Appendix B – Select Photographs

Figure 1. Typical variation in cross section (October 10, 2014)

Figure 2. Test Pit #2 (October 6, 2014)

Figure 3. Test Pit #3 (October 6, 2014)

Figure 4. Typical cracking (STA 163+00) (October 10, 2014)

Figure 5. Centerline cracking (October 10, 2014)

Appendix C – Gravel and HMA Mix Design

Shop Drawings

Roch Larochelle

From: Tom Billetter
Sent: Wednesday, March 06, 2013 7:54 AM
To: 'Roch Larochelle'
Subject: crushed stone coarse and fine submittal
Attachments: 2012 ROCHESTER CSFG.pdf; 2012 ROCHESTER CSCG.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

Attached are sieve analysis for crushed stone coarse and fine from Brox for your review.

TOM BILLETTER
PROJECT MANAGER/ESTIMATOR
AMERICAN EXCAVATING CORP
DERRY NH
603-231-4681

SUBMITTAL REVIEW

- [x] No Exceptions Taken.
- [ ] Corrections as noted - No Resubmission Required.
- [ ] Make corrections indicated - Resubmission Required.
- [ ] Rejected, See Remarks - Revise and Resubmit.
- [ ] No Action Taken.

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CMA ENGINEERS, INC.
By: [signature]
Date: 3/29/13

NHDOT ITEM 304.4/304.5 TO
Replace ITEM 304.2/304.3 (BID ITEMS 12/13)

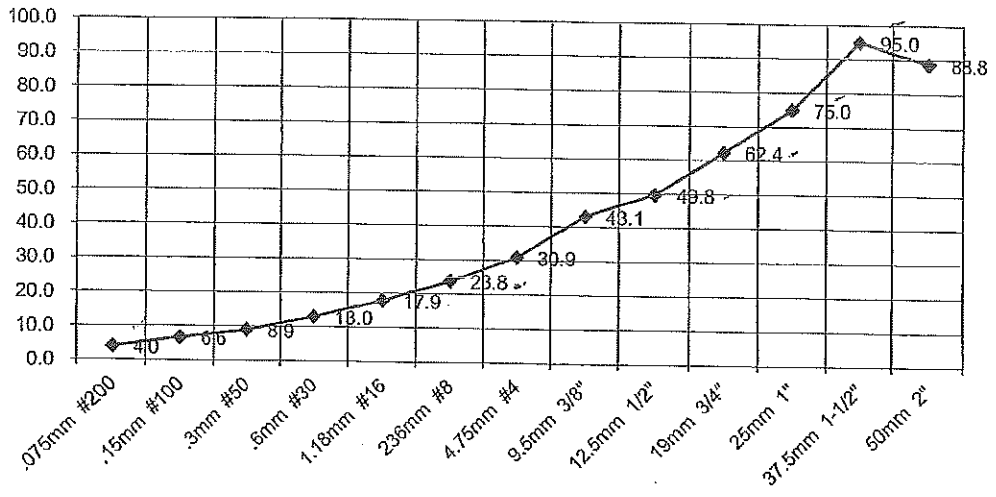
BROX INDUSTRIES, INC.
1471 Methuen Street - Dracut, MA 01826-5439
(978) 805-9788 Fax: (978) 805-9790

2012 GRADATION ANALYSIS

AS OF:	10/25/12	DESCRIPTION:	CRUSH STONE FINE	
LOCATION:	ROCHESTER, NH	SPECIFICATION:	NH 304.4	Sub. for 304.3
JOB:	Various, NH	SOURCE:	ROCHESTER, NH	

SIEVE SIZE		PERCENT PASSING	SPECIFICATION
50mm 2"		88.8	100
37.5mm 1-1/2"		95.0	85-100
25mm 1"		75.0	
19mm 3/4"		62.4	45-75
12.5mm 1/2"		49.8	
9.5mm 3/8"		43.1	
4.75mm #4		30.9	10-45
236mm #8		23.8	
1.18mm #16		17.9	
.6mm #30		13.0	
.3mm #50		8.9	
.15mm #100		6.6	
.075mm #200	Washed	4.0	0-5

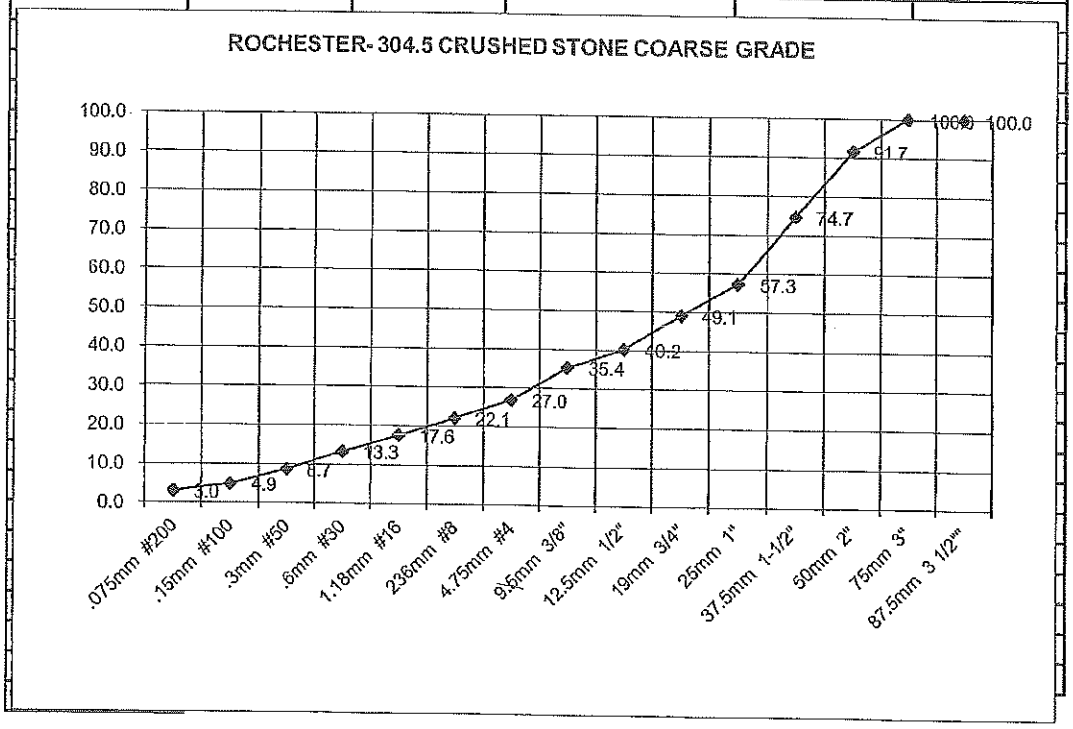
ROCHESTER 304.4 CRUSHED STONE FINE GRADE



BROX INDUSTRIES, INC.
1471 Methuen Street - Dracut, MA 01826-5439
(978) 805-9788 Fax: (978) 805-9790

2012 GRADATION ANALYSIS

AS OF:	10/25/12		DESCRIPTION:	CR. STONE C.G.	
LOCATION:	ROCHESTER		SPECIFICATION:	NH 304.5	Sub Rem 304.2
JOB:			SOURCE:	ROCHESTER	
LA WEAR:	52.70%	PERCENT			
SIEVE SIZE		PASSING		SPECIFICATION	
87.5mm 3 1/2""		100.0		100	
75mm 3"		100.0		85-100	
50mm 2"		91.7			
37.5mm 1-1/2"		74.7			
25mm 1"		57.3			
19mm 3/4"		49.1		40-70	
12.5mm 1/2"		40.2			
9.5mm 3/8"		35.4			
4.75mm #4		27.0		15-40	
236mm #8		22.1			
1.18mm #16		17.6			
.6mm #30		13.3			
.3mm #50		8.7			
.15mm #100		4.9			
.075mm #200	Washed	3.0		0-5	



Roch Larochelle

From:	Tom Billetter
Sent:	Saturday, April 06, 2013 10:00 AM
To:	'Roch Larochelle'
Subject:	drain fabric re submit
Attachments:	ADS_Geosynthetics_1001T_Nonwoven.pdf
Follow Up Flag:	Follow up
Flag Status:	Flagged

See attached fro re-submittal on drainage fabric

TOM BILLETTER
PROJECT MANAGER/ESTIMATOR
AMERICAN EXCAVATING CORP
DERRY NH
603-231-4681

02270

{ item 20 (Base)
item 20 (Alt 1)
(Resubmittal)

ADS GEOSYNTHETICS 1001T NONWOVEN GEOTEXTILE

Scope
This specification describes ADS Geosynthetics 10.0 oz (1001T) nonwoven geotextile.

Filter Fabric Requirements
ADS Geosynthetics 10.0 oz (1001T) is a needle-punched nonwoven geotextile made of 100% polypropylene staple fibers, which are formed into a random network for dimensional stability. ADS Geosynthetics 10.0 oz (1001T) resists ultraviolet deterioration, rotting, biological degradation, naturally encountered basics and acids. Polypropylene is stable within a pH range of 2 to 13. ADS Geosynthetics 10.0 oz (1001T) conforms to the physical property values listed below:

Filter Fabric Properties

PROPERTY	TEST METHOD	UNIT	M.A.R.V. (Minimum Average Roll Value)
Weight (Typical)	ASTM D 5261	oz/yd^2 (g/m^2)	10.0 (339)
Grab Tensile	ASTM D 4632	lbs (kN)	250 (1.11)
Grab Elongation	ASTM D 4632	%	50
Trapezoid Tear Strength	ASTM D 4533	lbs (kN)	100 (0.444)
CBR Puncture Resistance	ASTM D 6241	lbs (kN)	700 (3.11)
Permittivity*	ASTM D 4491	sec^{-1}	1.2
Water Flow*	ASTM D 4491	gpm/ft^2(l/min/m^2)	80 (3251)
AOS*	ASTM D 4751	US Sieve (mm)	100 (0.150)
UV Resistance	ASTM D 4355	%/hrs	70/500

PACKAGING	
Roll Dimensions (W x L) – ft	12.5 x 360 / 15x300
Square Yards Per Roll	500
Estimated Roll Weight - lbs	320

* At the time of manufacturing. Handling may change these properties.

SUBMITTAL REVIEW

- [x] No Exceptions Taken.
- [ ] Corrections as noted - No Resubmission Required.
- [ ] Make corrections indicated - Resubmission Required.
- [ ] Rejected, See Remarks - Revise and Resubmit.
- [ ] No Action Taken.

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CMA ENGINEERS, INC.
By: [signature]
Date: 4/9/13

ADS "Terms and Conditions of Sale" can be found on the ADS website, www.ads-pipe.com Advanced Drainage Systems and the ADS logo is a registered trademark of Advanced Drainage Systems, Inc. ©Advanced Drainage Systems, Inc #1001T 02/12

CMA ENGINEERS, INC.
55 South Commercial Street
Manchester, NH 03101
TEL (603) 627-0708
FAX (603) 627-0746

LETTER OF TRANSMITTAL

TO American Excavating Corporation
PO Box 1220
Derry, NH 03038

DATE 5/3/2013 | JOB NO. 745 (File G.6)
ATTENTION: Tom Billetter
RE: Tolend Road Reconstruction
Pavement Mix Designs

WE ARE SENDING YOU ☒ Attached ☐ Under separate cover via_____ the following items:
☐ Shop drawings ☐ Prints ☐ Plans ☐ Samples ☐ Specifications
☐ Copy of letter ☐ Change order ☐ _____

COPIES	DATE	NO.	DESCRIPTION
1	5/3/13	18	Pavement Mix Designs (75 gyration 12.5mm & 19mm)

THESE ARE TRANSMITTED as checked below:

☐ For approval ☒ Approved as submitted ☐ Resubmit _____ copies for approval
☐ For your use ☐ Approved as noted ☐ Submit _____ copies for distribution
☐ As requested ☐ Returned for corrections ☐ Return _____ corrected prints
☐ For review and comment
☐ FOR BIDS DUE _____ ☐ PRINTS RETURNED AFTER LOAN TO US

REMARKS:

See attached reviewed submittal. As agreed, these 75 gyration pavement mix designs will be used instead of the previously submitted 50 gyration mix designs.

COPY TO: File; Dave White

Signed _____ Daniel Hudson, P.E.

If enclosures are not as noted, kindly notify us at once.

745-Submittal-Reviewed-37-Pavement-130503

From:	Tom Billetter
To:	"Dan Hudson"; "Jack Kareckas"
Cc:	"Tom"
Subject:	submittal for crushed stone fine
Date:	Wednesday, August 07, 2013 2:53:30 PM

Hi Dan, attached is sieve analysis from Turner for some material we are processing on another job and would like to start using on Tolend Rd project, as you will see it meets spec for 304.4 Crushed stone fine, which is what we are using from Brox now. I have a stockpile on site that Jack has seen and is available for viewing if you so desire. I would like to start using this next week when we begin excavating again so a prompt response would be greatly appreciated if possible. Thanks

TOM BILLETTER
PROJECT MANAGER/ESTIMATOR
AMERICAN EXCAVATING CORP
DERRY NH
603-231-4681

SUBMITTAL REVIEW

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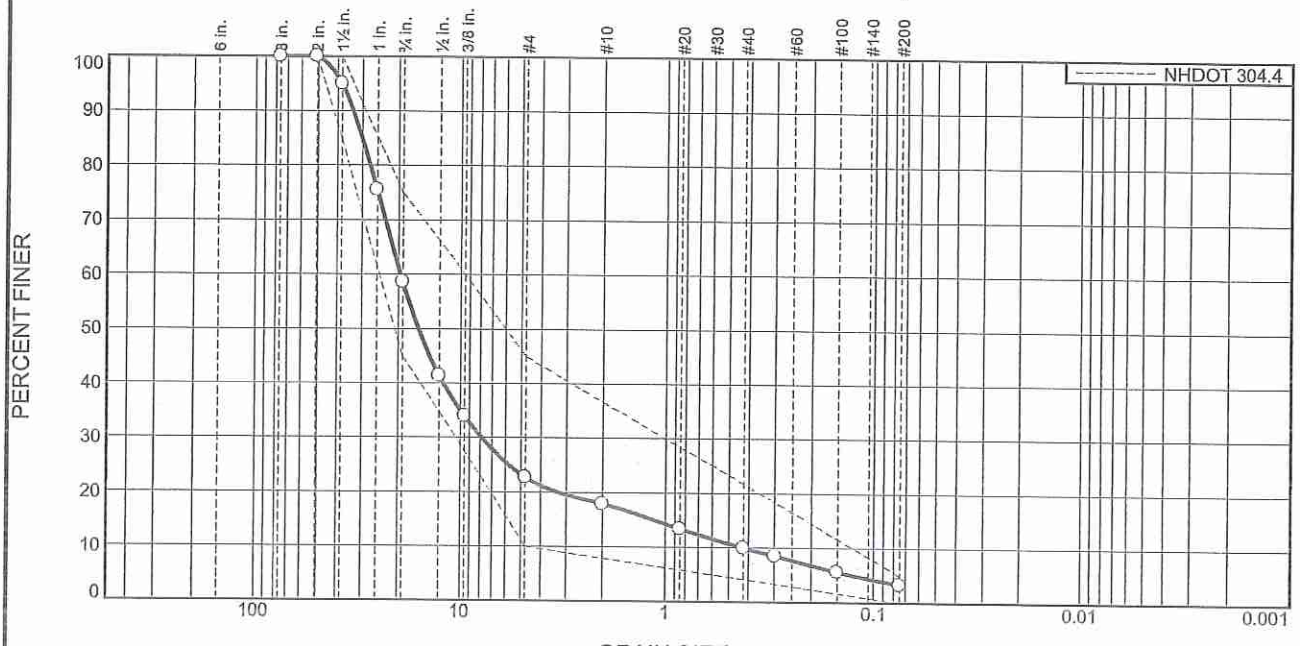
CMA ENGINEERS, INC.

By: _____

Date: 8/8/2013

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	41.4	35.9	4.8	7.9	6.6	3.4	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100.0		
2	100.0	100.0	
1 1/2	95.0	85.0 - 100.0	
1	75.6		
3/4	58.6	45.0 - 75.0	
1/2	41.4		
3/8	34.0		
#4	22.7	10.0 - 45.0	
#10	17.9		
#20	13.4		
#40	10.0		
#50	8.5		
#100	5.7		
#200	3.4	0.0 - 5.0	

* NHDOT 304.4

30-43
C1 9104
100
95-100
55-85
27-52
0-12 (SC/ML Portion)

Material Description

Crushed Gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 33.3960 D_{85}= 30.0793 D_{60}= 19.5324
D_{50}= 15.9820 D_{30}= 7.8323 D_{15}= 1.1246
D_{10}= 0.4260 C_u= 45.85 C_c= 7.37

Remarks

Material meets NHDOT 304.4 gradation specification.

Date Received: 8-6-13 **Date Tested:** 8-7-13
Tested By: Jeff Young
Checked By: Scott TeBordo
Title: Lab Manager

Location: GlenHill Rd Stockpile
Sample Number: 13-695 **Depth:** NHDOT 304.4 **Date Sampled:** 8-6-13

JOHN TURNER Dover, NH

Client: American Excavating
Project: Tolend Road, Dover, NH
Project No: 13-10-019 **Figure** 008B

Brox Industries
1471 Methuen St.
Dracut, MA 01826
Phone: 978-805-9788
Fax: 978-805-9790

SUPERPAVE JMF Submittal Cover Sheet and Forms Check List Verification

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

DESIGN ESAL LEVEL	NOMINAL MAX. SIZE
75 gyrations	19.0 mm

Washed Gradations & Specific Gravities	X
Dry Gradations & Consensius Properties	X
Combined Gradations	X
Gmm & Gmb Test Data	X
Volumetrics	X
Graph Data	X
Batch Weight	X
Job Mix Formula	X

SUBMITTAL REVIEW

- [x] No Exceptions Taken.
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CMA ENGINEERS, INC.

By: Daniel Hudson, P.E.

Date: 5/3/13

Washed Stockpile Gradations & Specific Gravities

NOMINAL MAX. SIZE
19.0 mm
DESIGN ESAL LEVEL
75 gyrations

SUPERPAVE Average Washed Gradation Summary

NUMBER OF SAMPLES AVERAGED 10

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

AGGREGATE INFORMATION

Aggregates		Source Number	Specific Gravities	
			Bulk	Apparent
Coarse	1.0" Stone	Rochester,NH	2.617	2.660
	3/4" Stone	Rochester,NH	2.603	2.655
	1/2" Stone	Rochester,NH	2.592	2.659
	3/8" Stone	Rochester,NH	2.578	2.655
Fine	Stone Dust	Rochester,NH	2.590	2.651
	Stone Sand	Rochester,NH	2.590	2.670
	Natural Sand	Rochester,NH	2.631	2.673
Mineral Filler		BHF	2.600	2.667
RAP		NH Streets	2.610	2.675
RAP Binder Content		4.50		

AVERAGE STOCKPILE BREAKDOWN (WASHED)

SIEVE SIZE	STOCKPILE/BIN 1.0" Stone		STOCKPILE/BIN 3/4" Stone		STOCKPILE/BIN 1/2" Stone		STOCKPILE/BIN 3/8" Stone		STOCKPILE/BIN Stone Dust		STOCKPILE/BIN Stone Sand		STOCKPILE/BIN Natural Sand		STOCKPILE/BIN Mineral Filler		STOCKPILE/BIN RAP	
	Rochester,NH		Rochester,NH		Rochester,NH		Rochester,NH		Rochester,NH		Rochester,NH		Rochester,NH		BHF		NH Streets	
	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing
50.000 mm	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0		100.0				100.0
37.500 mm	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	***	100.0	0.0	100.0
25.000 mm	33.0	67.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
19.000 mm	40.5	26.5	2.5	97.5	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
12.500 mm	17.0	9.5	71.0	26.5	5.5	94.5	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
9.500 mm	1.5	8.0	20.5	6.0	49.0	45.5	0.7	99.3	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	1.5	98.5
4.750 mm	2.5	5.5	2.7	3.3	40.5	5.0	66.6	32.7	0.0	100.0	0.0	100.0	1.5	98.5	0.0	100.0	16.5	82.0
2.360 mm	3.2	2.3	0.6	2.7	1.0	4.0	26.5	6.2	17.0	83.0	20.5	79.5	4.5	94.0	0.0	100.0	16.0	66.0
1.180 mm	0.5	1.8	0.5	2.2	0.7	3.3	1.1	5.1	23.5	59.5	28.8	50.7	8.5	85.5	0.0	100.0	14.0	52.0
0.600 mm	0.3	1.5	0.2	2.0	0.6	2.7	1.1	4.0	7.5	52.0	20.8	29.9	16.7	68.8	0.0	100.0	13.0	39.0
0.300 mm	0.2	1.3	0.3	1.7	0.4	2.3	0.7	3.3	25.0	27.0	16.7	13.2	28.1	40.7	0.2	99.8	14.5	24.5
0.150 mm	0.4	0.9	0.4	1.3	0.3	2.0	0.6	2.7	11.0	16.0	8.0	5.2	25.2	15.5	4.8	95.0	10.5	14.0
0.075 mm	0.2	0.7	0.3	1.0	0.5	1.5	0.7	2.0	7.1	8.9	3.2	2.0	11.0	4.5	23.0	72.0	6.0	8.0
PAN	0.7		1.0		1.5		2.0		8.9		2.0		4.5		72.0		8.0	
TOTAL	100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0	

Dry Stockpile Gradations &

NOMINAL MAX. SIZE
19.0 mm
DESIGN ESAL LEVEL
75 gyrations

SUPERPAVE Average Washed Gradation Summary

NUMBER OF SAMPLES AVERAGED 10

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

AGGREGATE INFORMATION

Aggregates		Source Number	CA Angularity	FA Angularity	Flat & Elongated	Sand Equivalent	Clay & Friable	LA Abraision	Sound-ness
Coarse	1.0" Stone	Rochester,NH	100/100		0.0			38.0	1.2
	3/4" Stone	Rochester,NH	100/100		0.1			38.0	1.2
	1/2" Stone	Rochester,NH	100/100		0.0			38.0	1.3
	3/8" Stone	Rochester,NH	100/100		0.2			41.0	1.3
Fine	Stone Dust	Rochester,NH		48.1		60	0.3		1.4
	Stone Sand	Rochester,NH		46.8		86	0.1		1.4
	Natural Sand	Rochester,NH		45.4		74	0.6		1.3
Mineral Filler		BHF							
RAP		NH Streets							
RAP Binder Content		4.50							

AVERAGE STOCKPILE BREAKDOWN (DRY)

SIEVE SIZE	STOCKPILE/BIN 1.0" Stone Rochester,NH		STOCKPILE/BIN 3/4" Stone Rochester,NH		STOCKPILE/BIN 1/2" Stone Rochester,NH		STOCKPILE/BIN 3/8" Stone Rochester,NH		STOCKPILE/BIN Stone Dust Rochester,NH		STOCKPILE/BIN Stone Sand Rochester,NH		STOCKPILE/BIN Natural Sand Rochester,NH		STOCKPILE/BIN Mineral Filler BHF		STOCKPILE/BIN RAP NH Streets	
	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing
50.000 mm	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
37.500 mm	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
25.000 mm	34.0	66.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
19.000 mm	41.0	25.0	3.0	97.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
12.500 mm	17.0	8.0	72.0	25.0	6.0	94.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
9.500 mm	1.0	7.0	20.0	5.0	50.0	44.0	1.0	99.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
4.750 mm	2.0	5.0	2.5	2.5	40.0	4.0	68.0	31.0	0.0	100.0	0.0	100.0	2.0	98.0	0.0	100.0	2.1	97.9
2.360 mm	3.0	2.0	0.5	2.0	1.0	3.0	26.0	5.0	18.0	82.0	21.0	79.0	5.0	93.0	0.0	100.0	17.4	80.5
1.180 mm	0.5	1.5	0.4	1.6	0.5	2.5	1.0	4.0	24.0	58.0	29.0	50.0	9.0	84.0	0.0	100.0	15.8	64.7
0.600 mm	0.3	1.2	0.2	1.4	0.5	2.0	1.0	3.0	18.0	40.0	21.0	29.0	17.0	67.0	0.0	100.0	13.9	50.7
0.300 mm	0.2	1.0	0.3	1.1	0.3	1.7	0.5	2.5	15.0	25.0	16.5	12.5	28.0	39.0	0.5	99.5	13.7	37.1
0.150 mm	0.3	0.7	0.3	0.8	0.2	1.5	0.5	2.0	11.0	14.0	7.8	4.7	26.0	13.0	5.5	94.0	14.2	22.8
0.075 mm	0.2	0.5	0.3	0.5	0.5	1.0	0.5	1.5	7.0	7.0	3.0	1.7	10.0	3.0	22.0	72.0	10.2	12.6
PAN	0.5		0.5		1.0		1.5		7.0		1.7		3.0		72.0		5.9	6.7
TOTAL	100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0		6.7	
																	100.0	

3/6/2013

Combined Gradations

Job:	Various, NH
Mix Type:	19.0 mm
Location:	Rochester, NH
Design No. of ESAL's:	75 gyrations

COMBINED AGGREGATE BLEND AVERAGE GRADATION

Aggregate	Stockpile / Bin	% Batch	% Passing												
			50.0 mm	37.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.600 mm	0.300 mm	0.150 mm	0.075 mm
Coarse	1.0" Stone	0.0													
	3/4" Stone	27.0	27.0	27.0	27.0	26.2	6.8	1.4	0.7	0.5	0.4	0.4	0.3	0.2	0.1
	1/2" Stone	15.5	15.5	15.5	15.5	15.5	14.6	6.8	0.6	0.5	0.4	0.3	0.3	0.2	0.2
	3/8" Stone	15.0	15.0	15.0	15.0	15.0	15.0	14.9	4.7	0.8	0.6	0.5	0.4	0.3	0.2
Fines	Stone Dust	0.0													
	Stone Sand	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0	15.8	10.0	5.8	2.5	0.9	0.3
	Natural Sand	0.0													
Mineral Filler		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4
RAP		22.0	22.0	22.0	22.0	22.0	22.0	21.5	17.7	14.2	11.2	8.2	5.0	2.8	1.5
TOTAL		**100.0**	**100.0**	**100.0**	**100.0**	**99.2**	**78.8**	**63.7**	**44.2**	**32.3**	**23.1**	**15.6**	**9.0**	**4.9**	**2.7**
Specification Limits					100	90-100	<90			26-49					2-8
EXTRACTION RESULTS (DRY)					100	99.0	80.0	66.7	45.7	33.0	24.3	16.9	10.3	5.7	3.3
EXTRACTION RESULTS (WASH)					100	99	80.7	67.4	46.4	33.7	24.7	17.3	10.7	6.3	4.1

3/6/2013

Gmm & Gmb Test Data

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

NOMINAL MAX. SIZE 19.0 mm
DESIGN ESAL LEVEL 75 gyrations

SUPERPAVE Design PGB Content Compacted

Gmm Test Results

G_{mm} = Maximum Specific Gravity of Hot Mix Asphalt

% AC	Test#	A	D	E	Gmm
4.7	1	1963.7	1521.0	2688.3	2.466
4.7	2	2716.7	1503.2	3125.0	2.481
				Avg. Gmm	2.473

A = Weight of dry sample in air (grams)
D = Weight of pycnometer filled with water at 25°C (grams)
E = Weight of pyncometer filled with sample and water at 25°C (grams)
G_{mm} = A/(A+D-E)

Gmb Test Reuslts of Gyratory Fabricated Specimens

Specimen	Asphalt Content %	Weight in Grams			Volume (mL)	Maximum Specific Gravity Gmm	@N-Design			@N-Initial			@ N-Maximum		
		In Air (g)	S.S.D. (g)	In Water (g)			Bulk Specific Gravity Gmb	% Gmm	Specimen Height mm	Specimen Height mm	Bulk Specific Gravity Gmb	% Gmm	Bulk Specific Gravity Gmb	% Gmm	Specimen Height (mm)
		a	b	c	d	e	f	g	h	I	k	m	n	o	
					b - c		a / d	100(f/e)	75	7	f(h/I)	100(k/e)	a/d	100(n/e)	115
N Design															
A	4.7	4713.6	4735.1	2744.4	1990.7		2.368	95.73	116.3	126.6	2.175	87.94			
B	4.7	4716.7	4739.4	2742.0	1997.4		2.361	95.47	117.0	127.4	2.169	87.68			
AVG.						2.473	2.365	95.60			2.172	87.81			
N Max															
A	4.7	4722.5	4733.7	2767.8	1965.9		2.386	96.45	116.6	126.3	2.202	89.04	2.402	97.12	115.6
B	4.7	4752.8	4760.2	2788.3	1971.9		2.386	96.45	117.4	127.0	2.205	89.16	2.410	97.44	116.2
AVG.						2.473	2.386	96.45			2.202	89.10	2.406	97.28	

3/6/2013

Volumetrics

NOMINAL MAX. SIZE
19.0 mm
DESIGN ESAL LEVEL
75 gyrations

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

SUPERPAVE Design PGB Content

Compacted Specimen Volumetric Property Summary

COMPOSITION OF SUPERPAVE MIXTURES (Analysis by mass of total mixture)

CONSTITUENT MATERIAL		Source	Specific Gravity Apparent	Specific Gravity Bulk	N des Results	N max Results	%Agg Batch
CA	1.0" Stone	Rochester,NH	2.660	2.617	0.00	0.00	0
	3/4" Stone	Rochester,NH	2.655	2.603	25.73	25.73	27
	1/2" Stone	Rochester,NH	2.659	2.592	14.77	14.77	15.5
	3/8" Stone	Rochester,NH	2.655	2.578	14.30	14.30	15
FA	Stone Dust	Rochester,NH	2.651	2.590	0.00	0.00	0
	Stone Sand	Rochester,NH	2.670	2.590	19.06	19.06	20
	Natural Sand	Rochester,NH	2.673	2.631	0.00	0.00	0
Mineral Filler		BHF	2.667	2.600	0.48	0.48	0.5
RAP			2.675	2.610	20.97	20.97	22
Total Aggregate					95.3	95.3	
Asphalt Cement				1.039	4.7	4.7	

Gmm	Max. Sp. Gr. of Paving Mix (AASHTO T209)	2.473	2.473
Gmb	Bulk Sp. Gr. of compacted mix @ Nmax gyrations (AASHTO T166)		2.406
%Gmm@Nmax	%Gmm@Nmax = [(Gmb@Nmax)/(Gmm)] x 100		97.3
Gmb@Nini	Bulk Sp. Gr. of compacted mix @ Nini gyrations	2.172	
%Gmm@Nini	%Gmm@Nini = [(Gmb@Nini)/(Gmm)] x 100	87.81	
Gmb@Ndes	Bulk Sp. Gr. of compacted mix @ Ndes gyrations	2.365	
%Gmm@Ndes	%Gmm @ Ndes = [(Gmb @Ndes)/(Gmm)] x 100	95.60	
Va(@Ndes)	Va(@Ndes) = 100[(Gmm - Gmb @Ndes)/Gmm]	4.4	
Gsb	Bulk Sp. Gr. of Total aggregate*	2.596	
Gsa	Apparent Sp. Gr. of Total aggregate	2.663	
Gse	Effective Sp. Gr. of Total Aggregate Gse = [Ps] / [(100/Gmm)-(Pb/Gb)]	2.654	
VMA	VMA = 100 - (Gmb @Ndes x Ps/Gsb)	13.19	
VFB	VFB = 100[(VMA - Va) / VMA]	66.63	
F	Fines = % passing #200	4.1	
Pbe	Pbe = Pb - {(Ps x Gb) x [(Gse - Gsb)/(Gse x Gsb)]}	3.9	
F/Pbe	Fines to Eff. AC Ratio = (% passing 0.075 sieve) / Pbe	1.06	
Remarks:			

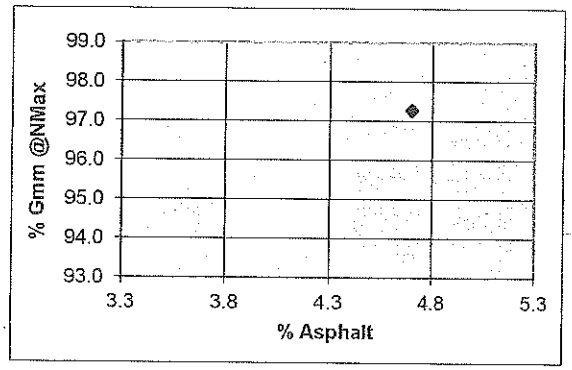
3/6/2013

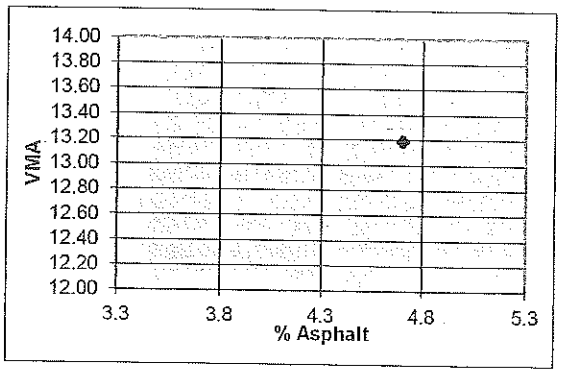
Graph Data

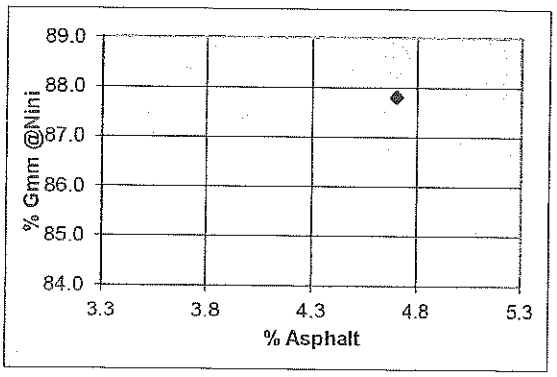
NOMINAL MAX. SIZE
19.0 mm
DESIGN ESAL LEVEL
75 gyrations

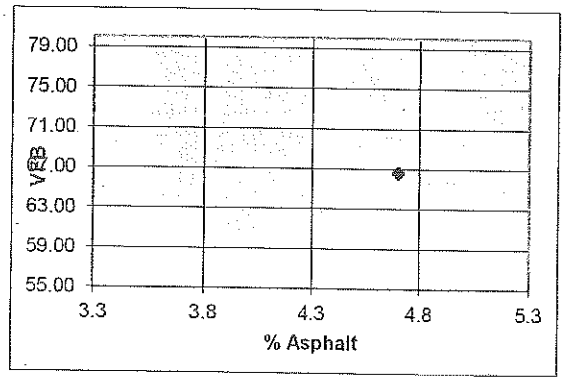
Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

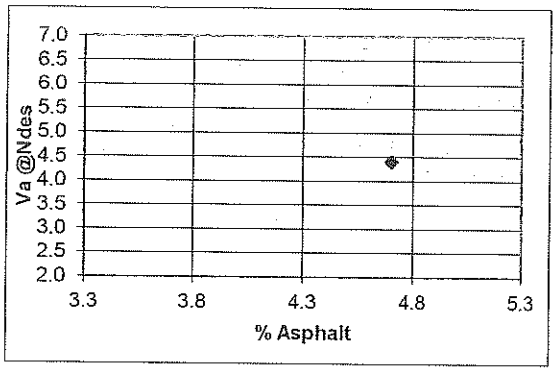
SUPERPAVE Volumetric Plot

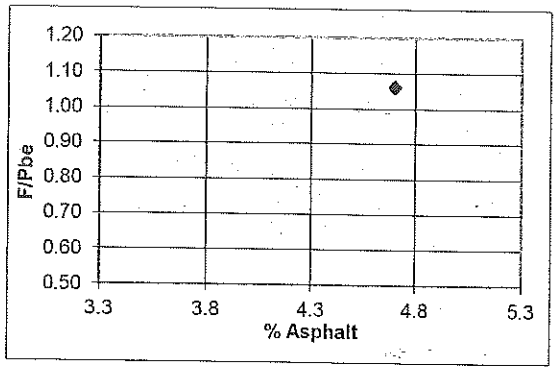












Values at Optimum AC Content

DESIGN PGB CONTENT

4.7

Property	%Gmm @Nmax	%Gmm @Nini	@Ndes Va, %	VMA, %	VFB, %	F/Pbe
Specs.	<98%	<89%	4%	13.0	65-75	.6-1.2
Actual	97.3	87.8	4.4	13.19	66.63	1.06

3/6/2013

Batch Weight

NOMINAL MAX. SIZE
19.0 mm
DESIGN ESAL LEVEL
75 gyrations

BULK	
Total Rap=	1035.2
Total Rap AC=	46.6
Total Virgin AC=	175.5
%TRB=	1.0

MAX	
Total Rap=	547.7
Total Rap AC=	23.6
Total Virgin AC=	93.9

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

SUPERPAVE Batch Weights for Mixture Verification

Combined SUPERPAVE (Gyratory Sample) Gradation at the % PGB Indicated (% total binder for RAP mixtures)

% AC	Aggregate Component	% Batch	Grams Batch	WEIGHT RETAINED (GRAMS) 50.0 mm	37.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.600 mm	0.300 mm	0.150 mm	0.075 mm	PAN	TOTAL WT. RET.
4.7	1.0" Stone	0.0	0.0															
	3/4" Stone	27.0	1215.8	0.0	0.0	0.0	36.5	875.4	243.2	30.4	6.1	4.9	2.4	3.6	3.6	3.6	6.1	1215.8
	1/2" Stone	15.5	698.0	0.0	0.0	0.0	0.0	41.9	349.0	279.2	7.0	3.5	3.5	2.1	1.4	3.5	7.0	698.0
	3/8" Stone	15.0	675.4	0.0	0.0	0.0	0.0	0.0	6.8	459.3	175.6	6.8	6.8	3.4	3.4	3.4	10.1	675.4
	Stone Dust	0.0	0.0															
	Stone Sand	20.0	900.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	189.1	261.2	189.1	148.6	70.2	27.0	15.3	900.6
	Natural Sand	0.0	0.0															
	Mineral Filler	0.5	22.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.2	5.0	16.2	22.5
	RAP	22.0	990.6															3512.3
	Total	100.0	4502.9															

(Specimen wtg.) = 4725.0 x 4.7 % A.C. = 222.1

(Specimen wtg.) = 4725.0 - 222.1 gr A.C. = 4502.9

Combined SUPERPAVE (Maximum Specific Gravity) Gradation at the % PGB Indicated (% total binder for RAP mixtures)

% AC	Aggregate Component	% Batch	Grams Batch	WEIGHT RETAINED (GRAMS) 50.0 mm	37.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.600 mm	0.300 mm	0.150 mm	0.075 mm	PAN	TOTAL WT. RET.
4.7	1.0" Stone	0.0	0.0															
	3/4" Stone	27.0	643.3	0.0	0.0	0.0	19.3	463.2	128.7	16.1	3.2	2.6	1.3	1.9	1.9	1.9	3.2	643.3
	1/2" Stone	15.5	369.3	0.0	0.0	0.0	0.0	22.2	184.6	147.7	3.7	1.8	1.8	1.1	0.7	1.8	3.7	369.3
	3/8" Stone	15.0	357.4	0.0	0.0	0.0	0.0	0.0	3.6	243.0	92.9	3.6	3.6	1.8	1.8	1.8	5.4	357.4
	Stone Dust	0.0	0.0															0.0
	Stone Sand	20.0	476.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.1	138.2	100.1	78.6	37.2	14.3	8.1	476.5
	Natural Sand	0.0	0.0															
	Mineral Filler	0.5	11.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.7	2.6	8.6	11.9
	RAP	22.0	524.2															1858.4
	Total	100.0	2382.5															

(Specimen wtg.) = 2500.0 x 4.7 % A.C. = 117.5

(Specimen wtg.) = 2500.0 - 117.5 gr A.C. = 2382.5

3/6/2013

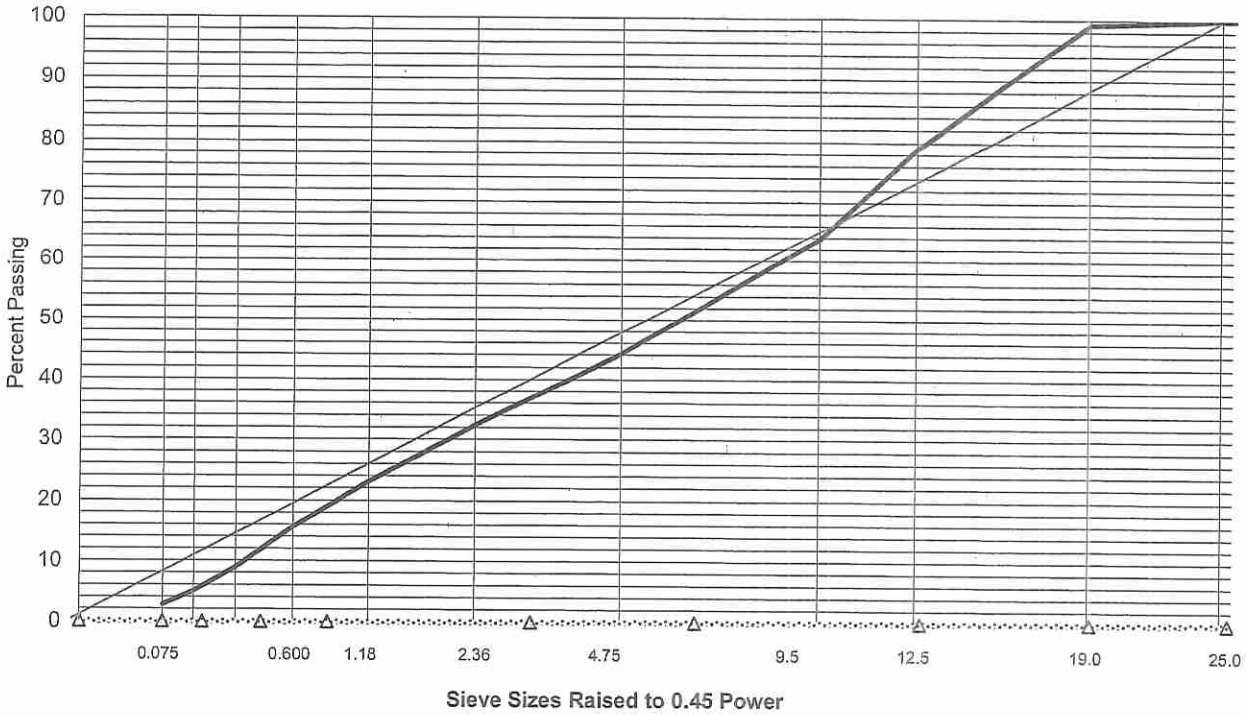
Job Mix Formula

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

DESIGN ESAL LEVEL
75 gyrations

SUPERPAVE Job Mix Formula

19.0 mm Nominal Maximum Size



Aggregates		Source	% Blend	Sand Blend
Coarse	1.0" Stone	Rochester,NH	0	
	3/4" Stone	Rochester,NH	27	
	1/2" Stone	Rochester,NH	15.5	
	3/8" Stone	Rochester,NH	15	
Fine	Stone Dust	Rochester,NH	0	0.0
	Stone Sand	Rochester,NH	20	100.0
	Natural Sand	Rochester,NH	0	0.0
	Mineral Filler	BHF	0.5	
	RAP	NH Streets	22	

Test	Result
LA Abrasion	38.8
Soundness	1.29
Flat & Elongated	0.1
Fine Agg Angularity	46.8
Sand Equivalency	86
Clay & Friable	0.1
Atterberg Limits	Non-plastic

Sieve Size (mm)		0.075	0.150	0.300	0.600	1.18	2.36	4.75	9.5	12.5	19.0	25.0	%PGB	Binder Grade
% Passing	General Limits	2 - 8					32-42			<90	90-100	100		PG 64-28
	JMF Range													
	Target Value	3.4	6.1	10.7	17.2	23.9	32.6	44.3	65.2	79.3	97.5	100	4.7	

Submitted for Review by: Jeff Lewis Date: 3/7/2013

Accepted for Verification/Production by: _____ Date: _____

Brox Industries
1471 Methuen St.
Dracut, MA 01826
Phone: 978-805-9788
Fax: 978-805-9790

SUPERPAVE JMF Submittal Cover Sheet and Forms Check List Verification

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

DESIGN ESAL LEVEL	NOMINAL MAX. SIZE
75 gyrations	12.5 mm

Washed Gradations & Specific Gravities	X
Dry Gradations & Consensius Properties	X
Combined Gradations	X
Gmm & Gmb Test Data	X
Volumetrics	X
Graph Data	X
Batch Weight	X
Job Mix Formula	X

SUBMITTAL REVIEW

- [x] No Exceptions Taken.
- [ ] Corrections as Noted - No Resubmission Required.
- [ ] Corrections as Noted - Resubmission Required.
- [ ] Rejected, See Remarks - Revise and Resubmit.
- [ ] No Action Taken.

Review is only for conformance with the design concept of the project and conformance with the information given in the Contract Documents. Contractor is responsible for differences to be confirmed and correlated at the job site; for information that pertains to fabrication; for techniques of construction; and for all other aspects of completion of the work.

CMA ENGINEERS, INC.

By: Daniel Hudson, P.E.

Date: 5/3/13

Washed Stockpile Gradations & Specific Gravities

NOMINAL MAX. SIZE	12.5 mm
DESIGN ESAL LEVEL	75 gyrations

SUPERPAVE Average Washed Gradation Summary

NUMBER OF SAMPLES AVERAGED 10

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

AGGREGATE INFORMATION

Aggregates		Source Number	Specific Gravities Bulk	Specific Gravities Apparent
Coarse	1.0" Stone	Rochester,NH	2.617	2.660
	3/4" Stone	Rochester,NH	2.603	2.655
	1/2" Stone	Rochester,NH	2.592	2.659
	3/8" Stone	Rochester,NH	2.578	2.655
Fine	Stone Dust	Rochester,NH	2.590	2.651
	Stone Sand	Rochester,NH	2.590	2.670
	Natural Sand	Rochester,NH	2.631	2.673
Mineral Filler		BHF	2.600	2.667
RAP		NH Streets	2.610	2.675
RAP Binder Content		4.50		

AVERAGE STOCKPILE BREAKDOWN (WASHED)

SIEVE SIZE	STOCKPILE/BIN 1.0" Stone Rochester,NH		STOCKPILE/BIN 3/4" Stone Rochester,NH		STOCKPILE/BIN 1/2" Stone Rochester,NH		STOCKPILE/BIN 3/8" Stone Rochester,NH		STOCKPILE/BIN Stone Dust Rochester,NH		STOCKPILE/BIN Stone Sand Rochester,NH		STOCKPILE/BIN Natural Sand Rochester,NH		STOCKPILE/BIN Mineral Filler BHF		STOCKPILE/BIN RAP NH Streets	
	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing
50.000 mm	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0		100.0				100.0
37.500 mm	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	***	100.0	0.0	100.0
25.000 mm	33.0	67.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
19.000 mm	40.5	26.5	2.5	97.5	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
12.500 mm	17.0	9.5	71.0	26.5	5.5	94.5	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
9.500 mm	1.5	8.0	20.5	6.0	49.0	45.5	0.7	99.3	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	1.5	98.5
4.750 mm	2.5	5.5	2.7	3.3	40.5	5.0	66.6	32.7	0.0	100.0	0.0	100.0	1.5	98.5	0.0	100.0	16.5	82.0
2.360 mm	3.2	2.3	0.6	2.7	1.0	4.0	26.5	6.2	17.0	83.0	20.5	79.5	4.5	94.0	0.0	100.0	16.0	66.0
1.180 mm	0.5	1.8	0.5	2.2	0.7	3.3	1.1	5.1	23.5	59.5	28.8	50.7	8.5	85.5	0.0	100.0	14.0	52.0
0.600 mm	0.3	1.5	0.2	2.0	0.6	2.7	1.1	4.0	7.5	52.0	20.8	29.9	16.7	68.8	0.0	100.0	13.0	39.0
0.300 mm	0.2	1.3	0.3	1.7	0.4	2.3	0.7	3.3	25.0	27.0	16.7	13.2	28.1	40.7	0.2	99.8	14.5	24.5
0.150 mm	0.4	0.9	0.4	1.3	0.3	2.0	0.6	2.7	11.0	16.0	8.0	5.2	25.2	15.5	4.8	95.0	10.5	14.0
0.075 mm	0.2	0.7	0.3	1.0	0.5	1.5	0.7	2.0	7.1	8.9	3.2	2.0	11.0	4.5	23.0	72.0	6.0	8.0
PAN	0.7		1.0		1.5		2.0		8.9		2.0		4.5		72.0		8.0	
TOTAL	100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0	

Dry Stockpile Gradations &

NOMINAL MAX. SIZE
12.5 mm
DESIGN ESAL LEVEL
75 gyrations

SUPERPAVE Average Washed Gradation Summary

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

NUMBER OF SAMPLES AVERAGED 10

AGGREGATE INFORMATION

Aggregates		Source Number	CA Angularity	FA Angularity	Flat & Elongated	Sand Equivalent	Clay & Friable	LA Abraision	Sound-ness
Coarse	1.0" Stone	Rochester,NH	100/100		0.0			38.0	1.2
	3/4" Stone	Rochester,NH	100/100		0.1			38.0	1.2
	1/2" Stone	Rochester,NH	100/100		0.0			38.0	1.3
	3/8" Stone	Rochester,NH	100/100		0.2			41.0	1.3
Fine	Stone Dust	Rochester,NH		48.1		60	0.3		1.4
	Stone Sand	Rochester,NH		46.8		86	0.1		1.4
	Natural Sand	Rochester,NH		45.4		74	0.6		1.3
Mineral Filler		BHF							
RAP		NH Streets							
RAP Binder Content		4.50							

AVERAGE STOCKPILE BREAKDOWN (DRY)

SIEVE SIZE	STOCKPILE/BIN 1.0" Stone Rochester,NH		STOCKPILE/BIN 3/4" Stone Rochester,NH		STOCKPILE/BIN 1/2" Stone Rochester,NH		STOCKPILE/BIN 3/8" Stone Rochester,NH		STOCKPILE/BIN Stone Dust Rochester,NH		STOCKPILE/BIN Stone Sand Rochester,NH		STOCKPILE/BIN Natural Sand Rochester,NH		STOCKPILE/BIN Mineral Filler BHF		STOCKPILE/BIN RAP NH Streets	
	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing	retained	passing
50.000 mm	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
37.500 mm	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
25.000 mm	34.0	66.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
19.000 mm	41.0	25.0	3.0	97.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
12.500 mm	17.0	8.0	72.0	25.0	6.0	94.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
9.500 mm	1.0	7.0	20.0	5.0	50.0	44.0	1.0	99.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0
4.750 mm	2.0	5.0	2.5	2.5	40.0	4.0	68.0	31.0	0.0	100.0	0.0	100.0	2.0	98.0	0.0	100.0	2.1	97.9
2.360 mm	3.0	2.0	0.5	2.0	1.0	3.0	26.0	5.0	18.0	82.0	21.0	79.0	5.0	93.0	0.0	100.0	17.4	80.5
1.180 mm	0.5	1.5	0.4	1.6	0.5	2.5	1.0	4.0	24.0	58.0	29.0	50.0	9.0	84.0	0.0	100.0	15.8	64.7
0.600 mm	0.3	1.2	0.2	1.4	0.5	2.0	1.0	3.0	18.0	40.0	21.0	29.0	17.0	67.0	0.0	100.0	13.9	50.7
0.300 mm	0.2	1.0	0.3	1.1	0.3	1.7	0.5	2.5	15.0	25.0	16.5	12.5	28.0	39.0	0.5	99.5	13.7	37.1
0.150 mm	0.3	0.7	0.3	0.8	0.2	1.5	0.5	2.0	11.0	14.0	7.8	4.7	26.0	13.0	5.5	94.0	14.2	22.8
0.075 mm	0.2	0.5	0.3	0.5	0.5	1.0	0.5	1.5	7.0	7.0	3.0	1.7	10.0	3.0	22.0	72.0	10.2	12.6
PAN	0.5		0.5		1.0		1.5		7.0		1.7		3.0		72.0		5.9	6.7
TOTAL	100.0		100.0		100.0		100.0		100.0		100.0		100.0		100.0		6.7	
																	100.0	

3/6/2013

Combined Gradations

Job:	Various, NH
Mix Type:	12.5 mm
Location:	Rochester, NH
Design No. of ESAL's:	75 gyrations

COMBINED AGGREGATE BLEND AVERAGE GRADATION

Aggregate	Stockpile / Bin	% Batch	% Passing												
			50.0 mm	37.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.600 mm	0.300 mm	0.150 mm	0.075 mm
Coarse	1.0" Stone	0.0													
	3/4" Stone	0.0													
	1/2" Stone	21.0	21.0	21.0	21.0	21.0	19.7	9.2	0.8	0.6	0.5	0.4	0.4	0.3	0.2
	3/8" Stone	25.0	25.0	25.0	25.0	25.0	25.0	24.8	7.8	1.3	1.0	0.8	0.6	0.5	0.4
Fines	Stone Dust	0.0													
	Stone Sand	27.5	27.5	27.5	27.5	27.5	27.5	27.5	27.5	21.7	13.8	8.0	3.4	1.3	0.5
	Natural Sand	4.0	4.0	4.0	4.0	4.0	4.0	4.0	3.9	3.7	3.4	2.7	1.6	0.5	0.1
Mineral Filler		0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4
RAP		22.0	22.0	22.0	22.0	22.0	22.0	21.5	17.7	14.2	11.2	8.2	5.0	2.8	1.5
TOTAL		**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**98.7**	**87.5**	**58.2**	**42.1**	**30.3**	**20.5**	**11.5**	**5.9**	**3.0**
Specification Limits						100	90-100	<90		42-52					2-8
EXTRACTION RESULTS (DRY)						100.0	99.3	88.3	59.5	43.2	31.7	22.0	13.1	6.8	3.8
EXTRACTION RESULTS (WASH)						100.0	99.5	89.0	60.3	44.0	32.5	22.7	13.7	7.5	4.6

3/6/2013

Gmm & Gmb Test Data

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

NOMINAL MAX. SIZE 12.5 mm
DESIGN ESAL LEVEL 75 gyrations

SUPERPAVE Design PGB Content Compacted

Gmm Test Results

G_{mm} = Maximum Specific Gravity of Hot Mix Asphalt

% AC	Test#	A	D	E	Gmm
5.5	1	2092.3	1577.9	2812.7	2.440
5.5	2	2489.8	1559.8	3024.2	2.428
				Avg. Gmm	2.434

A = Weight of dry sample in air (grams)
D = Weight of pycnometer filled with water at 25°C (grams)
E = Weight of pyncometer filled with sample and water at 25°C (grams)
G_{mm} = A/(A+D-E)

Gmb Test Reuslts of Gyratory Fabricated Specimens

Specimen	Asphalt Content %	Weight in Grams			Volume (mL)	Maximum Specific Gravity Gmm	@N-Design			@N-Initial			@ N-Maximum		
		In Air (g)	S.S.D. (g)	In Water (g)			Bulk Specific Gravity Gmb	% Gmm	Specimen Height mm	Specimen Height mm	Bulk Specific Gravity Gmb	% Gmm	Bulk Specific Gravity Gmb	% Gmm	Specimen Height (mm)
		a	b	c	d	e	f	g	h	I	k	m	n	o	
					b - c		a / d	100(f/e)	75	7	f(h/I)	100(k/e)	a/d	100(n/e)	115
N Design															
A	5.5	4673.6	4678.8	2674.2	2004.6		2.331	95.78	115.3	124.7	2.156	88.56			
B	5.5	4721.1	4724.1	2707.4	2016.7		2.341	96.18	115.8	124.6	2.176	89.38			
AVG.						2.434	2.336	95.98			2.166	88.97			
N Max															
A	5.5	4588.2	4592.2	2649.0	1943.2		2.340	96.14	112.7	121.5	2.171	89.18	2.361	97.00	111.7
B	5.5	4550.6	4553.2	2631.0	1922.2		2.344	96.30	111.8	120.4	2.177	89.43	2.367	97.26	110.7
AVG.						2.434	2.342	96.22			2.174	89.30	2.364	97.13	

3/6/2013

Volumetrics

NOMINAL MAX. SIZE
12.5 mm
DESIGN ESAL LEVEL
75 gyrations

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

SUPERPAVE Design PGB Content

Compacted Specimen Volumetric Property Summary

COMPOSITION OF SUPERPAVE MIXTURES (Analysis by mass of total mixture)

CONSTITUENT MATERIAL		Source	Specific Gravity Apparent	Specific Gravity Bulk	N des Results	N max Results	%Agg Batch
CA	1.0" Stone	Rochester,NH	2.660	2.617	0.00	0.00	0
	3/4" Stone	Rochester,NH	2.655	2.603	0.00	0.00	0
	1/2" Stone	Rochester,NH	2.659	2.592	19.85	19.85	21
	3/8" Stone	Rochester,NH	2.655	2.578	23.63	23.63	25
FA	Stone Dust	Rochester,NH	2.651	2.590	0.00	0.00	0
	Stone Sand	Rochester,NH	2.670	2.590	25.99	25.99	27.5
	Natural Sand	Rochester,NH	2.673	2.631	3.78	3.78	4
Mineral Filler		BHF	2.667	2.600	0.47	0.47	0.5
RAP			2.675	2.610	20.79	20.79	22
Total Aggregate					94.5	94.5	
Asphalt Cement				1.039	5.5	5.5	

Gmm	Max. Sp. Gr. of Paving Mix (AASHTO T209)	2.434	2.434
Gmb	Bulk Sp. Gr. of compacted mix @ Nmax gyrations (AASHTO T166)		2.364
%Gmm@Nmax	%Gmm@Nmax = [(Gmb@Nmax)/(Gmm)] x 100		97.1
Gmb@Nini	Bulk Sp. Gr. of compacted mix @ Nini gyrations	2.166	
%Gmm@Nini	%Gmm@Nini = [(Gmb@Nini)/(Gmm)] x 100	88.97	
Gmb@Ndes	Bulk Sp. Gr. of compacted mix @ Ndes gyrations	2.336	
%Gmm@Ndes	%Gmm @ Ndes = [(Gmb @Ndes)/(Gmm)] x 100	95.98	
Va(@Ndes)	Va(@Ndes) = 100[(Gmm - Gmb @Ndes)/Gmm]	4.0	
Gsb	Bulk Sp. Gr. of Total aggregate*	2.593	
Gsa	Apparent Sp. Gr. of Total aggregate	2.665	
Gse	Effective Sp. Gr. of Total Aggregate Gse = [Ps] / [(100/Gmm)-(Pb/Gb)]	2.640	
VMA	VMA = 100 - (Gmb @Ndes x Ps/Gsb)	14.86	
VFB	VFB = 100[(VMA - Va) / VMA]	72.95	
F	Fines = % passing #200	4.6	
Pbe	Pbe = Pb - {(Ps x Gb) x [(Gse - Gsb)/(Gse x Gsb)]}	4.8	
F/Pbe	Fines to Eff. AC Ratio = (% passing 0.075 sieve) / Pbe	0.95	
Remarks:			

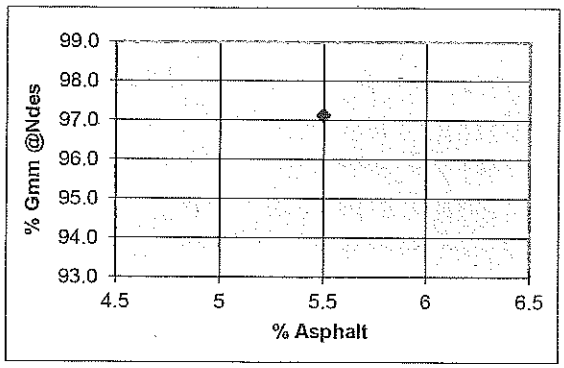
3/6/2013

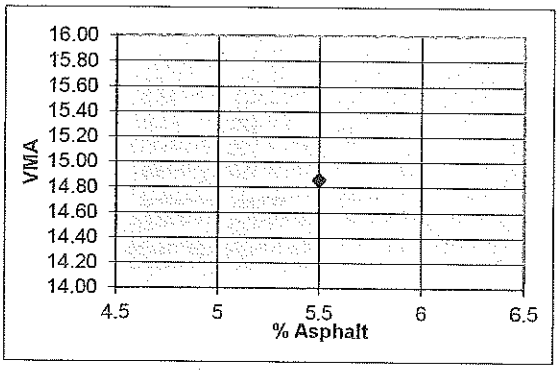
Graph Data

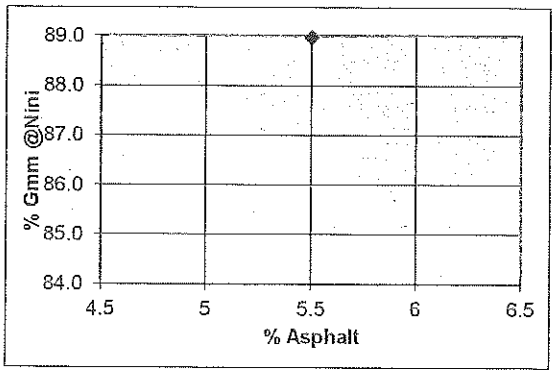
NOMINAL MAX. SIZE
12.5 mm
DESIGN ESAL LEVEL
75 gyrations

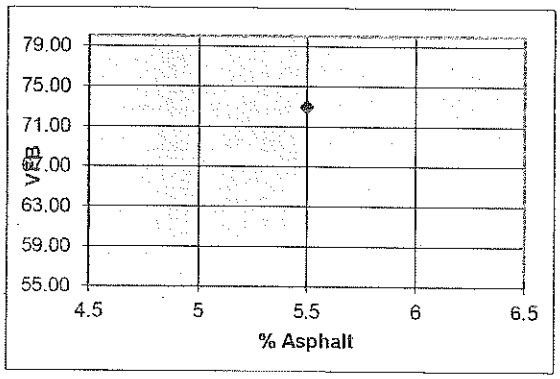
Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

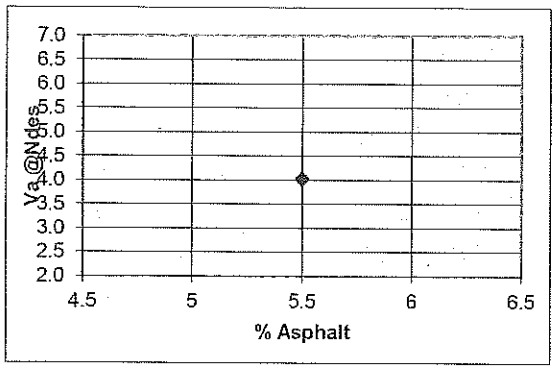
SUPERPAVE Volumetric Plot

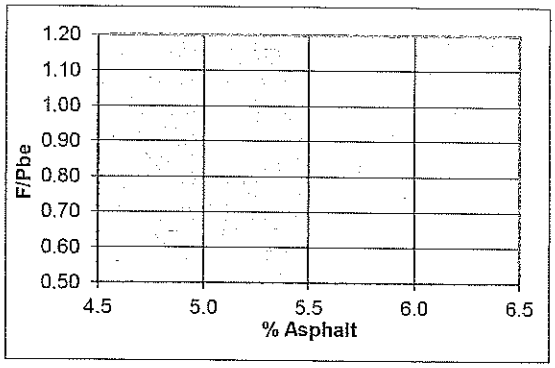












Values at Optimum AC Content

DESIGN PGB CONTENT

5.5

Property	%Gmm @Nmax	%Gmm @Nini	@Ndes Va, %	VMA, %	VFB, %	F/Pbe
Specs.	<98%	<89%	4%	14.0	65-75	.6-1.2
Actual	97.1	89.0	4.0	14.86	72.95	0.95

3/6/2013

Batch Weight

NOMINAL MAX. SIZE
12.5 mm
DESIGN ESAL LEVEL
75 gyrations

BULK	
Total Rap=	1026.5
Total Rap AC=	44.2
Total Virgin AC=	215.7

MAX	
Total Rap=	434.5
Total Rap AC=	18.7
Total Virgin AC=	91.3

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH

SUPERPAVE Batch Weights for Mixture Verification

Combined SUPERPAVE (Gyratory Sample) Gradation at the % PGB Indicated (% total binder for RAP mixtures)

% AC	Aggregate Component	% Batch	Grams Batch	WEIGHT RETAINED (GRAMS) 50.0 mm	37.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.600 mm	0.300 mm	0.150 mm	0.075 mm	PAN	TOTAL WT. RET.
	1.0" Stone	0.0	0.0															
	3/4" Stone	0.0	0.0															
	1/2" Stone	21.0	937.7	0.0	0.0	0.0	0.0	56.3	468.8	375.1	9.4	4.7	4.7	2.8	1.9	4.7	9.4	937.7
5.5	3/8" Stone	25.0	1116.3	0.0	0.0	0.0	0.0	0.0	11.2	759.1	290.2	11.2	11.2	5.6	5.6	5.6	16.7	1116.3
	Stone Dust	0.0	0.0															
	Stone Sand	27.5	1227.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	257.9	356.1	257.9	202.6	95.8	36.8	20.9	1227.9
	Natural Sand	4.0	178.6	0.0	0.0	0.0	0.0	0.0	0.0	3.6	8.9	16.1	30.4	50.0	46.4	17.9	5.4	178.6
	Mineral Filler	0.5	22.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.2	4.9	16.1	22.3
	RAP	22.0	982.3															3482.8
	Total	100.0	4465.1															

(Specimen wtg.) = 4725.0 x 5.5 % A.C. = 259.9

(Specimen wtg.) = 4725.0 - 259.9 gr A.C. = 4465.1

Combined SUPERPAVE (Maximum Specific Gravity) Gradation at the % PGB Indicated (% total binder for RAP mixtures)

% AC	Aggregate Component	% Batch	Grams Batch	WEIGHT RETAINED (GRAMS) 50.0 mm	37.5 mm	25.0 mm	19.0 mm	12.5 mm	9.5 mm	4.75 mm	2.36 mm	1.18 mm	0.600 mm	0.300 mm	0.150 mm	0.075 mm	PAN	TOTAL WT. RET.
	1.0" Stone	0.0	0.0															
	3/4" Stone	0.0	0.0															
	1/2" Stone	21.0	396.9	0.0	0.0	0.0	0.0	23.8	198.5	158.8	4.0	2.0	2.0	1.2	0.8	2.0	4.0	396.9
5.5	3/8" Stone	25.0	472.5	0.0	0.0	0.0	0.0	0.0	4.7	321.3	122.9	4.7	4.7	2.4	2.4	2.4	7.1	472.5
	Stone Dust	0.0	0.0															0.0
	Stone Sand	27.5	519.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	109.1	150.7	109.1	85.8	40.5	15.6	8.8	519.8
	Natural Sand	4.0	75.6	0.0	0.0	0.0	0.0	0.0	0.0	1.5	3.8	6.8	12.9	21.2	19.7	7.6	2.3	75.6
	Mineral Filler	0.5	9.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	2.1	6.8	9.5
	RAP	22.0	415.8															1474.2
	Total	100.0	1890.0															

(Specimen wtg.) = 2000.0 x 5.5 % A.C. = 110.0

(Specimen wtg.) = 2000.0 - 110.0 gr A.C. = 1890.0

3/6/2013

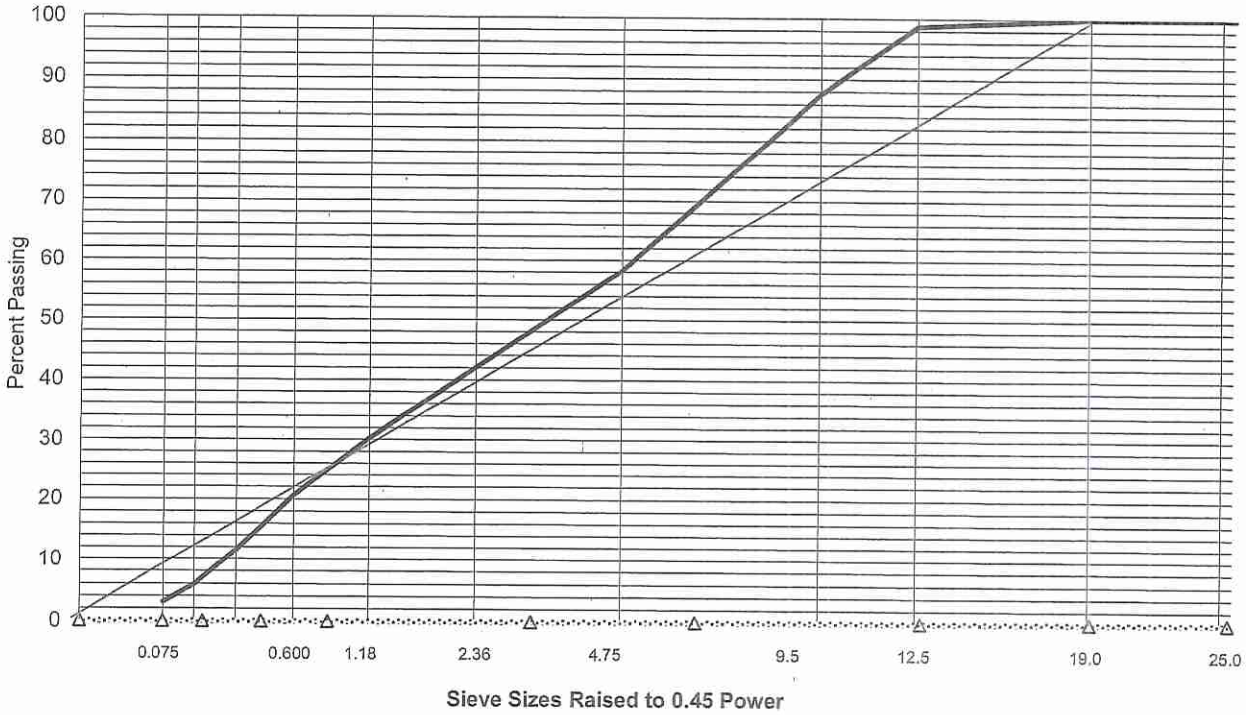
Job Mix Formula

DESIGN ESAL LEVEL
75 gyrations

SUPERPAVE Job Mix Formula

12.5 mm Nominal Maximum Size

Job:	Various, NH
Producer:	Brox Industries
Location:	Rochester, NH



Aggregates		Source	% Blend	Sand Blend
Coarse	1.0" Stone	Rochester,NH	0	
	3/4" Stone	Rochester,NH	0	
	1/2" Stone	Rochester,NH	21	
	3/8" Stone	Rochester,NH	25	
Fine	Stone Dust	Rochester,NH	0	0.0
	Stone Sand	Rochester,NH	27.5	87.3
	Natural Sand	Rochester,NH	4	12.7
	Mineral Filler	BHF	0.5	
	RAP	NH Streets	22	

Test	Result
LA Abrasion	39.6
Soundness	1.34
Flat & Elongated	0.1
Fine Agg Angularity	46.6
Sand Equivalency	84
Clay & Friable	0.1
Atterberg Limits	Non-plastic

Sieve Size (mm)		0.075	0.150	0.300	0.600	1.18	2.36	4.75	9.5	12.5	19.0	25.0	%PGB	Binder Grade
% Passing	General Limits	2 - 8					42-52		<90	90-100	100			PG 64-28
	JMF Range													
	Target Value	3.6	7.0	14.2	23.5	32.0	43.5	60.0	88.0	99.0	100.0		5.5	

Submitted for Review by: Jeff Lewis Date: 3/7/2013

Accepted for Verification/Production by: _____ Date: _____

Appendix D – Pavement Slips

BROX

ROX INDUSTRIES,INC.

Pursuant to applicable laws, responsibility for compliance with any and all state and federal guidelines, including, without implied limitation, any applicable weight restrictions remains with driver and/or employer. By accepting this receipt, driver and employer acknowledge being informed of the total weight of loaded vehicle, and agree to hold harmless and indemnify Brox Industries, Inc. for any damages or liability arising therefrom.

— THIS PRODUCT MAY HAVE BEEN PRODUCED USING REGULATED RECYCLABLE MATERIALS —

ASPHALT 100% RECYCLABLE

BROX IND. INC. 603-332-4262
ROCHESTER PLANT06"REDUCING OUR CARBON FOOTPRINT, 1 TON AT A TIME"...

1/09/2013
6:15

Ticket #
367656

istomer: 710913110
RICAN

Job: 710913110
TOLEND RD DOVER

Truck: 1472
License #:
Type:

n. #:
Check #:
Zone:
PICKUP
Trucker #:1472

ODUCT ID	PRODUCT DESCRIPTION	AMOUNT	
5	NH 19MM 750	18.23	Ton
			Each
			Each

oads: 45 Accum. Amount: 1,087.89 Ton

UT GROSS: 24,460 lb
.T. TARE: 0 lb
NET: 24,460 lb

nt Name: ROCHESTER
Weighmaster Name: SCOTT S HOLMES
ceived By:
Driver Name:

Start	AGG4	AGG3	AGG2	AGG5	AGG1	Start
Tol	2060	3360	4540	6280	7920	
sired	1900	3200	4080	6120	7760	
Tol	1740	3040	3920	5960	7600	
0	1880 M	3230 M	4100	6230	7740	0
60	1920	3190	4150	6180	8010+	8
50	1930	3210	4140	6030	7990+	2
Amt	5730	3900	5730	6060	5300	

gin Agg: 17650 Virgin AC: 904 Virgin AC %: 3.70%
cycle Agg:5661.7 Recycle AC: 236.0 Recycle AC %: 0.96% Moi
tered Add: 0 Metered Add: 0.00%
al Agg:23321.7 Total AC:1140.0 Total AC %: 4.66%

LAST #45

A 0000102

Quality. Integrity. *Family owned & operated since 1947*

BROX INDUSTRIES,INC.

Pursuant to applicable laws, responsibility for compliance with any and all state and federal guidelines, including, without implied limitation, any applicable weight restrictions remains with driver and/or employer. By accepting this receipt, driver and employer acknowledge being informed of the total weight of loaded vehicle, and agree to hold harmless and indemnify Brox Industries, Inc. for any damages or liability arising therefrom.

— THIS PRODUCT MAY HAVE BEEN PRODUCED USING REGULATED RECYCLABLE MATERIALS —

ASPHALT 100% RECYCLABLE

BROX IND. INC.603-332-4268
06/19/2013 ROCHESTER PLANT06"REDUCING OUR
CARBON FOOTPRINT, 1 TON AT A Ticket #
16:19 TIME"... 372492 DUPLICATE

Customer: 710913110 Job: 710913110 Truck: Type:
AMERICAN TOLEND RD DOVER AEP.
License #:

P.O. #: Check #: Zone: PICKUP Trucker #:

PRODUCT ID	PRODUCT DESCRIPTION	AMOUNT	
435	MH 19MM 75G	23.00	Ton
			Each
			Each

Loads: 37 Accum. Amount: 1,480.29 Ton

OUT GROSS: 46,040 lb
P.T. TARE: 0 lb
NET: 46,040 lb

Plant Name: ROCHESTER Weighmaster Name: STEVE HUNTER
Received By: _____ Driver Name: _____

LAST

A 0223385

...rity. Family owned & operated since 1947

BROX INDUSTRIES,INC.

Pursuant to applicable laws, responsibility for compliance with any and all state and federal guidelines, including, without implied limitation, any applicable weight restrictions remains with driver and/or employer. By accepting this receipt, driver and employer acknowledge being informed of the total weight of loaded vehicle, and agree to hold harmless and indemnify Brox Industries, Inc. for any damages or liability arising therefrom.

— THIS PRODUCT MAY HAVE BEEN PRODUCED USING REGULATED RECYCLABLE MATERIALS —

ASPHALT 100% RECYCLABLE

06/20/2013
09:44

BROX IND.INC.603-332-4262
ROCHESTER PLANT06"REDUCING OUR
CARBON FOOTPRINT, 1 TON AT A
TIME"...

Ticket #
372542

Customer: 710913110
AMERICAN

Job: 710913110
TOLEND RD DOVER

Truck: AEP
License #:

Type:

P.O. #:

Check #:

Zone:

PICKUP

Trucker #:

PRODUCT ID	PRODUCT DESCRIPTION	AMOUNT	
435	MH 19MM 75B	17.00	Ton
			Each
			Each

Loads: 15 Accum. Amount: 358.42 Ton

OUT GROSS: 34,000 lb
P.T. TARE: 0 lb
NET: 34,000 lb

Plant Name: ROCHESTER
Weighmaster Name: STEVE HUNTER
Received By: _____
Driver Name: Jay

LAST Load

A 0457119

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BROX INDUSTRIES,INC.

Pursuant to applicable laws, responsibility for compliance with any and all state and federal guidelines, including, without implied limitation, any applicable weight restrictions remains with driver and/or employer. By accepting this receipt, driver and employer acknowledge being informed of the total weight of loaded vehicle, and agree to hold harmless and indemnify Brox Industries, Inc. for any damages or liability arising therefrom.

— THIS PRODUCT MAY HAVE BEEN PRODUCED USING REGULATED RECYCLABLE MATERIALS —

ASPHALT 100% RECYCLABLE

BROX IND. INC. 603-332-4262
ROCHESTER PLANT06"REDUCING OUR
CARBON FOOTPRINT, 1 TON AT A
TIME"...

07/18/2013
15:45

Ticket #
175489

Customer: 710913119
AMERICAN

Job: 710913118
TOLEND RD DOVER

Truck: 1454
License #: NO.

Type: 4

P.O. #:

Check #:

Zone:

PICKUP

Trucker #:

PRODUCT ID	PRODUCT DESCRIPTION	AMOUNT	
435	MH 19MM 75D	20.03	Ton
			Each
			Each

Loader: 45 Accum. Amount: 1,040.28 Ton

OUT GROSS: 72,380 lb
P.T. TARE: 26,320 lb
NET: 46,060 lb

(Scale 5)

Plant Name: ROCHESTER
Received By:

Weighmaster Name: STEVE HUNTER
Driver Name:

LAST LOAD
LEFT SIDE

A 0453089

BROX INDUSTRIES,INC.

Pursuant to applicable laws, responsibility for compliance with any and all state and federal guidelines, including, without implied limitation, any applicable weight restrictions remains with driver and/or employer. By accepting this receipt, driver and employer acknowledge being informed of the total weight of loaded vehicle, and agree to hold harmless and indemnify Brox Industries, Inc. for any damages or liability arising therefrom.

— THIS PRODUCT MAY HAVE BEEN PRODUCED USING REGULATED RECYCLABLE MATERIALS —

ASPHALT 100% RECYCLABLE

BROX IND. INC. 603-332-4262
ROCHESTER PLANT06"REDUCING OUR
CARBON FOOTPRINT, 1 TON AT A
TIME"...

07/19/2013
12:52

Ticket #
375538

Customer: 710913110
AMERICAN

Job: 710913110
TOLEND RD DOVER

Truck: 1692
License #:

Type:

P.O. #:

Check #:

Zone:

PICKUP

Trucker #:1692

PRODUCT ID	PRODUCT DESCRIPTION	AMOUNT	
435	NH 19MM 75B	23.34	Ton
			Each
			Each

Loads: 24 Accum. Amount: 551.39 Ton

OUT GROSS: 76,620 lb
P.T. TARE: 29,940 lb
NET: 46,680 lb

(Scale 5)

Plant Name: ROCHESTER
Received By:

Weighmaster Name: STEVE HUNTER
Driver Name:

A 0433151

Quality. Integrity. *Family owned & operated since 1947*

BROX INDUSTRIES, INC.

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ASPHALT 100% RECYCLABLE

BROX IND. INC. 603-332-4162
ROCHESTER PLANT86"REDUCING OUR CARBON FOOTPRINT, 1 TON AT A TIME"...

08/06/2013
15:24

Ticket #
377837

Customer: 710913110
AMERICAN

Job: 710913110
TOLEND RD DOVER

Truck:
AEP

Type:

License #:

P.O. #:

Check #:

Zone:

PICKUP

Trucker #:

PRODUCT	PRODUCT DESCRIPTION	AMOUNT	
435	NH 19MM 75G	18.24	Ton
			Each
			Each

Loads: 29 Accum. Amount: 664.85 Ton

OUT GROSS: 36,480 lb
P.T. TARE: 0 lb
NET: 36,480 lb

Plant Name: ROCHESTER
Received By: _____

Weighmaster Name: STEVE HUNTER
Driver Name: _____

Ducky.

A 0454713

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BROX INDUSTRIES,INC.

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— THIS PRODUCT MAY HAVE BEEN PRODUCED USING REGULATED RECYCLABLE MATERIALS —

ASPHALT 100% RECYCLABLE

BROX IND. INC. 603-332-4262
ROCHESTER PLANT06"REDUCING OUR
CARBON FOOTPRINT, 1 TON AT A
TIME"...

08/29/2013
14:10

Ticket #
386574

Customer: 710913112
AMERICAN

Job: 710913110
TOLEND RD DOVER

Truck: 2006
License #:

Type:

P.O. #:

Check #:

Zone:

PICKUP

Trucker #:2006

PRODUCT ID	PRODUCT DESCRIPTION	AMOUNT	
435	NH 19MM 75G	22.92	Ton
			Each
			Each

Loads: 41 Accum. Amount: 1,082.00 Ton

OUT GROSS: 45,840 lb
P.T. TARE: 0 lb
NET: 45,840 lb

Plant Name: ROCHESTER
Received By:

Weighmaster Name: STEVE HUNTER
Driver Name: Flipper

A 3419541

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— THIS PRODUCT MAY HAVE BEEN PRODUCED USING REGULATED RECYCLABLE MATERIALS —

ASPHALT 100% RECYCLABLE

09/26/2013
16:25

BROX IND. INC. 603-332-4262
ROCHESTER PLANT06"REDUCING OUR CARBON FOOTPRINT, 1 TON AT A TIME"...

Ticket #
383575

Customer: 71091310
AMERICAN

Job: 71091310
TOLEND RD DOVER

Truck: 1658
Type: S
License #: NH.AP1402

P.O. #:
Check #:
Zone:
PICKUP
Trucker #:1658

PRODUCT ID	PRODUCT DESCRIPTION	AMOUNT	
438	NH 19MM 75B	34.96	Ton
			Each
			Each

Loads: 41 Accum. Amount: 1,207.05 Ton

GWT GROSS: 185,660 lb
P.T. TARE: 37,700 lb
NET: 148,000 lb

Manual Wt.

Plant Name: ROCHESTER
Received By:

Weighmaster Name: STEVE HUNTER
Driver Name: Josh

227+50 → 248+00

LAST LOAD C.T.

A 0461283

Quality. Integrity. Family owned & operated since 1947

BROX INDUSTRIES, INC.

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— THIS PRODUCT MAY HAVE BEEN PRODUCED USING REGULATED RECYCLABLE MATERIALS —

ASPHALT 100% RECYCLABLE

10-17-13

LAST LOAD

191+50 → 210+00

BROX IND.INC.603-332-4262
ROCHESTER PLANT06"REDUCING OUR
CARBON FOOTPRINT, 1 TON AT A
TIME"...

./17/2013
15:16

Ticket #
386252

ustomer: 710913110
MERICAN

Job: 710913110
TOLEND RD DOVER

Truck: 1232
License #:

Type:

.O. #: Check #: Zone: PICKUP Trucker #:1232

ODUCT ID	PRODUCT DESCRIPTION	AMOUNT	
35	NH 19MM 75G	14.69	Ton
			Each
			Each

Loads: 43 Accum. Amount: 1,119.67 Ton

OUT GROSS: 29,780 lb
.T. TARE: 0 lb
NET: 29,780 lb

int Name: ROCHESTER
eceived By: _____

Weighmaster Name: STEVE HUNTER
Driver Name: _____

A 0520585

Quality. Integrity. *Family owned & operated since 1947*

BROX INDUSTRIES,INC.

Pursuant to applicable laws, responsibility for compliance with any and all state and federal guidelines, including, without implied limitation, any applicable weight restrictions remains with driver and/or employer. By accepting this receipt, driver and employer acknowledge being informed of the total weight of loaded vehicle, and agree to hold harmless and indemnify Brox Industries, Inc. for any damages or liability arising therefrom.

— THIS PRODUCT MAY HAVE BEEN PRODUCED USING REGULATED RECYCLABLE MATERIALS —

ASPHALT 100% RECYCLABLE

BROX IND. INC. 603-332-4R62
ROCHESTER PLANT06"REDUCING OUR
CARBON FOOTPRINT, 1 TON AT A
TIME"...

1/06/2013
15:30

Ticket #
388382

ustomer: 710913110
ERICAN

Job: 710913110
TOLEND RD DOVER

Truck: 2006
License #:

Type:

O. #:

Check #:

Zone:

PICKUP

Trucker #:2006

ODUCT ID	PRODUCT DESCRIPTION	AMOUNT	
35	NH 19MM 75W	9.98	Ton
			Each
			Each

Loads: 40 Accum. Amount: 1,045.34 Ton

OUT GROSS: 19,960 lb
P.T. TARE: 0 lb
NET: 19,960 lb

Plant Name: ROCHESTER
Received By:

Weighmaster Name: STEVE HUNTER
Driver Name:

Last Load
Phase VIII
STA 248+00 - 265+50

A 0523011

Appendix E – Crack Inventory and QA/ QC Data from CMA

Tolena Road (From CMA)

Phase	Station	Offset	Brox	Brox Compaction	Brox Thickness	Brox Fines	Brox %AC	JTC	JTC Compaction	JTC Thickness	JTC Fines	JTC %AC	Cardno	Cardno Compaction	Cardno Thickness	Cardno Fines	Cardno %AC
Phase IIB	104+50	1'L						1	95.2%	3.77	-	-					
Phase IIB	104+50	1'R						2	95.4%	3.12	-	-					
Phase IIA	135+85	2.5'R						3	93.3%	-	4.9	4.73					
Phase I	143+75	3'R	1	95.0%	3.2	-	-										
Phase I	148+25	7'L	2	94.4%	3.5	-	-										
Phase IIIA	155+83	WB						4	96.2%	3.40	4.0	4.70	1	96.1%	3.38	4.8	5.20
Phase IIIA	164+00	CL						5	-	3.11	-	-					
Phase IIIA	164+00	1'R						6	93.8%	3.56	-	-					
Phase IIIA	164+00	1.5'L						7	93.8%	2.88	-	-					
Phase IIIA	164+00	8'L						8	96.7%	2.95	-	-					
Phase IIIA	164+00	3'L						9	-	2.92	-	-					
Phase IIIA	160+08	WB						10	97.2%	3.10	5.0	4.80	2	98.1%	3.00	2.6	5.00
Phase IIIA	166+21	WB						11	95.5%	2.95	4.0	4.61	3	95.3%	2.88	4.5	5.10
Phase IIIA	170+61	EB						12	94.9%	3.20	4.2	4.58	4	95.3%	3.13	4.2	5.30
Phase IIIB	180+67	WB						13	95.9%	3.95	4.6	4.58	5	95.5%	3.88	4.9	5.10
Phase IV	184+00	7'R						14	95.7%	-	3.5	4.91					
Phase VII	208+00	6'R						15	95.3%	3.51	-	-					
Phase VII	208+00	6'L						16	94.4%	3.30	-	-					
Phase VIII	248+75	3.5'L						17	93.0%	-	3.5	4.61					

Specs.

Compaction	92%	Min.
Thickness	2.8-4.2	3.5" target
Fines	2.4-4.4%	3.4% target
AC	4.3-5.1%	4.7% target

x.x = Over Target

x.x = Out of Spec.

provided by CMA
Summary of Cores/Extractions in pavement

CMA Pavement Summary
Calculated by: UE

	All Thickness	Phase III	All Compaction	All % Fines	All % AC			
	3.77		95.20%					
	3.12		95.40%					
			93.30%	4.90%	4.73%			
	3.2		95.00%					
	3.5		94.40%					
	3.4	3.4	96.20%	4.00%	4.70%			
	3.11	3.11						
	3.56	3.56	93.80%				1028	5/9/2013 – Phase I (1,028 T)
	2.88	2.88	93.80%				1480	
	2.95	2.95	96.70%				358	6/19/2013 – Phase IIA (1,480 T)
	2.92	2.92					1030	6/20/2013 – Phase IIB (358 T)
	3.1	3.1	97.20%	5.00%	4.80%		551	7/18/2013 – Phase IIIA (1,030 T)
	2.95	2.95	95.50%	4.00%	4.61%		664	7/19/2013 – Phase IIIB (551 T)
	3.2	3.2	94.90%	4.20%	4.58%		1082	8/6/2013 – Phase IV (664 T)
	3.95	3.95	95.90%	4.60%	4.58%		1207	8/29/2013 – Phase V (1,082 T)
			95.70%	3.50%	4.91%		1111	9/26/2013 – Phase VI (1,207 T)
	3.51		95.30%				1045	10/17/2013 – Phase VII (1,111 T)
	3.3		94.40%					11/6/2013 – Phase VIII (1,045 T)
			93.00%	3.50%	4.61%			
min	2.88	2.88	93.00%	3.50%	4.58%	min	358	
max	3.95	3.95	97.20%	5.00%	4.91%	max	1480	
avg	3.27625	3.202	95.04%	4.21%	4.69%	avg	955.6	
						sum	9556	

Photo 1. Cracking observed in January 2014

Tolend Road Crack Inventory July 3 and 8, 2014
CMA Engineers #745

Station Begin	Station End	Segment Length (ft)	Paving Mobilization	Base Paved	Base Construction	Testing Completed	Results of Concern	Centerline Cracks (Ft)	Butt Joint Cracks (Ft)	In-Lane Cracks (Ft)
101+25	107+25	600	Phase IIB	6/20/2013	Full Depth	JTC core 104+50 (2)	variable thickness 600	637	0	0
107+25	137+00	2975	Phase IIA	6/19/2013	Full Depth	Brox QC, JTC core 135+85, 2.5'R	4.9% fines 2975	826	0	42
137+00	154+00	1700	Phase I	5/9/2013	Full Depth	Brox QC	- 1700	1078 63	48 3	22 1.3
154+00	172+75	1875	Phase IIIA	7/18/2013	Full Depth	JTC cores 164+00 (5), JTC & Cardno cores @ 155+83 WB, 160+08 WB, 166+21 WB, & 170+61 EB	1875 variable thickness, 4.0 to 5.0% fines	1248 67	28 1.5	706 38
172+75	181+00	825	Phase IIIB	7/19/2013	Full Depth	JTC core 180+67 WB	4.6% - 4.9% fines 825	888 108	129 16	149 18
181+00	191+50	1050	Phase IV	8/6/2013	Full Depth	JTC core 184+00, 7.0'R	- 1050	1080 103	0 0	0 0
191+50	210+00	1850	Phase VII	10/17/2013	Full Depth	JTC core 208+00 (2)	- 1850	192 10	56 3	98 5
210+00	227+50	1750	Phase V	8/29/2013	Full Depth		1750	711 41	28 2	19 1.1
227+50	248+00	2050	Phase VI	9/26/2013	Full Depth		2050	134 7	28 1.4	0 0
248+00	265+50	1750	Phase VIII	11/6/2013	Reclaim	JTC core 248+75, 3.5'L	- 1750	248 14	0 0	0 0
Total		16425						7042	317	1036

2500'

80%

Tolend Road Crack Inventory July 3 and 8, 2014

CMA Engineers #745

Station Begin	Station End	Segment Length (ft)	Paving Mobilization	Centerline Cracks (Ft)	Butt Joint Cracks (Ft)	In-Lane Cracks (Ft)
101+25	107+25	600	Phase IIB	637	0	0
107+25	137+00	2975	Phase IIA	~~1285~~ 826	0	42
137+00	154+00	1700	Phase I	1078	48	22
154+00	172+75	1875	Phase IIIA	1248	28	706
172+75	181+00	825	Phase IIIB	888	129	149
181+00	191+50	1050	Phase IV	1080	0	0
191+50	210+00	1850	Phase VII	192	56	98
210+00	227+50	1750	Phase V	711	28	19
227+50	248+00	2050	Phase VI	134	28	0
248+00	265+50	1750	Phase VIII	248	0	0
Total		16425		~~7501~~ 7042	317	1036

Station Range		Paving Phase	Location	Centerline Crack (Ft)	Butt Joint Crack (Ft)	In-Lane Crack (Ft)	Other / Description
101+25 to	107+25	IIB	Barrington bump				
			Barrington bump to pit	176			
			Opposite pit rt to 20'				side lane cracks
			Pit to pole 4B/14	180			
			pole 4B/14	85			
			pole 4B/14 to 4B/13	169			
				27			
Segment Length (Ft):	600		Length of defects (Ft)	637	0	0	
107+25 to	137+00	IIA	pole 4B/14 to 4B/13			12	
			pole 4B/12			12	
			pole 4B/12 to 4B/11	31			
				66			
			pole 4B/11 to 4B/10	12			
				14			
				9			
				21			
				25			
			pole 4B/10 to 4B/7	14			
				11			
			pole 4B/7 to 4B/6	~~726~~			
			before pole 4B/4	47			
			pole 4B/6			18	rt side, y crack
			pole 4B/4 to 4B/3	24			
				13			
			pole 4B/3 to 4B/2	133			
			pole 4B/2 to 4B/1	68			
			pole 4B/1 to 4B/Y	71			
Segment Length (Ft):	2975		Length of defects (Ft)	~~1285~~	0	42	
137+00 to	154+00	I	Sta 137		24		take out bump
			Sta 136+50 to Sta 137+00	55			
			Sta 126 to Sta 128+/-		24		transverse joint (butt joints at right side lane repair)
			gate right lane past repair			12	
			pole 4/176 to Glen Hill	72			
			Glen Hill apron	72			
			Glen Hill Road			5	left lane
						5	left lane
			Glen Hill to #589	350			
			#589 to #581	40			
				12			
			pole 4/174 to 4/173X	65			
			pole 4/173X	77			
			pole 4/173 to 4/172X	152			
			pole 4/172X to #544	67			
			Sta	116			
Segment Length (Ft):	1700		Length of defects (Ft)	1078	48	22	

267 (transposed measurement)

826

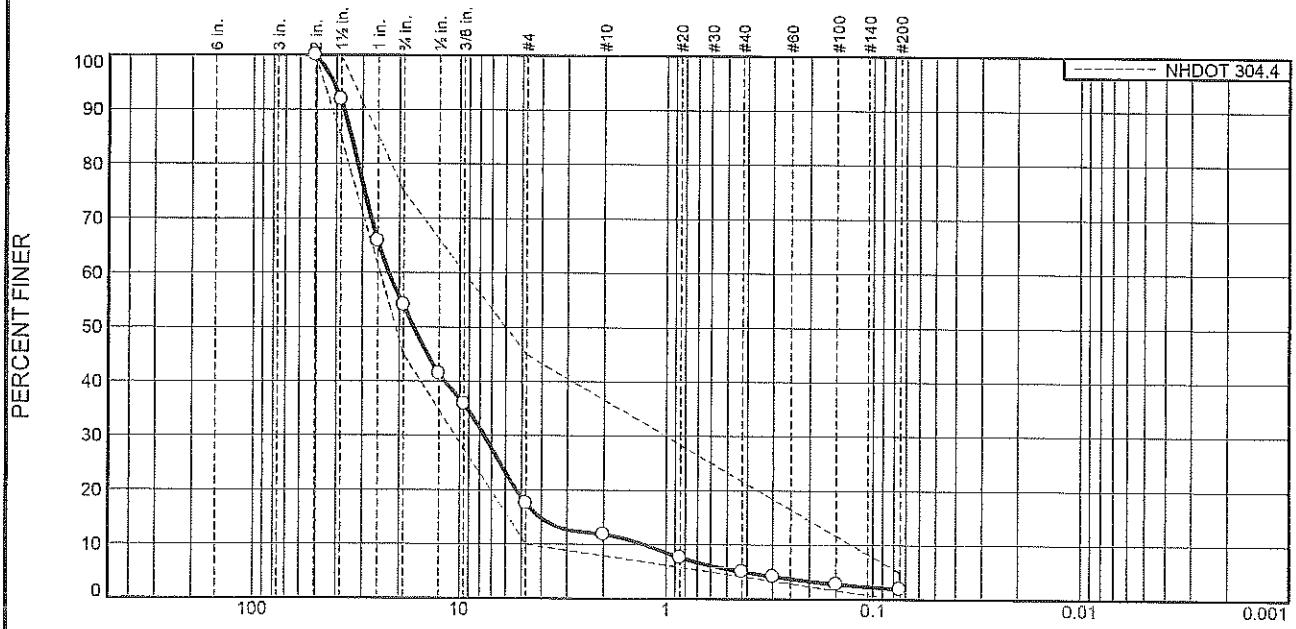
Station Range			Paving Phase	Location	Centerline Crack (Ft)	Butt Joint Crack (Ft)	In-Lane Crack (Ft)	Other / Description
154+00	to	172+75	IIIA	Phase I/IIIA		28		
							9	rt lane
							27	rt lane
							4	rt lane
				20'W of 4/166X			65	rt
				#535 to #532	28			right lane too
					68			
					33			
				#532	178			right lane too
				#523 to #524	116			
				#519 to #508	122			right lane too
				#523			6	rt
							27	lt
							7	lt
				#508 to #496	40			right lane too
					39			
					8			
					25			
					25			
					9			
					63			
					104			
				#508 to #496			26	rt
							23	
				#519 to #509			15	lt
							15	lt
				#496 to #486	32			
				#486 to #493	37			
				#503			9	lt
				4/165			9	lt
				#499			37	lt
							10	lt
							16	lt
				#493			14	rt
							7	rt
				#496			11	rt
				#493 to #477	175			
				#480	4			
					17			
					47			
				#477			67	lt
							15	lt
							22	lt
							19	lt
							6	lt
				#480			72	rt
							13	rt
				#475 to #473			16	lt
							4	lt
							34	lt
							16	lt
							31	lt
				#473			34	lt
							19	lt
							1	lt
				#473	78			
Segment Length (Ft):		1875		Length of defects (Ft)	1248	28	706	

Station Range		Paving Phase	Location	Centerline Crack (Ft)	Butt Joint Crack (Ft)	In-Lane Crack (Ft)	Other / Description
172+75 to	181+00	IIIB	#473 to #471			19	
						67	
						6	
						8	
			#473 to Sta 172+50	32			
				42			
			Phase IIIA/IIIB		28		
			Phase IIIA/IIIB to French Cross Road	386			
			French Cross Road to Dean Drive			6	lt
						12	lt
						12	lt
			French Cross Road to Dean Drive	390			
			Dean Drive				~~frost heave~~
			Dean Drive to #437		73		butt joint repair
			Dean Drive to #435	38			
			Dean Drive to #435			4	lt
						15	lt
			Phase 3B/4/Dean Drive		28		
Segment Length (Ft):	825		Length of defects (Ft)	888	129	149	
181+00 to	191+50	IV	Dean Drive to 4/153	40			
				188			
			pole 4/153 to 4/151	369			
			pole 4/151 to 40' E of 4/150	229			
			40' E 4/150 to Phase 4	254			
Segment Length (Ft):	1050		Length of defects (Ft)	1080			
191+50 to	210+00	VII	pole 4/149 to Phase 7			17	rt
						13	rt
						6	rt
						36	rt
			Phase 4/7		28		
			pole 4/148 to 4/147	88			
			Phase7 to pole 4/148			22	rt
			pole 4/148S to nancy Lane	104			
			crack or joint? Nancy Lane to Watson Road				
			Watson			4	
			Ph VII/V		28		bump
Segment Length (Ft):	1850		Length of defects (Ft)	192	56	98	

Abrupt right side superelevation transition at Dean Drive, distressed pavement.

Station Range		Paving Phase	Location	Centerline Crack (Ft)	Butt Joint Crack (Ft)	In-Lane Crack (Ft)	Other / Description
210+00 to	227+50	V	#309	109			
			#308	53			
			#311	68			
			#300	10		5	
			Rt Lane				
			#292	45			
			#292	70			
			#289	42			
			#289/271	35			
			#289/271	39			
			#271 TRANS Rt			5	
			#271 TRANS Lt			9	
			#266	16			
			#259/262	66			
			#259	48			
			#259	44			
			#254	66			
			V/VI Butt		28		
Segment Length (Ft):	1750		Length of defects (Ft)	711	28	19	
227+50 to	248+00	VI	Willow	42			
			#241	22			
			#241	17			
			#229	12			
			#220	13			
			#220	28			
			#173 VI/VII Butt		28		
Segment Length (Ft):	2050		Length of defects (Ft)	134	28	0	
248+00 to	265+00	VIII	#160	15			
			#160	29			
			#141	54			
			S of Upper Fac	19			
			S of Upper Fac	14			
			#125(Drive)	42			
			#125				
			#125	26			
			#108	16			
			Mone's Folly	12			
			Mone's Folly	21			
Segment Length (Ft):	1700		Length of defects (Ft)	248	0	0	

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	45.9	36.5	5.7	6.8	3.1	2.0	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100.0	100.0	
1 1/2	91.9	85.0 - 100.0	
1	65.9		
3/4	54.1	45.0 - 75.0	
1/2	41.5		
3/8	35.9		
#4	17.6	10.0 - 45.0	
#10	11.9		
#20	7.7		
#40	5.1		
#50	4.2		
#100	2.8		
#200	2.0	0.0 - 5.0	

* NHDOT 304.4

Material Description

Crushed Gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 36.7271 D_{85}= 33.8141 D_{60}= 22.4512
D_{50}= 16.9027 D_{30}= 7.5621 D_{15}= 4.0422
D_{10}= 1.2832 C_u= 17.50 C_c= 1.98

Remarks

Material meets gradation specification for NHDOT 304.4

Date Received: 4-15-13 **Date Tested:** 4-16-13

Tested By: Scott TeBordo

Checked By: Jestin Leclair

Title: Special Inspection

Location: Brox - Rochester
Sample Number: 13-216 **Depth:** 304.4

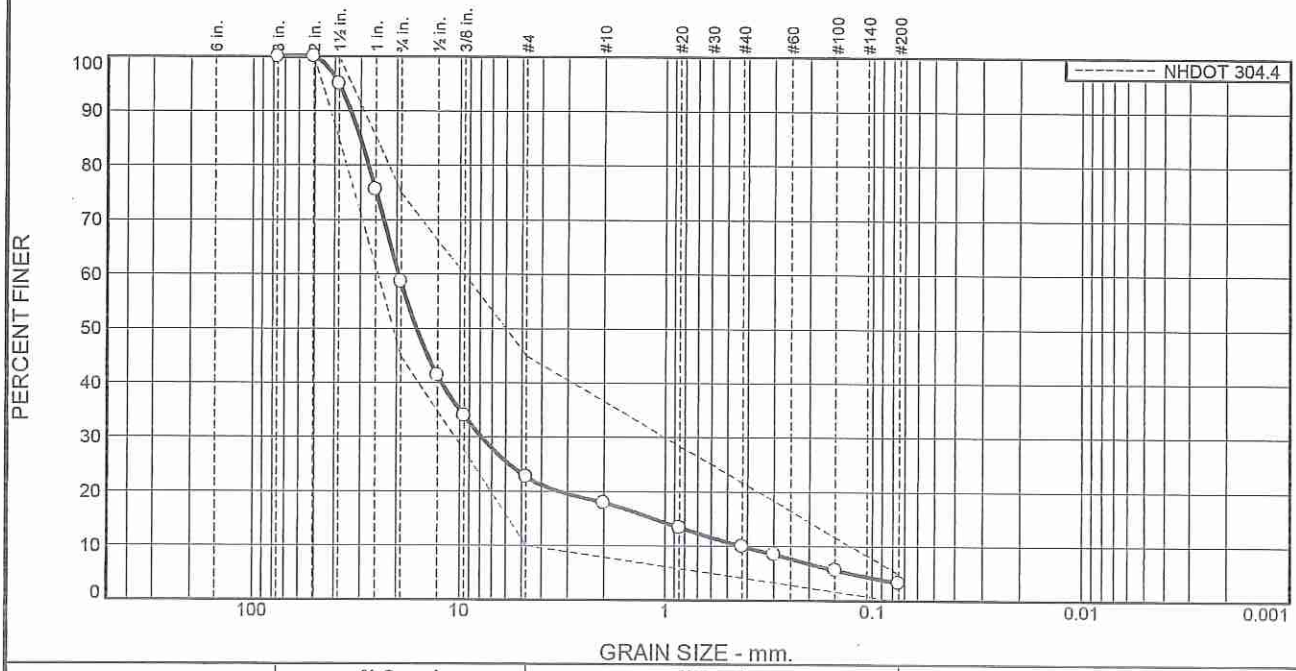
Date Sampled: 4-15-13

JOHN TURNER
Dover, NH

Client: American Excavating
Project: Tolend Road, Dover, NH

Project No: 13-10-019 **Figure** 002

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	41.4	35.9	4.8	7.9	6.6	3.4	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3	100.0		
2	100.0	100.0	
1 1/2	95.0	85.0 - 100.0	
1	75.6		
3/4	58.6	45.0 - 75.0	
1/2	41.4		
3/8	34.0		
#4	22.7	10.0 - 45.0	
#10	17.9		
#20	13.4		
#40	10.0		
#50	8.5		
#100	5.7		
#200	3.4	0.0 - 5.0	

* NHDOT 304.4

Material Description

Crushed Gravel

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 33.3960 D_{85}= 30.0793 D_{60}= 19.5324
D_{50}= 15.9820 D_{30}= 7.8323 D_{15}= 1.1246
D_{10}= 0.4260 C_u= 45.85 C_c= 7.37

Remarks

Material meets NHDOT 304.4 gradation specification.

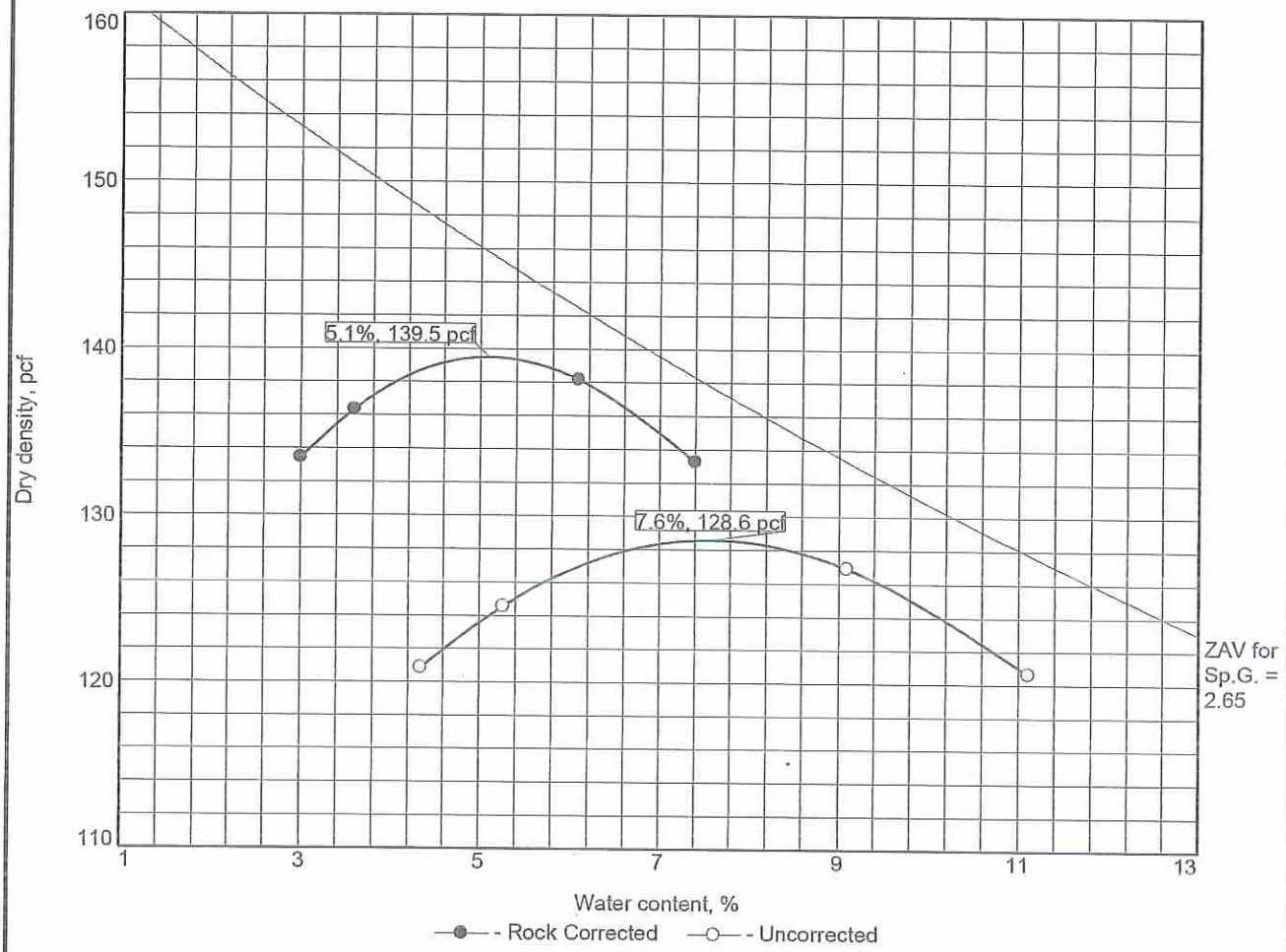
Date Received: 8-6-13 **Date Tested:** 8-7-13
Tested By: Jeff Young
Checked By: Scott TeBordo
Title: Lab Manager

Location: GlenHill Rd Stockpile
Sample Number: 13-695 **Depth:** NHDOT 304.4
Date Sampled: 8-6-13

JOHN TURNER Dover, NH

Client: American Excavating
Project: Tolend Road, Dover, NH
Project No: 13-10-019 **Figure** 008B

Moisture Density Report For Curve No. 13-695



Test specification: ASTM D 1557-07 Method C Modified
ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
NHDOT 304.4				2.65			35	3.4

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 139.5 pcf	128.6 pcf	Crushed Gravel
Optimum moisture = 5.1 %	7.6 %	

Project No. 13-10-019 **Client:** American Excavating
Project: Tolend Road, Dover, NH
Date: 8-12-13
○ **Location:** GlenHill Rd Stockpile **Sample Number:** 13-695

JOHN TURNER CONSULTING

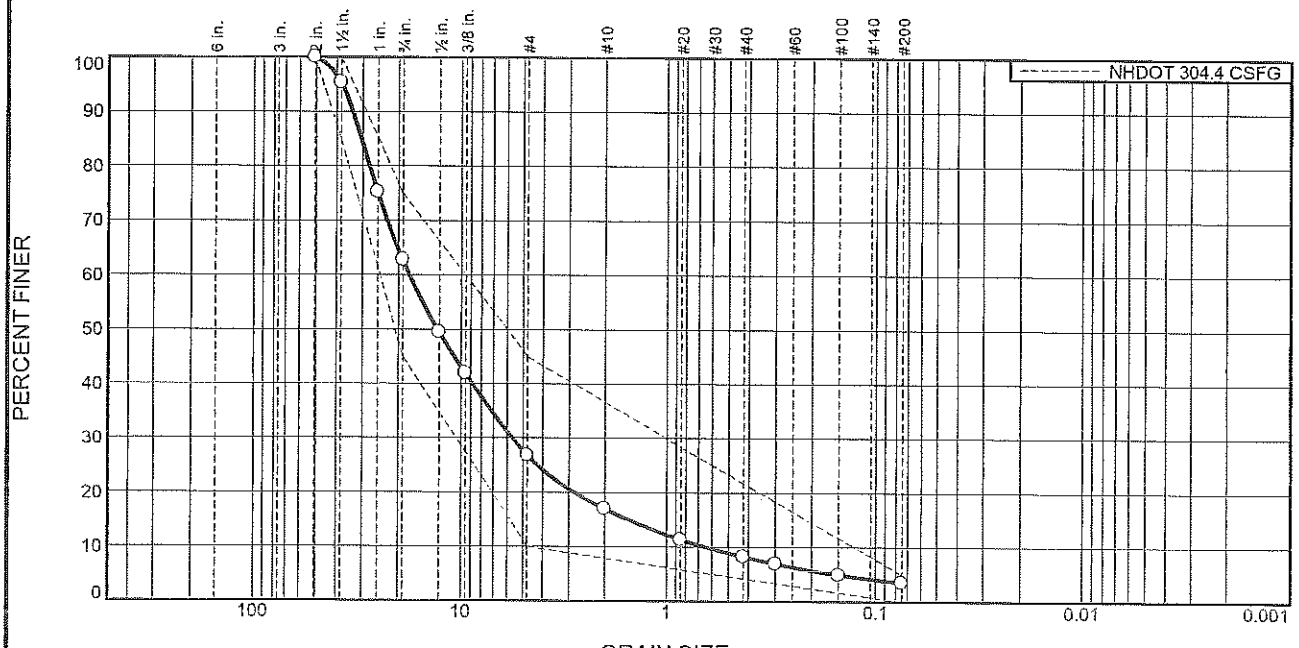
Dover, NH

Remarks:

Figure 008C

Tested By: Scott TeBordo **Checked By:** Jestin Leclair

Particle Size Distribution Report



% Cobbles	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	37.2	35.9	9.9	8.7	4.8	3.5	

Test Results (ASTM C 136 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
2	100.0	100.0	
1 1/2	95.4	85.0 - 100.0	
1	75.2		
3/4	62.8	45.0 - 75.0	
1/2	49.5		
3/8	42.0		
#4	26.9	10.0 - 45.0	
#10	17.0		
#20	11.4		
#40	8.3		
#50	7.0		
#100	5.0		
#200	3.5	0.0 - 5.0	

* NHDOT 304.4 CSFG

Material Description

Crushed Stone Fine Grade

Atterberg Limits (ASTM D 4318)

PL= LL= PI=

Classification

USCS (D 2487)= AASHTO (M 145)=

Coefficients

D_{90}= 33.4418 D_{85}= 30.3790 D_{60}= 17.6628
D_{50}= 12.9310 D_{30}= 5.6325 D_{15}= 1.5230
D_{10}= 0.6423 C_u= 27.50 C_c= 2.80

Remarks

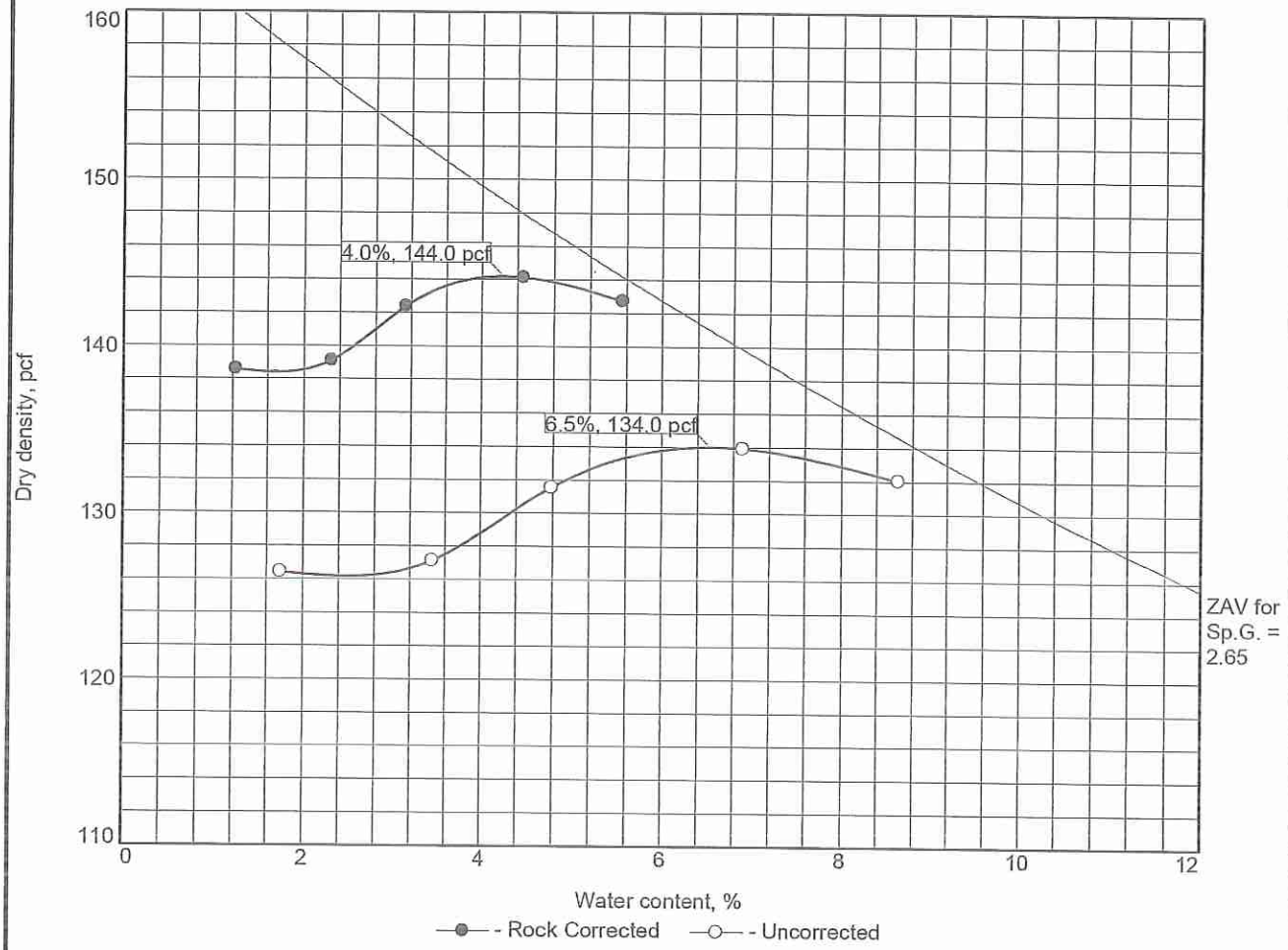
Date Received: 4-24-14 **Date Tested:** 4-24-14
Tested By: Justin Sigouin
Checked By: Jim Corti
Title: Supervisor

Location: Brox
Sample Number: 14-296 **Depth:** Road Base
Date Sampled: 4-24-14

JTC

Client: American Excavating
Project: Tolend Road, Dover, NH
Project No: 13-10-019 **Figure** 013

Moisture Density Report For Curve No. 14-296



Test specification: ASTM D 1557-91 Procedure C Modified
ASTM D 4718-87 Oversize Corr. Applied to Each Test Point

Elev/ Depth	Classification		Nat. Moist.	Sp.G.	LL	PI	% > 3/4 in.	% < No.200
	USCS	AASHTO						
Road Base				2.65			37.2	3.5

ROCK CORRECTED TEST RESULTS	UNCORRECTED	MATERIAL DESCRIPTION
Maximum dry density = 144.0 pcf	134.0 pcf	Crushed Stone Fine Grade
Optimum moisture = 4.0 %	6.5 %	

Project No. 13-10-019 **Client:** American Excavating
Project: Tolend Road, Dover, NH
Date: 14-26-14
○ **Location:** Brox **Sample Number:** 14-296

Remarks:

Figure 013A

Tested By: Justin Sigouin **Checked By:** Jim Corti