



*Letter of Transmittal*

To: CHRIS WILLIAMS  
VERMONT AGENCY OF TRANSPORTATI  
61 VALLEY VIEW  
MENDON, VT 05701  
Ph: (802)786-3812 Fax: (802)786-3810

Transmittal #: 8  
Date: 3/20/2015  
Job: M117 VTRANS CASTLETON BRF 015-2(10)

Subject: Submittal

- WE ARE SENDING YOU**
- Attached
  - Shop drawings
  - Copy of letter
  - Prints
  - Change order
  - Under separate cover via the following items:
  - Plans
  - Specifications
  - Samples
  - Submittal

Document Type	Copies	Date	No.	Description
Submittal	1		900.608-8 Rev 0	HPC Rapid Set

**THESE ARE TRANSMITTED as checked below:**

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

Remarks: PLease see attached HPC Rapid Set submittal from our supplier Carrara

Copy To: KEVIN TURE (W.M. SCHULTZ CONSTRUCTION)

From: MIKE GARN (W.M. SCHULTZ CONSTRUCTION)

Signature: 



PO Box 2620  
Ballston Spa, NY 12020  
Ph : 518 885-0060

**Submittal**

**Job:** M117  
VTRANS CASTLETON BRF 015-2(10)  
Castleton BRF 015-2  
Route 30  
Castleton, VT

**Spec Section No:** 900.608  
**Submittal No:** 8  
**Revision No:** 0  
**Sent Date:**

**Spec Section Title:**  
**Submittal Title:** HPC Rapid Set

**Contractor:**  
W.M. Schultz Construction, Inc

Contractor's Stamp

**SCHULTZ CONSTRUCTION, INC.**

CONTRACT NO. BRF 015-2(10)

SUBMITTAL TITLE HPC Rapid Set

ITEM & SECT. NO. 900.608

LOCATION OF WORK VT RT 30

SUB NO. 8 DATE 3/20/15

REVIEWED BY MG

VTRANS  
Chris Williams

Architect's Stamp

Engineer's Stamp

STATE OF VERMONT  
AGENCY OF TRANSPORTATION  
MATERIAL AND RESEARCH SECTION - STRUCTURAL CONCRETE UNIT

STRUCTURAL CONCRETE MIX DESIGN SUBMISSION

Concrete class: HPC RS  
 Additional Description: With Fly Ash  
 Ready Mix Supplier: CARRARA, JP & SONS INC - E MIDDLEBURY, VT  
 Designed By: Benjamin Cota  
 Design strength: 7000 PSI  
 Mix Design Style: Conventional  
 Agg weight - SSD or Dry: SSD

Agency Use Only	
Mix ID	HP00-RS-0
Mix Design #	
Approved by	
Approved Date	
Spec Book Year	2011

Mix designs are valid for a 12 month period from date of approval or unless there is a change in material, material property or design parameter.

<b>Cement:</b>		Specific Gravity	_____	_____ lb/cy	_____ cf
701.02	Source: _____ Brand Name: _____				
<b>Cement Type III:</b>		Specific Gravity	<u>3.103</u>	<u>600</u> lb/cy	<u>3.10</u> cf
701.04	Source: <u>LAFARGE CANADA - ST CONSTANT, QUEBEC</u> Brand Name: _____				
<b>Blended Cement:</b>		Specific Gravity	_____	_____ lb/cy	_____ cf
701.06	Source: _____ Brand Name: _____				
<b>Cement with Slag:</b>		Specific Gravity	_____	_____ lb/cy	_____ cf
701.07	Source: _____ Brand Name: _____				
<b>Pozzolan:</b>		Specific Gravity	_____	_____ lb/cy	_____ cf
725.03(a)	Source: _____ Brand Name: _____				
<b>Fly Ash:</b>		Specific Gravity	<u>2.350</u>	<u>150</u> lb/cy	<u>1.02</u> cf
725.03(a)	Source: <u>Headwaters Resources - Brayton Point, MA</u> Brand Name: _____				
<b>Silica Fume:</b>		Specific Gravity	_____	_____ lb/cy	_____ cf
725.03(b)	Source: _____ Brand Name: _____				
<b>Slag:</b>		Specific Gravity	_____	_____ lb/cy	_____ cf
725.03(c)	Source: _____ Brand Name: _____				
<b>Water</b>			<u>26.2</u> gals	<u>218.6</u> lb/cy	<u>3.50</u> cf
<b>Air Content Target</b>			<u>7.0</u> %		<u>1.89</u> cf
<b>Coarse Aggregate 3/8"</b>	Absorption _____	Specific Gravity	_____	_____ lb/cy	_____ cf
704.02A	Source: _____				
<b>Coarse Aggregate 3/4"</b>	Absorption <u>1.24</u>	Specific Gravity	<u>2.580</u>	<u>1460</u> lb/cy	<u>9.07</u> cf
704.02B	Source: <u>CARRARA JP - E MIDDLEBURY, VT</u>				
<b>Coarse Aggregate 1 1/2"</b>	Absorption _____	Specific Gravity	_____	_____ lb/cy	_____ cf
704.02C	Source: _____				
<b>Fine Aggregate:</b>	Absorption <u>0.98</u>	Specific Gravity	<u>2.613</u>	<u>1340</u> lb/cy	<u>8.22</u> cf
704.01	Source: <u>CARRARA JP - E MIDDLEBURY, VT</u> Fineness Modulus <u>2.90</u>				
<b>Air Entrainment Admixture</b>		Specific Gravity	<u>1.000</u>	<u>32</u> oz/cy	
725.02(b)	Source: <u>W.R. GRACE &amp; CO. - CAMBRIDGE, MA</u> Brand Name: <u>DAREX II</u>				
<b>Retarder Admixture:</b>		Specific Gravity	<u>1.000</u>	<u>0-4</u> oz/cwt	
725.02(c)	Source: <u>W.R. GRACE &amp; CO. - CAMBRIDGE, MA</u> Brand Name: <u>Daratard 17</u>				
<b>High Range Water Reducer Admixture:</b>		Specific Gravity	<u>1.000</u>	<u>14</u> oz/cwt	
725.02(h)	Source: <u>W.R. GRACE &amp; CO. - CAMBRIDGE, MA</u> Brand Name: <u>ADVA 405</u>				
<b>Other Admixtures:</b>					
<b>Specific performance admixture</b>		Specific Gravity	<u>1.000</u>	<u>1.5</u> gal/cy	<u>0.20</u> cf
725.02(i)	Source: <u>W.R. GRACE &amp; CO. - CAMBRIDGE, MA</u> Brand Name: <u>ECLIPSE 4500</u>				
	Source: _____ Brand Name: _____	Specific Gravity	_____	_____	_____ cf
	Source: _____ Brand Name: _____	Specific Gravity	_____	_____	_____ cf
	Source: _____ Brand Name: _____	Specific Gravity	_____	_____	_____ cf
		<b>TOTAL</b>	<u>44.743</u>	<u>3781</u> lb	<u>27.00</u> cf

Maximum Water/Cementitious Ratio 0.36  
 Maximum Water (gal/cy) 32.4  
 Slump Min/Max (inch) 6.0 min 10.0 max  
 Air Content Min/Max (%) 5.5 min 8.5 max  
 Design Unit Wt. (lb/cf) 140.04

Notes:

100% OF THE ECLIPSE 4500 (SHRINKAGE REDUCING ADMIXTURE) SHALL BE ACCOUNTED FOR AS MIX WATER; THE MAXIMUM WATER IS 30.9 GAL/CY WITH THIS INCLUSION.



**Grace Analytical**  
**Cambridge Center**

W R Grace & Co.-Conn.  
62 Whittemore Ave.  
Cambridge, MA 02140-1692

Tel (617) 498-4899  
Fax (617) 498-4360

NVLAP Lab Code 200258-0

**CONFIDENTIAL**

**Rapid Chloride Permeability**

J. P. Carrera, Middlebury, VT

13-0105

5/21/2013

ecc: Bill Brooks  
Terry Harris  
Terry Roberie  
Ted Sibbick  
Stephen Garrity  
Tim Durning

# CONFIDENTIAL

## Rapid Chloride Permeability

J. P. Carrera, Middlebury, VT

13-0105

5/21/2013

### Background Information/Problem Details

Customer is looking to get mix a design approved for VT DOT production. It is for High Early closure mix. The cylinders were cast on February 19<sup>th</sup> 2013. It was requested that the samples be tested for Rapid Chloride Permeability at 56 days of age on April 16<sup>th</sup> 2013. Shrinkage measurements were also required.

### Scope of this Project

Run Shrinkage testing on three beams and Rapid Chloride Permeability testing on three cylinders at 56 days of age.

### Mix Proportions

The samples received reportedly had the following mix design proportions:

Component	No Mix I.D
Cement: Lafarge Type III	600
Fly Ash: Brayton Pt	150
Total Cementious:	750
Coarse Aggregate: 3/4" Stone	1460
Fine Aggregate: Sand	1340
<i>Admixtures:</i>	
ADVA 405	20 oz/cwt (added manually)
Eclipse 4500	1.25 gal/yd <sup>3</sup> (added manually)
Darex II	8 oz/yd <sup>3</sup>
Water: Plant Water	250
w/c Ratio	0.33
Designed Air:	7%

Components are given as pcy, unless otherwise stated.

### Sample Description

Three cylinders were submitted for ASTM C1202 testing. It was requested that the cylinders be tested at 56 days of age. One 2" x 4" slices was cut from each of the cylinders and tested for Chloride Permeability at 56 days of age.

Six 3" x 3" x 11" beams were also submitted for ASTM C157 Length change of Hardened Concrete. Of the three beams originally submitted, two of them (sample 1, & 3) were not able to be read due to the pins not being properly spaced. Three additional beams were later submitted and one of those (sample 9) also could not be read due to pin spacing.

<u>Sample #</u>	<u>Identification</u>	<u>Tests Performed</u>
13-0105-2	3" x 3" x 11" beam No I.D.	Length Change
13-0105-4	4" x 8" cylinder labeled No I.D "d"	Rapid Chloride Permeability
13-0105-5	4" x 8" cylinder labeled No I.D "e"	Rapid Chloride Permeability
13-0105-6	4" x 8" cylinder labeled No I.D "f"	Rapid Chloride Permeability
13-0105-7	3" x 3" x 11" beam No I.D.	Length Change
13-0105-8	3" x 3" x 11" beam No I.D.	Length Change

**Results**

**Rapid Chloride Permeability AASHTO T277 / ASTM C1202**

Sample ID	Date Cast	Date Tested	Sample Age	Coulombs
13-0105-4 "d"	2/19/2013	4/16/2013	56 Days	1194
13-0105-5 "e"	2/19/2013	4/16/2013	56 Days	802
13-0105-6 "f"	2/19/2013	4/16/2013	56 Days	906

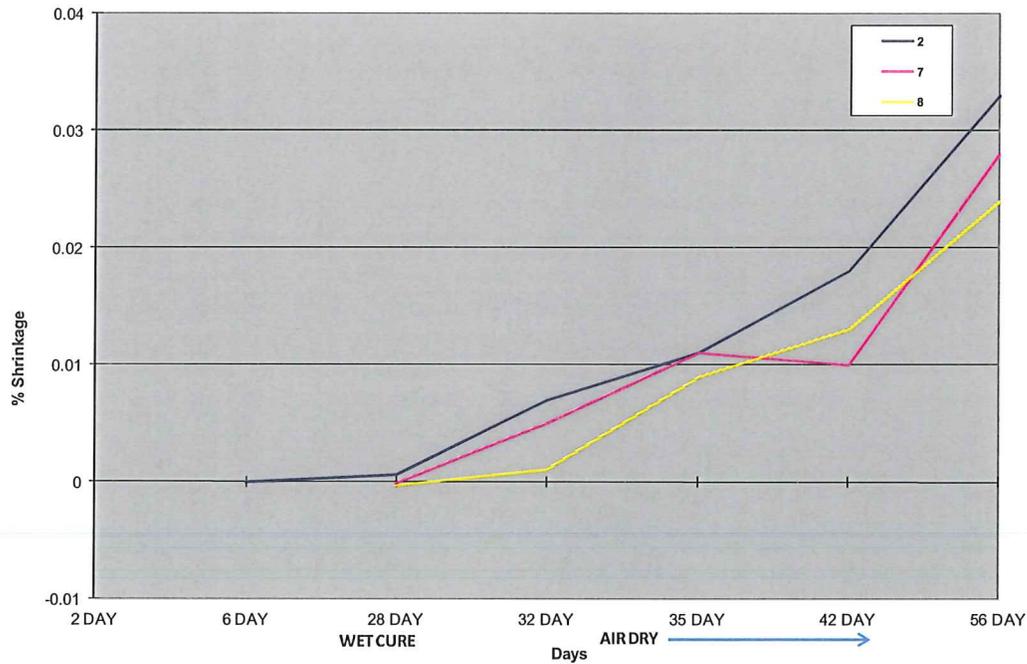
**Rapid Chloride Permeability AASHTO T277 / ASTM C1202  
Result Interpretation Table**

Charge Passed Coulombs	Chloride Permeability
> 4000	High
2000 - 4000	Moderate
1000 - 2000	Low
100 - 1000	Very Low
< 100	Negligible

### Shrinkage Testing

ASTM C157 Length Change of Hardened Concrete states that the testing should begin  $24 \pm \frac{1}{2}$  hour from the addition of water to cement during the mixing operation. Samples were tested as soon as they were received. Sample 2 testing began 6 days after the concrete was made. Samples 7 and 8 testing began 2 days after the concrete was made.

batch # 13-0105



Sample #	Initial Reading Wet Cure		Wet Cure		Air Dry Cure		Air Dry Cure	
	2 Day	6 Day	28 Day	% Change	32 Day	% Change	35 Day	% Change
2	-	-0.0394	-0.0400	0.006	-0.0401	0.007	-0.0405	0.011
7	-0.0974	-	-0.0973	-0.001	-0.0979	0.005	-0.0985	0.011
8	-0.0702	-	-0.0699	-0.003	-0.0703	0.001	-0.0711	0.009

Sample #	Air Dry		Air Dry	
	42 Day	% Change	56 Day	% Change
2	-0.0412	0.018	-0.0427	0.033
7	-0.0984	0.010	-0.1002	0.028
8	-0.0715	0.013	-0.0726	0.024

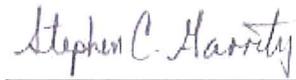
**Acknowledgements**

ASTM C-1202 done by: Z. Alhussaini

ASTM C-157 done by: S. Garrity

**Reviewed By**

Ted Sibbick – Senior Petrographer



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Stephen C. Garrity  
Grace Analytical  
Cambridge Center

<b>2012</b>		RMS 905 AASHTO T303 (Modified)	DATE RECEIVED:	LAB NUMBER:
			CEMENT	FLY ASH

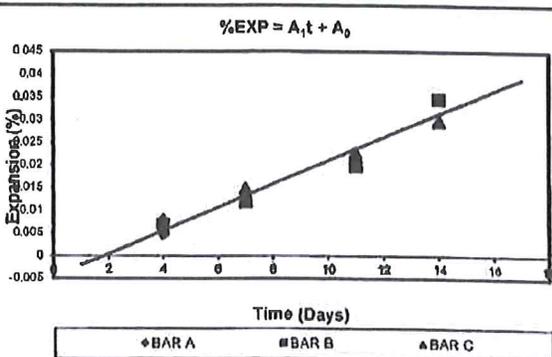
80.0%	20.0%	0.0%	0.0%
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**PLANT, LABORATORY, AGGREGATE, AND MITIGATION SOURCES**

Plant:	J. P. CARRARA & SONS	Location:	MIDDLEBURY, VT		
Laboratory:	ATC ASSOCIATES	Location:	AVON, MA		
Aggregate:	J. P. CARRARA & SONS	Location:	MIDDLEBURY, VT	Type:	FINE
Cement:	LAFARGE	Location:	ST. CONSTANT, QC, CA	Type:	III
Fly Ash:	HEADWATERS RESOURCES	Location:	SOMERSET, MA	Type:	F
Slag:		Location:		Type:	
Silica Fume:		Location:			
Identification No.:		Year used:	2012		
Date Sampled:	5/14/2012	Sampler:	CONTRACTOR		

EXPANSION LENGTHS					% EXPANSION RESULTS				
TIME (Days)	MORTAR BAR (UNIT OF LENGTH)				TIME (Days)	MORTAR BAR (%)			
	A	B	C	G		A	B	C	AVERAGE
2	0.0916	0.1002	0.0925	10	0				
6	0.0921	0.1009	0.0933		4	0.005	0.007	0.008	0.01
9	0.0928	0.1014	0.0940		7	0.012	0.012	0.015	0.01
13	0.0938	0.1022	0.0948		11	0.022	0.020	0.023	0.02
16	0.0951	0.1037	0.0955		14	0.035	0.035	0.030	0.03

**REGRESSION ANALYSIS**

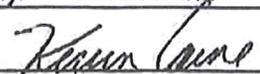
TIME (Days)	EXP. (%)	BEST FIT (%)	SSE	SST	$A_1 = 0.0025733$ $A_0 = -0.004668$ $R^2 = 0.95$		
4	0.005	0.006	4.494E-07	0.0001832			
4	0.007	0.006	1.705E-06	0.0001337			
4	0.008	0.006	5.298E-06	0.0001116			
7	0.012	0.013	2.113E-06	4.357E-05			
7	0.012	0.013	2.143E-06	4.37E-05			
7	0.015	0.013	2.303E-06	1.317E-05			
11	0.022	0.024	3.377E-06	1.095E-05			
11	0.020	0.024	1.472E-05	1.716E-06			
11	0.023	0.024	7.206E-07	1.847E-05			
14	0.035	0.031	1.105E-05	0.0002621			
14	0.035	0.031	1.086E-05	0.0002612			
14	0.030	0.031	2.666E-06	0.0001262			

**RESULTS**

**PASS**

Note: Pass/Fail determination is based on MassDOT's expansion criteria of 0.08% maximum expansion for metamorphic aggregate or 0.10% maximum expansion for all other aggregates. A "12 Point Linear Regression" of 4, 7, 11, and 14 days is used to determine reliability of results and to develop %Expansion =  $A_1t + A_0$  plot. Repeat AASHTO T303 (Modified) if  $r^2$  value is less than 0.95.

Comments:

Tested by: ANTONIO RODRIGUES	Reviewed by: KEVIN CAINE
Signature: 	Signature: 
Date: 6/11/2012	Date:

<b>2012</b>		RMS 905 AASHTO T303 (Modified)	DATE RECEIVED:	LAB NUMBER:
		CEMENT	FLY ASH	SLAG

80.0%	20.0%	0.0%	0.0%
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**PLANT, LABORATORY, AGGREGATE, AND MITIGATION SOURCES**

Plant:	J. P. CARRARA & SONS	Location:	MIDDLEBURY, VT		
Laboratory:	ATC ASSOCIATES	Location:	AVON, MA		
Aggregate:	J. P. CARRARA & SONS	Location:	MIDDLEBURY, VT	Type:	COARSE
Cement:	LAFARGE	Location:	ST. CONSTANT, QC, CA	Type:	III
Fly Ash:	HEADWATERS RESOURCES	Location:	SOMERSET, MA	Type:	F
Slag:		Location:		Type:	
Silica Fume:		Location:			
Identification No.:		Year used:	2012		
Date Sampled:	5/14/2012	Sampler:	Contractor		

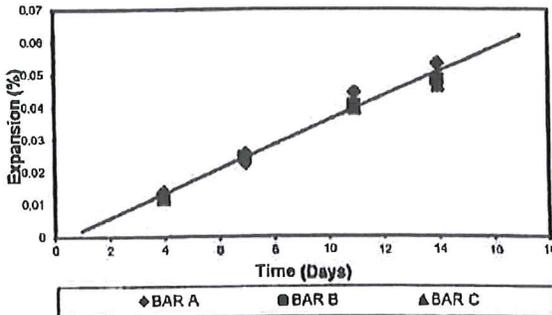
EXPANSION LENGTHS					% EXPANSION RESULTS				
TIME (Days)	MORTAR BAR (UNIT OF LENGTH)				TIME (Days)	MORTAR BAR (%)			
	A	B	C	G		A	B	C	AVERAGE
2	0.0975	0.0923	0.0768	10	0				
6	0.0989	0.0935	0.0781		4	0.014	0.012	0.013	0.01
9	0.0998	0.0948	0.0794		7	0.023	0.025	0.026	0.02
13	0.1020	0.0964	0.0808		11	0.045	0.041	0.040	0.04
16	0.1029	0.0972	0.0815		14	0.053	0.049	0.047	0.05

**REGRESSION ANALYSIS**

TIME (Days)	EXP. (%)	BEST FIT (%)	SSE	SST
4	0.014	0.013	2.531E-07	0.0003336
4	0.012	0.013	2.165E-06	0.0004097
4	0.013	0.013	2.123E-07	0.0003698
7	0.023	0.025	3.404E-06	8.747E-05
7	0.025	0.025	2.203E-08	5.416E-05
7	0.026	0.025	1.39E-06	4.005E-05
11	0.045	0.040	2.428E-05	0.0001546
11	0.041	0.040	9.744E-07	7.216E-05
11	0.040	0.040	3.277E-09	5.723E-05
14	0.053	0.051	6.654E-06	0.0004557
14	0.049	0.051	5.51E-06	0.0002697
14	0.047	0.051	1.812E-05	0.0002106

$A_1 = 0.0037537$      $A_0 = -0.001653$      $R^2 = 0.97$

$\%EXP = A_1t + A_0$



**RESULTS**

**PASS**

Note: Pass/Fail determination is based on MassDOT's expansion criteria of 0.08% maximum expansion for metamorphic aggregate or 0.10% maximum expansion for all other aggregates. A "12 Point Linear Regression" of 4, 7, 11, and 14 days is used to determine reliability of results and to develop %Expansion =  $A_1t + A_0$  plot. Repeat AASHTO T303 (Modified) if  $r^2$  value is less than 0.95.

**Comments:**

Tested by: Antonio Rodrigues	Reviewed by: Kevin Caine
Signature: 	Signature: 
Date: 5/18/2012	Date:

February 19, 2015

Report No. 25.30620.001-2

Mr. Ben Cota  
JP Carrara & Sons  
2464 Case Street  
Middlebury, VT 05753

Re: Aggregate Test Results

Gentlemen:

The following are test results of samples of aggregate as delivered to this laboratory on January 23, 2015.

1. Sample Description

<u>Sample No.</u>	<u>Description</u>	<u>Source</u>
C-36a	3/4" Stone	JP Carrara Middlebury, VT
C-36b	Concrete Sand	JP Carrara Middlebury, VT

2. Washed Sieve Analysis (% passing by weight)

<u>Sieve Size (mm)</u>	<u>C-36a</u>	<u>C-36b</u>
3/4" (19.0)	100	
1/2 (12.5)	64	
3/8 (9.5)	37	100
#4 (4.75)	2	95
8 (2.36)	1	84
16 (1.18)	1	70
30 (.600)		49
50 (.300)		22
100 (.150)		8
200 (.075)	0.6	2.5
Fineness Modulus		2.73

3. Specific Gravity & Absorption (AASHTO T84, AASHTO T88)

<u>Test</u>	<u>C-33a</u>	<u>C-33b</u>
Specific Gravity	2.580	2.613
Absorption (%)	1.24	0.98

Should you have any questions or require additional information, please do not hesitate to call.

Sincerely,



Kevin Caine  
Laboratory Manager

KC/sjm

**WR Grace Company**

W. R. Grace & Co.-Conn.  
62 Whittemore Avenue  
Cambridge, MA 02140

T 617-498-4555  
F 617-234-7576  
E Denise.I.white@grace.com  
W www.graceconstruction.com

April 6, 2011

J P Carrara & Sons  
2464 Case Street, Rte. 116  
Middlebury, Vermont 05753

Project Name: All

This is to certify that DAREX® II AEA, an air-entraining admixture, as manufactured and supplied by Grace Construction Products, W. R. Grace & Co.-Conn., is formulated to comply with the Standard Specification for Air-Entraining Admixtures for Concrete, ASTM C 260 (AASHTO M 154).

DAREX II AEA does not contain calcium chloride or chloride containing compounds as a functional ingredient. Chloride ions may be present in trace amounts contributed from the process water used in the manufacturing.

**GRACE**



Denise White  
Technical Service Support

**WR Grace Company**

W. R. Grace & Co.-Conn.  
62 Whittemore Avenue  
Cambridge, MA 02140

T 617-498-4555  
F 617-234-7576  
E Denise.i.white@grace.com  
W www.graceconstruction.com

April 6, 2011

J P Carrara & Sons  
2464 Case Street, Rte. 116  
Middlebury, Vermont 05753

Project Name: All

This is to certify that DARATARD® 17, a Water-Reducing and Retarding, as manufactured and supplied by Grace Construction Products, W. R. Grace & Co.-Conn., is formulated to comply with the Standard Specification for Chemical Admixtures for Concrete, ASTM C 494, Type D (AASHTO M 194, Type D).

DARATARD 17 does not contain calcium chloride or chloride containing compounds as a functional ingredient. Chloride ions may be present in trace amounts contributed from the process water used in the manufacturing.

**GRACE**



Denise White  
Technical Service Support

Grace Construction Products

W.R. Grace & Co. - Conn.  
62 Widdowson Avenue  
Canbridge, MA 02149-1592

1 617-375-1100  
www.graceconstruction.com

5/13/2013

Chuck French  
JP Carrara & Sons, Inc.  
2464 Case St  
Middlebury, Vermont 05753

Project Name: VT HES 701.04 - Hancock  
Product Selected: Eclipse® 4500

GRACE

This is to certify that the Eclipse 4500, a Shrinkage Reducing Admixture, as manufactured and supplied by Grace Construction Products, W.R. Grace & Co. - Conn., is formulated to comply with the Specifications for Chemical Admixtures for Concrete, ASTM: C494, Type S Specific Performance.

Eclipse 4500 does not contain calcium chloride containing compounds as functional ingredients and is essentially chloride free.

The foregoing is in addition to and not in substitution for our standard Conditions of Sale attached.



G. Terry Harris  
Technical Services Manager

Grace Construction Products

W.R. Grace & Co. - Conn.  
62 Wall Street Avenue  
Cambridge, MA 02142-1632

1 877-876-1409  
www.graceconstruction.com

5/13/2013

Chuck French  
JP Carrara & Sons, Inc.  
2464 Case St  
Middlebury, Vermont 05753

Project Name: VT HES 701.04 – Hancock  
Product Selected: ADVA® 405

GRACE

This is to certify that the ADVA 405, a High Range Water Reducer, as manufactured and supplied by Grace Construction Products, W.R. Grace & Co., – Conn., is formulated to comply with the Specifications for Chemical Admixtures for Concrete, ASTM: C494, Type A, F, AASHTO: M194, Type A, F and complies with the Specification for Chemical Admixtures for Use in Producing Flowing Concrete, ASTM C 1017.

ADVA 405 does not contain calcium chloride or chloride containing compounds as a functional ingredient. Chloride ions may be present in trace amounts contributed from the process water used in manufacturing.

The foregoing is in addition to and not in substitution for our standard Conditions of Sale attached



G. Terry Harris  
Technical Services Manager