

EVALUATION OF
THE ALBERT S. NADEAU/JOHNSON VT 3/4" CRUSHED GRAVEL
FOR USE IN STRUCTURAL CONCRETE

REPORT 82-6
JULY 1982

REPORTING ON WORK PLAN 82-C-12

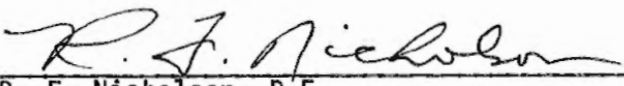
STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

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Date July 16, 1982

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ABSTRACT

As aggregate sources are developed, tests must be conducted to assure that the materials meet specifications and perform satisfactorily when used in concrete mixtures.

This report documents results of tests performed on a proposed new source of coarse aggregate for structural concrete. The material tested was a 3/4 inch crushed gravel produced at the Albert S. Nadeau facilities in Johnson, Vermont.

Results indicate that the material performs satisfactorily.

INTRODUCTION

As new aggregate sources are developed for use in structural concrete, they must be evaluated not only to determine their compliance with materials specifications, but to examine their performance in concrete mixtures. A procedure has been developed whereby proposed new aggregate sources are evaluated by comparing results of tests performed on concrete using the new aggregate, with results obtained from concrete containing a reference aggregate. See Appendix A for evaluation procedures.

A request was received from Carl L. Anderson, President, A. G. Anderson Co., Inc., to evaluate crushed gravel coarse aggregate being produced at the Albert S. Nadeau facility in Johnson, Vermont. Mr. Anderson indicated the coarse aggregate is to be used in structural concrete produced at the A. G. Anderson ready-mix plant in Johnson, Vermont.

Samples of 3/4 inch crushed gravel were obtained by Materials and Research Division representatives and evaluated for compliance with the requirements of Section 704.02 of the Standard Specifications. Materials were obtained and the performance-in-concrete phase of the evaluation was conducted in the Central Laboratory of the Materials and Research Division.

PROCEDURES

PHASE I - SECTION 704.02 TESTS

The 3/4 inch crushed gravel was sampled on June 2, 1982 from a stockpile at the A. G. Anderson ready-mix plant in Johnson. The material was examined for gradation, wear, fractured faces, thin and elongated pieces and soundness. It was found to comply with the Section 704.02 requirements. The reports on Laboratory Nos. G8200083 and A82-0535, which document these tests, are in Appendix B.

PHASE II - PERFORMANCE-IN-CONCRETE TESTS

The performance-in-concrete tests were conducted on concrete prepared in the Central Laboratory. Mixtures were designed by Structural Concrete Subdivision personnel for Class A and Class B concrete, using the following materials:

Coarse Aggregate:

A. Proposed New Aggregate

3/4 inch Crushed Gravel
Albert S. Nadeau, Johnson, Vermont

B. Reference Aggregate

3/4 inch Crushed Igneous Stone
Cooley, Websterville, Vermont

Fine Aggregate:

Albert S. Nadeau, Johnson, Vermont

Cement:

Type II
Northeast Cement Co., Inc., St. Constant, Que.

Air Entraining Admixture:

Darex AEA
W. R. Grace & Co., Cambridge, Massachusetts

Water Reducing Admixture:

WRDA with Hycol
W. R. Grace & Co., Cambridge, Massachusetts

Aggregate properties used for preparing mix designs are shown
in Table I and Table 2.

TABLE 1
COARSE AGGREGATE PROPERTIES

	Bulk Specific Gravity	Absorption, Percent	Dry Rodded Unit Weight, lbs/ft ³
New Aggregate - Nadeau/Johnson	2.66	0.8	102.78
Reference Aggregate - Cooley/Websterville	2.61	0.7	94.14

TABLE 2
FINE AGGREGATE PROPERTIES

	Bulk Specific Gravity	Absorption, Percent	Fineness Modulus
Reference Aggregate Nadeau/Johnson	2.64	1.1	2.90

The concrete used in this evaluation was mixed in a Sears rotary drum mixer with batch size being 1.5 cubic feet. Aggregates were dried prior to the start of mixing operations.

Two batches each of the Class A and Class B concrete containing the 3/4 inch crushed gravel (new aggregate) were prepared as well as two batches each of the Class A and Class B concrete containing the 3/4 inch crushed igneous stone (reference aggregate).

The mix proportions used are shown in Table 3 and Table 4.

TABLE 3
NEW AGGREGATE MIX DESIGN
BATCH QUANTITIES PER C.Y.

	Class A		Class B	
	Batch 1	Batch 2	Batch 3	Batch 4
*Nadeau Coarse Aggregate, lbs.	1707	1707	1707	1707
*Fine Aggregate, lbs.	1194	1194	1343	1343
Cement, lbs.	660	660	611	611
Air Entraining Admixture, oz.	4.5	5	3	3
Water Reducing Admixture, oz.	19.8	19.8	18.3	18.3
Net Water, gal.	33.1	32.1	32.6	31.0

*Weights converted to saturated surface - dry condition.

TABLE 4
REFERENCE AGGREGATE MIX DESIGN
BATCH QUANTITIES PER C.Y.

	Class A		Class B	
	Batch 5	Batch 6	Batch 7	Batch 8
*Cooley Coarse Aggregate, lbs.	1561	1561	1561	1561
*Fine Aggregate, lbs.	1308	1308	1457	1457
Cement, lbs.	660	660	611	611
Air Entraining Admixture, oz.	4	4.5	3	3
Water Reducing Admixture, oz.	19.8	19.8	18.3	18.3
Net Water, gal.	32.1	31.8	31.2	29.2

*Weights converted to saturated surface - dry condition.

Tests were performed on the fresh concrete to determine Slump, Air Content and Unit Weight. Six test cylinders (6" X 12") were cast from each batch. The cylinders were tested for compressive strength, two each, at ages 7, 14 and 28 days.

RESULTS

The results of tests on the fresh and hardened concrete are shown in Table 5 and Table 6.

TABLE 5

NEW AGGREGATE TEST RESULTS

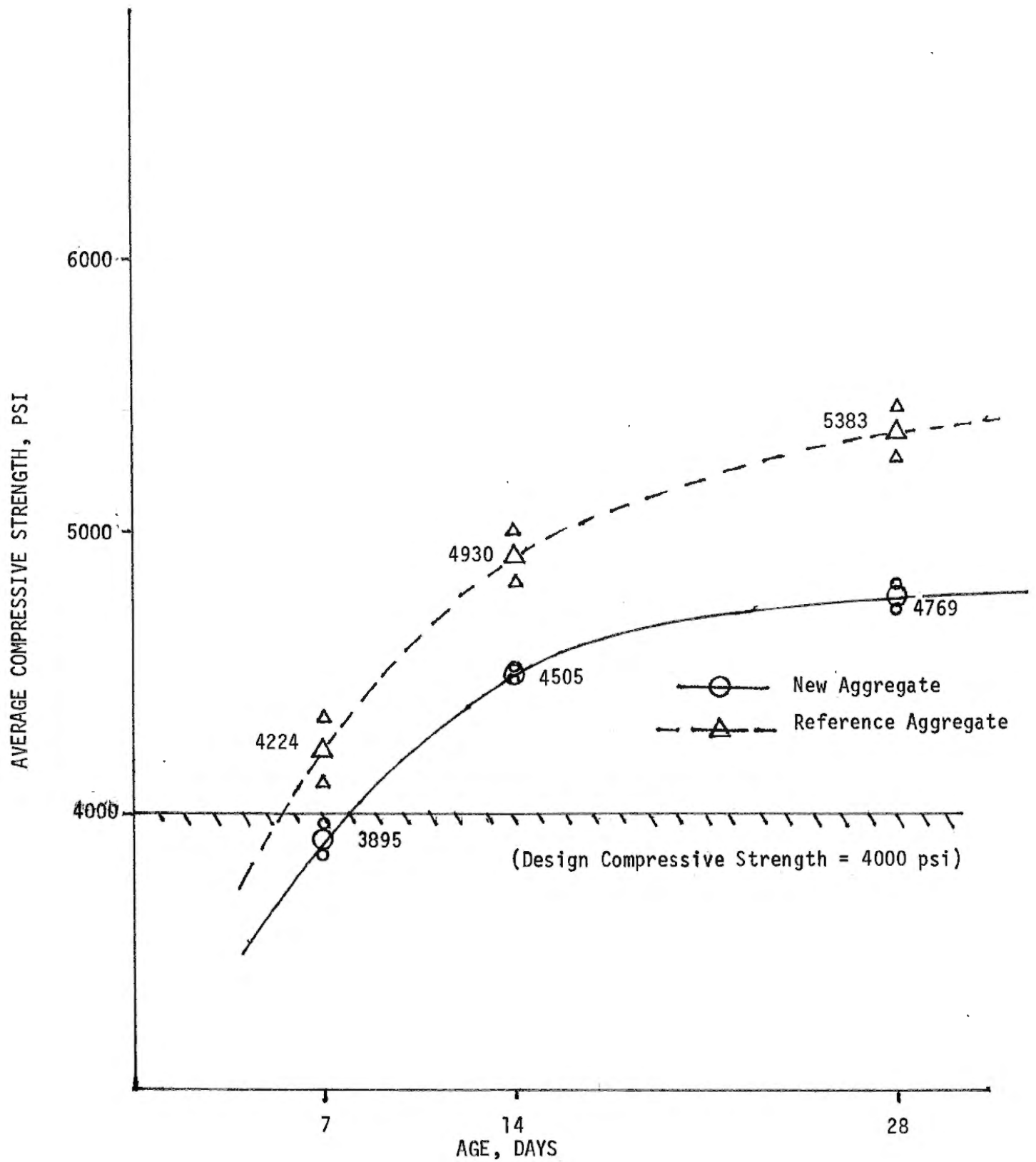
	Class A		Class B	
	Batch 1	Batch 2	Batch 3	Batch 4
Slump, inches	3	3½	3	2½
Air Content, percent	4.3	4.9	4.8	4.4
Unit Weight, lbs/ft ³	-	147.22	147.84	148.20
Compressive Strength, psi				
7 days	3957	3833	3537	3714
14 days	4523	4487	4364	4298
28 days	4731	4806	4589	4616
(Design Compressive Strength, psi)	(4000)		(3500)	

TABLE 6

REFERENCE AGGREGATE TEST RESULTS

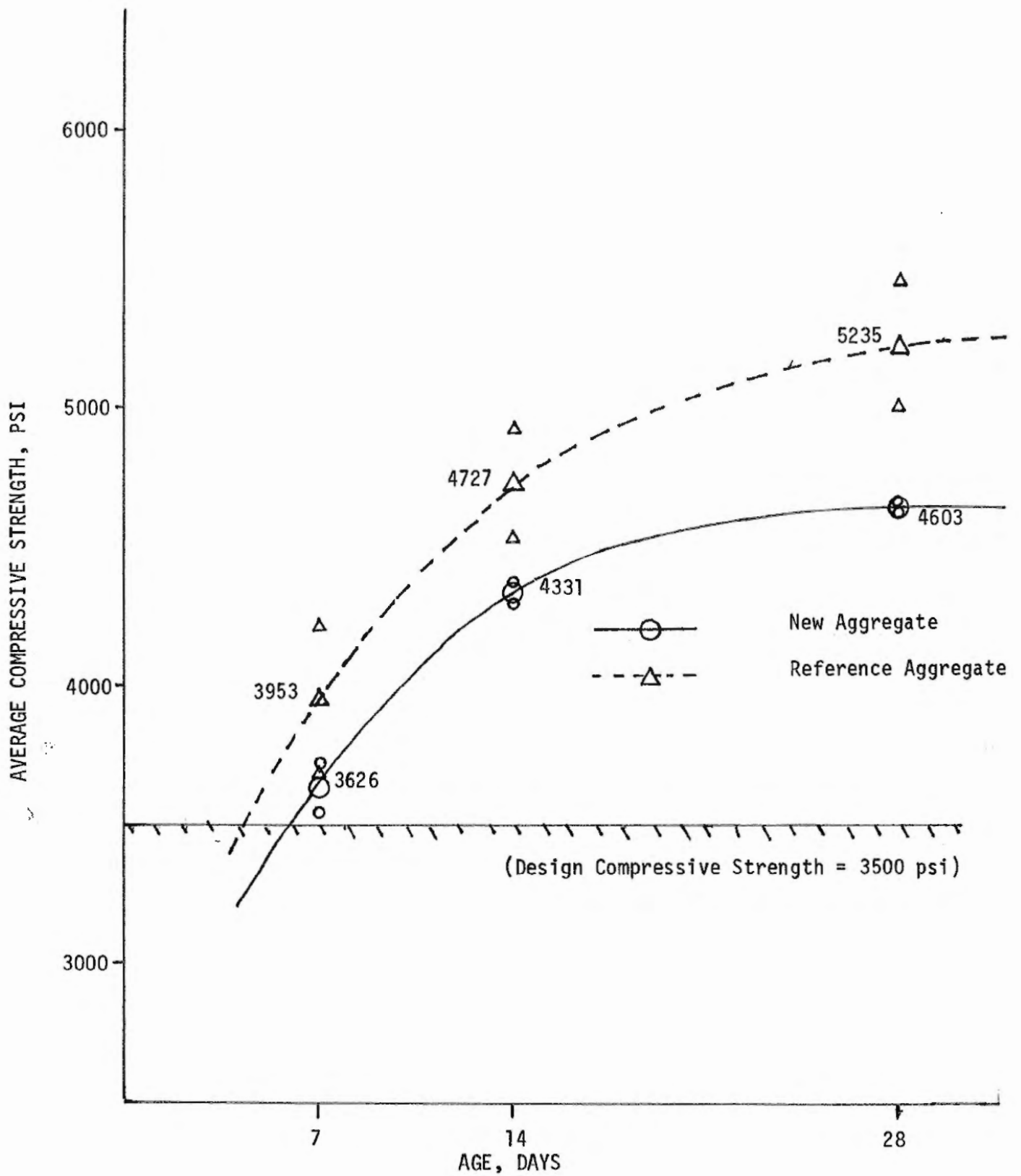
	Class A		Class B	
	Batch 5	Batch 6	Batch 7	Batch 8
Slump, inches	3	3¼	3¼	1
Air Content, percent	4.7	5.0	5.3	3.9
Unit Weight, lbs/ft ³	145.20	145.30	145.20	149.14
Compressive Strength, psi				
7 days	4107	4341	3683	4222
14 days	4832	5027	4532	4921
28 days	5292	5473	5009	5460
(Design Compressive Strength, psi)	(4000)		(3500)	

The results of compressive strength tests are also shown on Laboratory Reports Nos. C8200143 through C8200150 in Appendix C. Strength/Age plots illustrating average compressive strengths are shown in Figure I and Figure II.



AVERAGE COMPRESSIVE STRENGTH VS AGE
CLASS A

Figure I



AVERAGE COMPRESSIVE STRENGTH VS AGE
CLASS B

Figure II

CONCLUSIONS AND RECOMMENDATIONS

- 1) The 3/4 inch crushed gravel coarse aggregate from the Albert S. Nadeau facility in Johnson, Vermont, complied with all requirements of Section 704.02 when tested in conjunction with this evaluation.
- 2) Although compressive strengths obtained from concrete, using the Nadeau/Johnson aggregate, did not reach the same levels as the reference concretes, the Nadeau/Johnson strengths were acceptable.
- 3) It is recommended that the present Albert S. Nadeau facility in Johnson, Vermont, be approved as a source of crushed gravel coarse aggregate for use in structural concrete.
- 4) During the initial uses of concrete containing this aggregate on Agency projects, Materials and Research Division representatives shall conduct tests necessary to determine the performance of this aggregate in concrete under field conditions.

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Appendix A

VERMONT PROCEDURE FOR EVALUATING A NEW
SOURCE OF STRUCTURAL CONCRETE AGGREGATE

VT-AOT-MRD 9-82

1. SCOPE

A procedure for evaluating new structural concrete aggregate sources by testing proposed new aggregates for compliance with Section 700 requirements and by comparing results of tests performed on concrete using the new aggregate with results obtained from concrete containing a reference aggregate.

2. PROCEDURE

General

The evaluation of a new structural concrete aggregate source (i.e., one on which the Materials and Research Division has no service-in-concrete data) shall be divided into two sections called:

Phase I Section 700 and related tests, and Phase II Performance-in-Concrete tests.

All requests for evaluation of new structural concrete aggregate sources shall be made, in writing, to the Materials and Research Engineer. Requests shall describe the type of material proposed for use as well as the location and quantity of available stockpiles.

Materials and Research Division personnel shall perform all work necessary for both the Phase I and Phase II sections of this evaluation process. The work will be performed in an expeditious manner consistent with availability of manpower. Evaluations may require 60 calendar days or more from the date the aggregate is available for testing (controlled by the availability of personnel to perform testing). Delays beyond the control of the Materials and Research Division shall be documented and notification given of the consequent extension of time required to complete the evaluation.

Test results shall be the basis for determining acceptance, further testing, or rejection of the proposed new material. Failure of the material to comply with all applicable requirements, during any phase of testing, may necessitate rescheduling or termination of the evaluation.

The cost of materials necessary to complete the evaluation will be borne by the requesting party.

A report shall be prepared documenting the Materials and Research Division's involvement in the evaluation. A copy of the report shall be forwarded with a cover letter, informing the requesting party of the acceptability or nonacceptability of the aggregate.

Phase I

1. Following receipt of the written request, the Structural Concrete Engineer will schedule a field petrographic examination of the proposed new aggregate source by the Vermont A.O.T. Chief Geologist.
2. The Structural Concrete Engineer or his representative will visit the site and determine:
 - (a) Does a stockpile of at least 50 cubic yards of processed material exist?
 - (b) Can samples be obtained in the standard manner from the stockpiles?
3. If 2(a) and 2(b) are yes, the Structural Concrete Engineer shall make necessary arrangements for obtaining samples from the designated stockpile.
4. The material shall be tested at the Central Laboratory using the Structural Concrete Subdivision Annual Aggregate Testing Program procedure.
5. Report the results (as an Evaluation Sample) on the Standard Materials and Research Division forms.

Phase II

1. The performance-in-concrete tests shall be performed on concrete prepared at the Central Laboratory. The proposed new aggregate will be evaluated by comparing results of tests performed on concrete using the new aggregate with results obtained from concrete containing a reference aggregate. Cement, admixtures, and aggregates, other than the proposed new aggregate, will be selected by the Structural Concrete Engineer. Normally, these materials will be the same as the materials currently in use at the Ready-mix plant where the proposed new aggregate will be used.
2. Mix proportions for each class of concrete required shall be designed or approved by the Materials and Research Division and shall conform to Table 501.03A of the Vermont Standard Specifications for Highway and Bridge Construction, current edition.
3. Test cylinders shall be fabricated and cured in accordance with AASHTO T23. They shall be tested for compressive strength at ages 7, 14, and 28 days in accordance with AASHTO T22.
4. Tests of Slump, Air Content, and Unit Weight shall be in accordance with AASHTO T119, AASHTO T152, and AASHTO T121, respectively.

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Montpelier, Vermont 05602Appendix B

REPORT ON SAMPLE OF AGGREGATE

Report JUN 17 1982, 1982Laboratory No. G8200083Tested By W. MeyerName Coarse Aggregate for Concrete Item 501Identification Marks Evaluation Sample 3/4" Crushed GravelSubmitted by W. Meyer Title PFP Address Sampled 6/2, 1982 Received 6/3, 1982Sample from stockpile @ A.G. Anderson Johnson, VtQuantity Represented ----Source of Material Albert S. Nadeau Johnson, VTLocation used or to be used Work Plan 82-C-12Examined for 704.02

TEST RESULTS

Total Sample		Fineness Modulus		Percent of Wear	
Sieve Size	% Passing	% Coarser Than			
4 1/2"		No. 100		AASHTO T3	
4"		No. 50		AASHTO T4	
3 1/2"		No. 30		AASHTO T96	<u>30.6</u>
3"		No. 16		"B" Grading	
2 1/2"		No. 8		Fractured Faces, %	<u>63</u>
2"		No. 4		Thin & Elongated	
1 3/4"		Fineness Modulus =		Pieces, %	<u>2</u>
1 1/2"				Soundness, % Loss	
1"	<u>100</u>				
3/4"	<u>99</u>				
5/8"	<u>---</u>				
1/2"	<u>---</u>				
3/8"	<u>34</u>				
No. 4	<u>4</u>				
No. 8	<u>2</u>				
No. 10					
No. 16					
No. 30					
No. 50					
No. 100					
No. 200					

Comments:

This material was examined for gradation, wear, fractured faces, and thin and elongated pieces. The results are as indicated.

Sand
Portion

S. J. Gage, P.E., Chief Engineer

By: R. F. Nicholson 1847
R. F. Nicholson, P.E., Materials & Research Engineer

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Montpelier, Vermont 05602

Appendix B

REPORT ON SAMPLE OF AGGREGATE

Report JUN 28 1982, 1982Laboratory No. A82-0535Tested By M. LavinName Coarse Aggregate for Concrete 501Identification Marks Preliminary Sample Crushed GravelSubmitted by W. Meyer Title PFP Address Sampled 6/2, 19 82 Received 6/3, 19 82Sample from stockpile @ Anderson JohnsonQuantity Represented Source of Material A. Nadeau JohnsonLocation used or to be used Work Plan 82-C-12Examined for Item 704.02 Soundness

TEST RESULTS

Total Sample		Fineness Modulus		Percent of Wear	
Sieve Size	% Passing	% Coarser Than			
4 1/2"		No. 100		AASHTO T3	
4"		No. 50		AASHTO T4	
3 1/2"		No. 30		AASHTO T96	
3"		No. 16		Fractured Faces, %	
2 1/2"		No. 8			
2"		No. 4			
1 3/4"		Fineness Modulus =		Thin & Elongated Pieces, %	
1 1/2"					
1"		Comments:		Soundness, % Loss <u>2.17</u>	
3/4"					
5/8"					
1/2"					
3/8"					
No. 4		Sand Portion		S. J. Gage, P.E., Chief Engineer	
No. 8					
No. 10					
No. 16					
No. 30					
No. 50					
No. 100				By: <u>R. F. Nicholson</u> 1987	
No. 200					

Comments:

This material was examined for soundness.
The results are as indicated.By: R. F. Nicholson 1987
R. F. Nicholson, P.E., Materials & Research Engineer

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Montpelier, Vermont 05602

Appendix C

Report on Concrete Test Beam or Cylinders

Laboratory No. C8200149 (28) Report of 7, 14, 28 Day Breaks Date typed 7-8-82
Pay Item Performance in Concrete Type of Sample _____ Evaluation _____
Submitted by W. Meyer Title PFP Address _____
Source of Material Mat. & Res. Lab., Berlin, Vt. Quantity Represented 1 1/2 c.f.
Coarse Aggregate Albert S. Nadeau, Johnson, Vt. Fine Aggregate Albert S. Nadeau, Johnson, Vt.
Cement Brand Northeast Type II Lbs. 660
Air Entraining Admixture Darex AEA Dosage 4 1/2 oz/cy Admixture WRDA Hycol Dosage 3 oz/cwt
Maximum allowable water content, Gal/Cy _____ Total Aggregate, Dry Wgt. 2874
Field Tested by W. Meyer Lab. Tested by Eaton
Sampled from Sears Mixer @ Lab Date Sampled: 6-10-82
Location Used or to be Used _____ Test Mix Batch #1 _____
Examined for Mod. of Rupture _____ Compressive Strength _____

TEST RESULTS

Unit Weight Fresh Concrete _____ Air: Pressure 4.3 Chace _____
Total Water, Gal/Cy Used 33.1 Slump _____ Temperature, Concrete 72 Ambient 72

Specimen No.	Cyl. Unit Wgt. P.C.F.	Date Rec'd	Date Broken	Desired age at break	Age at Break	Type* S - F	Break 1 P.S.I.	Break 2 P.S.I.	Ave. P.S.I.	Break Type	
Test #1A	1 150									1	2
	2 150		6-17	7	7	S	3944	3970	3957		
	3 150										
	4 150		6-24	14	14	S	4580	4465	4523		
	5 150										
	6 150		7-8	28	28	S	4792	4669	4731		

*S = Standard Cured; F = Field Cured

Types of Breaks:



m1m

Comments:
TA 183H Rev.
2M 4/81

S. J. Gage, P.E., Chief Engineer

By: R. F. Nicholson 1827
R. F. Nicholson, P.E., Materials & Research Engineer

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Report on Concrete Test Beam or Cylinders

Laboratory No. C8200150 (28) Report of 7, 14, 28 Day Breaks Date typed 7-8-82

Pay Item Performance in concrete Type of Sample Evaluation

Submitted by W. Meyer Title PFP Address

Source of Material Mat. & Res. Lab., Berlin, Vt. Quantity Represented 1 1/2 c.f.

Coarse Aggregate Albert S. Nadeau, Johnson, Vt. Fine Aggregate Albert S. Nadeau, Johnson, Vt.

Cement Brand Northeast Type II Lbs. 660

Air Entraining Admixture Darex AEA Dosage 5 oz/cy Admixture WRDA Hycol Dosage 3 oz/cwt

Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 2874

Field Tested by W. Meyer Lab. Tested by Eaton

Sampled from Sears Mixer @ Lab Date Sampled: 6-10-82

Location Used or to be Used Test Mix Batch #2

Examined for Mod. of Rupture Compressive Strength

TEST RESULTS

Unit Weight Fresh Concrete 147.22 Air: Pressure 4.9 Chace

Total Water, Gal/Cy Used 32.1 Slump 3 1/2 Temperature, Concrete 72 Ambient 72

Specimen No.	Cyl. Unit Wgt. P.C.F.	Date Rec'd	Date Broken	Desired age at break	Age at Break	Type* S - F	Break 1 P.S.I.	Break 2 P.S.I.	Ave. P.S.I.	Break Type	
										1	2
Test #2A	1	148									
	2	148	6-17	7	7	S	3864	3802	3833		
	3	148									
	4	149	6-24	14	14	S	4447	4527	4487		
	5	148									
	6	148	7-8	28	28	S	4801	4810	4806		

*S = Standard Cured; F = Field Cured

Types of Breaks:

m/m



Comments:
TA 183H Rev.
2M 4/81

S. J. Gage, P.E., Chief Engineer

By: *R. F. Nicholson*
R. F. Nicholson, P.E., Materials & Research Engineer

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Montpelier, Vermont 05602

Appendix C

Report on Concrete Test Beam or Cylinders

Laboratory No. C8200145 (28) Report of 7, 14, 28 Day Breaks Date typed 7-8-82
Pay Item Performance in concrete Type of Sample Evaluation
Submitted by W. Meyer Title PFP Address
Source of Material Mat. & Res. Lab., Berlin, Vt. Quantity Represented 1 1/2 c.f.
Coarse Aggregate A. S. Nadeau, Johnson, Vt. Fine Aggregate A. S. Nadeau, Johnson, Vt.
Cement Brand Northeast Type II Lbs. 611
Air Entraining Admixture Darex AEA Dosage 3 oz/cy Admixture WRDA Hycol Dosage 3 oz/cwt
Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 3021
Field Tested by W. Meyer Lab. Tested by Eaton
Sampled from Sears Mixer @ Lab Date Sampled: 6-10-82
Location Used or to be Used Test Mix Batch #3
Examined for Mod. of Rupture Compressive Strength

TEST RESULTS

Unit Weight Fresh Concrete 147.84 Air: Pressure 4.8 Chace
Total Water, Gal/Cy Used 32.6 Slump 3 Temperature, Concrete 70 Ambient 72

Specimen No.	Cyl. Unit Wgt. P.C.F.	Date Rec'd	Date Broken	Desired age at break	Age at Break	Type* S - F	Break 1 P.S.I.	Break 2 P.S.I.	Ave. P.S.I.	Break Type	
										1	2
Test #1B	1	149		7	7	S	3528	3546	3537		
	2	150	6-17	14	14	S	4394	4333	4530		
	3	150	6-24	28	28	S	4536	4642	4589		
	4	149									
	5	150	7-8								
	6	150									

*S = Standard Cured; F = Field Cured

Types of Breaks:



mlm

Comments:
TA 183H Rev.
2M 4/81

S. J. Gage, P.E., Chief Engineer

By: R. F. Nicholson 18A7
R. F. Nicholson, P.E., Materials & Research Engineer

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Report on Concrete Test Beam or Cylinders

Laboratory No. C8200146 (28) Report of 7. 14. 28 Day Breaks Date typed 7-8-82
Pay Item Performance in Concrete Type of Sample _____ Evaluation _____
Submitted by W. Meyer Title _____ PFP _____ Address _____
Source of Material Mat. & Res. Lab., Berlin, Vt Quantity Represented 1 1/2 c.f.
Coarse Aggregate Albert S. Nadeau, Johnson, Vt. Fine Aggregate Albert S. Nadeau, Johnson, Vt.
Cement Brand Northeast Type II Lbs. 611
Air Entraining Admixture Darex AEA Dosage 3 oz/cy Admixture WRDA Hycol Dosage 3 oz/cwt
Maximum allowable water content, Gal/Cy _____ Total Aggregate, Dry Wgt. 3021
Field Tested by W. Meyer Lab. Tested by Eaton
Sampled from Sears Mixer @ Lab Date Sampled: 6-10-82
Location Used or to be Used _____ Test Mix Batch #4
Examined for Mod. of Rupture _____ Compressive Strength _____

TEST RESULTS

Unit Weight Fresh Concrete 148.20 Air: Pressure 4.4 Chace _____
Total Water, Gal/Cy Used 31.0 Slump 2 1/2 Temperature, Concrete 70 Ambient 72

Specimen No.	Cyl. Unit Wgt. P.C.F.	Date Rec'd	Date Broken	Desired age at break	Age at Break	Type* S - F	Break 1 P.S.I.	Break 2 P.S.I.	Ave. P.S.I.	Break Type	
										1	2
Test #2B	1										
	2		6-17	7	7	S	3731	3696	3713		
	3										
	4		6-24	14	14	S	4324	4271	4298		
	5										
	6		7-8	28	28	S	4633	4598	4616		

*S = Standard Cured; F = Field Cured

Types of Breaks:

mlm



Comments:
TA 183H Rev.
2M 4/81

S. J. Gage, P.E., Chief Engineer

By: R. F. Nicholson /RAF
R. F. Nicholson, P.E., Materials & Research Engineer

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Report on Concrete Test Beam or Cylinders

Laboratory No. C8200147 (28) Report of 7, 14, 28 Day Breaks Date typed 7-8-82

Pay Item Performance in Concrete Type of Sample Evaluation

Submitted by W. Meyer Title PFP Address

Source of Material Mat. & Res. Lab., Berlin, Vt. Quantity Represented 1 1/2 c.f.

Coarse Aggregate Cooley - Websterville, Vt. Fine Aggregate Albert S. Nadeau, Johnson, Vt.

Cement Brand Northeast Type II Lbs. 660

Air Entraining Admixture Darex AEA Dosage 4 oz/cy Admixture WRDA Hycol Dosage 3 oz/cwt

Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 2844

Field Tested by W. Meyer Lab. Tested by Eaton

Sampled from Sears Mixer @ Lab Date Sampled: 6-10-82

Location Used or to be Used Reference Mix Batch #5

Examined for Mod. of Rupture Compressive Strength

TEST RESULTS

Unit Weight Fresh Concrete 145,20 Air: Pressure 4.7 Chace

Total Water, Gal/Cy Used 32,1 Slump 3 Temperature, Concrete 70 Ambient 72

Specimen No.	Cyl. Unit Wgt. P.C.F.	Date Rec'd	Date Broken	Desired age at break	Age at Break	Type* S - F	Break 1 P.S.I.	Break 2 P.S.I.	Ave. P.S.I.	Break Type	
										1	2
Ref. #1A	1	148									
	2	147	6-17	7	7	S	3996	4218	4107		
	3	148									
	4	148	6-24	14	14	S	4783	4881	4832		
	5	148									
	6	149	7-8	28	28	S	5447	5137	5292		

*S = Standard Cured; F = Field Cured

Types of Breaks:

mlm



Comments:
TA 183H Rev.
2M 4/81

S. J. Gage, P.E., Chief Engineer

By: R. F. Nicholson 1097
R. F. Nicholson, P.E., Materials & Research Engineer

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WP 82-C-12
Project Number

MATERIALS AND RESEARCH DIVISION
Montpelier, Vermont 05602

Appendix C

Report on Concrete Test Beam or Cylinders

Laboratory No. C8200148 (28) Report of 7. 14. 28 Day Breaks Date typed 7-8-82
Pay Item Performance in Concrete Type of Sample Evaluation
Submitted by W. Meyer Title PFP Address
Source of Material Mat. & Res. Lab., Berlin, Vt. Quantity Represented 1 1/2 c.f.
Coarse Aggregate Cooley - Websterville, Vt. Fine Aggregate Albert S. Nadeau, Johnson, Vt.
Cement Brand Northeast Type II Lbs. 660
Air Entraining Admixture Darex AEA Dosage 4 1/2 oz/cy Admixture WRDA Hycol Dosage 3 oz/cwt
Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 2844
Field Tested by W. Meyer Lab. Tested by Eaton
Sampled from Sears Mixer @ Lab Date Sampled: 6-10-82
Location Used or to be Used Reference Mix Batch # 6
Examined for Mod. of Rupture Compressive Strength

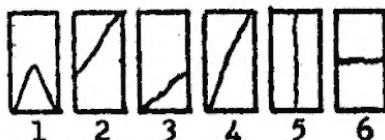
TEST RESULTS

Unit Weight Fresh Concrete 145.30 Air: Pressure 5.0 Chace
Total Water, Gal/Cy Used 31.8 Slump 3 1/4 Temperature, Concrete 72 Ambient 72

Specimen No.	Cyl. Unit Wgt. P.C.F.	Date Rec'd	Date Broken	Desired age at break	Age at Break	Type* S - F	Break 1 P.S.I.	Break 2 P.S.I.	Ave. P.S.I.	Break Type	
										1	2
Ref. #2A	1	147									
	2	148		6-17	7	S	4288	4394	4341		
	3	148									
	4	147		6-24	14	S	4996	5058	5027		
	5	148									
	6	147		7-8	28	S	5464	5482	5473		

*S = Standard Cured; F = Field Cured

Types of Breaks:



S. J. Gage, P.E., Chief Engineer

By: R. F. Nicholson 1897
R. F. Nicholson, P.E., Materials & Research Engineer

Comments:
TA 183H Rev.
2M 4/81

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Montpelier, Vermont 05602

Appendix C

Report on Concrete Test Beam or Cylinders

Laboratory No. C8200143 (28) Report of 7, 14, 28 Day Breaks Date typed 6-21-82

Pay Item Performance in Concrete Type of Sample Evaluation

Submitted by W. Meyer Title PFP Address

Source of Material Mat. & Res. Lab. Berlin, Vt. Quantity Represented 1 1/2 c.f.

Coarse Aggregate Cooley - Websterville, Vt. Fine Aggregate Albert S. Nadeau, Johnson, Vt.

Cement Brand Northeast Type II Lbs. 611

Air Entraining Admixture Darex AEA Dosage 3 oz/cy Admixture WRDA Hycol Dosage 3 oz/cwt

Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 2991

Field Tested by W. Meyer Lab. Tested by Eaton

Sampled from Sears Mixer @ Lab. Date Sampled: 6-10-82

Location Used or to be Used Reference Mix Batch # 7

Examined for Mod. of Rupture Compressive Strength

TEST RESULTS

Unit Weight Fresh Concrete 145.20 Air: Pressure 5.3 Chace

Total Water, Gal/Cy Used 31.2 Slump 3 1/4 Temperature, Concrete 70 Ambient 72

Specimen No.	Cyl. Unit Wgt. P.C.F.	Date Rec'd	Date Broken	Desired age at break	Age at Break	Type* S - F	Break 1 P.S.I.	Break 2 P.S.I.	Ave. P.S.I.	Break Type	
										1	2
Rep #1B	1	147									
	2	147	6-17	7	7	S	3660	3705	3683		
	3	147									
	4	148	6-24	14	14	S	4554	4509	4532		
	5	147									
	6	147	7-8	28	28	S	5058	4960	5009		

*S = Standard Cured; F = Field Cured

Types of Breaks:

m/m



S. J. Gage, P.E., Chief Engineer

R. F. Nicholson 10/97

By: R. F. Nicholson, P.E., Materials & Research Engineer

Comments:
TA 183H Rev.
2M 4/81

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MATERIALS AND RESEARCH DIVISION
Montpelier, Vermont 05602

Appendix C

Report on Concrete Test Beam or Cylinders

Laboratory No. C8200144(28) Report of 7, 14, 28 Day Breaks Date typed 7-8-82

Pay Item Performance in Concrete Type of Sample Evaluation

Submitted by W. Meyer Title PFP Address

Source of Material Mat. & Res. Lab., Berlin, Vt Quantity Represented 1 1/2 c.f.

Coarse Aggregate Cooley - Websterville, Vt. Fine Aggregate Albert S. Nadeau, Johnson, Vt.

Cement Brand Northeast Type II Lbs. 611

Air Entraining Admixture Darex AEA Dosage 3 oz/cy Admixture WRDA Hycol Dosage 3 oz/cwt

Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 2991

Field Tested by W. Meyer Lab. Tested by Eaton

Sampled from Sears Mixer @ Lab Date Sampled: 6-10-82

Location Used or to be Used Reference Mix Batch # 8

Examined for Mod. of Rupture Compressive Strength

TEST RESULTS

Unit Weight Fresh Concrete 149.14 Air: Pressure 3.9 Chace

Total Water, Gal/Cy Used 29.2 Slump 1 Temperature, Concrete 70 Ambient 72

Specimen No.	Cyl. Unit Wgt. P.C.F.	Date Rec'd	Date Broken	Desired age at break	Age at Break	Type* S - F	Break 1 P.S.I.	Break 2 P.S.I.	Ave. P.S.I.	Break Type	
Ref. #2B	1	150									
	2	151		6-17	7	S	4138	4306	4222		
	3	150									
	4	150		6-24	14	S	4925	4916	4921		
	5	151									
	6	151		7-8	28	S	5420	5499	5460		

*S = Standard Cured; F = Field Cured

Types of Breaks:

mlm



Comments:
TA 183H Rev.
2M 4/81

S. J. Gage, P.E., Chief Engineer

R. F. Nicholson 1097

By: R. F. Nicholson, P.E., Materials & Research Engineer

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISIONAppendix DRESEARCH INVESTIGATIONWork Plan No. 82-C-12Subject Evaluation of Crushed Gravel Coarse Aggregate, Albert S. Nadeau,Investigation Requested By Carl L. Anderson Johnson, Vermont
Date May 28, 1982Date Information Required As soon as possible.Purpose of Investigation To evaluate the "crushed gravel coarse aggregate"
from Albert S. Nadeau, Johnson, Vermont, proposed
for use as a structural concrete aggregate.Proposed Tests or Evaluation Procedure See Vermont Procedure For Evaluating
a New Source of Structural Concrete Aggregate, VT-AOT-MRD 9-82.1. Performance-in-concrete tests will be performed using two
batches each of Class A and Class B concrete containing
the proposed new aggregate and two batches each of Class A
and Class B concrete containing a reference aggregate.Proposal Discussed With R. Frascoia Projected Manpower Requirements 18 Man Days
Investigation To Be Conducted By Structural Concrete SubdivisionProposed Starting Date June 2, 1982 Estimated Completion Date July 30, 1982Approval/Disapproval by Materials Engineer R. A. Nichols 7/6/82Comments by Materials Engineer Received in present form for
approval on 7/6/82.Materials & Research Division
Agency of Transportation