NEW YORK CONTRACTOR'S EXPERIENCE WITH PERFORMANCE TESTING

2021 North East Asphalt User Producer Group

Virtual Meeting

October 27, 2021

HISTORY OF MIX DESIGN

1890
- **Barber Asphalt Paving Company**
- Asphalt cement 12 to 15% / Sand 70 to 83% / Pulverized carbonite of lime 5 to 15%

1905
- **Clifford Richardson, New York Testing Company**
- Surface sand mix: 100% passing No. 10, 15% passing No. 200, 9 to 14% asphalt
- Asphaltic concrete for lower layers, VMA terminology used, 2.2% more VMA than current day mixes or ~0.9% higher binder content

1920s
- **Hubbard Field Method** (Charles Hubbard and Frederick Field)
- Sand asphalt design
- 30 blow, 6" diameter **with compression test (performance)** asphaltic concrete design (Modified HF Method) Stability

1927
- **Francis Hveem** (Caltrans)
- Surface area factors used to determine binder content; **Hveem stabilometer and cohesionmeter** used
- Air voids not used initially, mixes generally drier relative to others, fatigue cracking an issue Stability + Durability

1943
- **Bruce Marshall**, Mississippi Highway Department
- Refined Hubbard Field method, standard compaction energy with drop hammer
- Initially, only used air voids and VFA, VMA added in 1962; **stability and flow utilized** Stability + Durability

1993
- **Superpave**
- Level 1 (volumetric)
- Level 2 and 3 (performance based, but **never implemented**)

BINDER CONTENT LOWER

Performance Based Specification

Introduction

The Northeast Asphalt User Producer Group's (NEAUPG) Asphalt Mix Committee is looking closely as a region at Performance Based Specifications (PBS). The Committee would like to provide state agencies in the Northeast with information on laboratory tests which will closely predict asphalt pavement performance in the field over a typical design life. We expect that this process will require multiple tests based on differing criteria and performance characteristics. The eventual objective is to allow states the opportunity to maintain specifications that meet their needs while allowing producers/contractors the means to deviate from those specifications if the require tests are run and criteria are met on mixes in the laboratory

We are reaching out to research centers, State Materials Engineers, and stake
laboratory tests that may be used to predict in place performance and if ther
effect. This includes the actual test, test protocols, and possible standards.

We appreciate your participation in this Survey. All results will be kept confi
report. You will be sent a full copy of Survey results when finalized.

Thank you for your time in this matter.

Respectfully yours,

NEAUPG Mix Committee
Co-chairs: Edmund Naras – Pavement Management Engineer, MassDOT
Bruce Barkevich – Vice President, New York Construction Mate

Optimized Mix Design for Performance

Northeast Asphalt User Producer Group (NEAUPG)
Annual Meeting
Burlington, Vermont
October 2015

Shane Buchanan
Oldcastle Materials

Oldcastle® Materials

Nebraska Transportation Center

MID-AMERICA TRANSPORTATION CENTER

NDOR
Nebraska Department of Roads

Report SPR-P1(15) MPMC07

Final Report
26-1121-4023-001

Development of a Semicircular Bend (SCB) Test Method for Performance Testing of Nebraska Asphalt Mixtures

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2015

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"This report was funded in part through grant[s] from the Federal Hi...
The views and opinions of the authors [or agency] expressed h...

TechBrief

The Asphalt Pavement Technology Program is an integrated, national effort to improve the long-term performance and cost effectiveness of asphalt pavements. Managed by the Federal Highway Administration through partnerships with state highway agencies, industry and academia the program's primary goals are to reduce congestion, improve safety, and foster technology innovation. The program was established to develop and implement guidelines, methods, procedures and other tools for use in asphalt pavement materials selection, mixture design, testing, construction and quality control.

U.S. Department of Transportation
Federal Highway Administration

Office of Asset Management, Pavements, and Construction

FHWA-HIF-14-015

September 2014

The Need for Asphalt Mixture Cracking Tests and the Steps Toward Implementation

This Technical Brief covers the motivations for pursuing asphalt mixture cracking tests, provides an overview of the different cracking test methods, describes the necessary steps toward implementation, and identifies gaps where further research is needed.

Introduction

At the conclusion of the Strategic Highway Research Program (SHRP) over 20 years ago, it was envisioned that the new asphalt mix design system would have three levels based on the design traffic for the pavement. Level I was envisioned to be for low traffic pavements and the mix design requirements would be primarily based on traditional volumetric properties. Level II would be used for the majority of projects that carry moderate traffic levels and would include volumetric requirements plus a limited set of mixture performance tests. Level III would be for high traffic pavements also start with a volumetric based mix design followed by an expanded set of advanced performance tests. However, the "performance tests" were never implemented, except for a few special projects, primarily because the tests were not considered practical for routine use for the thousands of mix designs used each year in the United States.

Early in the implementation of Superpave mix design, more focus was given to addressing rutting. Mix designs for moderate and high traffic pavements were designed to improve rutting resistance by following more restrictive aggregate requirements and the binder grade bumping guidelines. Many states also added rutting test requirements to mix designs for moderate and high traffic projects. As the early projects built under the Superpave system have matured, most highway agencies have recognized that rutting problems have been virtually eliminated.

1

NCHRP

REPORT 704

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

A Performance-Related Specification for Hot-Mixed Asphalt

TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES

Illinois Department of Transportation
2300 South Dirksen Parkway / Springfield, Illinois / 62764

December 28, 2015

CIRCULAR LETTER 2015-19

ILLINOIS FLEXIBILITY INDEX TEST – PILOT PROJECTS

COUNTY ENGINEERS / SUPERINTENDENTS OF HIGHWAYS
MUNICIPAL ENGINEERS / DIRECTORS OF PUBLIC WORKS / MAYORS
METROPOLITAN PLANNING ORGANIZATIONS – DIRECTORS
TOWNSHIP HIGHWAY COMMISSIONERS
CONSULTING ENGINEERS

The department has been developing a new hot-mix asphalt (HMA) performance test for durability through research at the Illinois Center for Transportation. This new performance test is known as the Illinois Flexibility Index Test (I-FIT). The objective of the I-FIT test is to ensure HMA mixtures have the necessary flexibility to resist premature cracking.

The department is preparing to implement the newly developed test on a pool of pilot projects during the 2016 construction season. The department is asking for local public agency volunteers interested in participating with the pilot program. The department will evaluate these pilot projects through our experimental feature process.

The Illinois Flexibility Index Test is performed on pucks prepared from either gyratory compacted HMA or six-inch cores taken from in-place pavement.

Testing and Analysis of LWT and SCB Properties of Asphaltic Concrete Mixtures

Samuel Cooper III

Louisiana Transportation Conference
February 18 - 20, 2013
Baton Rouge, Louisiana

LOUISIANA TRANSPORTATION RESEARCH CENTER
LTRC

Mix	Virgin	10% RAP "S"	15% RAP "S"	20% RAP "S"	20% RAP "V"
19.0mm	-	-	-	6.0	4.1
12.5mm	-	-	4.6	6.0	-
9.5mm	3.1	1.2	-	3.5	2.5

Advance Testing

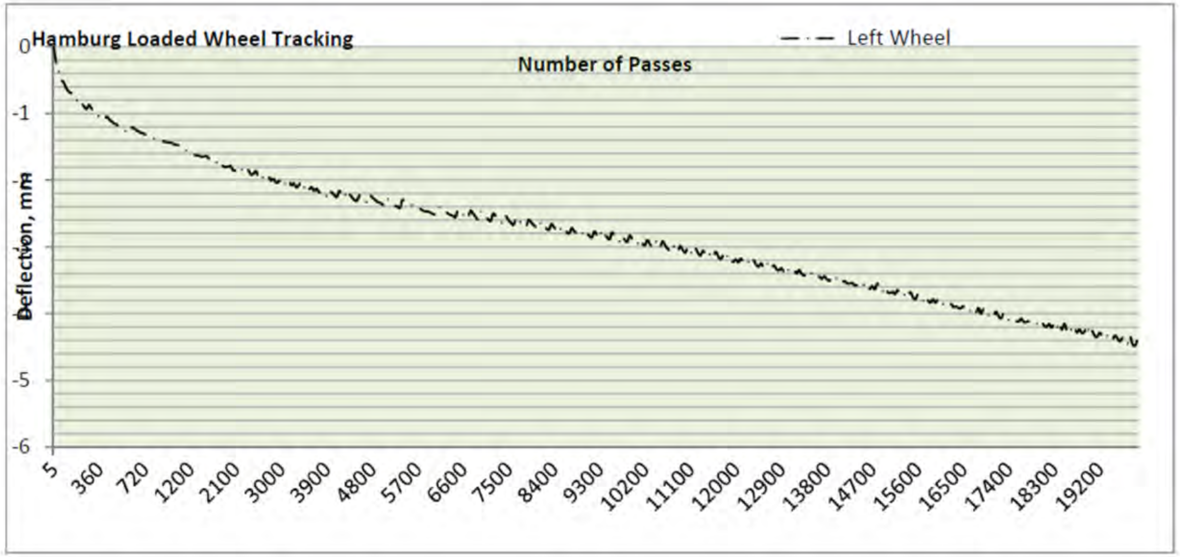
3348 Route 208, Campbell Hall, NY 10916
Phone: 845-496-1600 Fax: 845-496-1398
42 Day Farm Road, West Stockbridge, MA 01266
Phone/Fax: 413-232-8566

Hamburg Wheel-Track Testing of Compacted HMA

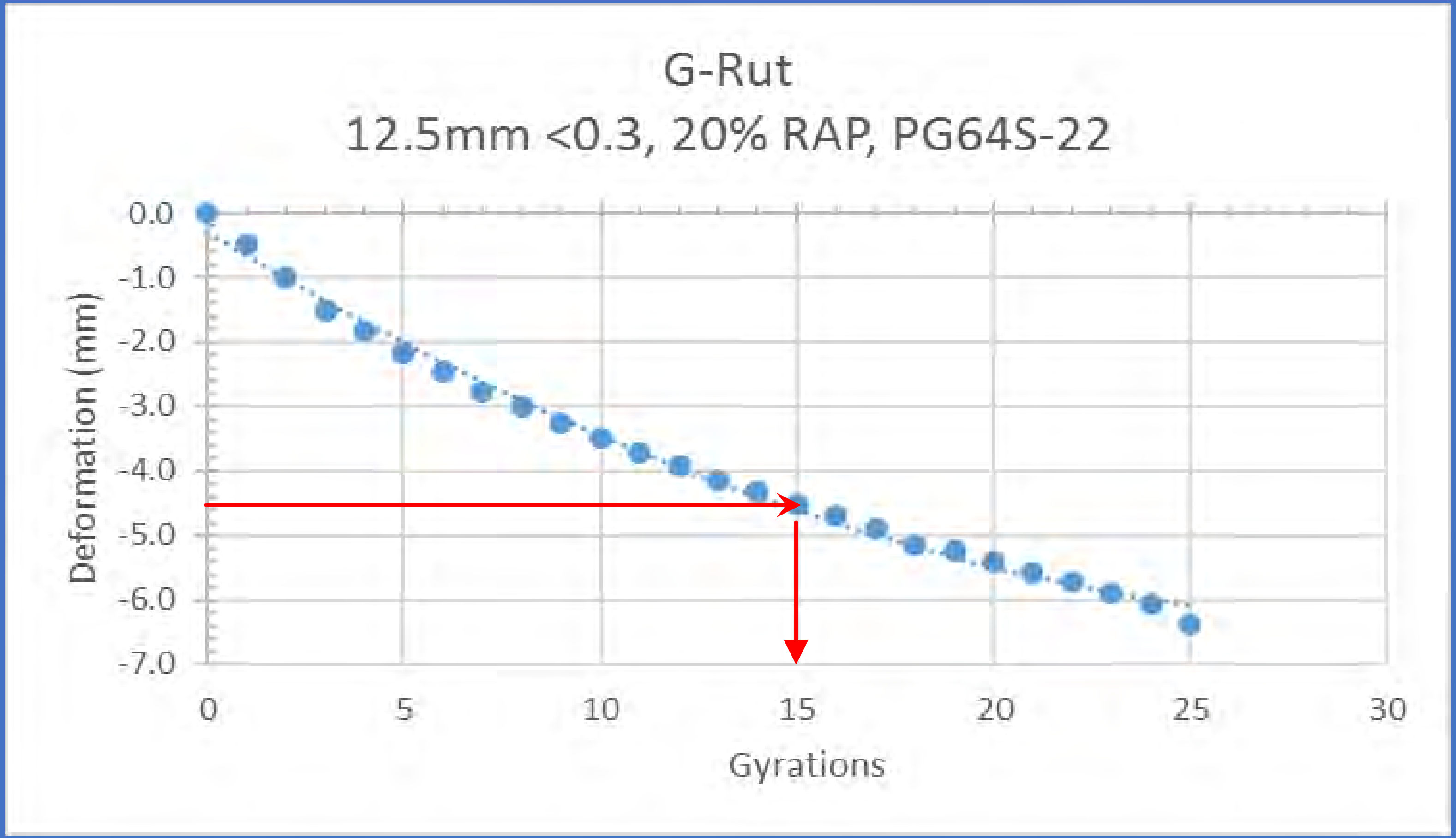
Test Method AASHTO T 324

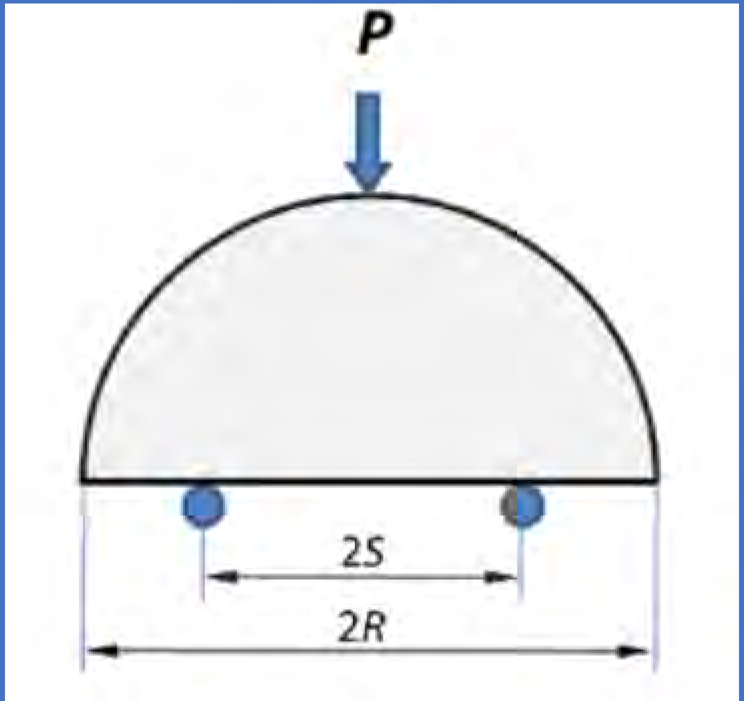
Client:	Barree Stone Products	Project	QC- Hamburg Testing Albion, NY
Material:	12.5 mm < 0.3m, 20% RAP	Project Number:	160954
Source:	Barrie	Lab Number:	16-1488
Date Sampled:	11/1/2016	Sampled By:	Client
Date Tested:	11/14/2016	Tested By:	John Brinsfield

	LEFT WHEEL		RIGHT WHEEL
Sample Number	2	4	[redacted]
Diameter	150.0	150.0	
Thickness	60.0	60.0	
Dry Mass	2482.7	2478.4	
SSD Mass	2495.3	2486.9	
Mass in Water	1454.0	1448.9	
Volume	1041.3	1038	
Bulk SpGr	2.384	2.388	
Max SpGr	2.541	2.541	
% Air Void	6.18	6.02	
Max Impression (mm)	4.48		
PassNo./Point	19900/11		
Creep Slope	-0.000101715		
Strip Slope	N/A		
Stripping Inflection Point	N/A		
Fail Depth	12.7		
Pass?	Yes		

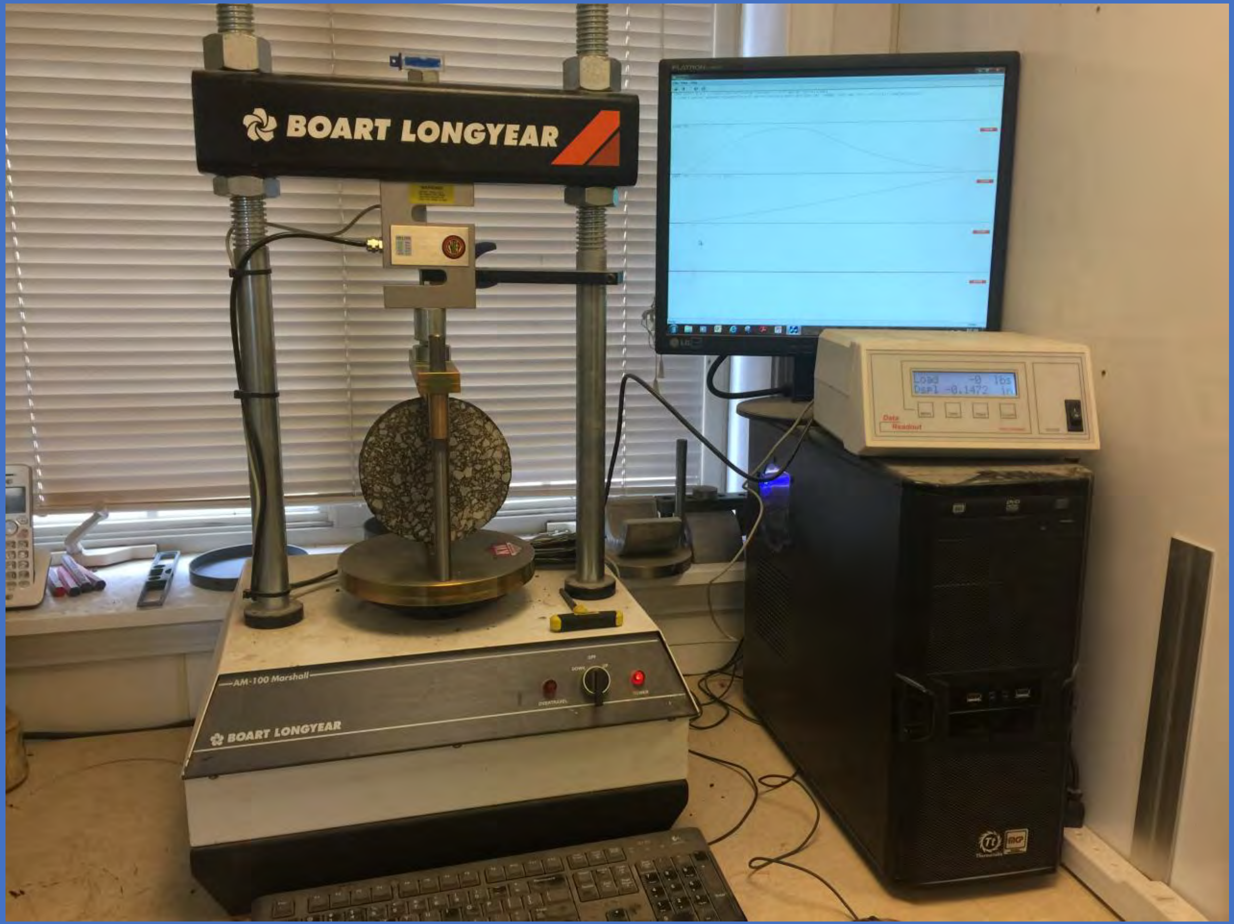


G-RUT


G-Rut
12.5mm <0.3, 20% RAP, PG64S-22
Deformation (mm)
0.0
-1.0
-2.0
-3.0
-4.0
-5.0
-6.0
-7.0
0
5
10
15
20
25
30
Gyrations


P
2S
2R

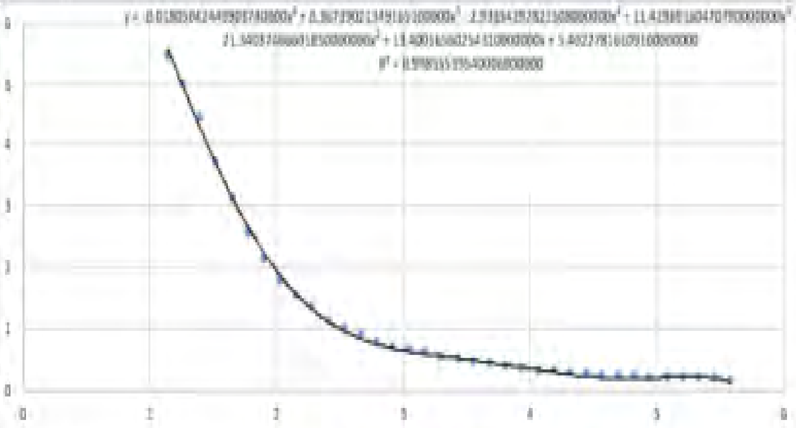

GEO


BOART LONGYEAR
AM-100 Marshall
BOART LONGYEAR

Directions:	**Fill in yellow cells and use the solver on blue cells**
Project:	Barre Stone Products, 12.5mm <0.3, PG64S-22, 20% RAP
Sample ID:	072816-316-12-2-L
Target AV%:	3.9
Air Voids:	2.33

Dimensions:	Notch (15mm)	Thickness (50mm)	Ligament Length
Measurement 1	15.83	52.04	56.1
Measurement 2	15.71	52.29	55.91
Measurement 3		52.1	
Average:	15.77	52.14333333	56.005

Raw Data						Processed Data				
X-axis (# of Lines)	Y-Axis (# of Lines)	Conversion to lbs	Conversion to kn	Conversion to mm		Stroke (mm)	Load (kN)	F'	F''	
0	0	0	0	0		0	0	13.4002	-42.681	0.07062
1	10	250	1.1120554	0.127		0.127	1.1120554	8.5092	-34.524	0.21185
2	20	500	2.2241108	0.254		0.254	2.2241108	4.58669	-27.415	0.54955
3	29.5	737.5	3.28056343	0.381		0.381	3.28056343	1.5051	-21.268	0.46959
4	37	925	4.11460498	0.508		0.508	4.11460498	-0.8525	-16	0.56492
5	43	1075	4.78183822	0.635		0.635	4.78183822	-2.5929	-11.555	0.65907
6	47.5	1187.5	5.28226315	0.762		0.762	5.28226315	-3.8131	-7.7959	0.6885
7	50	1250	5.560277	0.889		0.889	5.560277	-4.6008	-4.7118	0.70969
8	50.5	1262.5	5.61587977	1.016		1.016	5.61587977	-5.0347	-2.2142	0.70262
9	49	1225	5.44907146	1.143		1.143	5.44907146	-5.1855	-0.2382	0.66576
10	45	1125	5.0042493	1.27		1.27	5.0042493	-5.1147	1.27777	0.60025
11	40	1000	4.4482216	1.397		1.397	4.4482216	-4.8777	2.39192	0.51902
12	33.5	837.5	3.72538559	1.524		1.524	3.72538559	-4.5218	3.15905	0.43429
13	28	700	3.11375512	1.651		1.651	3.11375512	-4.0878	3.63059	0.36014
14	23	575	2.55772742	1.778		1.778	2.55772742	-3.6101	3.85459	0.29659
15	19	475	2.11290526	1.905		1.905	2.11290526	-3.1173	3.87571	0.24715
16	16	400	1.77928884	2.032		2.032	1.77928884	-2.6325	3.73523	0.21185
17	14	350	1.55687756	2.159		2.159	1.55687756	-2.1738	3.47106	0.1836
18	12	300	1.33446648	2.286		2.286	1.33446648	-1.7547	3.11771	0.15535
19	10	250	1.1120554	2.413		2.413	1.1120554	-1.3844	2.70633	0.15417
20	9	225	1.00084986	2.54		2.54	1.00084986	-1.0685	2.26468	0.12005
21	8	200	0.88964432	2.667		2.667	0.88964432	-0.8094	1.81713	0.10592
22	7	175	0.77843878	2.794		2.794	0.77843878	-0.6063	1.38469	0.09592
23	6.3	157.5	0.700594902	2.921		2.921	0.700594902	-0.4563	0.98497	0.08544
24	5.8	145	0.644992132	3.048		3.048	0.644992132	-0.3542	0.6522	0.07858
25	5.3	132.5	0.589389362	3.175		3.175	0.589389362	-0.2933	0.33725	0.07132
26	4.8	120	[illegible]	3.302		3.302	[illegible]	[illegible]	[illegible]	[illegible]



	Start	Finish	Inflection	Max Load
Load	5.402278161	6.2275	5.48559	5.61588
Disp	0	1.016	1.18075	1.016

	Raw Coefficents	Integral Coefficients
6	-0.018050424	-0.002578632
5	0.367390215	0.061231702
4	-2.933542928	-0.586708586
3	11.4296916	2.857422901
2	-21.34037467	-7.113458222
1	13.4001656	6.700082801
0	5.402278161	5.402278161

Wf (Joules) 9.420

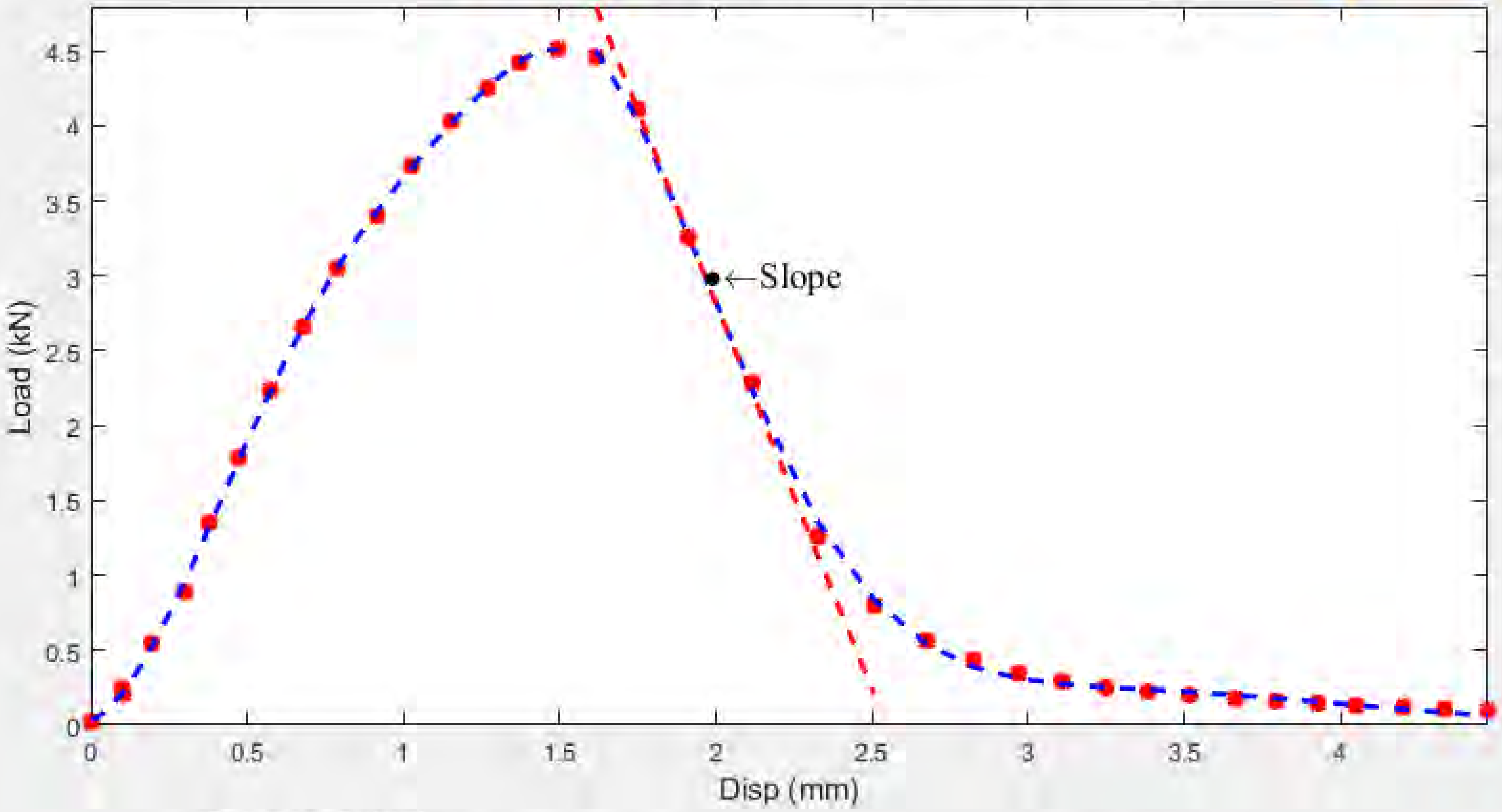
Area(lg)	0.00292
Gf (Joules/m2)	3225.75
Secant Stiffness	5.52744
Flexibility Index	6.21847

-5.187368428 3225.75 6.21847

Note: Adjust the trendline to go from the peak load to final load and paste the corr

Upload Data

Project ID: NCAT ROUND ROBIN Specimen ID: 3C
Thickness: 50.1 mm Ligament: 57.6 mm



Summary Output

Fracture Energy (J/m2)	2531.88
Strength (Psi)	89.92
Slope	-5.15
Flexibility Index	4.92

2019 SPECIAL NOTE ASPHALT MIXTURE PERFORMANCE TESTING

NYSDOT & INDUSTRY V1.00

October 27, 2021

SPECIAL NOTE

ASPHALT MIXTURE PERFORMANCE TESTING

This Special Note requires the asphalt producer to collect asphalt mixture during the production for this project. The Producer will perform the following tasks and the cost of producing, shipping, and testing these specimens at an AMRL approved laboratory capable of performing these tests and at the Producer laboratory will be included in the bid price of the asphalt mixture. The Producer and RME will agree on the production day to implement the requirements of this note.

Task 1. Collection of Asphalt Mixture.

The Producer shall collect mixture for testing as follows on a two sublot day production:

Sublot 1 – Testing Lab and Producer Lab

Sublot 2 – Producer Lab only

a) The producer shall supply sufficient mixture to the AMRL approved laboratory so that the required specimens can be fabricated and tested as listed in Task 2.
b) The Producer shall collect sufficient mixture to fabricate specimens in their lab and tested as listed in Task 3.

The mixture shall be collected after the first 300 tons. If the production is such that it yields only one sublot, then it will be divided into two sublot for the day.

Task 2. **<u>Number of Specimens (Testing Lab).</u>**

The testing laboratory will make the following number of specimens for performance testing:

a. Overlay Tester – 5 specimens
b. Asphalt Pavement Analyzer (APA) or Hamburg Wheel Tracker – 6 specimens
c. Semi-circular Bend (SCB) – 4 specimens
d. Ideal-CT – 3 specimens
e. High Temperature Indirect Tension – 3 specimens
f. Gradation
g. Asphalt content using chemical extraction.

Task 3. **<u>Number of Specimens (Producer Lab).</u>**

The producer will make the following number of specimens for performance testing:

a. Semi-circular Bend (SCB) – 4 specimens
b. Ideal-CT – 3 specimens
c. High Temperature Indirect Tension – 3 specimens

Task 4.

<u>Test Results.</u> The Producer will submit both the testing lab and Produce lab results to the Materials Bureau once the tests are completed. In addition, the Producer shall submit the volumetric results of the mixture during the production for the day selected. The QAF will be a 1.0.

GROUP - 31502 - COMPREHENSIVE BITUMINOUS CONCRETE

HOT MIX ASPHALT (OGS Statewide) - AWARD# 23148

AGENCY/USER COMPLETES THIS SECTION FOR QUICK QUOTE/PRICE CALCULATION

Date when the Quick Quote form is sent to the Contractor: April / 3 / 20 19

NOTE:

1. The user and the Contractor understand that the Project's Total Cost to be shown below will include all the needed Price Adjustments for the month indicated (the month when the Quick Quote form is sent to the Contractor). If the project (or part of the project) is executed in a different month than the one used to calculate this Quick Quote, then the Project's Total Cost will change accordingly to reflect the Price Adjustments for the Month in which the project (or part of the project) was actually performed.

2. The Contractor understands that at no time may a quick quote unit price (without the Price Adjustment) exceed the contract price. Materials cost, hauling expenses, etc., can be lowered by the Contractor any time during the quick quote process.

Agency/User: NYSDOT Monroe County West Residency

Project Name: NY 19 FOB Paving — Project # 401982

Project Location: NY 19 from NY 104 to NY 18

County: Monroe — City: T/o Clarkson/Hamlin — Zip Code: 14420

Material #1 - Specified Item #:

402.098303 - 9.5 F3 Top Course HMA, 80 Series Compaction

Estimated Total Quantity for Material #1: 7,594.0 Tons


Hamlin
NYSDOT QQ 401982
Rt. 19 Overlay between Rts. 104 & 18 in the Towns of Clarkson & Hamlin, NY
Clarkson
Clarkson
N
2 mi

BR 257

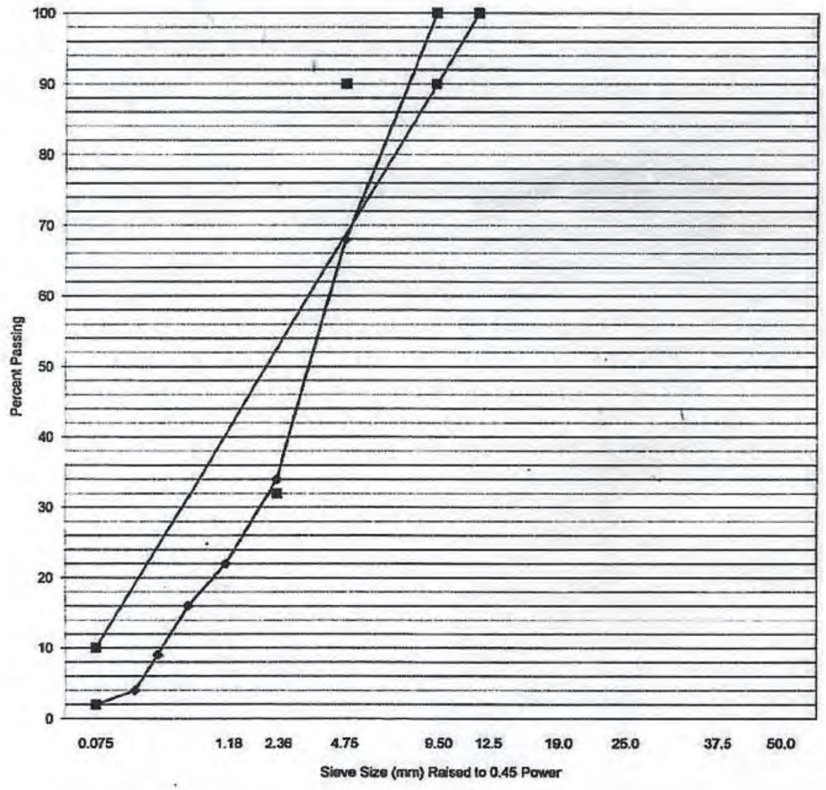
NEW YORK STATE
DEPARTMENT OF TRANSPORTATION
MATERIALS BUREAU

Job Mix Formula

9.5mm F3 Top Mix

Producer		
BARRE STONE PRODUCTS, INC.		
Location	Plant ID	Region
Barre 6 Ton Batch	H0306	4

ESALs	Type	PG Binder	Additive	Coding	Site Manager #
< 30M	HMA	PG 64S-22		9F32HB	H030618154
	HMA	PG 64V-22		9F32HC	H030618154
	WMA	PG 64S-22	EVO	9F32WB	H030618155
	WMA	PG 64V-22	EVO	9F32WC	H0306 18 155



Aggregates		Source Number	Blend %	Blend	Blend Limits to Maintain C.A.P.'s		
					C.A.A.	F.A.A.	Flat/Elong
Coarse	No. 3A Stone						
	No.2 Stone						
	No. 1 Stone			1 Fric. Blend			
	No. 1 Stone NC Stone						
	No. 1A Stone	4-18R	47	1A Fric.Blend	49		
	No. 1A Stone NC Stone			100/0			
Fine	No. 1B Stone	4-18R	33	Fines Blend		50.2	
	Man. Sand			2/1			
	Natural Sand	4-49F				38.4	
	Mineral Filler						
	RAP	Barre	20		52	46.0	1.0

Sieve Size		0.075mm	0.150mm	0.300mm	0.600mm	1.18mm	2.36mm	4.75mm	9.5mm	12.5mm	19.0mm	25.0mm	37.5mm	50.0mm	% Binder
% Passing	General Limits	2 - 10					32 - 67	≤ 90	90 - 100	97 -100	100				5.8 Min.
	JMF Range	0 - 7	0 - 9	4 - 14	11 - 21	17 - 27	29 - 39	63 - 73	95 - 100	95 - 100	100				
	Target Value	2	4	9	16	22	34	68	100	100	100				6.2
														Virgin AC	4.9

Prepared By : Greg Rose GR Date : Aug-2018

Accepted for Verification/Production By: Matt [signature] Date: 08/17/2018

Revisions	% Binder
09/18	6.3

Mix Gmm:	2.510		
Sample Height (mm):	62		62mm for Ideal-CT
Target Air Voids (%):	7.0	CF	7.0% for Ideal-CT
Trial Weights* :	2500	1.023	
Rounded Weights:	2500		Ideal-CT Sample Weight

Sample Height (mm):	95		95mm for HT-IDT
Target Air Voids (%):	7.0	CF	7.0% for HT-IDT
Trial Weights* :	3842	1.02	
Rounded Weights:	3840		HT-IDT Sample Weight

Sample Height (mm):	160		160mm for SCB
Target Air Voids (%):	8.5	CF	8.5% for SCB
Trial Weights* :	6429	1.01	
Rounded Weights:	6430		SCB Sample Weight

Input
Result
Correction Factor


OHAUS
6420.3 g
OFF
ON/TARE


2
3
1
4
5


HOT
A
J
D
B
K
E
C
F
I

Plant Production	Units	Target	Range	Lot 4A	Rutgers	Lot 4B
Voids	%	3.16	2.5 - 4.5	4.53	-	3.69
VMA	%	16.4	> 15.0	16.73	-	16.03
VFB	%	76.5	65.0 - 80.0	72.92	-	76.99
AC Content	%	6.3	6.1 - 6.5	6.5	6.3	6.3

Plant Gradation	Units	Target	Range	Lot 4A	Rutgers *	Lot 4B
1/2"	%	100	100	100	100	100
3/8"	%	100	95 - 100	99.7	98.5	99.7
#4	%	68	63 - 73	69.9	72.7	70.9
#8	%	34	29 - 39	31.3	35.3	33.6
#16	%	22	17 - 27	19.6	22.3	21.5
#30	%	16	11 - 21	13.1	15.7	14.5
#50	%	9	4 - 14	7.8	10.9	8.3
#100	%	4	0 - 9	4.3	7.7	4.2
#200	%	2	0 - 7	2.4	5.7	2.1

APA, HAMBURG & OVERLAY

APA Rutting @ 8,000 Cycles @ 64°C	Units	Target	Range	Lot 4A	Rutgers	Lot 4B
Rut Depth	mm		4 - 7	-	4.38	-

Hamburg Rutting at 20,000 Cycles @ 50°C	Units	Target	Range	Lot 4A	Rutgers	Lot 4B
Rut Depth	mm	< 12.5	n/a	-	10.45	-

Overlay Test for Crack Resistance @ 25°C	Units	Target	Range	Lot 4A	Rutgers	Lot 4B
# of Cycles to Failure	Cycles		100 - 700	-	1171	-

This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: D8225 – 19

Standard Test Method for Determination of Cracking Tolerance Index of Asphalt Mixture Using the Indirect Tensile Cracking Test at Intermediate Temperature[1]

This standard is issued under the fixed designation D8225; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This test method covers the procedures for preparing, testing, and measuring asphalt mixture cracking resistance using cylindrical laboratory-prepared asphalt mix samples or pavement cores. Testing temperatures are selected from the long-term pavement performance (LTPP) database intermediate temperatures. The test method describes the determination of the cracking tolerance index, CT_{Index}, and other parameters determined from the load-displacement curve. These parameters can be used to evaluate the resistance of asphalt mixtures to cracking.

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D8 Terminology Relating to Materials for Roads and Pavements

D3203/D3203M Test Method for Percent Air Voids in Compacted Asphalt Mixtures

D3666 Specification for Minimum Requirements for Agencies Testing and Inspecting Road and Paving Materials

D6373 Specification for Performance Graded Asphalt Binder

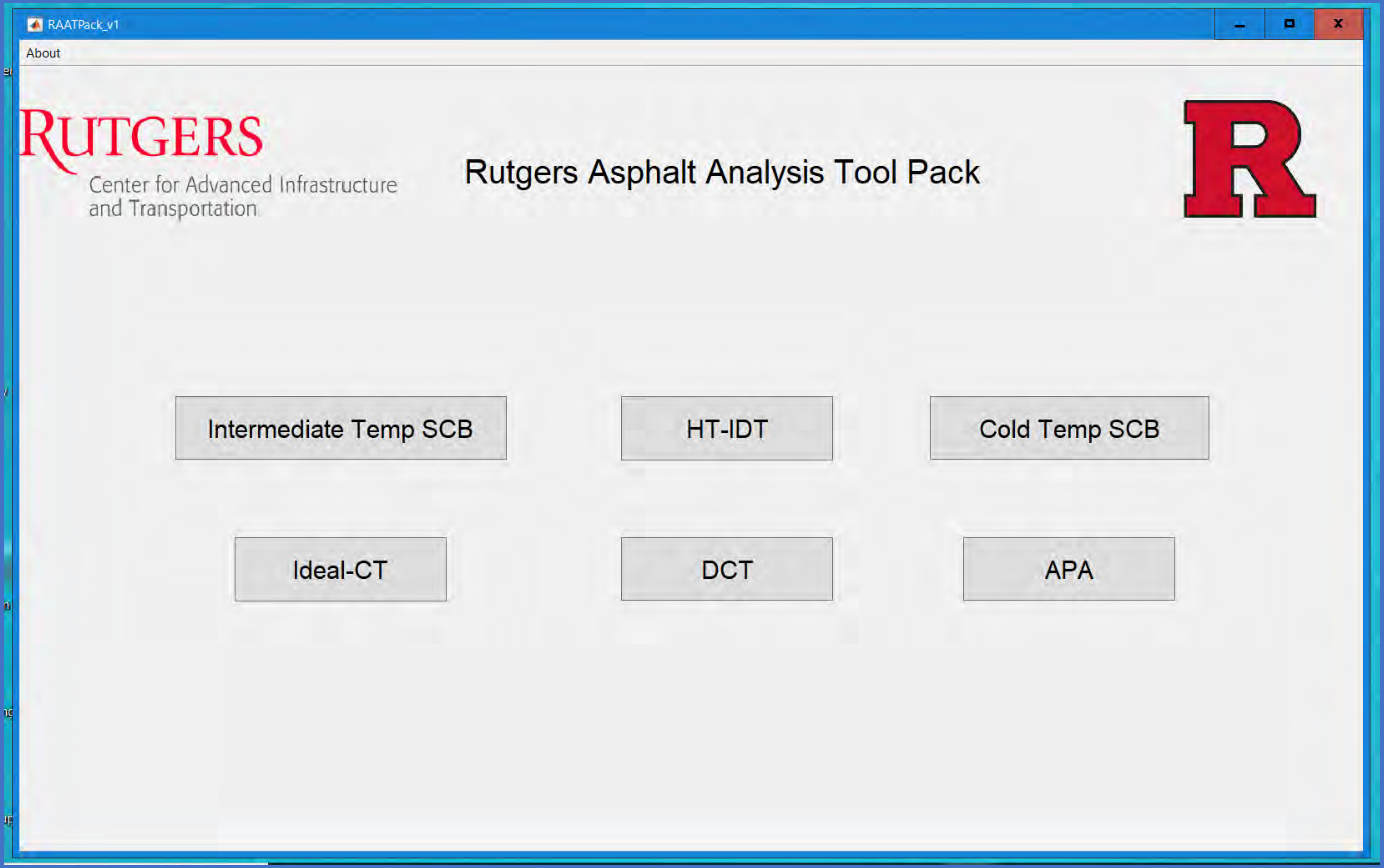
D6925 Test Method for Preparation and Determination of the Relative Density of Asphalt Mix Specimens by Means

Standard Method of Test for Determining the Fracture Potential of Asphalt Mixtures Using the Flexibility Index Test (FIT)

AASHTO Designation: TP 124-18[1]

Technical Section: 2d, Bituminous Materials

Release: Group 3 (August)


RAATPack_v1
About
RUTGERS
Center for Advanced Infrastructure and Transportation
Rutgers Asphalt Analysis Tool Pack
Intermediate Temp SCB
HT-IDT
Cold Temp SCB
Ideal-CT
DCT
APA

HT IDT

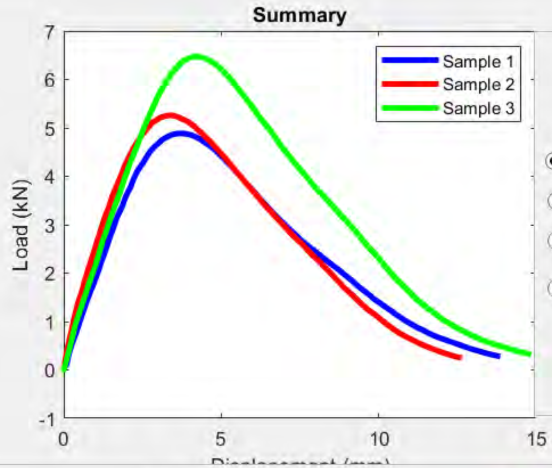
RAPL HTIDT Analyzer

Project Name	NYSDOT R4 - AMP Testing
Mix Type	9.5 F3 Top, 75 gyr, 20% RAP
Test Temperature	42C
Institution	Barre Stone Products, Inc.
Date Tested	5-30-19
Technician	Greg Rose

Sample	Air Voids (%)	Thickness (mm)	Diameter (mm)		
A	6.98	94.8	150.0	Open	C:\Users\Greg Rose\Documents\SCB\IDT\RAAT Data\HT-IDT 052919 A.xlsx
C	7.04	94.8	150.0	Open	C:\Users\Greg Rose\Documents\SCB\IDT\RAAT Data\HT-IDT 052919 C.xlsx
K	7.13	95.0	150.0	Open	C:\Users\Greg Rose\Documents\SCB\IDT\RAAT Data\HT-IDT 052919 K.xlsx

Summary Table

				Average	Standard Deviation	COV (%)
Specimen ID	1.00	1.00	1.00	0.00		
Air Voids (%)	6.98	7.04	7.13	7.05		
Thickness (mm)	94.80	94.80	95.00	94.87		
Diameter (mm)	150.00	150.00	150.00	150.00		
Peak Load (N)	4884.15	5257.80	6472.16	5538.03		
IDT Strength (kPa)	218.77	235.51	289.29	247.86		



- All Samples
- Sample 1
- Sample 2
- Sample 3

Run

Export

Pass/Fail Criteria

Minimum IDT Strength (kPa) 200

Update Pass/Fail Criteria

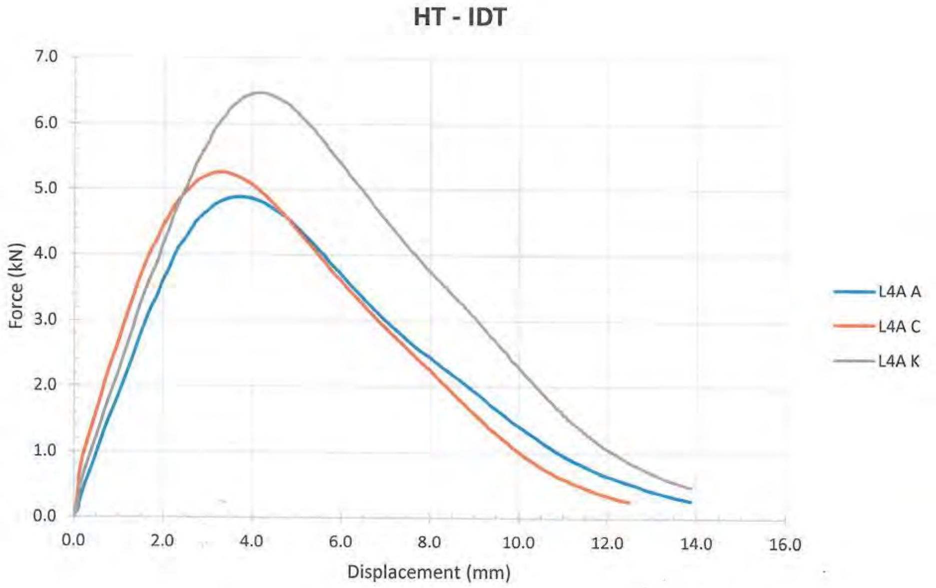
Sample 1	✓ Pass
Sample 2	✓ Pass
Sample 3	✓ Pass
Average	✓ Pass

ASTM D6931 - 17

Standard Test Method for Indirect Tensile (IDT) Strength of Asphalt Mixtures

Project Name:	NYSDOT R4 - AMP Testing	**Institution:**	Barre Stone
Mix Type:	9.5 F3, PG64S-22, 20% RAP	**Date Tested:**	05/30/19
Test Temperature:	42C	**Technician:**	Greg Rose

Specimen ID	L4A A	L4A C	L4A K	Average	Standard Deviation	COV (%)
Air Voids (%)	7.0	7.0	7.1	**7.0**	**0.0**	**0.7**
Thickness (mm)	94.7	94.7	95.0	**94.8**	**0.1**	**0.1**
Diameter (mm)	150.0	150.0	150.0	**150.0**	**0.0**	**0.0**
Peak Load (N)	4884	5258	6472	**5538**	**677.9**	**12.2**
IDT Stregth (kPa)	219	236	289	**248.0**	**30.0**	**12.1**
IDT Strength (psi)	31.8	34.2	42.0	**36.0**	**4.4**	**12.1**



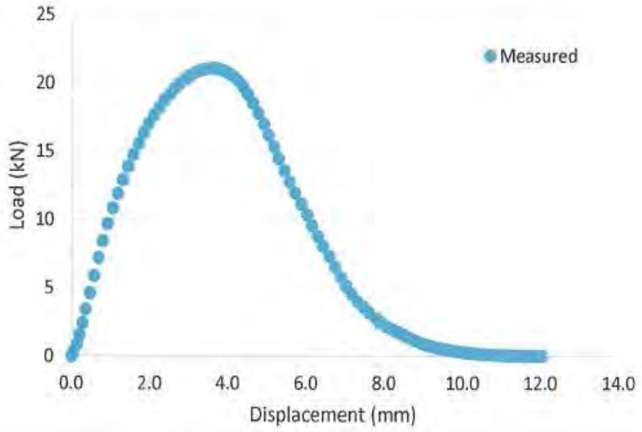
HIGH TEMPERATURE IDT

High Temperature Indirect Tensile Strength (HT-IDT) @ 42°C	Units	Target	Range	Lot 4A	Rutgers	Lot 4B
Voids	%	7.0	6.5 - 7.5	7.0	7.0	6.9
Thickness	mm	95.0	94.0 - 96.0	94.8	95.5	95.0
Diameter	mm	150.0		150.0	149.9	150.0
Peak Load	N			5538.0	5146.7	5563.2
HT-IDT	kPa		158 - 324	248.0	228.9	248.7
HT-IDT	PSI		23 - 47	36.0	33.2	36.1

High Temperature Indirect Tensile Strength (HT-IDT) @ 44°C	Units	Target	Range	Lot 4A	Rutgers	Lot 4B
Voids	%	7.0	6.5 - 7.5	-	7.3	-
Thickness	mm	95.0	94.0 - 96.0	-	95.1	-
Diameter	mm	150.0		-	150.0	-
Peak Load	N			-	5320.0	-
HT-IDT	kPa		158 - 324	-	237.2	-
HT-IDT	PSI		23 - 47	-	34.4	-

Specimen Information	
ID	1
Thickness (mm)	61.9
Diameter (mm)	150

Analysis Results	
P100 (kN)	21.093
L100 (mm)	3.607
P85 (kN)	17.788
P65 (kN)	13.598
L85 (mm)	4.745
L65 (mm)	5.410
L75 (mm)	5.077
m75	6.297
Work of Fracture (kN.mm)	104.987
Fracture Energy (kN/mm)	0.011
CT	60.69



Raw Data

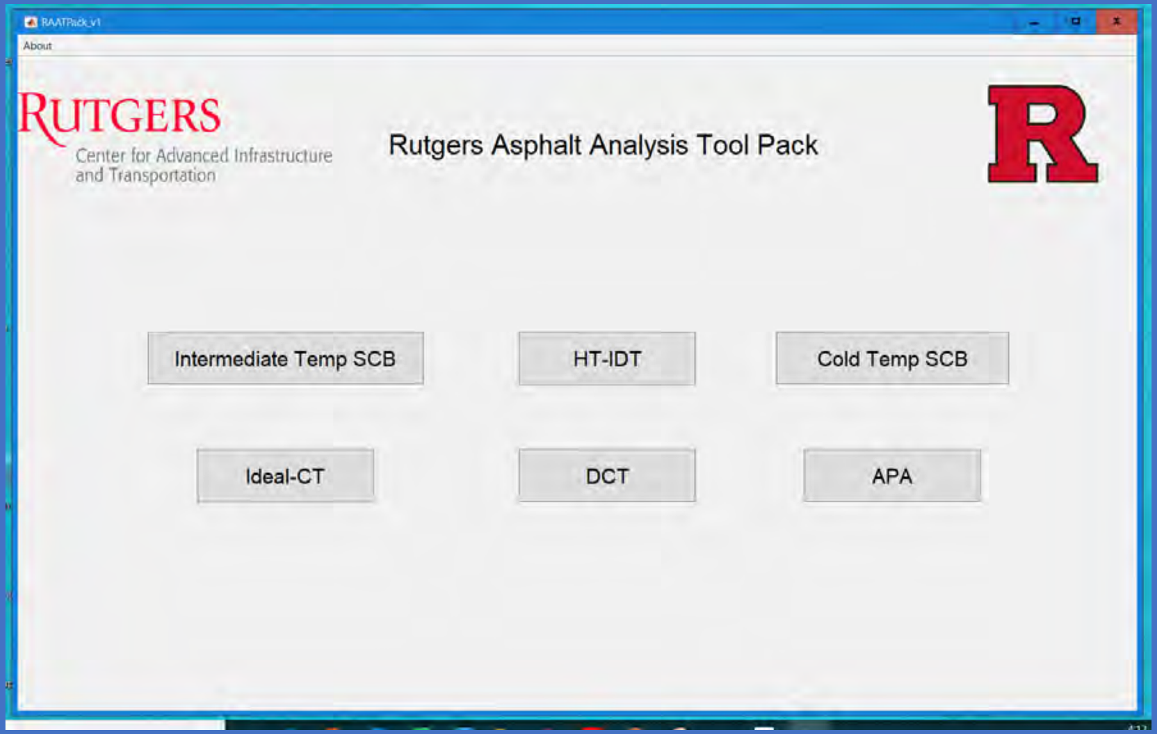
Load (lbf)	Displacement (in.)	Time (sec)
13	0	0.000
13	0	0.133
13	0	0.266
13	0	0.399
13	0	0.532
48	0.0011	0.665
64	0.0015	0.798
187	0.005	0.931
348	0.0076	1.064
542	0.0109	1.197
767	0.014	1.330
1033	0.0179	1.463
1321	0.0222	1.596
1612	0.0263	1.729
1898	0.0309	1.862
2176	0.0358	1.995
2435	0.0408	2.128

Data Analysis

Load (kN)	Post-Peak Load (kN)	Displacement (mm)	Work Increment (kN.mm)
0.058	0.000	0.000	0.000
0.058	0.000	0.000	0.000
0.058	0.000	0.000	0.000
0.058	0.000	0.000	0.000
0.058	0.000	0.000	0.000
0.214	0.000	0.028	0.004
0.285	0.000	0.038	0.003
0.832	0.000	0.127	0.050
1.548	0.000	0.193	0.079
2.411	0.000	0.277	0.166
3.412	0.000	0.356	0.229
4.595	0.000	0.455	0.397
5.876	0.000	0.564	0.572
7.171	0.000	0.668	0.679
8.443	0.000	0.785	0.912
9.679	0.000	0.909	1.128
10.831	0.000	1.036	1.302

IDEAL - CT

Proposed Ideal-CT	Units	Target	Range	Lot 4A	Rutgers		Lot 4B
Voids	%	7.0	6.5 - 7.5	7.1	7.0		7.0
Thickness	mm	62.0	61.0 - 63.0	62.1	62.2		62.0
Diameter	mm	150.0	148.0 - 152.0	150.0	150.0		150.0
Peak Load	kN			13.2	10.2		12.6
Displacement (L)	mm			6.2	6.5		6.3
Tensile Strength	kPa			901.7	697.5		858.9
Fracture Energy (Gf)	J/m^2			9,825.1	8,066.7		9,413.7
Slope (S)	kN/mm			2.32	1.65		2.25
Gf/S				4,235.4	4,999.7		4,225.4
(Gf/S)*(L/D)			70 - 250	176.0	217.5		178.8



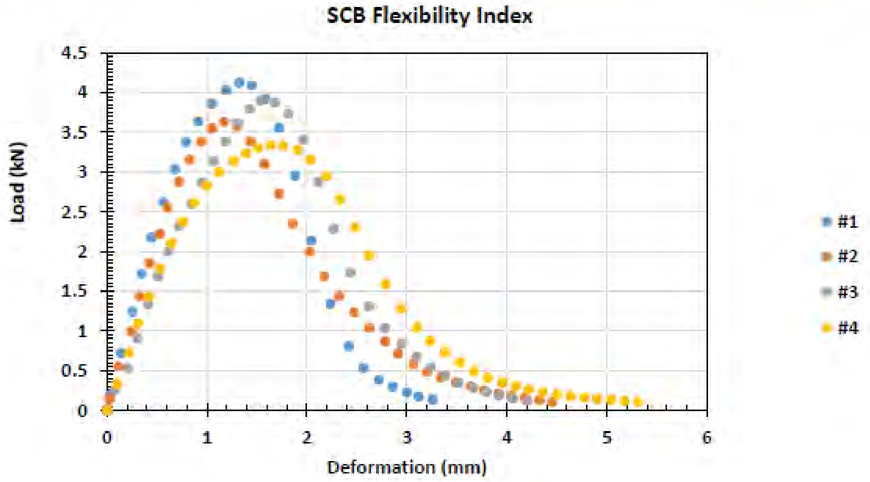
AASHTO TP 124

Standard Method of Test for Determining the Fracture Potential of Asphalt Mixtures Using Semicircular Bend Geometry (SCB) at Intermediate Temperature

Project Name:	2019 Barre Stone	Institution:	Barre Stone
Mix Type:	9.5 F3 64S-22 20% RAP	Date Tested:	05/30/19
Test Temperature:	25C	Technician:	Greg Rose

Specimen ID	L4A1	L4A7	L4A8	L4A10	Average	Standard Deviation	COV (%)
Air Voids (%)	6.6	7.2	7.4	7.1	7.1	0.3	4.8
Thickness (mm)	48.40	49.10	48.00	49.00	48.6	0.5	1.1
Ligament Length (mm)	58.50	55.90	58.10	57.90	57.6	1.2	2.0
Max Load (kN)	4.12	3.63	3.90	3.34	3.7	0.3	9.0
Fracture Energy, G_f (J/m^2)	2413.5	2462.4	2632.7	2799.2	2576.9	175.4	6.8
Slope (kN/mm)	-4.74	-2.53	-3.67	-2.41	-3.34	1.09	32.8
Flexibility Index (FI)	5.09	9.73	7.17	11.60	8.4	2.9	34.0

Flexibility Index (FI)	8.40	PASS
Minimum Flexibility Index (FI) Criteria	8	

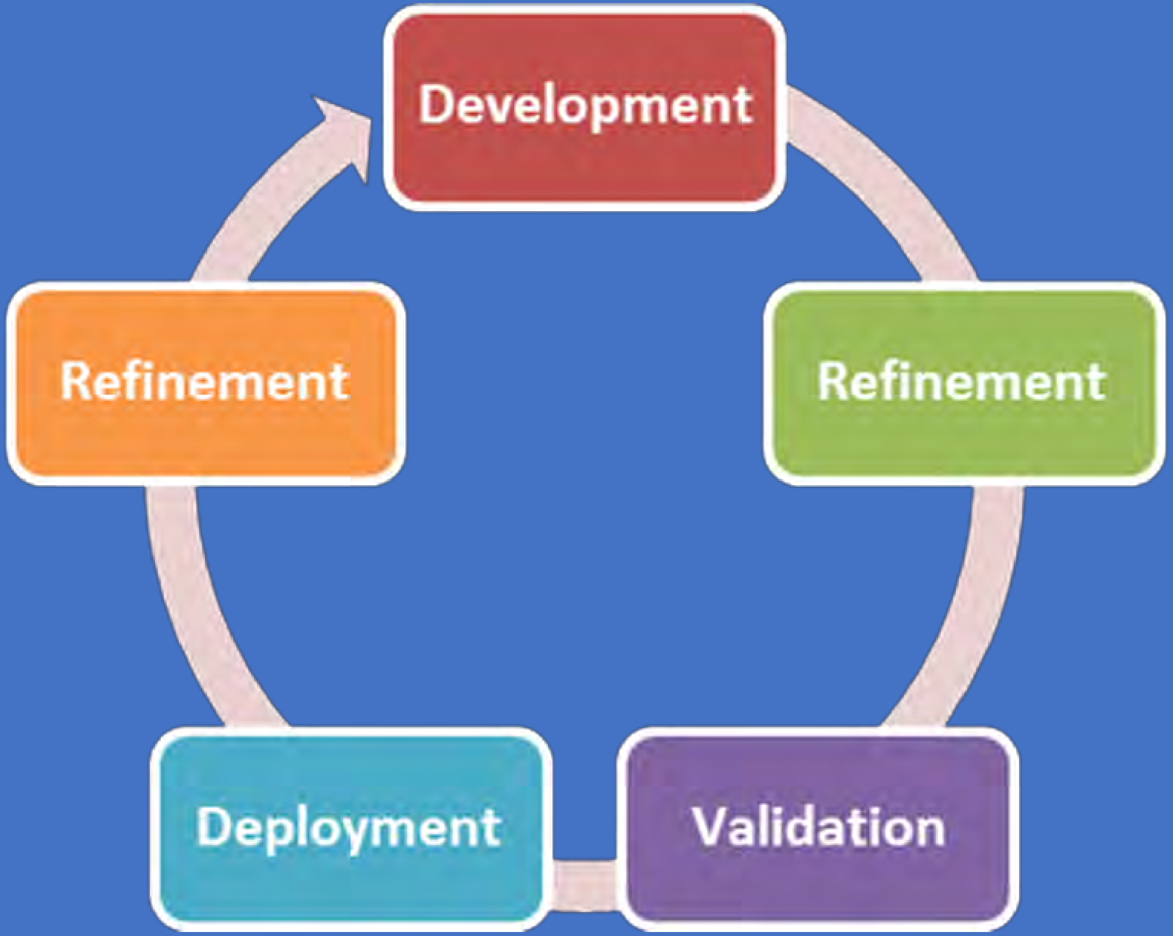


This report was developed using the Rutgers Asphalt Analysis Tool-Pack (RAAT-Pack)

SEMICIRCULAR BEND (SCB)

Semicircular Bend (SCB)	Units	Target	Range	Lot 4A	Rutgers		Lot 4B
Voids	%	7.0	6.0 - 8.0	7.1	7.1		7.0
Thickness	mm	50.0	49.0 - 51.0	48.6	49.9		48.8
Ligament	mm			57.6	58.1		57.9
Max Load	kN			3.75	3.30		3.28
Fracture Energy	J/m^2			2604.3	3200.8		2513.2
Slope	kN/mm			-3.28	-1.72		-2.31
Flexibility Index	FI	> 8.0		8.6	18.8		11.4

SPECIFICATION PROCESS



SPECIAL NOTE ITERATIONS

Test Method	Criteria	v 2.00 (2020)		v 3.00 (2021)		v 4.00 (2022)	
		Min. Design Value	Max. COV	Min. Design Value	Max. COV	Min. Design Value	Max. COV
Flexibility Index	Flexibility Index	6	≤ 20	6	≤ 40	8	≤ 40
Indirect Tensile Strength Test	IDT Strength	100 psi	≤ 20	30 psi	≤ 40	30 psi	≤ 40
Determination of CT Index	CT Index	-	-	100	≤ 40	135	≤ 40

D264122 95A1

SPECIAL NOTE
D264122 – P.I.N. 9358.39

HMA MIXTURE EVALUATION USING PERFORMANCE TESTING

Description:

This note covers the requirements for asphalt mixture verification and production under a performance testing process. Plant Quality Adjustment Factors do not apply for mixture produced under this note. Department mixture Quality Assurance will consist of paver sampling and review of Contractor control charts.

All provisions of Sections 401 Asphalt Production and 402 Hot Mix Asphalt (HMA) Pavements of the NYS Standard Specifications apply except as modified below.

Mixture Design Process

HMA mixtures shall be designed to meet the requirements of New York State Materials Method 5.16. Additionally, the mixture shall be tested to meet the performance testing requirements specified in *Table 1 - Performance Testing*.

Table 1 – Performance Testing

Test Methods	Criteria	Design Criteria	COV
AASHTO TP 124-18 Flexibility Index Test	Flexibility Index	6	≤20
ASTM D6931-17 Indirect Tensile Strength Test	IDT Strength	100 psi	≤20
ASTM D8225-19 Determination of CT Index	CT Index	-	-

Quality Control Process

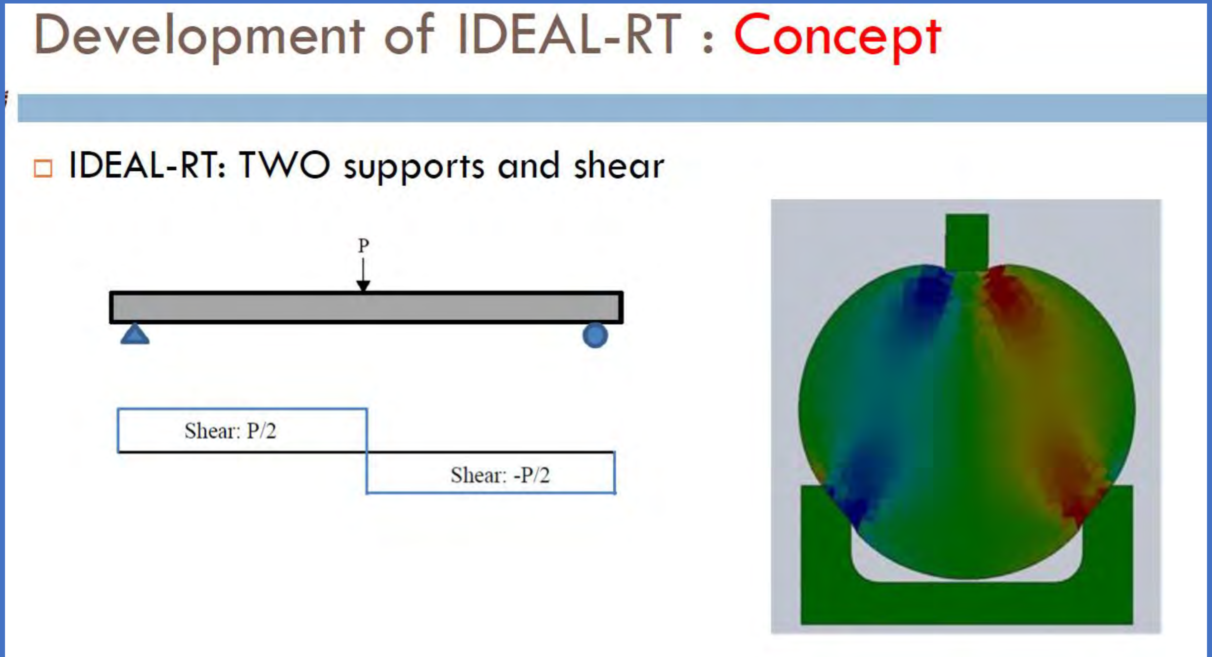
The Quality Assurance Technician (QAT) is not required at the HMA Plant. The QAT shall not be responsible for any activities at the Producer Lab.

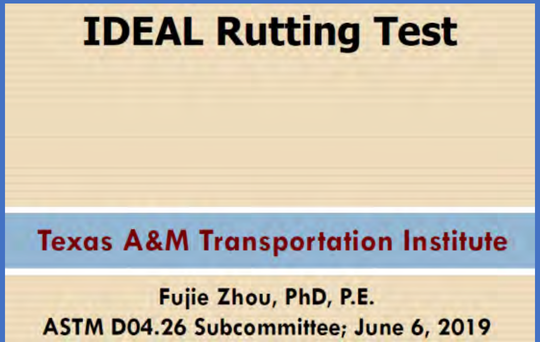
The test properties described in *Table 2* shall be recorded by the Contractor on control chart templates, provided by the Department. These control charts should be used by the Contractor to identify any changes in the mixture production. These Control Charts will be filled out and submitted to the Regional Materials Engineer daily.

Table 2: Testing and Sampling Table

Plant Test Property	Test Method	Contractor Testing Frequency *All Sampling at Plant	Department Testing Frequency *All Sampling at Paver
Aggregate Gradation	AASHTO T27	One per Sublot	One per Day (Enough material for two tests will be collected)
Aggregate Moisture	AASHTO T 255	One per Lot	Monitor and Verify
Mix Temperature	N/A	Two per Sublot	-
Air Voids	MM 5.16, AASHTO T269	One per 3 Lots	One per 3 Days
Indirect Tensile Strength	ASTM D6931-17	One per 3 Lots	One per 3 Days
Semi-Circular Bending	AASHTO TP 124-18	One per 3 Lots	One per 3 Days
Determination of CT Index	ASTM D8225-19	One per 3 Lots	One per 3 Days

IDEAL RUT TEST





QUESTIONS?

GREG ROSE

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