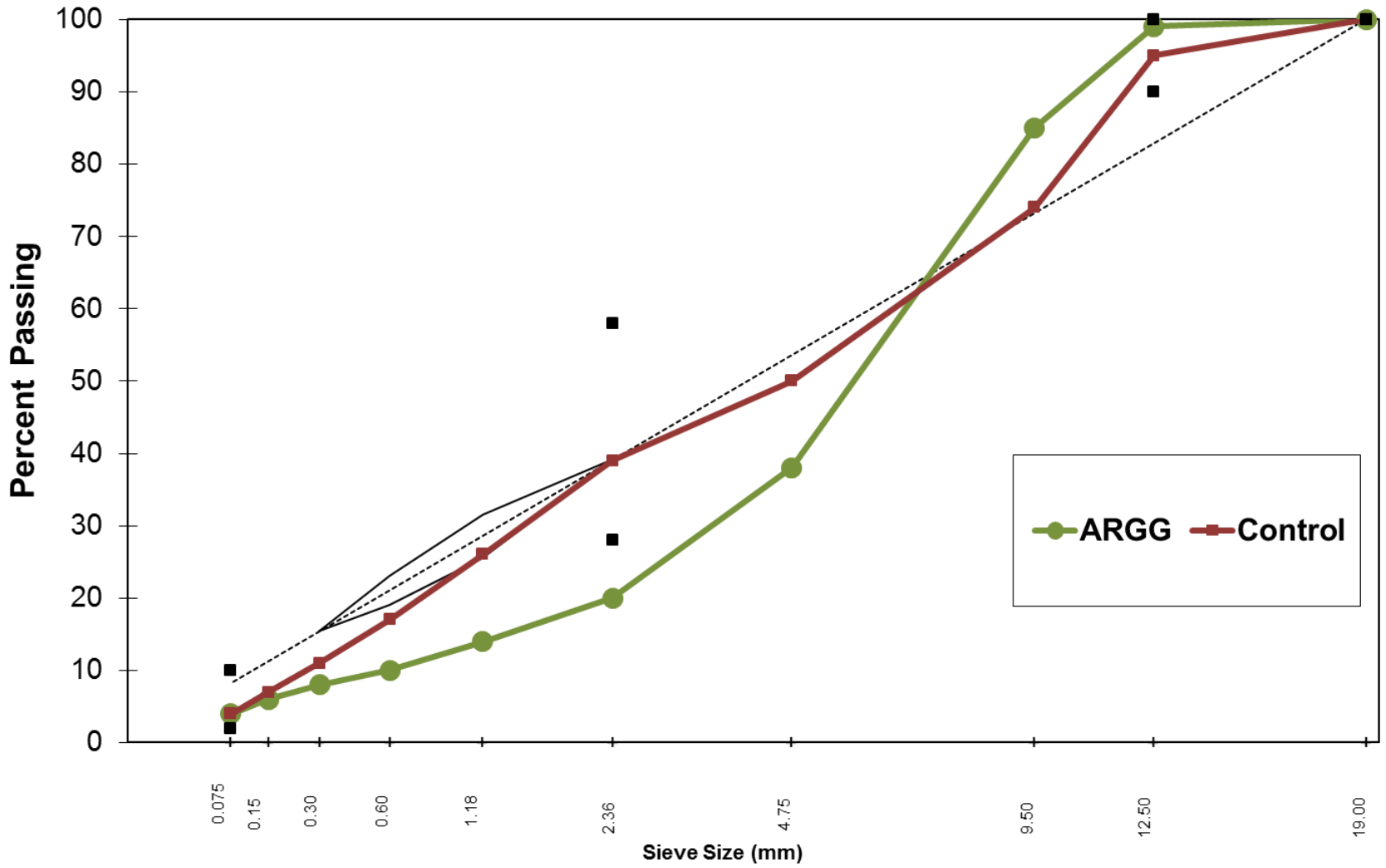
I-295 ARGG Mix After 20,000 Passes

MAINEDOT
Maine Department of Transportation

	12.5mm Warner Bros Contr	ARGG
Mix NMAS	12.5mm	12.5mm
Design ESALs	0.3 to <3 Million	3-10 Million
Design Gyrations	75	100
Stockpile Percentages		
12.5mm	35%	18%
9.5mm	10%	57%
Manufactured Sand	-	15%
Stone Dust	20%	-
Natural Sand	20%	-
RAP	15%	10%
Gradation		
19.0 mm	100	100
12.5 mm	95	99
9.5 mm	74	85
No. 4	50	38
No. 8	39	20
No. 16	26	14
No. 30	17	10
No. 50	11	8
No. 100	7	6
No. 200	4	4
Combined Aggregate Specific Gravity, Gsb	2.748	2.803
Binder		
Binder Content, %	5.20%	8.0%
Binder Type	PG64-28	PG58-28 with CRM
Compaction Temperature	285ºF	300ºF
Design Volumetric Properties		
Air Voids, %	3.6%	4%
VMA, %	15.0	21.0
VFA, %	74.6	83.0
Maximum Theoretical Specific Gravity, Gmm	2.583	2.485
HSRC Lab Verification of Volumetric Properties		
Air Voids, %	3.9%	2.7%
VMA, %	14.8	19.9
VFA, %	73.6	86.6
Maximum Theoretical Specific Gravity, Gmm	0.9	2.508

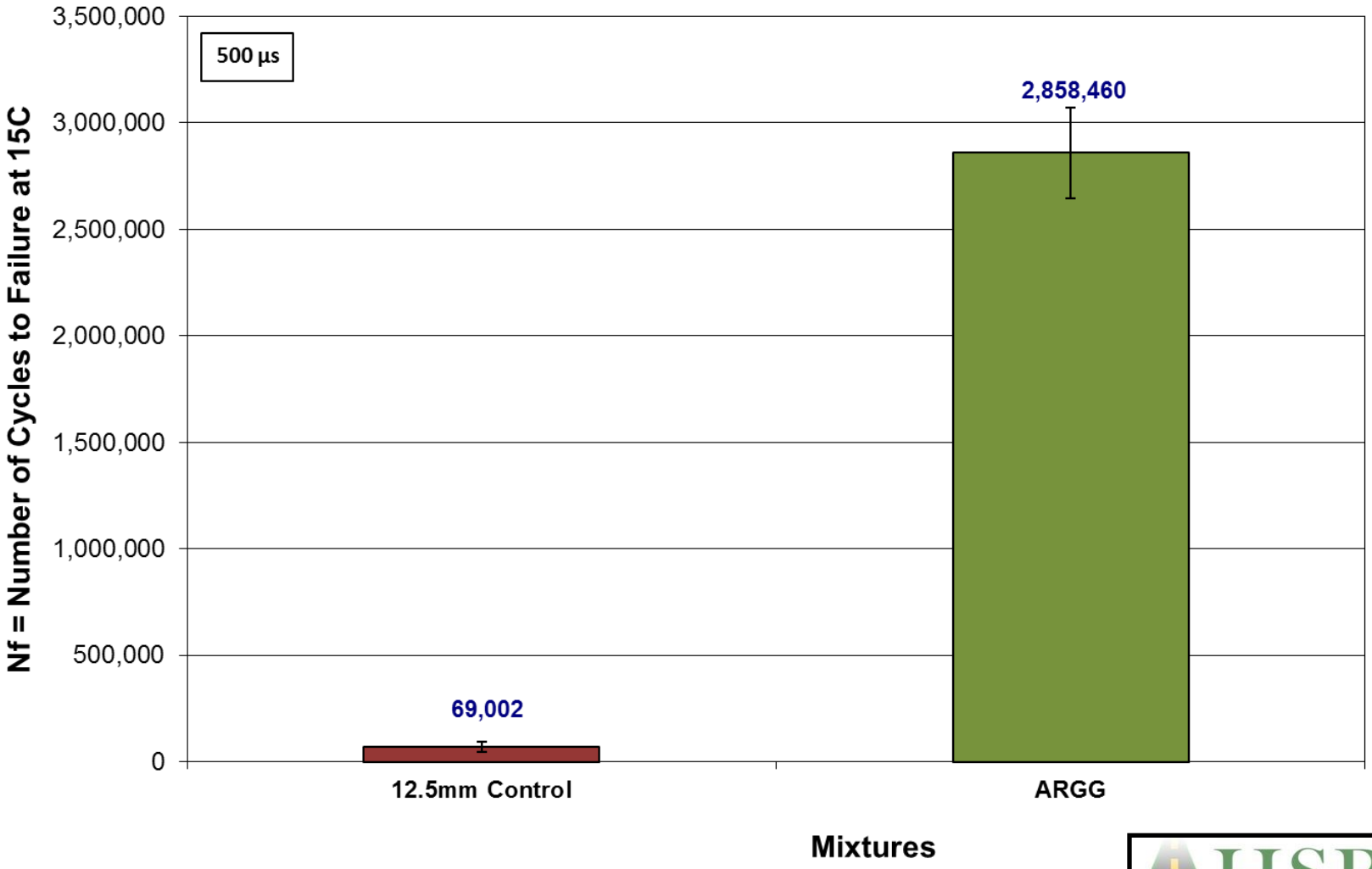
HSRC
Highway Sustainability Research Center

MassDOT Control vs ARGG Gradations



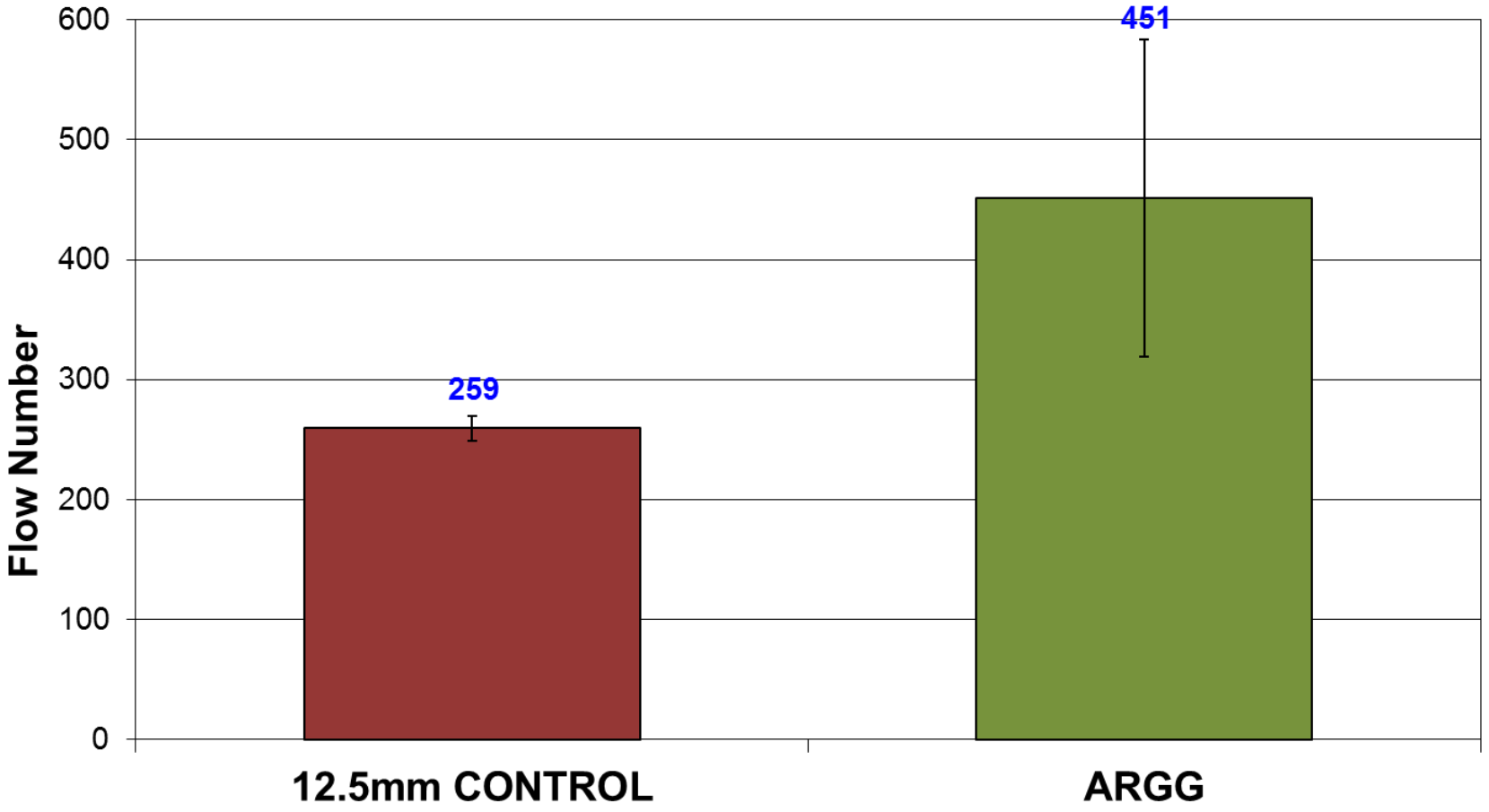
HSRC
Highway Sustainability Research Center

AASHTO T321 Beam Fatigue Nf to 50% Reduction in Initial Stiffness

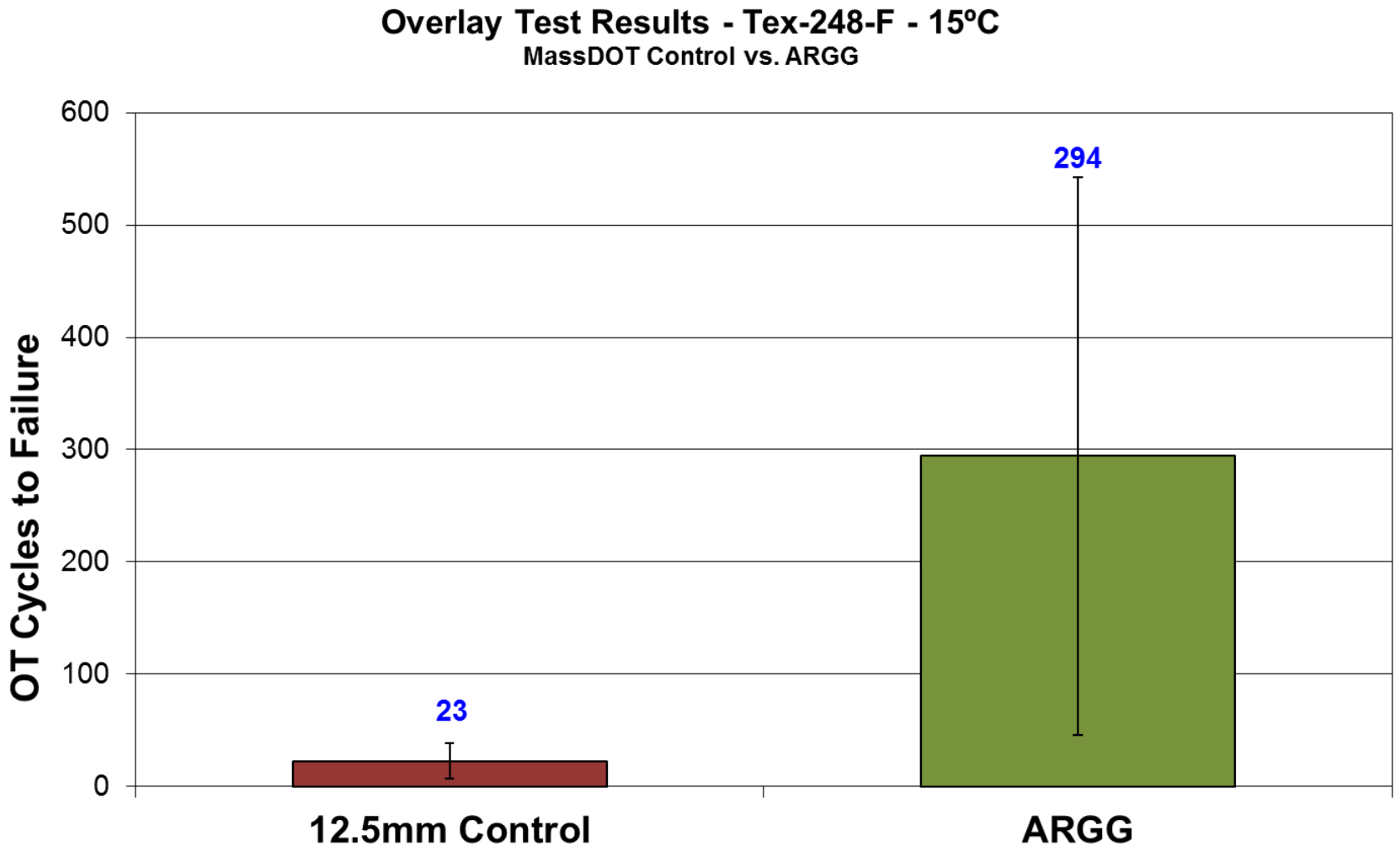


HSRC
Highway Sustainability Research Center

Flow Number - AASHTO TP79 - 50ºC 600 kPa Deviator Stress
MassDOT Control vs ARGG



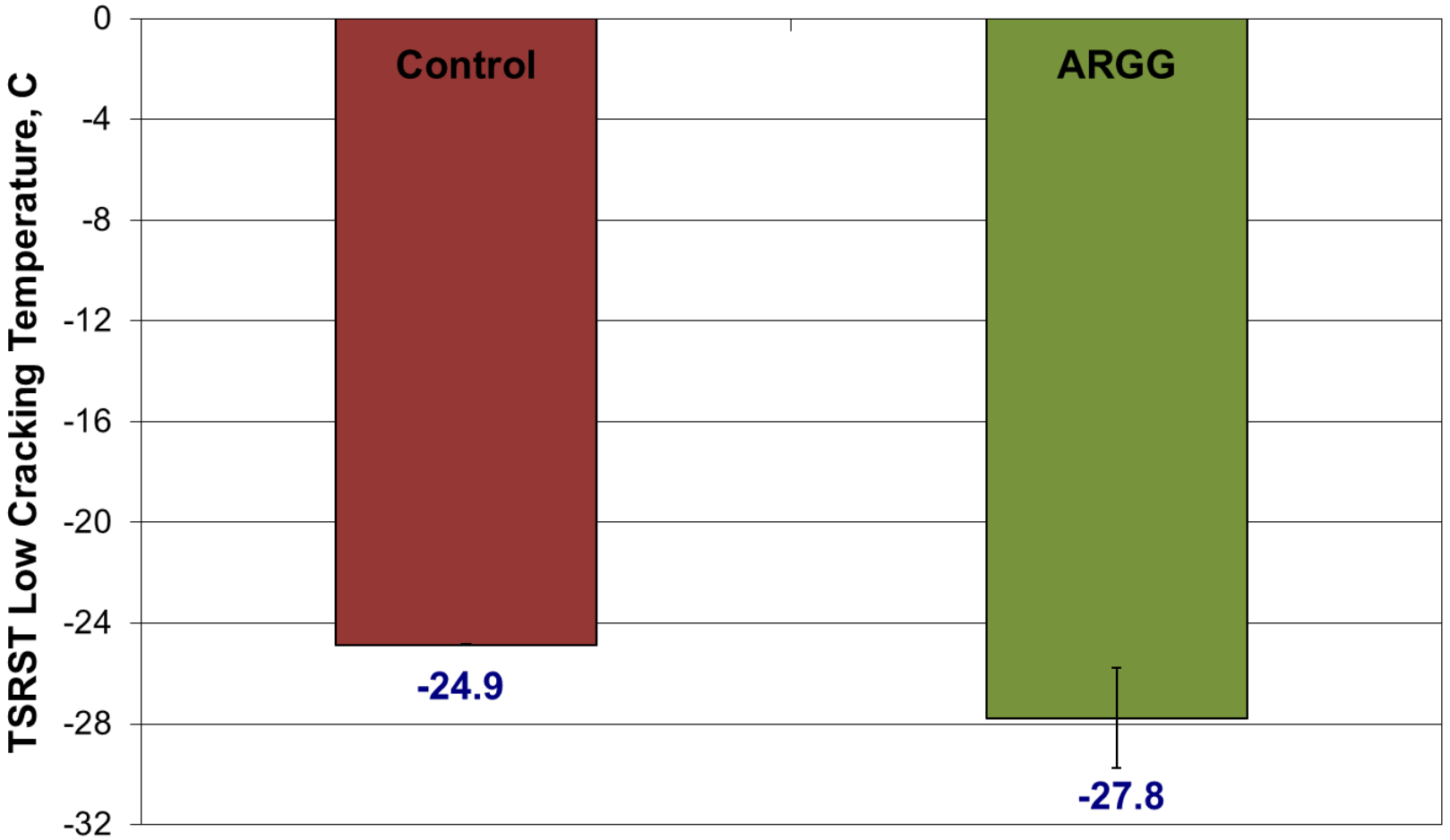
HSRC
Highway Sustainability Research Center



HSRC
Highway Sustainability Research Center

TSRST Results - AASHTO TP10

MassDOT Control vs ARGG



HSRC
Highway Sustainability Research Center

AR Mixture QC Plan Requirements

- Verify Compliance of AR Binder for Specification Properties
- Verify Aggregate physical and gradation requirements
- Establish appropriate mix design criteria for mixture
  - Min % binder, VMA, gradation limits, voids in mix, WMA additive, mix and placement temperatures
- Establish required production sampling and testing criteria and frequency at plant
- Establish required sampling of field placed mix, density or coring requirements and frequency
- Determine additional required performance testing
  - Overlay tester, flexural beam, Hamburg, APA
- Establish protocol if there are compliance issues

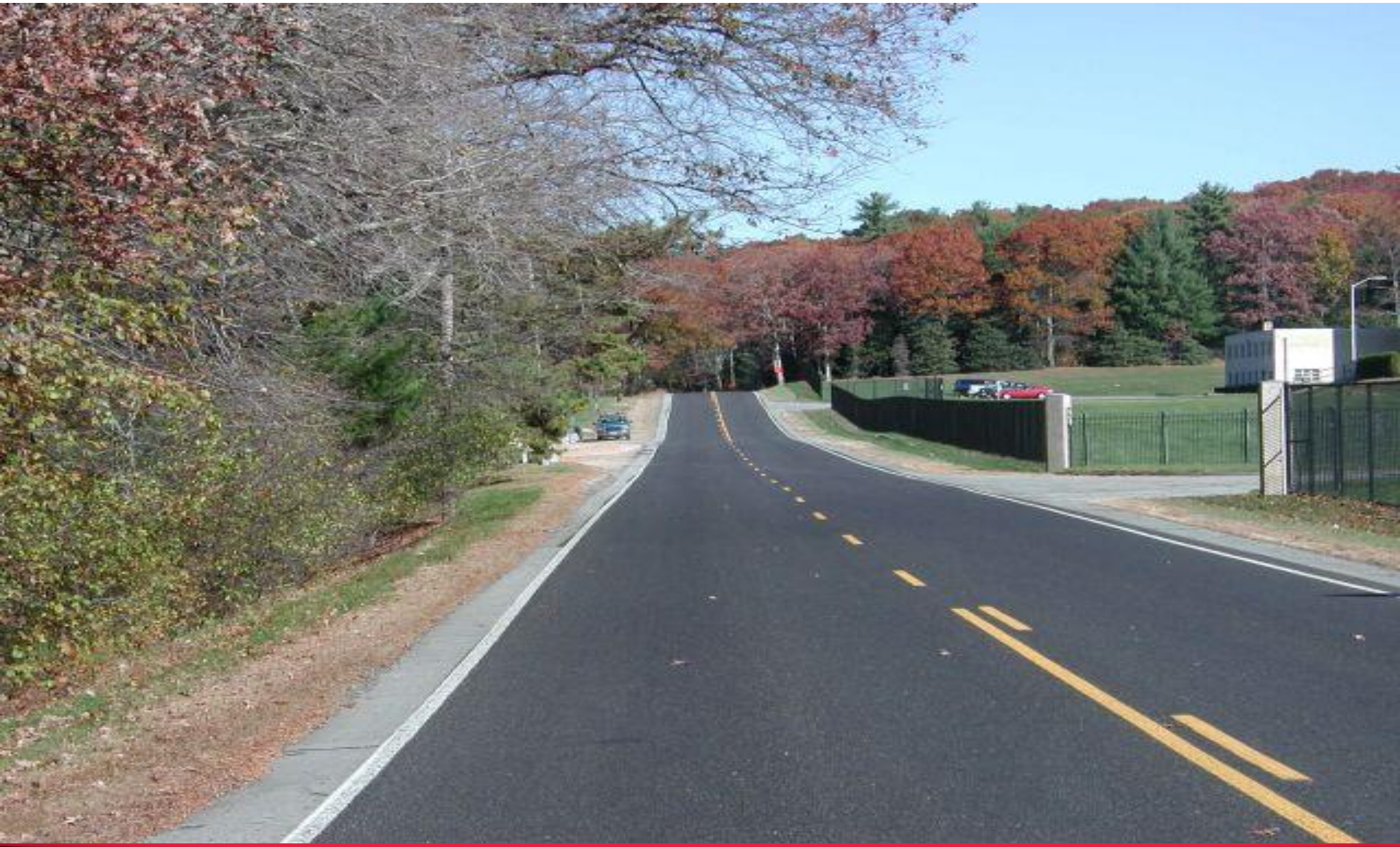
SAM/SAMI Applications

Asphalt Rubber Chip Seal — Sprayer

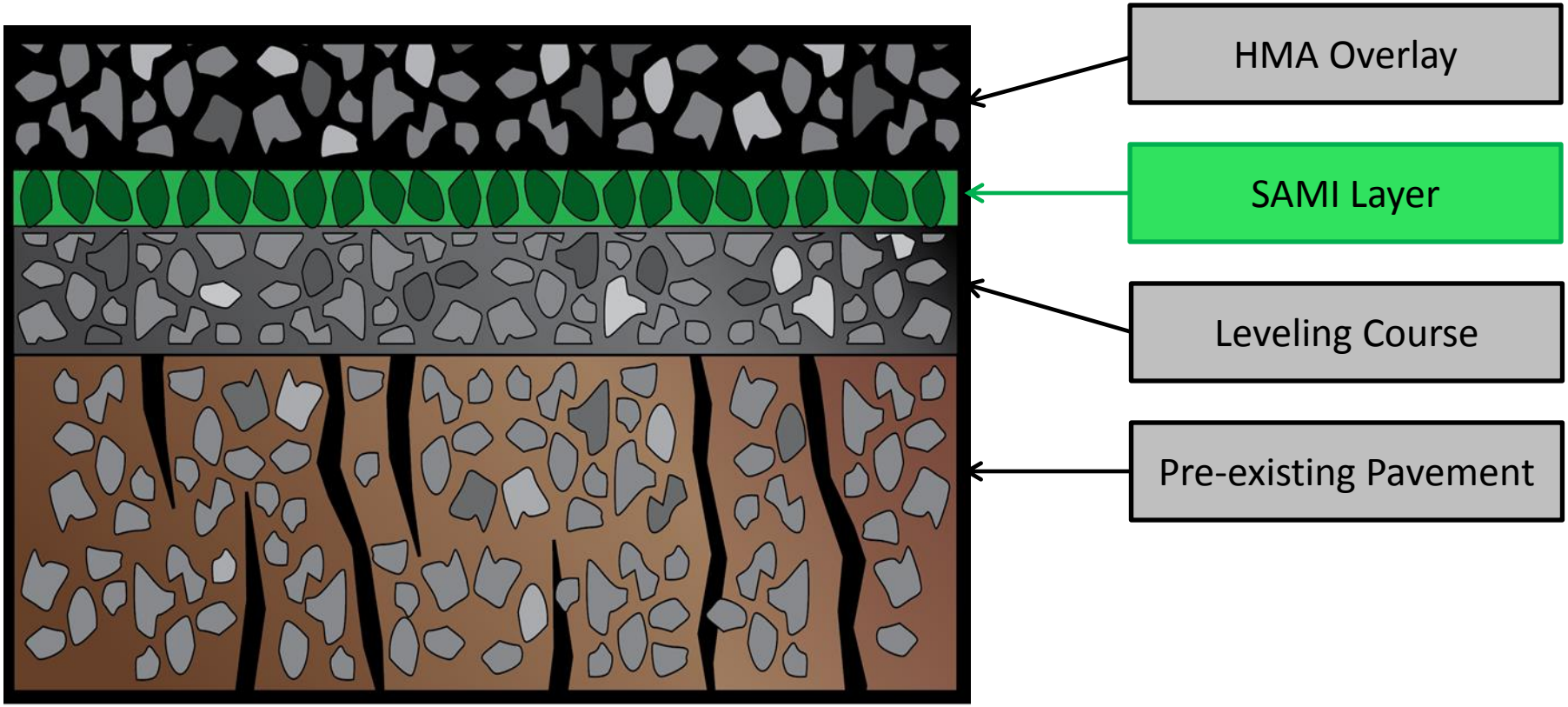
Asphalt Rubber Chip Seal — Chip Spreader

Asphalt Rubber Chip Seal — Rolling

Asphalt Rubber Chip Seal



Stress Absorbing Membrane - SAMI



Crumb Rubber SAMI – with HMA overlay

Cheshire Lanesboro
HMA over Rubber Chip Seal SAMI

- Route 8 Cheshire Lanesboro
- HMA over Rubber Chip Seal SAMI
- Crack stops at SAMI.
- Effective on most longitudinal cracking.
- Effective on less severe transverse cracking.

Summary – Asphalt Rubber Applications

- AR Binder and Terminal Blend have completely different properties
- AR Binder enhances the performance of mixes by stiffening the binder, increasing elasticity (crack resistance), and resistance to migration
- AR mixes are easily designed using current test methods and proper specifications. Typically AR mixes have 20% higher binder contents than conventional mixes

Summary – continued

- AR OGFC, ARGG & ARBWC mixes have been used successfully in many states and climates with great success
- AR mixes reduce rutting, oxidation, cracking and pavement noise and provide smooth surfaces
- Utilizing best practices, AR mixes are user friendly
- QC Plans for the AR Binder and AR Mixes are an essential component of any successful project

Summary – continued

- AR mixes can easily be adapted to warm mix applications reducing mix temperatures, emissions and binder aging
- There is on going data collection and research to determine the long term performance of AR mixes
- ***AR mixes consume old tires and are environmentally friendly***

Questions

THANK YOU

All States Materials Group®

Products & Services

- ECOBIT™ with SonneWarmix™ WMA Binder
- CRMB for HMA
- PG Graded Binders
- Asphalt Rubber SAM & SAMI
- FiberMat® SAM & SAMI
- Bonded Pavements
- Chip Seals
- Liquid Calcium/Magnesium Chloride
- Full Depth Reclamation
- Hot & Cold Mix Asphalt

Rod Birdsall, PE
Consultant
(413) 687-2208
rbirdsall@asmg.com

Mark Edsall
Technical Marketing
(315) 396-1883
medsall@asmg.com

Website:
www.ASMG.COM