High Early

PRECAST / READY-MIX CONCRETE

J. P. CARRARA & SONS, INC

CONCRETE CONTRACTORS

ARCHITECTURAL / STRUCTURAL PRECAST CONTRACTORS

2464 Case Street
MIDDLEBURY, VT 05753
TEL (802) 388-6363
FAX (802) 388-9010

CROWN POINT, NY 12928
TEL (518) 597-3680

RT 7 SO.
NO. CLARENDON, VT 05701
TEL (802) 775-2301
FAX (802) 775-1048

CONCRETE MIX DESIGN

DATE :	March 4, 2014					
PROJECT :	Rochester sub-footer			STATE:	VT	
ENGINEER :	VAOT					
CONTRACTOR :	Schultz Construction, Inc.					
CONCRETE SUPPLIER :	J.P. Carrara & Sons, Inc., Middlebury, VT					$G_{s,\ SSD}$
CEMENT SOURCE & TYPE :	Lafarge Type III					3.12
FLY ASH SOURCE & CLASS:	Headwaters Resources - Class F - Brayton Point					2.33
COARSE AGGREGATE(1):	J.P. Carrara & Sons, Inc., Middlebury, VT	P-stone (3/4")		ABS =	0.99%	2.585
FINE AGGREGATE :	J.P. Carrara & Sons, Inc., Middlebury, VT	JPC sand		ABS =	1.04%	2.594
AIR ENTRAINING AGENT :	W.R. Grace Darex II					
RETARDING AGENT :	W.R. Grace Daratard					
MID-RANGE WATER REDUCER:	W.R. Grace Adva 405					
HIGH-RANGE WATER REDUCER:	W.R. Grace Adva 405		Extended Slump Life WR			
SELF-CONSOLIDATING ADMIX:	W.R. Grace Adva 405					

QUANTITIES PER CUBIC YARD

Identification # : VT701.04

Mix Description : 2500psi @ 12hrs

								Yield
SPECIFICATIONS REQUIREMENT,	28	Day Strength (psi)	3,500	750 # Total Cementious (CM)				
Lafarge Type III		(lbs)	600					3.08
Fly Ash, Class F		(lbs)	150	20% by weight of CM				1.03
P-stone (3/4")		(lbs)(SSD)	1460	52% by weight of total agg.				9.05
JPC sand		(lbs)(SSD)	1340	48% by weight of total agg.				8.28
WATER (gallons) : (Maximum Water =	36.0	Gal.)	32.5					4.34
W/C RATIO (lbs/lb) : (Max W/C =	0.40	)	0.36					
W.R. Grace Darex II	(2-30 range)	(oz/yd^3)	30.0	7.0%	+ / --	1.5%		1.49
W.R. Grace Daratard	(0-6 range)	(oz/cwt)	0.0					
W.R. Grace Adva 405	(6-12 range)	(oz/cwt)	8.0	4"	slump	+ / --	2"	
W.R. Grace Adva 405	(12-18 range)	(oz/cwt)	15.0	8"	slump	+ / --	2"	
W.R. Grace Adva 405	(18-24 range)	(oz/cwt)	21.0	24"	spread	+ / --	4"	
								27.3

Mix Properties: Mix Density (#/ft^3) 140.1

Prepared By: Benjamin L. Cota, Precast Production Engineer

LAFARGE CEMENT

Cement Mill Test Report

Month of Issue: February 2014

Plant:	St-Constant, Quebec
Product:	Portland Cement Type III
Silo:	1 and 11
Manufactured:	January 2013

ASTM C 150-11 and AASHTO M 85-09 Standard Requirements

CHEMICAL REQUIREMENTS

	Spec limit	Test Result
Rapid Method, X-Ray *(C 114)*		
SIO2 (%)	—	19.3
Al2O3 (%)	—	4.9
Fe2O3 (%)	—	2.4
CaO (%)	—	61.7
MgO (%)	6.0 max	2.9
SO3 (%)	4.5 max	4.3
Insoluble residue (%)	0.75 max	0.60
Loss on ignition @ 950°C (%)	3.0 max	2.4
CO2 (%)	—	1.5
CaCO3 in Limestone (%)		86.7
Limestone in cement (%)		3.1
Na2Oeq (%)		0.88
Potential Phase Composition *(C 150)*		
C3S (%)	—	52
C2S (%)	—	15
C3A (%)	15 max	9
C4AF (%)	—	7

PHYSICAL REQUIREMENTS

	Spec limit	Test Result
Air content of mortar (%) *(C 185)*	12 max	6
Blaine Fineness (m2/kg) *(C 204)*	—	559
Retained on a 45 µm sieve (%) *(C 430)*	—	0.5
Autoclave expansion (%) *(C 151)*	0.80 max	0.08
Compressive strength (PSI) *(C 109)*		
1 day	1740 min	4385
3 days	3480 min	5685
28 days	—	7205
Time of setting (minutes)		
Vicat initial *(C 191)*	45 - 375	90
Mortar Bar Expansion (%) (C 1038)*	0.02 max	0.009

* Current Production run not available - most recent provided.

We certify that the above described cement, at the time of shipment, meets the chemical and physical requirements of applicable VTAOT Specifications for Type III CEMENT;

ASTM C 150-12 & AASHTO M 85-12 STANDARD SPECIFICATIONS FOR TYPE III CEMENT;

For additional information on this cement test report, please contact our regional technical representative David Johns at (484) 695-5902.

Certified By:

Pascale Poulin

Pascale Poulin - Quality Coordinator
February 15, 2014

ECAN BU - St-Constant Plant
1 Chemin Lafarge, St-Constant
Phone: 450-632-7750 #218

LAFARGE
NORTH AMERICA

January 1st, 2013

The specific gravity of the Lafarge Type III Portland Cement manufactured at the St-Constant, Quebec, Canada plant is 3.12.

Northeast District
82 Flanders Road, Suite 202
Westborough, MA 01581
Office: (508) 366-9001
Fax: (508) 366-9091

HEADWATERS RESOURCES

ASTM C618 / AASHTO M295 Testing of
Brayton Point Fly Ash

Sample Type: 3200-ton **Report Date:** 2/25/2014

Sample Date: 12/23 - 1/16/14 **MTRF ID:** 166BP

Sample ID:

Chemical Analysis			ASTM / AASHTO Limits Class F	Class C	ASTM Test Method
Silicon Dioxide (SiO2)	59.26	%			
Aluminum Oxide (Al2O3)	27.30	%			
Iron Oxide (Fe2O3)	5.23	%			
Sum of Constituents	91.79	%	70.0% min	50.0% min	D4326
Sulfur Trioxide (SO3)	0.24	%	5.0% max	5.0% max	D4326
Calcium Oxide (CaO)	1.49	%			D4326
Magnesium Oxide (MgO)	1.00	%			
Sodium Oxide (Na2O)	0.79	%			
Potassium Oxide (K2O)	2.61	%			
Moisture	0.04	%	3.0% max	3.0% max	C311
Loss on Ignition	2.17	%	6.0% max 5.0% max	6.0% max 5.0% max	C311 AASHTO M295
Available Alkalies, as Na2O **When required by purchaser**	0.91	%	not required 1.5% max	1.5% max	C311 AASHTO M295
Physical Analysis					
Fineness, % retained on #325	25.72	%	34% max	34% max	C311, C430
Strength Activity Index - 7 or 28 day requirement					C311, C109
7 day, % of control	78	%	75% min	75% min	
28 day, % of control	84	%	75% min	75% min	
Water Requirement, % control	98	%	105% max	105% max	
Autoclave Soundness	-0.03	%	0.8% max	0.8% max	C311, C151
Density	2.33				C604

The strength activity index is not to be considered a measure of the compressive strength of concrete containing the fly ash.

Headwaters Resources certifies that pursuant to current ASTM C618 protocol for testing, the test data listed herein was generated by applicable ASTM methods and meets the requirements of ASTM C618.

Doug Rhodes, CET
Facility Manager

AAP AASHTO R18

Materials Testing & Research Facility
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Taylorsville, Georgia 30178
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www.headwaters.com

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Shaping the Future

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www.cardno.com

April 23, 2013

Report No. 25.30620.0003-1

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 April 5, 2013.

1. Sample Description

Sample No.	Description	Source
C-161a	3/4" Stone	JP Carrara
C-161b	Concrete Sand	JP Carrara

2. Specific Gravity and Absorption Test Results (ASTM C127, ASTM C128)

Sample No.	Specific Gravity	Absorption (%)
C-161a	2.585	0.99
C-161b	2.594	1.04

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

Sincerely,

Kevin Caine

Kevin Caine
Laboratory Manager

KC/sjm

J.P. CARRARA & SONS, INC.
2464 Case St.
Middlebury, VT 05753
Ph. 388-6363 Fax 388-9010

Fine Aggregate Sieve Analysis

Material Source: **JPC Middlebury Concrete Sand** | *2.94* | **Graph A** | Date: *2/26/2014*

if "other", note source:

Material Quantity: 997.0 grams Min = 500 grams

Evaluation performed by: M.C. B.C.

Sieve Size	Cumulative Wt. Retained (g)	Cumulative % Retained	% Passing	Select Applicable Specification: VAOT % Passing low	high	Consecutive Sieve % Retention	Additional informantion pertinent to material sample: ASTM C 566	
3/8"	0.0	0.0	**100.0**	100	100	0	sample wet weight, W:	**1049.00**
No. 4	49.0	4.9	**95.1**	95	100	4.9	sampe dry weight, D:	997.00
No. 8	222.0	22.3	**77.7**	0	100	22.3	total moisture, p:	5.22%
No. 16	389.0	39.0	**61.0**	50	80	34.1	material absorption:	1.04%
No. 30	552.0	55.4	**44.6**	25	60	33.1	surface moisture:	4.18%
No. 50	767.0	76.9	**23.1**	10	30	37.9		
No. 100	917.0	92.0	**8.0**	2	10	36.6		
No. 200	969.0	97.2	**2.8**	0	100	20.3		
Pan	997.0			FM Range		FM Variance, Base FM = 2.94		
	FM =	**2.90**		2.6	3.1	2.74	3.14	

2012	massDOT Highway	RMS 905 AASHTO T303 (Modified)	DATE RECEIVED:	LAB NUMBER:

CEMENT	FLY ASH	SLAG	SILICA
80.0%	20.0%	0.0%	0.0%

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

TIME (Days)	MORTAR BAR (UNIT OF LENGTH) A	B	C	G
2	0.0916	0.1002	0.0925	
6	0.0921	0.1009	0.0933	
9	0.0928	0.1014	0.0940	10
13	0.0938	0.1022	0.0948	
16	0.0951	0.1037	0.0955	

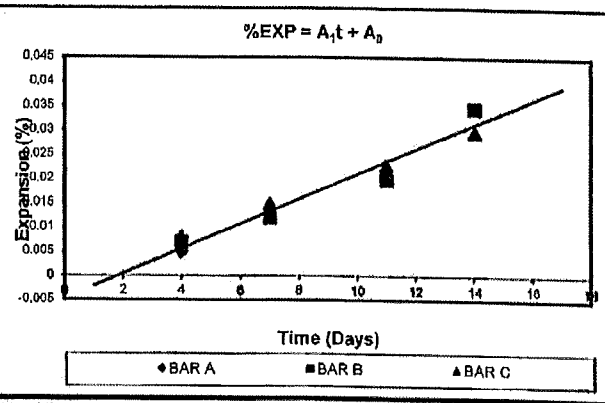
% EXPANSION RESULTS

TIME (Days)	MORTAR BAR (%) A	B	C	AVERAGE
0				
4	0.005	0.007	0.008	0.01
7	0.012	0.012	0.015	0.01
11	0.022	0.020	0.023	0.02
14	0.035	0.035	0.030	**0.03**

REGRESSION ANALYSIS

TIME (Days)	EXP. (%)	BEST FIT (%)	SSE	SST
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

A_1 = 0.0025733 A_0 = -0.004668 R^2 = 0.95



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 = $A_1 t + A_0$ 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:

J.P. CARRARA & SONS, INC.
2464 Case St.
Middlebury, VT 05753
Ph. 388-6363 Fax 388-9010

Coarse Aggregate Sieve Analysis

Material Source: **JPC Middlebury P - Stone (3/4)** | *3/4* | **Graph A** | Date: *2/26/2014*

if "other", note source:

Material Quantity: **12.03** Lbs; minimum: **11.0**

Select Applicable Specification: **VAOT**

Select Size Designation **19.0mm (3/4")**

Material evaluation performed by: M.C. B.C.

Sieve Size	Cumulative Wt. Retained (#)	Cumulative % Retained	**% Passing**	% Passing low	% Passing high
2"	0.00	0.0	**100.0**	100	100
1-1/2"	0.00	0.0	**100.0**	100	100
1"	0.00	0.0	**100.0**	100	100
3/4"	1.13	9.4	**90.6**	90	100
1/2"	6.80	56.5	**43.5**	0	100
3/8"	8.90	74.0	**26.0**	20	55
No. 4	11.56	96.1	**3.9**	0	10
No. 8	11.80	98.1	**1.9**	0	5
No. 16	11.82	98.3	**1.7**	0	5
PAN	12.03	100.0	**0.0**	0	5

additional information pertinent to material sample:

ASTM C 566

sample wet weight, W:	12.29
sampe dry weight, D:	12.03
total moisture, p:	2.16%
material absorption:	0.99%
surface moisture:	1.17%

2012	massDOT Highway	RMS 905 AASHTO T303 (Modified)	DATE RECEIVED:	LAB NUMBER:

CEMENT	FLY ASH	SLAG	SILICA
80.0%	20.0%	0.0%	0.0%

PLANT, LABORATORY, AGGREGATE, AND MITIGATION SOURCES

Plant:	J. P. CARRARA & SONS	*Location:*	MIDDLEBURY, VT		
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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

TIME (Days)	MORTAR BAR (UNIT OF LENGTH) A	B	C	G
2	0.0975	0.0923	0.0768	
6	0.0989	0.0935	0.0781	
9	0.0998	0.0948	0.0794	10
13	0.1020	0.0964	0.0808	
16	0.1029	0.0972	0.0815	

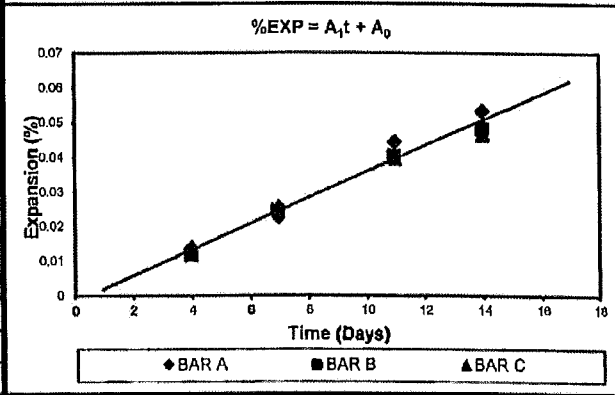
% EXPANSION RESULTS

TIME (Days)	MORTAR BAR (%) A	B	C	AVERAGE
0				
4	0.014	0.012	0.013	0.01
7	0.023	0.025	0.026	0.02
11	0.045	0.041	0.040	0.04
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



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 = $A_1 t + A_0$ 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:* Kevin Caine
Date: 5/16/2012	*Date:*

WR Grace Company

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

T 617-498-4555
F 617-234-7576
E Denise.l.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.l.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

62 Whittemore Avenue
Cambridge, MA 02140-1692

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

CONDITIONS

All orders are accepted and all sales are made subject only to the provisions of the written contract between us under which the order is placed, or if no such contract exists, subject only to the terms on the face hereof and to the following provisions:

1. **Delivery and Freight; Risk of Loss.** Title to and all risk of loss of all goods sold hereunder shall pass to Buyer upon delivery f.o.b. W. R. Grace & Co.'s (Grace) plant to an agent of the Buyer including a common carrier, notwithstanding any prepayment or allowance of freight by Grace. If Grace pays freight Grace shall have the right to select the carrier, routing and means of transportation, provided that Buyer may make an alternate selection and pay Grace's additional costs, if any.

2. **Freight, Weights and Orders.**

(a) Whenever Grace is to pay freight Grace shall have the right initially to designate routing and means of transportation. If Buyer requires a more expensive routing and/or means of transportation Buyer shall reimburse Grace for any extra cost involved. GRACE SHALL NOT BE LIABLE FOR ANY DELAY IN TRANSPORTATION HOWEVER OCCASIONED.

(b) Grace's invoice weights, volumes, sizes and tares shall be treated as prima facie correct except that in case of bulk shipments by carload, tank car or otherwise carriers' weights shall be accepted as conclusive.

(c) Buyer's orders are not binding upon Grace until accepted in writing by an authorized employee at Grace's offices.

3. **Examination, Suitability and Claims.** Buyer shall examine and test each shipment of goods promptly upon delivery to Buyer and before any part of the goods has been changed from its original condition, and Buyer hereby waives all claims for any cause after any part of the goods has been treated, processed or changed in any manner (except for reasonable test quantities). Buyer assumes sole responsibility for determining whether the goods are suitable for their contemplated use (whether or not such use is known to Grace). Buyer waives all claims of which Grace is not notified in writing within thirty (30) days after delivery of the goods or in respect of goods disposed of or returned without Grace's consent.

4. **Warranties, Remedies and Limitations.**

(a) Grace warrants to Buyer that at the time of delivery the goods sold hereunder will conform substantially to the description on the face hereof. Grace's liability and Buyer's remedy under this warranty are limited in Grace's discretion to replacement of goods returned to Grace which are shown to Grace's reasonable satisfaction to have been nonconforming or to refund of the purchase price, or, if not paid, to a credit in the amount of the purchase price. Transportation charges for the return of nonconforming goods to Grace and the risk of loss thereof will be borne by Grace only if returned in accordance with written instructions from Grace.

(b) Grace warrants that the goods will not in and of themselves infringe any patent of the United States or Canada. Grace's liability under this warranty is conditioned upon Buyer's giving prompt written notice of any claim of patent infringement made against Buyer, all information available to Buyer in respect of the claim, and Buyer's granting Grace exclusive control of its settlement and/or litigation. Grace may discontinue without liability deliveries of the goods if in Grace's opinion their manufacture, sale or use would expose it to patent infringement. If the use or resale of the goods is finally enjoined, Grace shall at Grace's option (i) procure for Buyer the right to use or resell the goods previously delivered, (ii) replace such goods with equivalent noninfringing goods, (iii) modify them so they become noninfringing but equivalent, or (iv) refund the purchase price (less a reasonable allowance for use, damage and obsolescence). Grace makes no warranty against patent infringement resulting from the manufacture, use or sale of the goods if made to Buyer's specifications or from use of the goods in combination with other matter or in the operation of any process, and if a claim, suit or action is based thereon Buyer shall defend, indemnify and save harmless Grace therefrom.

(c) Grace warrants to Buyer that it will convey goods sold hereunder. Grace's liability and Buyer's remedy under this warranty are limited to the removal of any title defect or, at the election of Grace, to the replacement of the goods or any part thereof which are defective in title; provided, however, that the rights and remedies of the parties with respect to patent infringement shall be limited to the provisions of paragraph (b) above.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND ARE GIVEN AND ACCEPTED IN LIEU OF ANY AND ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTY OF MERCHANTABILITY AND THE IMPLIED WARRANTY OF FITNESS FOR A PARTICULAR PURPOSE. THE REMEDIES OF BUYER FOR ANY BREACH OF WARRANTY SHALL BE LIMITED TO THOSE PROVIDED HEREIN AND FOR DELAY OR NONDELIVERY WHICH IS NOT EXCUSABLE TO THE PURCHASE PRICE OF THE GOODS IN RESPECT OF WHICH THE DELAY OR NONDELIVERY IS CLAIMED TO THE EXCLUSION OF ANY AND ALL OTHER REMEDIES INCLUDING, WITHOUT LIMITATION, INCIDENTAL OR CONSEQUENTIAL DAMAGES. NO AGREEMENT VARYING OR EXTENDING THE FOREGOING WARRANTIES, REMEDIES OR THIS LIMITATION WILL BE BINDING UPON GRACE UNLESS IN WRITING SIGNED BY DULY AUTHORIZED OFFICER OF GRACE.

5. **Prices, Credit and Payment.**

(a) Buyer shall pay for goods according to the terms of payment as specified on the face hereof or those terms specifically quoted to Buyer in writing. Pro rata payments shall become due as deliveries are made. Prices are subject to change without notice; however, on orders accepted for shipment within thirty (30) days, prices in effect at the time of acceptance will apply unless shipment is delayed beyond thirty (30) days, at which event prices in effect at the time of shipment will apply.

(b) If Buyer shall fail to fulfill the terms of payment, or if Grace at any time shall have any doubt as to Buyer's financial responsibility, Grace without liability to Buyer may decline to make further shipments except against cash or satisfactory security.

(c) If Grace is prevented from revising prices, or from continuing any price thereof in effect by any action of government or by compliance with any request of government, Grace may cancel this contract or any undelivered portion thereof without liability to Buyer upon written notice of such cancellation to Buyer.

6. **Taxes, Duties and Excises.** In the absence of satisfactory evidence of exemption supplied to Grace by Buyer, Buyer shall pay in addition to the price of the goods all taxes, duties, excises or other charges for which Grace may be responsible for collection or payment to any government (national, state, or local) upon, measured by or relating to the importation, exportation, production, or any phase or part of the production, storage, sale, transportation and/or use of the goods identified on the face hereof.

7. **Force Majeure.**

(a) Buyer acknowledges that the goods called for hereunder are to be specially manufactured by Grace to fulfill this contract and delivery dates are based on the assumption that there will be no delay due to causes beyond the reasonable control of Grace.

(b) Grace shall not be charged with any liability for delay or nondelivery when due to delays of suppliers, production problems, acts of God or the public enemy, compliance with any applicable foreign or domestic court order or governmental regulation, order or request whether or not it proves to be invalid, fires, riots, labor disputes, unusually severe weather, or any other cause beyond the reasonable control of Grace. During the period when deliveries are affected by the matters identified in this paragraph, Grace may omit delivery during the period of continuance of such circumstances and the contract quantity shall be reduced by the quantity so omitted, but this contract shall remain otherwise in effect. Grace shall endeavor to allocate any available goods among all buyers including its own divisions, departments and affiliates in such manner as it considers fair.

8. **Assignment and Nonwaiver.**

(a) This contract is not assignable or transferable by Buyer whether voluntary or by operation of law, in whole or in part, without the prior written consent of Grace.

(b) Grace's failure to insist upon strict performance of any provision hereof shall not be deemed to be a waiver of Grace's rights or remedies or a waiver by Grace of any subsequent default by Buyer in the performance of or compliance with any terms hereof.

9. Separate Contract. Each delivery shall stand and may be recovered for as a separate and independent contract. If Buyer fails to fulfill the terms of order, purchase or payment under this or any other contract with Grace, Grace without prejudice to other lawful remedies may at its option defer further shipments hereunder until such default is made good, treat each default as a breach of this entire contract or terminate this contract.

10. **Compliance with Fair Labor Standards Act.** Grace hereby certifies that all goods sold hereunder which are produced or manufactured in the United States of America are produced in compliance with Sections 6, 7 and 12 of the Fair Labor Standards Act of 1938, as amended (29 U.S. Code 201-219), or of any order of the Administrator issued under Section 14 of said Act. All requirements as to the certified contemplated in the October 26, 1949 amendment to the Fair Labor Standards Act of 1938 shall be considered as satisfied by this certification.

11. Royalties, Miscellaneous. The purchase of equipment from Grace confers no license, express or implied, under any patent. When goods identified on the face hereof include goods suitable for use according to Grace's patents, a royalty (amount obtainable upon request) is included in the purchase price. Goods identified on the face hereof may vary according to Grace's established limits, sizes and tolerances in effect at the time of delivery in respect of such goods. ANY ADVICE FURNISHED BUYER CONCERNING THE USE OF THE GOODS SHALL REPRESENT GRACE'S BEST JUDGEMENT IN THE CIRCUMSTANCES BUT IS ACTED UPON AT BUYER'S SOLE RISK.

12. **Entire Contract and Construction.**

(a) The contract between Buyer and Grace in respect of the goods identified on the face hereof consists in its entirety of the terms and conditions appearing on the face and back of this document in lieu of all others, and supersedes all previous communications, representations or agreements, either oral or written, between the parties hereto with respect to the subject matter hereof. No modification shall be effected by the acknowledgement or acceptance of Buyer's purchase order forms or other documents containing terms or conditions different from or in addition to those contained herein.

(b) Acceptance or use by Buyer of any goods delivered hereunder shall be an acceptance of these as the only terms and conditions applying to the purchase and sale of said goods unless other terms and conditions be agreed to in writing signed by both parties specifically referring to this contract.

(c) This contract shall be interpreted in accordance with and the construction thereof shall be governed by the laws of the Commonwealth of Massachusetts. Captions as used in these terms and conditions are for convenience of reference only and shall not be deemed or construed as in any way limiting or extending the languages of the provisions to which such captions may refer.

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Rapid Chloride Permeability

J. P. Carrera, Middlebury, VT

13-0105

4/29/2013

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

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Rapid Chloride Permeability

J. P. Carrera, Middlebury, VT

13-0105

4/29/2013

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 19th 2013. It was requested that the samples be tested for Rapid Chloride Permability at 56 days of age on April 16th 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
Admixtures:	
ADVA 405	20 oz/cwt (added manually)
Eclipse 4500	1.25 gal/yd^3 (added manually)
Darex II	8 oz/yd^3
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.

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Sample #	Identification	Tests Performed
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

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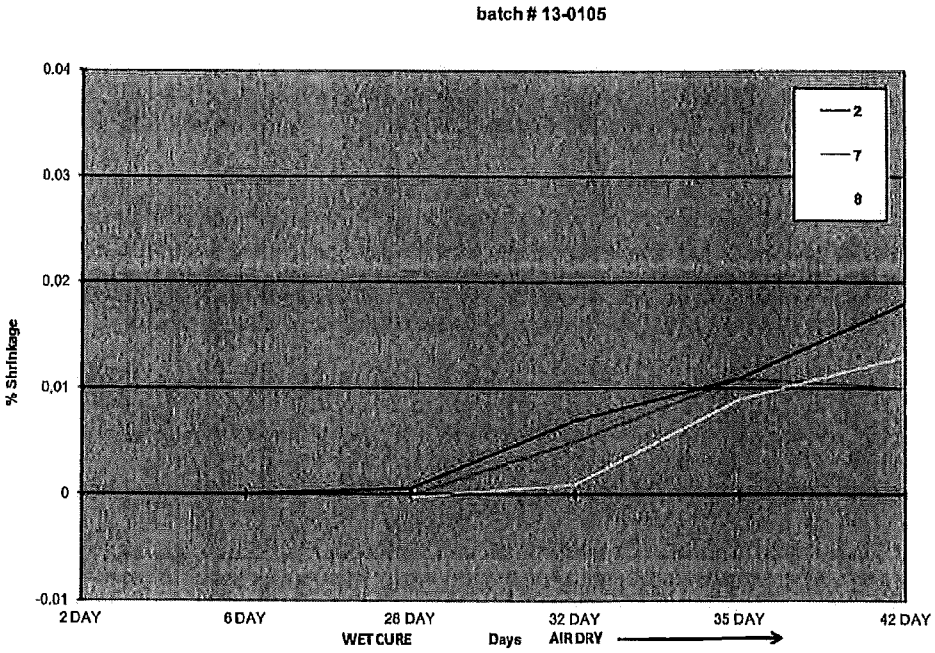
Shrinkage Testing

ASTM C157 Length Change of Hardened Concrete states that the testing should begin 24 ± ½ 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 2 days after the concrete was made. Samples #7 and #8 testing began 6 days after the concrete was made.



	Initial Reading Wet Cure		Wet Cure		Air Dry Cure		Air Dry Cure	
Sample #	2 Day	6 Day	28 Day	% Change	32 Day	% Change	35 Day	% Change
2	-	-0.0394	-0.0400	0.006	-0.0401	0.0007	-0.0405	0.0011
7	-0.0974	-	-0.0973	-0.0001	-0.0979	0.0005	-0.0985	0.0011
8	-0.0702	-	-0.0699	-0.0003	-0.0703	0.0001	-0.0711	0.0009

	Air Dry		Air Dry	
Sample #	42 Day	% Change	56 Day	% Change
2	-0.0412	0.0018	-0.0427	0.0033
7	-0.0984	0.0010	Due 5/6	
8	-0.0715	0.0013	Due 5/6	

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Acknowledgements
ASTM C-1202 done by: Z. Alhussaini
ASTM C-157 done by: S. Garrity

Reviewed By
Ted Sibbick – Senior Petrographer

Stephen C. Garrity

Stephen C. Garrity
Grace Analytical
Cambridge Center

PRECAST / READY-MIX CONCRETE

J. P. CARRARA & SONS, INC

CONCRETE CONTRACTORS

ARCHITECTURAL / STRUCTURAL PRECAST CONTRACTORS

2464 Case Street
MIDDLEBURY, VT 05753
TEL (802) 388-6363
FAX (802) 388-9010

CROWN POINT, NY 12928
TEL (518) 597-3680

RT 7 SO.
NO. CLARENDON, VT 05701
TEL (802) 775-2301
FAX (802) 775-1048

CONCRETE MIX DESIGN - Strength Test Records

Mix Specification: 5000 PSI
28" Max Spread
7.0% +/- 1.5% Air
Max W/C = 0.40

Record No.	28 Day Break	Record No.	28 Day Break
1	8,058	16	
2	7,541	17	
3	7,661	18	
4	8,376	19	
5	6,983	20	
6		21	
7		22	
8		23	
9		24	
10		25	
11		26	
12		27	
13		28	
14		29	
15		30	

Average = 7,724 **PSI**

# of Tests: 5

Std. Dev., S_s (ACI 318 - 5.3.1)	Mod. Factor Table 5.3.1.2	Required Avg Strength (T5.3.2.1) (5-1)	(5-2)	f'_{cr}	Mix Avg	Pass?
530	1.1*f'c + 700	N/A	N/A	6,200	7,724	√

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TEL (802) 775-2301
FAX (802) 775-1048

Ready-Mix Concrete Placement Report

Date Submitted: 6/3/2013

Project Name, Location: Hancock Bridge Closure Pour; Rt 125 Hancock, VT

Contractor/Owner: Parent Construction

Mix ID, Description: VT701.04 - High Performance, High Early Strength

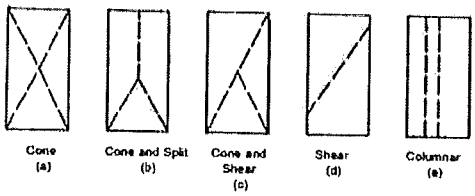

FIG. 2 Sketches of Types of Fracture

Pour Date	Load Sampled	Spread	Air Content	Concrete Temperature	Cylinders Cast	Compressive Strength Results - Avg of (2)			
						24hr	Break Type	28 Day	Break Type
5/30/2013	Single Load, 6.5 yds, M42	26"	5.5%	76°	7	4,755	Cone (a)	7,660	
6/25/2013	Single Load, 8 yds, M57	26"	5.3	77	6	5,272	Cone/split (b)	8,304	
6/26/2013	Single Load, 8 yds, M57	28"	7.1	72	6	4,158	shear (d)	7,190	

Prepared By: _____

Benjamin L. Cota, Production Engineer

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

STRUCTURAL CONCRETE MIX DESIGN SUBMISSION

Agency Use Only	
Mix ID	HP13-RS-020
Mix Design #	020
Approved by	jwild
Approved Date	5/28/2013
Spec Book Year	2013

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: 5000 PSI
Design by dry weight or saturated surface dry: SSD

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.

Cement: 701.02	Source:		Specific Gravity			lb/cy	0.00 cf
	Brand Name:						
Cement Type III: 701.04	Source:	LAFARGE CANADA - ST CONSTANT, QUEBEC	Specific Gravity	3.120	600	lb/cy	3.08 cf
	Brand Name:						
Blended Cement: 701.06	Source:		Specific Gravity			lb/cy	0.00 cf
	Brand Name:						
Cement with Slag: 701.07	Source:		Specific Gravity			lb/cy	0.00 cf
	Brand Name:						
Pozzolan: 725.03(a)	Source:		Specific Gravity			lb/cy	0.00 cf
	Brand Name:						
Fly Ash: 725.03(a)	Source:	HEADWATERS RESOURCES - BRAYTON POINT, MA	Specific Gravity	2.360	150	lb/cy	1.02 cf
	Brand Name:						
Silica Fume: 725.03(b)	Source:		Specific Gravity			lb/cy	0.00 cf
	Brand Name:						
Slag: 725.03(c)	Source:		Specific Gravity			lb/cy	0.00 cf
	Brand Name:						
Water				31 gals	258.7	lb/cy	4.14 cf
Air Content Target				5.5 %			1.485 cf
Coarse Aggregate 3/8" 704.02A	Source:	Absorption	Specific Gravity			lb/cy	0.00 cf
Coarse Aggregate 3/4" 704.02B	Source:	CARRARA JP - E MIDDLEBURY, VT; Absorption 0.99	Specific Gravity	2.585	1460	lb/cy	9.05 cf
Coarse Aggregate 1 1/2" 704.02C	Source:	Absorption	Specific Gravity			lb/cy	0.00 cf
Fine Aggregate: 704.01	Source:	CARRARA JP - E MIDDLEBURY, VT; Absorption 1.04	Specific Gravity	2.594	~~1293~~ 1340 per Carrara lb/cy		8.03 cf
			Fineness Modulus	2.88			
Air Entrainment Admixture 725.02(b)	Source:	Grace	Specific Gravity		10-30	oz/cy	
	Brand Name:	DAREX II					
Retarder Admixture: 725.02(c)	Source:	W.R. GRACE & CO. - CAMBRIDGE, MA	Specific Gravity		0-6	oz/cwt	
	Brand Name:	Daratard 17					
High Range Water Reducer Admixture: 725.02(h)	Source:	Grace	Specific Gravity		18-24	oz/cwt	
	Brand Name:	ADVA 405					
Other Admixtures:	Source:	Grace	Specific Gravity	1.000	1.5	gal/cy	0.20 cf
	Brand Name:	Eclipse 4500					
	Source:		Specific Gravity				0.00 cf
	Brand Name:						
	Source:		Specific Gravity				0.00 cf
	Brand Name:						
			TOTAL	45.039	3780	lb	27.00 cf

Maximum Water/Cementitious Ratio	0.40		
Maximum Water (gal/cy)	35.9		
Slump Min/Max (inch)		min	max
Air Content Min/Max (%)	5.5	min	8.5 max
Design Unit Wt. (lb/cf)	140.01		

Approved by Jason Wild, VAOT Structural Concrete Engineer 5/28/13. Mix has been lab tested at the stated proportions and appears to satisfy the specified criteria for the Vermont ER BRF 0174(16) job

Notes:
Sand is 1340# not 1233# as is calculated here (SCC requires higher sand content than ACI 211 calculates). 100% of the 1.5 gal/cy of shrinkage compensating admix will be accounted for as mix water, thus increasing the target w/c ratio to 0.36 (maximum shall be 0.40). The mix is designed to yield 27.3 cf/cy at a minimum air content.
Per Ben Cota - Carrara