CONSTRUCTION LEADERS

LETTER OF TRANSMITTAL			
DATE:	**August 12, 2015**	PCL JOB NO:	**5515002**
ATTN:	**Chris Barker**	TRANSMITTAL NO:	**089**

To: **State of Vermont Agency of Transportation**
One National Life Drive
Montpelier, VT 05633-5001
(802) 828-0053

Re: Hartford Lateral Slide
Project No.: IM 091-2(79)
Contract ID.: 12A132 County: Windsor PCL FILE NO: 5515002-055

WE ARE SENDING **X** Attached ____ Under separate cover via **Email & SP** the following:
____ Shop drawings ____ Prints ____ Plans ____ Samples ____ Specifications
____ Copy of Letter ____ Change Order **X** Other

COPIES	SPEC.	REVISION	DESCRIPTION
1	**704.06**		**Dense Graded Crushed Stone Lab Results**

TRANSMITTED for as checked below:

____ For approval ____ Approved as submitted ____ Resubmit ____ Copies for approval
X For your use ____ Approved as noted ____ Submit **X** Copies for distribution
____ As requested ____ Returned for corrections ____ Return ____ Corrected prints
____ For review and comment

Remarks:

The included lab results were sent to Jack Williams 8/12/2015 by Randy Rhoades (M & W Soils Engineering, Inc.

By: **Erich Heymann,** Project Engineer

COPY TO: Project Files

3810 Northdale Blvd., Suite 200; Tampa, FL • (813) 264-9500 • (813) 264-6689 (fax)

CONSTRUCTION LEADERS

SUBMITTAL NO. : 55
Dense Graded Crushed Stone Lab Results

Item No.	Specification	Description
1	704.06	Dense Graded Crushed Stone Lab Results

PROJECT:
HARTFORD LATERAL SLIDE
PROJECT NO.: IM 091-2(79)
CONTRACT ID.: 12A132

OWNER:
STATE OF VERMONT AGENCY OF TRANSPORTATION

ENGINEER OF RECORD:
STATE OF VERMONT AGENCY OF TRANSPORTATION

CONTRACTOR:
PCL CIVIL CONSTRUCTORS, INC.

AUGUST 12, 2015

3810 Northdale Blvd., Suite 200; Tampa, FL • (813) 264-9500 • (813) 264-6689 (fax)

M&W SOILS ENGINEERING, INC

SOILS AND CONCRETE LABORATORIES

265 Main Street
PO Box 1466
Charlestown,NH 03603
603-826-5873

38 "A" Street
PO Box 928
Wilder, VT 05088
802-295-6692

MECHANICAL ANALYSIS OF AGGREGATES AND GRANULAR MATERIAL

Project: **BAZIN BROTHERS**

Type of Material: 2" Dense Grade — Sample #: 81015TSSDNGRD

Source of Material: Dummerston Pit — Date in Lab: 8/10/2015

Sample from: Delivered by Bazin — Date Tested: 8/11/2015

Report To: Bob Bazin — Technician: C. Brown

Sieve	Weight	% Retained	Cumulative % Retained	Cumulative % Finer	Specification
6"	0.0	0.0	0.0	**100.0**	VT 704.06A
4"	0.0	0.0	0.0	**100.0**	
3"	0.0	0.0	0.0	**100.0**	90-100
2-1/2"	0.0	0.0	0.0	**100.0**	
2"	3138.9	10.4	10.4	**89.6**	75-100
1-1/2"	1354.2	4.5	14.9	**85.1**	
1"	3996.7	13.3	28.2	**71.8**	50-80
3/4"	2379.0	7.9	36.1	**63.9**	
1/2"	4856.8	16.1	52.3	**47.7**	30-60
3/8"	1070.0	3.6	55.8	**44.2**	
#4	1863.9	6.2	62.0	**38.0**	15-40
pan	11433.9	38.0	100.0	**0.0**	

Sand Sieves			Cumulative % Finer Sand Portion	Cumulative % Finer Total Sample	
#4	0.0	0.0	100.0	**38.0**	
#10	38.6	9.9	90.1	**34.2**	
#20	84.8	21.8	68.3	**26.0**	
#40	97.7	25.1	43.2	**16.4**	
#100	83.8	21.5	21.7	**8.2**	
#200	35.3	9.1	12.6	**4.8**	0-6
pan	49.1	12.6	0.0	**0.0**	

Moisture Content: 2.7 %

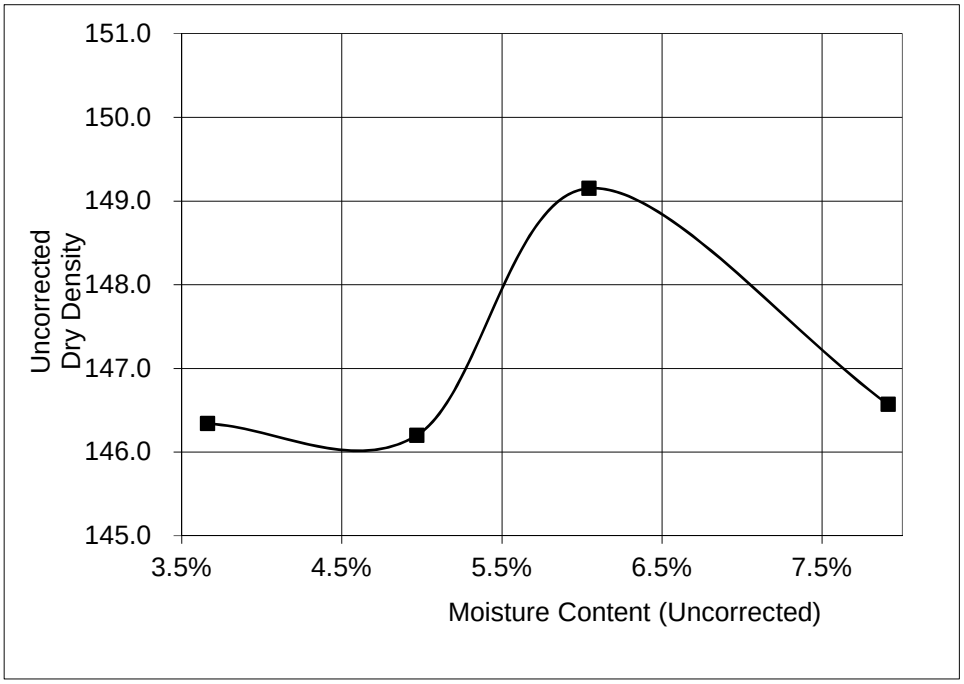
This sample meets the requested specification.
This sample was washed in accordance with AOT practice.

M & W Soils Engineering, Inc.

PO Box 1466, 265 Main Street, Charlestown, NH
PO Box 918, 38 "A" Street, Wilder, VT

Project: Hartford IM 091-2 (79)
Client: Bazin Brothers
Date: 8-10-15
Soil type: 2-1/2" Dense Grade
Soil source: Twin State Hartland Pit
Curve # CURVE1OF810

Moisture-Density Curve



ASTM 1557, method D

Maximum Density	149.2	#/cft	
Corrected Maximum Density	151.4	#/cft	by AASHTO T-224, per VT AOT
Optimum Moisture	6.0%		
Corrected Optimum Moisture	5.3%		by AASHTO T-224, per VT AOT

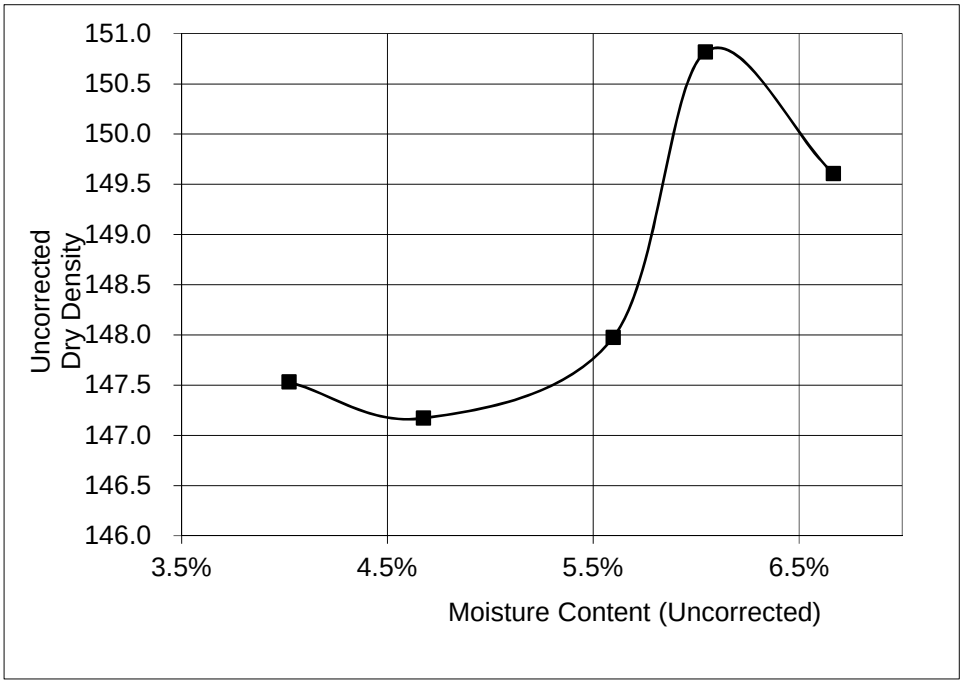
Sieve	% passing
1-1/2"	93.4%

M & W Soils Engineering, Inc.

PO Box 1466, 265 Main Street, Charlestown, NH
PO Box 918, 38 "A" Street, Wilder, VT

Project: Hartford IM 091-2 (79)
Client: Bazin Brothers
Date: 8-10-15
Soil type: 2-1/2" Dense Grade
Soil source: Twin State Hartland Pit
Curve # CURVE2OF810

Moisture-Density Curve



ASTM 1557, method D

Maximum Density	150.8	#/cft	
Corrected Maximum Density	152.8	#/cft	by AASHTO T-224, per VT AOT
Optimum Moisture	6.0%		
Corrected Optimum Moisture	5.3%		by AASHTO T-224, per VT AOT

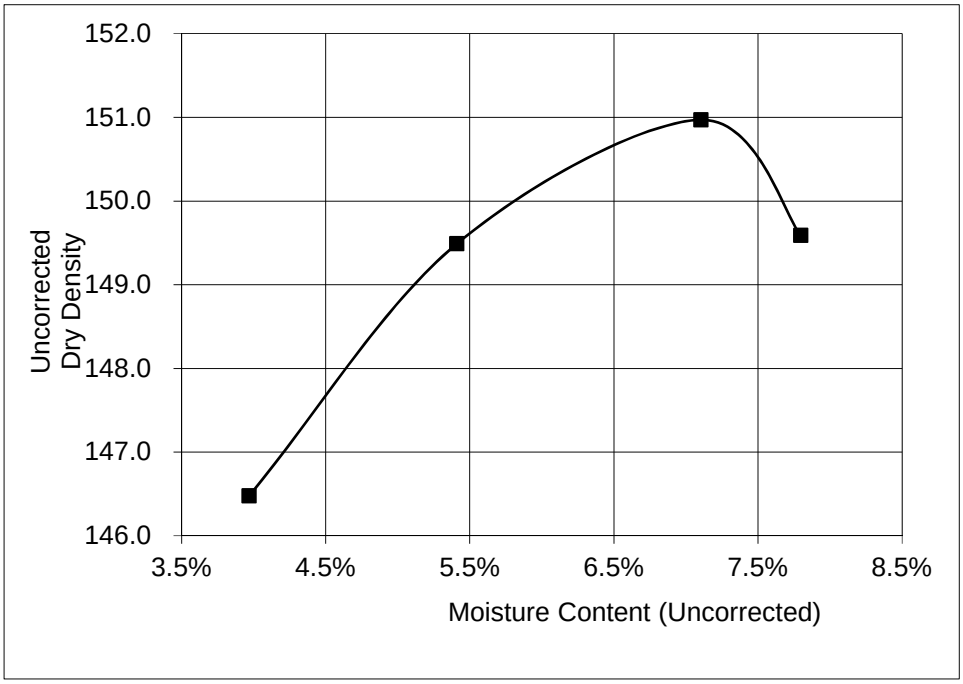
Sieve	% passing
1-1/2"	85.1%

M & W Soils Engineering, Inc.

PO Box 1466, 265 Main Street, Charlestown, NH
PO Box 918, 38 "A" Street, Wilder, VT

Project: Hartford IM 091-2 (79)
Client: Bazin Brothers
Date: 8-10-15
Soil type: 2-1/2" Dense Grade
Soil source: Twin State Hartland Pit
Curve # CURVE3OF810

Moisture-Density Curve



ASTM 1557, method D

Maximum Density	151.0	#/cft	
Corrected Maximum Density	153.0	#/cft	by AASHTO T-224, per VT AOT
Optimum Moisture	7.1%		
Corrected Optimum Moisture	6.2%		by AASHTO T-224, per VT AOT

Sieve	% passing
1-1/2"	85.1%

Corrected Copy No.: _____

Date: _____

Vermont Agency of Transportation
Materials & Research Section
(PREPARED BY M+W SOILS ENGINEERING)

STANDARD ERROR
WORKSHEET

DISTRIBUTION

Res. Eng. _____

Others _____

VT AOT - MRD 54-09

Project Name & Number: HARTFORD IM 091.2 (79)

Material Source: TWIN STATE S+G

Pay Item Number & Name: 704.06A, Dense Graded Crushed Stone For Subbase

Material Spec. Number & Name: "

Fill in the individual sample value, x, where indicated.
A minimum of three samples are required and if the standard error is ≥1.00 additional samples will be required.

Note: All values are tested and reported in pcf.

Minimum of 3 Samples Required						
	n	w	x	$\bar{x}$	s	se
CURVE 1 OF 810	1	5.3	151.4	------	------	--------
CURVE 2 OF 810	2	5.3	152.8	------	------	--------
CURVE 3 OF 810	3	6.2	153.0	152.4	.87	.50
	4					
	5					
	6					
	7					
	8					
	9					
	10					

n = Number of sample values

w = Optimum Moisture Content

x = Individual sample value

$\bar{x}$ = Sample average

s = Standard deviation

$$s = \sqrt{\frac{1}{n-1}\sum_{i=1}^{n}\left(x_i - \bar{x}\right)^2}$$

se = Standard error

$$se = \frac{s}{\sqrt{n}}$$

Reviewed by: M+W Soils, Randall Rhoades, PE Date: 8-12-15

Vermont Agency of Transportation
Materials & Research Section

DISTRIBUTION
Res. Eng. _____
Others _____

Lab ID: MtW Soils

LAB TO FIELD
STONE CORRECTION

AASHTO T-224

Project Name & Number: HARTFORD IM 091.2 (79)
Material Source: TWIN STATE S+G
Pay Item Number & Name: 704.06A, Dense Graded Crushed Stone for Subbase
Material Spec. Number & Name: CURVE 1 OF 810
Sampled By: R. Pratt, MtW — Sample Date: 8-10-15
Tested By: C. BROWN, R. RHOADES — Date Tested: 8-11-15

Calculate the corrected Optimum Moisture

@ Assumed 2% moisture for material retained on required sieve

A) Optimum Moisture (Example: 4.1% then use 0.041)	.06
B) % of material passing required sieve (Example: 77.0% then use 77.0)	85.1
C) @Assumed % moisture of material retained on required sieve (Example: 2.0% then use 0.020)	.01
D) % of material retained on the required sieve (Example: 23.0% then use 23.0)	14.9
E) (A x B) Opt Moist * percent passing required sieve	5.11
F) (C x D) @Assumed % moisture of retained material * % retained material	.15
G) (E + F) **Corrected Optimum Moisture**	5.26

Calculate the corrected Maximum Dry Density

1) 62.4 (known) x 2.65 (assumed Bulk Sp. Gr.) = 165.36 or (62.4 x actual Bulk Sp Gr)	165.36
2) Maximum Dry Density (Example: 145.0)	149.2
3) % of material retained on the required sieve (Example: 23.0% then use 23.0)	14.9
4) % of material passing required sieve (Example: 77.0% then use 77.0)	85.1
5) (2 x 3) Max Dry Density * % of retained material	2223
6) (1 x 4) Known * % of passing material	14072
7) (2 x 1) x 100 Max Dry Density * known * 100	2467171
8) (5 - 6)	16295
9) (7 / 8) **Corrected Maximum Dry Density**	151.4

Vermont Agency of Transportation
Materials & Research Section

DISTRIBUTION
Res. Eng. _____
Others _____

Lab ID: MtW Soils

LAB TO FIELD
STONE CORRECTION

AASHTO T-224

Project Name & Number: HARTFORD IM 091.2 (79)
Material Source: TWIN STATE S+G
Pay Item Number & Name: 704.06A, Dense Graded Crushed Stone for Subbase
Material Spec. Number & Name: CURVE 2 OF 8 10
Sampled By: R. Pratt, MtW — Sample Date: 8-10-15
Tested By: C. BROWN, R. RHOADES — Date Tested: 8-11-15

Calculate the corrected Optimum Moisture

@ Assumed 2% moisture for material retained on required sieve

A)	Optimum Moisture (Example: 4.1% then use 0.041)	.06
B)	% of material passing required sieve (Example: 77.0% then use 77.0)	85.1
C)	@Assumed % moisture of material retained on required sieve (Example: 2.0% then use 0.020)	.01
D)	% of material retained on the required sieve (Example: 23.0% then use 23.0)	14.9
E)	(A x B) Opt Moist * percent passing required sieve	5.11
F)	(C x D) @Assumed % moisture of retained material * % retained material	.15
G)	(E - F) **Corrected Optimum Moisture**	5.26

Calculate the corrected Maximum Dry Density

1)	62.4 (known) x 2.65 (assumed Bulk Sp. Gr.) = 165.36 or (62.4 x actual Bulk Sp Gr)	165.36
2)	Maximum Dry Density (Example: 145.0)	150.8
3)	% of material retained on the required sieve (Example: 23.0% then use 23.0)	14.9
4)	% of material passing required sieve (Example: 77.0% then use 77.0)	85.1
5)	(2 x 3) Max Dry Density * % of retained material	2247
6)	(1 x 4) Known * % of passing material	14072
7)	(2 x 1) x 100 Max Dry Density * known * 100	2493629
8)	(5 - 6)	16319
9)	(7 / 8) **Corrected Maximum Dry Density**	152.8

Vermont Agency of Transportation
Materials & Research Section

DISTRIBUTION
Res. Eng. _____
Others _____

Lab ID: MtW Soils

LAB TO FIELD
STONE CORRECTION

AASHTO T-224

Project Name & Number: HARTFORD IM 091.2 (79)
Material Source: TWIN STATE S+G
Pay Item Number & Name: 704.06A, Dense Graded Crushed Stone for Subbase
Material Spec. Number & Name: SAMPLE CURVE 3 OF 8 10
Sampled By: R. Pratt, MtW
Sample Date: 8-10-15
Tested By: C. BROWN, R. RHOADES
Date Tested: 8-11-15

Calculate the corrected Optimum Moisture

@ Assumed 2% moisture for material retained on required sieve

A) Optimum Moisture (Example: 4.1% then use 0.041)	.071
B) % of material passing required sieve (Example: 77.0% then use 77.0)	85.1
C) @Assumed % moisture of material retained on required sieve (Example: 2.0% then use 0.020)	.01
D) % of material retained on the required sieve (Example: 23.0% then use 23.0)	14.9
E) (A x B) Opt Moist * percent passing required sieve	6.04
F) (C x D) @Assumed % moisture of retained material * % retained material	.15
G) (E - F) **Corrected Optimum Moisture**	6.19

Calculate the corrected Maximum Dry Density

1) 62.4 (known) x 2.65 (assumed Bulk Sp. Gr.) = 165.36 or (62.4 x actual Bulk Sp Gr)	165.36
2) Maximum Dry Density (Example: 145.0)	151.0
3) % of material retained on the required sieve (Example: 23.0% then use 23.0)	14.9
4) % of material passing required sieve (Example: 77.0% then use 77.0)	85.1
5) (2 x 3) Max Dry Density * % of retained material	2250
6) (1 x 4) Known * % of passing material	14072
7) (2 x 1) x 100 Max Dry Density * known * 100	2496936
8) (5 - 6)	16322
9) (7 / 8) **Corrected Maximum Dry Density**	153.0