EVALUATION OF FINE AGGREGATE FROM H. A. MANOSH CORP.- HYDE PARK, VERMONT FOR USE IN STRUCTURAL CONCRETE

REPORT 90-05
OCTOBER 1990

REPORTING ON WORK PLAN 90-C-6

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

PAUL R. PHILBROOK, SECRETARY OF TRANSPORTATION
ROBERT L. MERCHANT, P. E., DIRECTOR OF CONSTRUCTION & MAINTENANCE
M. W. LAWSON, P. E., MATERIALS & RESEARCH ENGINEER
C. C. BENDA, P. E., STRUCTURAL CONCRETE ENGINEER

Prepared By:

W. L. Meyer, Technician C
Structural Concrete Subdivision

Reviewed By:

M. W. Lawson, P. E.
Materials & Research Engineer

Date: OCTOBER 5, 1990

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ABSTRACT

To produce the optimum structural concrete, aggregates must be tested and evaluated to assure conformance to required specifications.

This report documents results of tests performed on a proposed new source of fine aggregate for structural concrete. The material tested was a fine aggregate produced at the H. A. Manosh Corporation facilities in Hyde Park, Vermont.

Test results and evaluation confirm this material meets the required specifications as a fine aggregate source for structural concrete.

INTRODUCTION

To provide an accurate evaluation of an aggregate for use in structural concrete, not only should tests be initiated to assure compliance with required specifications, but a collation of the new aggregate with a previously evaluated reference aggregate should be performed. This procedure compares both aggregates by preparing and testing concrete mixtures under the same conditions.

Mr. Gary Nolan, Construction Manager of the H. A. Manosh Corporation initially requested an evaluation of concrete sand, processed at the Ferland pit in Garfield (Hyde Park), Vermont, in June 1988. Following his request, samples of the material were obtained by Materials and Research Division representatives and evaluated for compliance with the requirements of Section 704.01 of the Standard Specifications for Construction. The Agency of Transportation's Chief Geologist also traveled to the site to perform a field petrographic analysis of the material.

Initial samples, obtained in July 1988, failed to comply with Fineness Modulus requirements and the manufacturer was informed of the problem. No further action was taken until April 1990 when Mr. Nolan indicated the material was in compliance with specifications and he would like to have more samples obtained. Subsequent testing confirmed Mr. Nolan's claims and materials were obtained for the performance-in-concrete phase of the evaluation which was conducted in the Central Laboratory of the Materials and Research Division.

PROCEDURES

PHASE I - SECTION 704.01 AND SECTION 704.02 TESTS

The proposed new fine aggregate was sampled, by representatives of the Materials and Research Division, from a stockpile at the H. A. Manosh facilities in Hyde Park, Vermont. The material was examined for Gradation (AASHTO T 27-84), Organic Impurities (AASHTO T 21-86), Sodium Sulfate Soundness (AASHTO T 104-86) and Compressive Strength of Mortar (Section 704.01, (c) of the Standard Specifications for Construction).

Two initial samples, obtained on July 28, 1988, failed to comply with Fineness Modulus requirements. One sample, obtained on May 1, 1990, also failed to comply with Fineness Modulus requirements, however, two additional samples obtained on that date were found to be in compliance with requirements.

The reference fine aggregate was sampled from a stockpile at the S. T. Griswold ready mix concrete plant in Morrisville, Vermont. The coarse aggregate was sampled from a stockpile at the A. G. Anderson ready mix plant in Berlin, Vermont. The reference fine aggregate was examined for Gradation (AASHTO T 27-84) and Organic Impurities (AASHTO T 21-86). The coarse aggregate was examined for Gradation (AASHTO T 27-84), only. The reference fine aggregate and coarse aggregate were found to comply respectively with Section 704.01 and Section 704.02 requirements. Fine aggregate test results are shown in Table 1 and Table 2. Coarse aggregate test results are shown in Table 3. Aggregate test results are also shown on Laboratory Report Nos.

G8800472, G8800473, C88 0802, G9000103, G9000121, G9000122, G9000123, G9000129, C900262 and A900256 in Appendix B.

The Vermont Agency of Transportation, Chief Geologist traveled to the facility in Hyde Park, Vermont to make an on-site investigation of the raw material source and to obtain samples for analysis. A copy of the Chief Geologist's petrographic analysis is shown in Appendix C.

TABLE 1

FINE AGGREGATE TEST DATA (Proposed New Aggregate)

	H. A. Manosh, Hyde Park, VT Dates Sampled					V.A.O.T. Specification Requirements
	7-28-88	7-28-88	5-1-90	5-1-90	5-1-90	
Sieve Size	% Passing	% Passing	% Passing	% Passing	% Passing	% Passing
3/8"	100	100	100	100	100	100
#4	99	99	99	98	98	95-100
#8	92	91	90	78	80	-
#16	79	78	77	56	57	50-80
#30	56	55	53	34	33	25-60
#50	27	26	28	18	17	10-30
#100	9	9	10	9	8	2-10
Fineness Modulus	2.38	2.42	2.43	3.07	3.07	2.60-3.10
Organic Impurities, color	1	1	-	-	<1	2 maximum
Compressive Strength of Mortar, % of Standard Sand						
3 days		131			132	100 minimum
7 days		116			126	100 minimum
Soundness, % loss					4.56	8 maximum

TABLE 2

FINE AGGREGATE TEST DATA (Reference Aggregate)

	A. S. Nadeau, Johnson, VT Date Sampled 5-11-90	V.A.O.T. Specification Requirements
Sieve Size	% Passing	% Passing
3/8"		100
#4	100	95-100
#8	81	-
#16	60	50-80
#30	39	25-60
#50	22	10-30
#100	9	2-10
Fineness Modulus	2.89	2.60-3.10
Organic Impurities, color	<1	2 maximum

TABLE 3

COARSE AGGREGATE TEST DATA

	3/4" Crushed Igneous Stone Cooley, Websterville, VT Date Sampled 5/23/90	V.A.O.T. Specification Requirements
Sieve Size	%Passing	%Passing
1"	100	100
3/4"	99	90-100
3/8"	27	20-55
#4	4	0-10
#8	2	0-5

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:

Fine Aggregate

A. Proposed New Aggregate
H. A. Manosh Corporation, Hyde Park, Vermont

B. Reference Aggregate
A. S. Nadeau, Johnson, Vermont

Coarse Aggregate

Cooley, Websterville, Vermont

Cement

Type II
Northeast Cement Co., St. Constant, Quebec

Air Entraining Admixture

Micro Air
Master Builders Corp., Cleveland, Ohio

Water Reducing Admixture

Pozzolith 322N
Master Builders Corp., Cleveland, Ohio

Aggregate properties used for preparing mix designs are shown in Table 4 and Table 5.

TABLE 4

FINE AGGREGATE PROPERTIES

	Bulk Specific Gravity	Absorp., Percent	Fineness Modulus
Proposed New Aggregate H. A. Manosh, Hyde Park, Vermont	2.69	0.9	3.07
Reference Aggregate A. S. Nadeau, Johnson, Vermont	2.64	1.0	2.83

TABLE 5

COARSE AGGREGATE PROPERTIES

	Bulk Specific Gravity	Absorp., percent	Dry Rodded Unit Weight, lbs/cu. ft.
Cooley, Websterville, Vermont 3/4" Crushed Igneous Stone	2.63	0.6	97.73

The concrete used in this evaluation was mixed in a Sears rotary drum mixer with batch size being 1.8 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 new fine aggregate were prepared as well as two batches each of the Class A and Class B concrete containing the reference fine aggregate.

The mix proportions used are shown in Table 6 and Table 7.

TABLE 6

NEW AGGREGATE MIX DESIGN
BATCH QUANTITIES PER C.Y.

	Class A		Class B	
	Batch 1	Batch 2	Batch 5	Batch 6
*Coarse Aggregate, lbs.	1557	1557	1557	1557
*New Fine Aggregate, lbs.	1346	1346	1469	1469
Cement, lbs.	660	660	611	611
Air Entraining Admixture, oz.	3.5	5.0	2.0	2.0
Water Reducing Admixture, oz.	33.0	33.0	30.6	30.6
Net Water, gal.	31.6	31.2	32.1	31.4

*Weights converted to saturated surface-dry condition

TABLE 7

REFERENCE AGGREGATE MIX DESIGN
BATCH QUANTITIES PER C.Y.

	Class A		Class B	
	Batch 3	Batch 4	Batch 7	Batch 8
*Coarse Aggregate, lbs.	1636	1636	1636	1636
*Reference Fine Aggregate, lbs.	1241	1241	1362	1362
Cement, lbs.	660	660	611	611
Air Entraining Admixture, oz.	3.5	3.5	4.0	3.0
Water Reducing Admixture, oz.	33.0	33.0	30.6	30.6
Net Water, gal.	30.5	31.1	30.2	31.4

*Weights converted to saturated surface-dry condition

Tests were performed on the fresh concrete to determine Slump (AASHTO T 119-86), Air Content (AASHTO T 152-86) and Unit Weight (AASHTO T 121-86). Six test cylinders (6" x 12") and one 3" w x 3" d x 16" l freeze-thaw specimen were cast from each batch. The cylinders were tested for compressive strength (AASHTO T 22-86), two each at ages 7, 15 and 28 days. The freeze-thaw specimens were moist cured for 14 days, after which they were subjected to freezing and thawing (AASHTO T 161-86) in a 3% NaCl solution.

RESULTS

Results of tests on the fresh concrete and compressive strength test results are shown in Table 8 and Table 9.

TABLE 8

PERFORMANCE TEST RESULTS
NEW AGGREGATE

	Class A		Class B	
	Batch 1	Batch 2	Batch 3	Batch 4
Slump, inches	3 1/4	2 1/2	3 1/4	2 3/4
Air Content, percent	4.8	5.3	5.1	5.7
Unit Weight, lbs/cu. ft.	146.58	146.14	146.82	145.93
Compressive Strength, psi				
7 days	4630	4570	4105	4150
15 days	5280	5285	4485	4425
28 days	5640	5590	4920	4910
(Design Compressive Strength, psi)	(4000)		(3500)	

TABLE 9

PERFORMANCE TEST RESULTS
REFERENCE CONCRETE

	Class A		Class B	
	Batch 5	Batch 6	Batch 7	Batch 8
Slump, inches	3	3 1/4	3 1/4	3
Air Content, percent	5.9	5.3	6.6	7.1
Unit Weight, lbs/cu. ft.	144.73	145.41	143.45	141.61
Compressive Strength, psi				
7 days	4500	4535	3775	3755
15 days	4920	4725	4280	3920
28 days	5305	5170	4730	4500
(Design Compressive Strength, psi)	(4000)		(3500)	

The results of compressive strength tests are also shown on Laboratory Report Nos. C900263 through C900270 in Appendix D. Strength vs. age plots illustrating average compressive strengths in psi over time in days are shown in Figure I and Figure II.

The results of dynamic testing of freeze-thaw specimens are shown in Table 10. The percent weight change resulting from freezing and thawing of specimens is shown in Table 11. Freeze-thaw test results are also summarized in Figure III and Figure IV. These figures show a comparison of results obtained with the reference aggregate and the new aggregate after 300 cycles of freezing and thawing.

TABLE 10

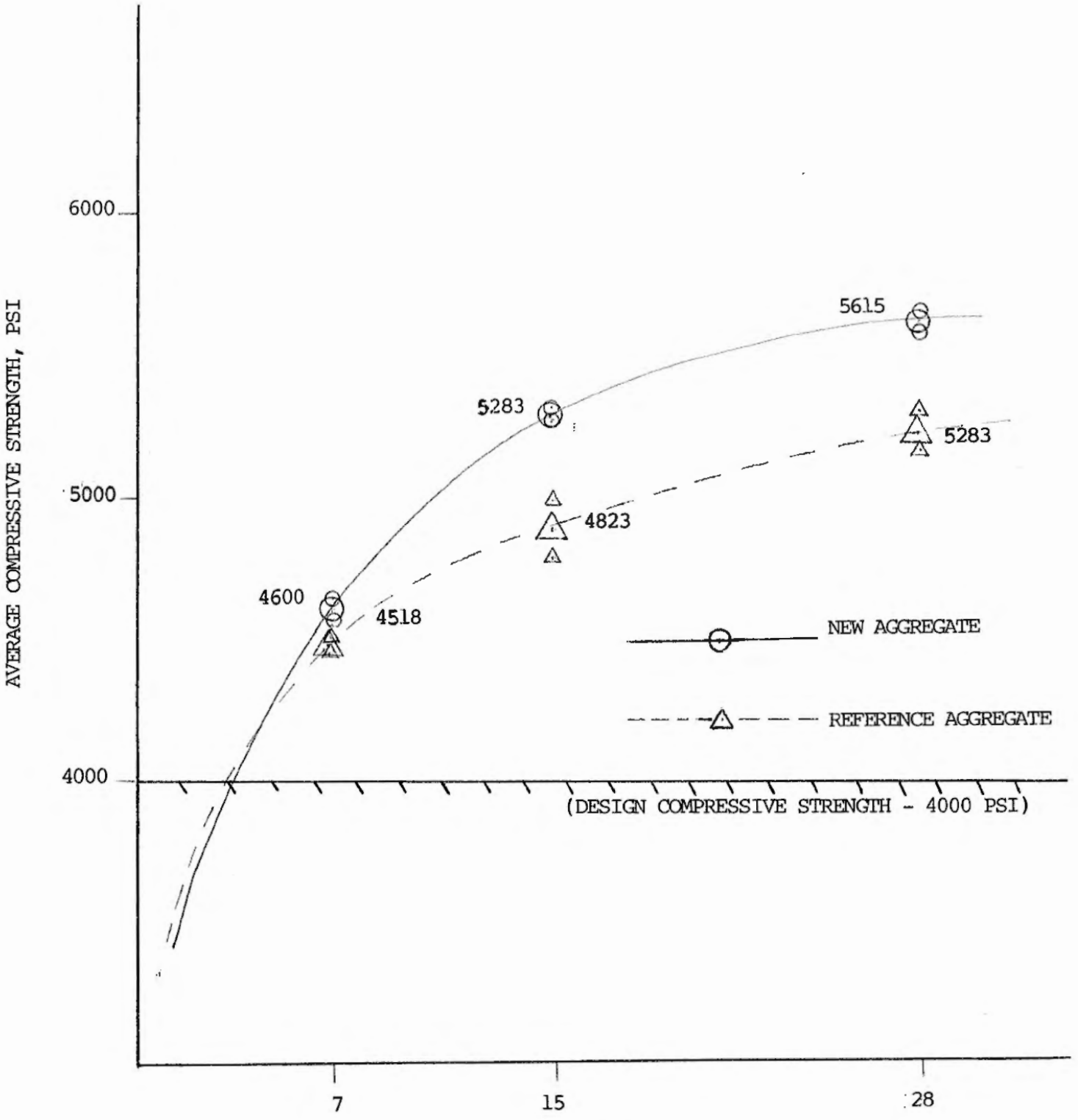
FREEZE-THAW TEST RESULTS - DURABILITY FACTOR

No. of Cycles	New Aggregate				Reference Aggregate			
	Class A		Class B		Class A		Class B	
	Batch 1	Batch 2	Batch 5	Batch 6	Batch 3	Batch 4	Batch 7	Batch 8
	Durability Factor							
50	102.3	100.6	102.1	98.8	100.1	100.6	100.9	99.1
100	104.7	103.0	102.6	100.5	104.0	102.1	101.9	102.4
150	106.8	104.7	107.4	101.6	106.0	104.7	103.2	104.5
200	108.5	105.5	108.6	96.6	105.2	103.9	105.7	103.5
250	110.3	106.1	108.3	96.0	106.0	104.8	108.0	103.9
300	109.5	107.6	104.4	89.1	107.1	105.6	107.6	104.6

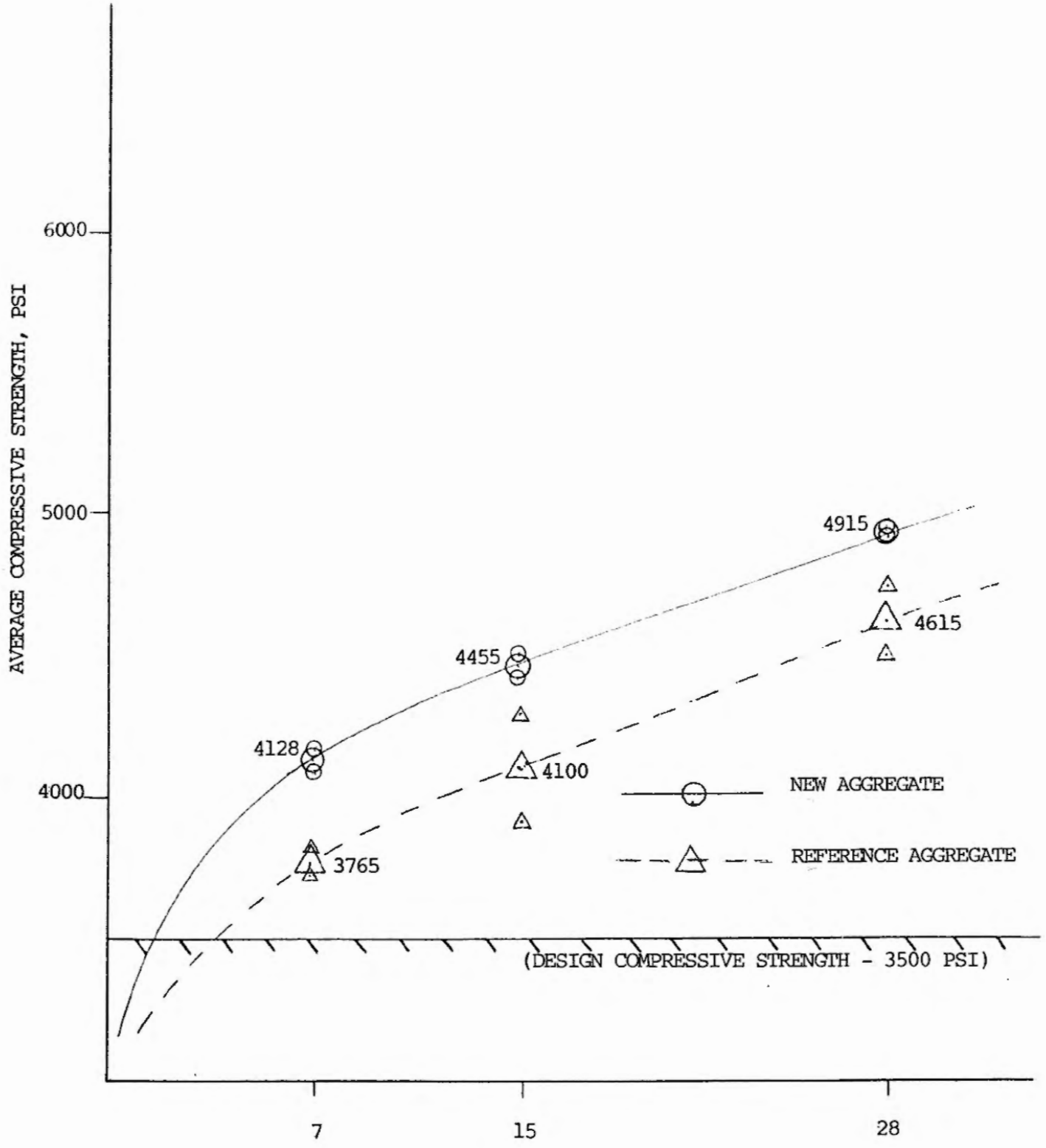
TABLE 11

FREEZE-THAW TEST RESULTS - PERCENT WEIGHT CHANGE

No. of Cycles	New Aggregate				Reference Aggregate			
	Class A		Class B		Class A		Class B	
	Batch 1	Batch 2	Batch 5	Batch 6	Batch 3	Batch 4	Batch 7	Batch 8
	Percent Weight Change							
50	-1.0	-1.1	-2.0	-1.2	-0.2	-0.3	-0.2	-0.3
100	-3.2	-3.7	-5.8	-4.6	-2.0	-2.6	-2.0	-2.5
150	-2.7	-3.6	-6.7	-4.9	-1.0	-2.0	-1.1	-1.8
200	-3.6	-4.8	-8.6	-7.3	-1.7	-2.9	-1.6	-2.5
250	-4.6	-6.0	-10.4	-9.4	-2.4	-3.6	-2.3	-3.1
300	-5.8	-7.1	-12.4	-11.8	-3.7	-5.0	-3.1	-3.9



AVERAGE COMPRESSIVE STRENGTH VS AGE
CLASS A
FIGURE I



AVERAGE COMPRESSIVE STRENGTH VS AGE

CLASS B
FIGURE II

Batch Number	No. Cycles	Weight Lbs.	Percent Weight Loss	Fundamental Transverse Frequency "N"	"N"	Individual Durability Factor DF	Average DF	Relative Durability Factor RDF
Reference Aggregate								
5	0	12.40		1556	2421136			
			3.7			107.1		
5	300	11.94		1610	2592100			
							106.4	
6	0	12.11		1553	2411809			
			5.0			105.6		
6	300	11.51		1596	2547216			
								102.1
New Aggregate								
1	0	12.52		1553	2411809			
			5.8			109.5		
1	300	11.79		1625	2640625			
							108.6	
2	0	12.50		1555	2418025			
			7.1			107.6		
2	300	11.61		1613	2601769			

SUMMARY OF FREEZE-THAW TEST RESULTS

CLASS A

FIGURE III

Batch Number	No. Cycles	Weight Lbs.	Percent Weight Loss	Fundamental Transverse Frequency "N"	"N"	Individual Durability Factor DF	Average DF	Relative Durability Factor RDF
Reference Aggregate								
7	0	12.18		1507	2271049			
			3.1			107.6		
7	300	11.80		1563	2442969			
							106.1	
8	0	12.12		1489	2217121			
			3.9			104.6		
8	300	11.65		1523	2319529			
								91.2
New Aggregate								
3	0	12.25		1523	2319529			
			12.4			104.4		
3	300	10.73		1556	2421136			
							96.8	
4	0	11.90		1536	2359296			
			11.8			89.1		
4	300	10.50		1450	2102500			

SUMMARY OF FREEZE-THAW TEST RESULTS

CLASS B

FIGURE IV

SUMMARY AND CONCLUSIONS

1. Several initial samples of proposed new fine aggregate from the H. A. Manosh Corporation facility in Hyde Park, Vermont failed to comply with fineness modulus requirements. Subsequent samples obtained from the same facility were found to be in compliance with these requirements. The fine aggregate complied with all remaining requirements of Section 704.01 when tested in conjunction with this evaluation.

2. The average 28 day compressive strengths of concrete containing the Manosh fine aggregate were approximately six percent greater than the strengths of concrete containing the reference aggregate. The Class A concrete containing the new fine aggregate had an average compressive strength of 5615 psi at 28 days, while the Class A concrete containing the reference fine aggregate yielded an average compressive strength of 5283 psi. The Class B concrete containing the new fine aggregate had an average compressive strength of 4915 psi at 28 days, while the Class B concrete containing the reference fine aggregate had an average compressive strength of 4615 psi.

3. Results of freezing and thawing tests showed the Class A concrete containing the new aggregate performed slightly better in sonic testing than Class A concrete containing the reference aggregate. The average durability factor for the Class A concrete with the new aggregate was 108.6 while the Class A concrete with the reference aggregate had an average durability factor of 106.4.

The Class A concrete containing the new aggregate, however, showed slightly greater weight loss (6.5%) than the Class A concrete containing the reference aggregate (4.4%). The Class B concrete containing the new aggregate showed reduced performance for both sonic testing and percent of weight loss when compared to the Class B concrete containing the reference aggregate. The average durability factor was 106.1 for the Class B concrete with the reference aggregate and 96.8 for the Class B concrete with the new aggregate. The percent weight loss averaged 3.5% for the Class B concrete with the reference aggregate and 12.1% for the Class B concrete containing the new aggregate.

4. Mix design Tables, shown on page 8, indicate the Class A and Class B mixtures containing the new aggregate required greater quantities of water than the mixes containing the reference aggregate to develop the same slump. Class A mixes used an average 0.6 gallons/yd^3 more while producing a slightly lower slump and Class B mixes required an additional 1.5 gallons/yd^3 to produce an identical slump.

RECOMMENDATIONS

1. It is recommended that the present H. A. Manosh Corporation facilities in Hyde Park, Vermont be approved as a source of fine aggregate for use in structural concrete.

2. 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. Due to the range of results obtained in freeze-thaw tests, it is recommended that subsequent testing include fabrication of freeze-thaw specimens to permit further examination of this concrete property.

Prepared By: W. Meyer WJM
Date: March 26, 1982
Page: 1 of 2

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

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.

TA 419Rev. 1M 6/88

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

Laboratory Number G8800477 Pay Item 501
Project Name Manosh Pit Project Number
Sampled By Chris Benda Date Sampled 7/28/88 Examined For 704.01
Sampled From Stockpile Plant Manosh, Garfield
Source of Material Manosh, Garfield
Quantity Represented — Sample Type investigative
Sample Comparison No Cross Reference Number

MATERIAL TESTED Fine Aggregate for Concrete

SIEVE SIZE	WEIGHT INDIV.	% RETAINED INDIV.	% RETAINED CUMUL.	% PASSING CUMUL.
RET ----				
RET 3/8	2			100
RET 4	7	1	1	99
RET 8	61	7	8	92
RET 16	115	13	21	79
RET 30	196	23	44	56
RET 50	252	29	73	27
RET 100	153	18	91	9
PAN	82	9		
TOTAL	868	100	238	

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AUG 03 1988
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Fineness Modulus
Cumul. Total Retained/100 2.38

Organic Impurities: Color 1

T&E / Total Weight = ____ = ____ % Thin & Elongated Pieces

Fractures / Total Weight = ____ = ____ % Fractured Faces

Original Weight ____ Grading ____
Final Weight ____ Percent Wear ____ AASHTO T96

( ) Test results are in compliance with specifications.

(X) Test results are outside specifications.

Comments: FINENESS MODULUS IS 0.28 BELOW SPECIFICATION REQUIREMENTS

Tested By Peter O. Collins Reviewed By C. C. Benda, P.E. CCB
Date Completed 8/3/88 Date 8-8-88 Initials

TA 410Rev. 1M 6/88

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

Laboratory Number G8800473 Pay Item 501
Project Name WALWORTH PIT Project Number
Sampled By Chris Benda Date Sampled 7/28/88 Examined For 704.01
Sampled From Stockpile Plant Manosh, Garfield
Source of Material Manosh, Garfield
Quantity Represented — Sample Type investigative
Sample Comparison No Cross Reference Number

MATERIAL TESTED Fine Aggregate for Concrete

SIEVE SIZE	WEIGHT INDIV.	% RETAINED INDIV.	% RETAINED CUMUL.	% PASSING CUMUL.
RET ___"				
RET 3/8				100
RET 4	5	1	1	99
RET 8	47	8	9	91
RET 16	82	13	22	78
RET 30	141	23	45	55
RET 50	177	29	74	26
RET 100	107	17	91	9
PAN	58	9		
TOTAL	617	100	242	

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AUG 03 1988
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DIV.

Fineness Modulus
Cumul. Total Retained/100 2.42

Organic Impurities: Color 1

T&E / Total Weight = ____ = ____ % Thin & Elongated Pieces

Fractures / Total Weight = ____ = ____ % Fractured Faces

Original Weight ____ Grading ____
Final Weight ____ Percent Wear ____ AASHTO T96

( ) Test results are in compliance with specifications.

(X) Test results are outside specifications.

Comments: FINENESS MODULUS IS 0.18 BELOW SPECIFICATION REQUIREMENTS

Tested By Peter J. Collins Reviewed By C. C. Benda, P.E. CCB
Date Completed 8/3/88 Date 8-8-88 Initials

TA183 Rev. 1M 7/80
1M 6/86

C, Benda CB
F Reed
CF

STATE OF VERMONT
AGENCY OF TRANSPORTATION

MATERIALS & RESEARCH DIVISION
MONTPELIER, VERMONT 05602

REPORT OF MISCELLANEOUS SAMPLE

Report 08-19-88, 19

Laboratory No. C88 0802 Tested By P COTE

Name FINE AGGREGATE FOR CONCRETE

Identification Marks INVESTIGATIVE

Submitted by C BENDA Title Address

Sampled 07-28-88 Received 07-28-88 Testing Completed 08-15-1988

Sample From STOCKPILE

Quantity Represented 1000 cubic yards

Source of Material MANOSH, GARFIELD, VT

Project Name & Number HARDWICK BRZ1447(12)

Examined For ITEM 704.01 - compressive strength of mortar

TEST RESULTS

AMOUNT OF CEMENT (E) 500 g
AMOUNT OF AGGREGATE 1500 g

COMPRESSIVE STRENGTH	3 days	7 days
w/aggregate	14,700	16,750
	15,200	17,450
	15,350	17,750
w/Ottawa Sand	10,550	14,850
	12,250	15,100
	11,750	14,800

PMM

Director, Dept. of Planning and Preconstruction

By: J. R. Phelan RJP
J. R. Phelan, P.E., Materials & Research Engineer

TA 419Rev. 2.5M 7-89

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

CF
Bender

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

C9000103

Laboratory Number
Pay Item 501
Project Name Work Plan
Project Number 90-C-6
Sampled By Meyer
Date Sampled 05-11-90
Examined For 704.01
Sampled From Stockpile
Plant Griswold Morrisville
Source of Material Nadeau Johnson
Quantity Represented —
Sample Type Preliminary
Sample Comparison No
Cross Reference Number

MATERIAL TESTED Fine Aggregate For Concrete

SIEVE SIZE	WEIGHT INDIV.	% RETAINED INDIV.	% RETAINED CUMUL.	% PASSING CUMUL.
RET				
RET 3/8				
RET 4	2.4	—		100
RET 8	91.0	19	19	81
RET 16	101.8	21	40	60
RET 30	101.9	21	61	39
RET 50	84.2	17	78	22
RET 100	62.2	13	91	9
PAN	43.2	9		
TOTAL	486.7	100	289	

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Fineness Modulus
Cumul. Total Retained/100 2.89

Organic Impurities: Color <1

T&E / Total Weight = ____ = ____ % Thin & Elongated Pieces

Fractures / Total Weight = ____ = ____ % Fractured Faces

Original Weight ____ Grading ____
Final Weight ____ Percent Wear ____ AASHTO T96

(✓) Test results are in compliance with specifications.

( ) Test results are outside specifications.

Comments: ____

Tested By W. Dean J. Meyer
Date Completed 5/11/90
Reviewed By C. C. Benda, P.E.
Date 5.23.90
C.C.B. Initials

TA 419Rev. 2M 9-88

CF
BENDA

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

Laboratory Number C9000121 Pay Item 501.
Project Name Evaluation of Fine Aggregate Project Number WP 90-C-6
Sampled By Armstrong Date Sampled 5-1-90 Examined For 704.01
Sampled From Stockpile Plant H.A. Manosh Hyde Park, Vt.
Source of Material H.A. Manosh Hyde Park Vt.
Quantity Represented — Sample Type Investigative
Sample Comparison No Cross Reference Number

MATERIAL TESTED Fine Aggregate for Concrete

SIEVE SIZE	WEIGHT INDIV.	% RETAINED INDIV.	% RETAINED CUMUL.	% PASSING CUMUL.
RET 3/8				
RET 4	8	1.3	1	99
RET 8	55	9.0	10	90
RET 16	76	12.6	23	77
RET 30	143	23.8	47	53
RET 50	155	25.7	72	28
RET 100	106	17.6	90	10
PAN	60	10.0		
TOTAL	602	100.0	243	

Fineness Modulus
Cumul. Total Retained/100 2.43

Organic Impurities: Color _____

T&E / Total Weight = _____ = _____ % Thin & Elongated Pieces

Fractures / Total Weight = _____ = _____ % Fractured Faces

Original Weight _____ Grading _____
Final Weight _____ Percent Wear _____ AASHTO T96

( ) Test results are in compliance with specifications.

(✓) Test results are outside specifications.

Comments: South Side of large stockpile. Material Stockpiled in fall of 89. EM 0.17 LOW

Tested By K. Holt & Armstrong Reviewed By C. C. Benda, P.E. CCB
Date Completed 5/1/90 Date 5.23.90 Initials

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STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

CF
BENDA

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

Laboratory Number C9000122 Pay Item 501.
Project Name Evaluation of Fine Aggregate Project Number WP 90-C-6
Sampled By Armstrong Date Sampled 5-1-90 Examined For 704.01
Sampled From Stockpile Plant H.A. Manosh Hyde Park Vt
Source of Material H.A. Manosh Hyde Park VT.
Quantity Represented — Sample Type Investigative
Sample Comparison No Cross Reference Number

MATERIAL TESTED Fine Aggregate for Concrete

SIEVE SIZE	WEIGHT INDIV.	% RETAINED INDIV.	% RETAINED CUMUL.	% PASSING CUMUL.
RET				
RET 3/8	—			100
RET 4	16	2	2	98
RET 8	149	20	22	78
RET 16	161	22	44	56
RET 30	165	22	66	34
RET 50	120	16	82	18
RET 100	70	9	91	9
PAN	68	9		
TOTAL	749	100	307	

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Fineness Modulus
Cumul. Total Retained/100 3.07

Organic Impurities: Color

T&E / Total Weight = ___ = ___ % Thin & Elongated Pieces

Fractures / Total Weight = ___ = ___ % Fractured Faces

Original Weight
Final Weight
Grading
Percent Wear AASHTO T96

(✓) Test results are in compliance with specifications.

( ) Test results are outside specifications.

Comments: East End of large stockpile - Combination of old & new material

Tested By Holt & Armstrong Reviewed By C. C. Benda, P.E. CCB
Date Completed 5/11/90 Date 5-23-90 Initials

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STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION

CF

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

Laboratory Number G9006123 Pay Item 501.
Project Name Evaluation of Fine Aggregate Project Number WP 90-C-6
Sampled By S. Armstrong Date Sampled 5/1/90 Examined For 704.01
Sampled From Stockpile Plant H.A. Manosh Hyde Park, Vt.
Source of Material H.A. Manosh, Hyde Park Vt.
Quantity Represented _____ Sample Type Investigative
Sample Comparison No Cross Reference Number _____

MATERIAL TESTED Fine Aggregate for Concrete

SIEVE SIZE	WEIGHT INDIV.	% RETAINED INDIV.	% RETAINED CUMUL.	% PASSING CUMUL.
RET ____				
RET 3/8				100
RET 4	14	2.2	2	98
RET 8	115	17.9	20	80
RET 16	144	22.4	43	57
RET 30	155	24.1	67	33
RET 50	107	16.6	83	17
RET 100	59	9.2	92	8
PAN	49	7.6		
TOTAL	643	100.0	307	

RECEIVED MAY 2 1990 MATERIALS & RESEARCH DIVISION

Fineness Modulus
Cumul. Total Retained/100 3.07

Organic Impurities: Color <1

T&E / Total Weight = _____ = _____ % Thin & Elongated Pieces

Fractures / Total Weight = _____ = _____ % Fractured Faces

Original Weight _____ Grading _____
Final Weight _____ Percent Wear _____ AASHTO T96

(✓) Test results are in compliance with specifications.

( ) Test results are outside specifications.

Comments: North Side of large Stockpile. New material this year

Tested By S. Hall & Armstrong Reviewed By C. C. Benda, P.E. C.C.B
Date Completed 5/1/90 Date 5-23-90 Initials

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MATERIALS AND RESEARCH DIVISION

GRAY BARNUM C12

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

Laboratory Number C9000129 Pay Item 501.25
Project Name GROTON Project Number F 022-6-1(27)S
Sampled By ARMSTRONG Date Sampled 5-23-90 Examined For 704.02
Sampled From STOCKPILE Plant ANDERSON VERMONT
Source of Material COOLEY WEBSTER, NH
Quantity Represented 2067 Sample Type ACCEPTANCE
Sample Comparison NO Cross Reference Number

MATERIAL TESTED 3/4" Crushed Igneous Stone For Concrete

SIEVE SIZE	WEIGHT INDIV.	% RETAINED INDIV.	% RETAINED CUMUL.	% PASSING CUMUL.
RET				
RET				
RET 1				100
RET 3/4	0.4	1.1		99
RET 1/2	16.6	43.6		55
RET 3/8	10.5	27.7		27
RET 4	8.9	23.5		4
RET 8	0.7	1.8		2
PAN	0.8	2.1		
TOTAL	37.9	100.0		

RECEIVED MAY 29 1990 MATERIALS & RESEARCH

Fineness Modulus
Cumul. Total Retained/100 _____

Organic Impurities: Color _____

T&E / Total Weight = _____ = _____ % Thin & Elongated Pieces

Fractures / Total Weight = _____ = _____ % Fractured Faces

Original Weight _____ Grading _____
Final Weight _____ Percent Wear _____ AASHTO T96

(4) Test results are in compliance with specifications.

( ) Test results are outside specifications.

Comments: _____

Tested By [signature] Reviewed By C. C. Benda, P.E. CCB
Date Completed MAY 23 90 Date 6-6-90 Initials

TA182 Rev. 500 11-89

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION
MONTPELIER, VERMONT 05602

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REPORT OF MISCELLANEOUS SAMPLE

Report 6/26/90 19

Laboratory No. C900262 Tested By A. Stone

Name Fine Aggregate for Concrete

Identification Marks ACC

Submitted by M. Meyer Title CLP Address

Sampled 5/1/90, 19 Received 6/18/90 19 Testing Completed 6/26/90, 19

Sample from Stockpile

Quantity Represented n/a

Source of Material Nanosh, Hyde Park

Project Name & Number Workplan WP-90-C-6

Examined for 704.01

TEST RESULTS
COMPRESSIVE STRENGTH PSI

	C900262:		C900251 (Comparison with Ottawa Sand)	
3 Days	1. 3538		1. 2635	
	2. 3453	3478 (1.32)	2. 2565	2628
	3. 3443		3. 2688	
7 Days	4. 4287		4. 3413	
	5. 4143	4213 (1.26)	5. 3225	3343
	6. 4208		6. 3393	

R80

Vermont Agency of Transportation
Materials and Research Division
Montpelier, Vermont 05602

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REPORT ON SAMPLE OF AGGREGATE

LAB NO.: A900256
Project: Work Plan WP90-C-6
Pay Item: Structural Concrete 501.
Material Name/Type: Fine Aggregate for Concrete
Material Spec No.: 704.01
Quantity Represented:
Sample Source: Manosh Hyde Park
Material Source: Manosh Hyde Park
Sample Type: Investigative
Comments: Soundness

Report Date: 06/11/90
Sampled By: R Holt
Date Sampled: 05/01/90
Sampled From: Stockpile
Date Received: 05/09/90
Tested By: M Lavin
Test Date: 06/08/90
Comparison Sample?:
X-Ref.No.:

TEST RESULTS

TOTAL SAMPLE SIEVE SIZE	% PASSING
4-1/2"	
4"	
3-1/2"	
3"	
2-1/2"	
2"	
1-3/4"	
1-1/2"	
1"	
3/4"	
1/2"	
3/8"	
NO. 4	
NO. 8	
NO. 16	
NO. 30	
NO. 50	
NO. 100	
NO. 200	

FINENESS MODULUS % COARSER THAN

NO. 4	
NO. 8	
NO. 16	
NO. 30	
NO. 50	
NO. 100	

FINENESS MODULUS

COLOR =

PERCENT OF WEAR AASHTO T96 GRADING

FRACTURED FACES, %

THIN & ELONGATED PIECES, %

SOUNDNESS, % LOSS 4.56

COMMENTS: Test Results are in compliance with specifications

REVIEWED BY: R. J. O'BRIEN, CHEMIST, TESTING LAB SUPERVISOR

FOR: M. W. Lawson, MATERIALS & RESEARCH ENGINEER

pla

AGENCY OF TRANSPORTATION **OFFICE MEMORANDUM**

TO: C. C. Benda, Structural Concrete Engineer

FROM: A. J. McBean, Chief Geologist AJM | GBA

DATE: August 8, 1988

SUBJECT: Petrographic Analysis of Washed Sand from the Manosh Pit, Hyde Park, VT.

The Manosh Pit in the Village of Garfield (Hyde Park Township), is developed in a glacial deposit consisting of sand and gravelly sand overlain by coarse gravel layers. The deposit was mapped in 1963 by Paul MacClintock as lake sand overlain by beach gravels. In The Surficial Geology and Pleistocene History of Vermont, VGS Bulletin No. 31, 1969, by David Stewart and Paul MacClintock, it is hypothesized that this material represents a shoreline feature of glacial Lake Morrisville which flooded a large portion of the Lamoille River Valley when glacial ice dammed the natural outlets.

Petrographically, the sands consist of quartz and quartzite, schist, phyllite, gneiss, peridotite-dunite rocks and a trace of organics. The last rock type mentioned occurs sporadically in a very narrow belt trending generally north-south through the state. As these rocks are found nearly due north of the pit in question, it is logical that the source area for the sand was in part from this region.

The composition of the sand varies with size. In general, the finer size fraction has a higher quartz content than the coarser material. Conversely, there is an increase in schist, gneiss and phyllite fragments as grainsize increases. The peridotite-dunite rock fragments (ultramafics) increase as grainsize decreases.

Texturally, the sand grains are equant to ovoid and increase in angularity with a decrease in size. Sieve sizes #4 and #8 are rated as subrounded to subangular. The #16 sieve material is mostly subangular and the #30 and #50 sieve size material is subangular to angular. A slight to moderate amount of weathering is seen in all size fractions of the sand. The majority of quartz grains have a limonite (iron-stain) coating in the coarser sizes which becomes less apparent in the finer size fractions. The rock fragments, especially the mica schist, are spotted with areas of total weathering which explains the scarcity of rock fragments in the finer fractions. The ultramafic fragments show slight to moderate weathering. This is seen as a white to greenish gray coating around the grains. There is a slight chance that these grains will be alkali reactive, forming Magnesium Hydroxide compounds. This is somewhat dependent on the degree to which the ultramafic grains have been altered to serpentine as this product is more reactive than any other. The only serpentine seen was as fine bands cross cutting the grains of dunite.

In general, this sand can be characterized as a quartz-rich material with an overall slight degree of weathering. There is a slight chance of alkali reactivity if enough of the ultramafic particles have been weathered to serpentine. The strength of some grains in the coarser #8 and #4 size fractions is questionable and should be considered in other tests of the sands durability (such as the compressive strength and freeze-thaw test). No clay or significant amounts of organic material was noted.

TA 296A 20M 11/84

The weathered nature of this sand and the presence of ultramafic particles are the only negative petrographic properties found.

AJM/mlm

cc JRP/Lab Flie
AJM File

TA 188 Rev. 10/86

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AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION
MONTPELIER, VERMONT 05602

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Bendzsza

REPORT ON CONCRETE TEST BEAM OR CYLINDER

LAB.NO. C900663 PAY.ITEM 501.22 Concrete, Class A

PROJ.NAME Work Plan PROJ.NO. WP90-C-6 REPORTED 07/19/90

EXAM.FOR 501 C.L. A Compressive Strength SAMPLE TYPE PREL SAMPLED 06/20/90

RESIDENT ADDRESS

SAMPLED/SUBMITTED BY Meyer TITLE FIELD TEST BY SCS

SAMPLE FROM Laboratory Mixer QUANT.REPRESENTED 1.8 cf LAB TEST BY Graham

SOURCE OF MATERIAL M&R Lab COARSE AGGREGATE Cooley Webstersville

FINE AGGREGATE Manosh Hyde Park TOTAL AGGREGATE DRY WGT., LBS/CY 2903

CEMENT BRAND Northeast TYPE 2 LBS. 660 AIR ENT.ADMIX. Microair DOSAGE 3.5 oz/cy

ADMIXTURE POZZOLITH322N DOSAGE 5 oz/cwt ADMIXTURE DOSAGE

LOCATION USED Test Mix Batch No M1

	TEST RESULTS	SPECIFICATIONS MIN.	SPECIFICATIONS MAX.
UNIT WGT.FRESH CONC., LBS/CF	146.58	N.A.	N.A.
AIR CONTENT, %	4.80	5.00	7.00
SLUMP, INCHES	3.25	2.00	4.00
TOTAL WATER, GAL/CY	31.60	N.A.	35.1
W/C RATIO	0.399	N.A.	0.44
CONCRETE TEMP., DEGREES F	73	50	80
AMBIENT TEMP., DEGREES F	N.D.	10	85

SPECIMEN NO.	CYL.UNIT.WGT. LBS/CF	DATE REC'D	DATE BROKEN	DESIRED AGE AT BREAK	AGE AT BREAK	CURE S-F*	BREAK P.S.I.	AVG.BRK P.S.I.	BREAK TYPE*
M-1-A 1	N.D.	06/21	06/27	7	7	S	4470	N.A.	N.D.
M-1-A 2	N.D.	06/21	06/27	7	7	S	4790	4630	N.D.
M-1-A 3	N.D.	06/21	07/05	14	15	S	5330	N.A.	N.D.
M-1-A 4	N.D.	06/21	07/05	14	15	S	5230	5280	N.D.
M-1-A 5	N.D.	06/21	07/18	28	28	S	5650	N.A.	N.D.
M-1-A 6	N.D.	06/21	07/18	28	28	S	5630	5640	N.D.

*See MATERIALS SAMPLING MANUAL for explanation.

COMMENTS: Test(s) outside specifications:
Air Content

DIRECTOR, DEPT. OF
PLANNING & PRECONSTRUCTION
Milan W. Lawson
MATERIALS & RESEARCH ENGINEER
BY: PLO

pla

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MATERIALS AND RESEARCH DIVISION
MONTPELIER, VERMONT 05602

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REPORT ON CONCRETE TEST BEAM OR CYLINDER

LAB.NO. C900864 PAY.ITEM 501.22 Concrete, Class A

PROJ.NAME Work Plan PROJ.NO. WP90-C-6 REPORTED 07/19/90

EXAM.FOR 501 CL. A Compressive Strength SAMPLE TYPE PREL SAMPLED 06/20/90

RESIDENT ADDRESS

SAMPLED/SUBMITTED BY Meyer TITLE FIELD TEST BY SCS

SAMPLE FROM Laboratory Mixer QUANT.REPRESENTED 1.8 cf LAB TEST BY Granam

SOURCE OF MATERIAL M & R Lab COARSE AGGREGATE Cooley Webesterville

FINE AGGREGATE Manosh Hyde Park TOTAL AGGREGATE DRY WGT., LBS/CY 2903

CEMENT BRAND Northeast TYPE 2 LBS. 660 AIR ENT.ADMIX. Microair DOSAGE 5 oz/cy

ADMIXTURE POZZOLITH322N DOSAGE 5 oz/cwt ADMIXTURE DOSAGE

LOCATION USED Test Mix Batch No M2

	TEST RESULTS	SPECIFICATIONS MIN.	SPECIFICATIONS MAX.
UNIT WGT.FRESH CONC., LBS/CF	146.14	N.A.	N.A.
AIR CONTENT, %	5.30	5.00	7.00
SLUMP, INCHES	2.50	2.00	4.00
TOTAL WATER, GAL/CY	31.20	N.A.	35.1
W/C RATIO	0.395	N.A.	0.44
CONCRETE TEMP., DEGREES F	73	50	80
AMBIENT TEMP., DEGREES F	N.D.	10	85

SPECIMEN NO.	CYL.UNIT.WGT. LBS/CF	DATE REC'D	DATE BROKEN	DESIRED AGE AT BREAK	AGE AT BREAK	CURE S-F*	BREAK P.S.I.	AVG.BRK P.S.I.	BREAK TYPE*
M-2-A 1	N.D.	06/21	06/27	7	7	S	4620	N.A.	N.D.
M-2-A 2	N.D.	06/21	06/27	7	7	S	4520	4570	N.D.
M-2-A 3	N.D.	06/21	07/05	14	15	S	5310	N.A.	N.D.
M-2-A 4	N.D.	06/21	07/05	14	15	S	5260	5285	N.D.
M-2-A 5	N.D.	06/21	07/18	28	28	S	5570	N.A.	N.D.
M-2-A 6	N.D.	06/21	07/18	28	28	S	5610	5590	N.D.

*See MATERIALS SAMPLING MANUAL for explanation.

COMMENTS: This material meets the requirements for the tests indicated for Item 501

DIRECTOR, DEPT. OF
PLANNING & PRECONSTRUCTION
Milan W. Lawson
MATERIALS & RESEARCH ENGINEER
BY: RJD

dla

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MONTPELIER, VERMONT 05602

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REPORT ON CONCRETE TEST BEAM OR CYLINDER

LAB.NO. C900265 PAY.ITEM 501.25 Concrete, Class B

PROJ.NAME Work Plan PROJ.NO. WP90-C-6 REPORTED 07/19/90

EXAM.FOR 501 Cl. B Compressive Strength SAMPLE TYPE PREL SAMPLED 06/20/90

RESIDENT ADDRESS

SAMPLED/SUBMITTED BY Meyer TITLE FIELD TEST BY SCS

SAMPLE FROM Laboratory Mixer QUANT.REPRESENTED 1.8 cf LAB TEST BY Stone

SOURCE OF MATERIAL M & R Lab COARSE AGGREGATE Cooley Webstersville

FINE AGGREGATE Manosh Hyde Park TOTAL AGGREGATE DRY WGT., LBS/CY 3026

CEMENT BRAND Northeast TYPE 2 LBS. 611 AIR ENT.ADMIX. Microair DOSAGE 2 oz/cy

ADMIXTURE POZZOLITH322N DOSAGE 5 oz/cwt ADMIXTURE DOSAGE

LOCATION USED Test Mix Batch No M3

	TEST RESULTS	SPECIFICATIONS MIN.	MAX.
UNIT WGT.FRESH CONC., LBS/CF	146.82	N.A.	N.A.
AIR CONTENT, %	5.10	4.00	6.00
SLUMP, INCHES	3.25	2.00	4.00
TOTAL WATER, GAL/CY	32.10	N.A.	35.0
W/C RATIO	0.438	N.A.	0.49
CONCRETE TEMP., DEGREES F	72	50	80
AMBIENT TEMP., DEGREES F	N.D.	10	85

SPECIMEN NO.	CYL. UNIT.WGT. LBS/CF	DATE REC'D	DATE BROKEN	DESIRED AGE AT BREAK	AGE AT BREAK	CURE S-F*	BREAK P.S.I.	AVG. BRK P.S.I.	BREAK TYPE*
M-3-B 1	N.D.	06/21	06/27	7	7	S	4170	N.A.	N.D.
M-3-B 2	N.D.	06/21	06/27	7	7	S	4040	4105	N.D.
M-3-B 3	N.D.	06/21	07/05	14	15	S	4570	N.A.	N.D.
M-3-B 4	N.D.	06/21	07/05	14	15	S	4400	4485	N.D.
M-3-B 5	N.D.	06/21	7/18	28	28	S	4870	N.A.	N.D.
M-3-B 6	N.D.	06/21	07/18	28	28	S	4970	4920	N.D.

*See MATERIALS SAMPLING MANUAL for explanation.

COMMENTS: This material meets the requirements for the tests indicated for Item 501

DIRECTOR, DEPT. OF
PLANNING & PRECONSTRUCTION
Milan W. Lawson
MATERIALS & RESEARCH ENGINEER
BY: TJO

pla

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MATERIALS AND RESEARCH DIVISION
MONTPELIER, VERMONT 05602

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REPORT ON CONCRETE TEST BEAM OR CYLINDER

LAB. NO. C900866 PAY. ITEM 501.25 Concrete, Class B

PROJ. NAME Work Plan PROJ. NO. WP90-C-6 REPORTED 07/19/90

EXAM. FOR 501 Cl. B Compressive Strength SAMPLE TYPE PREL SAMPLED 06/20/90

RESIDENT ADDRESS

SAMPLED/SUBMITTED BY Meyer TITLE FIELD TEST BY SCS

SAMPLE FROM Laboratory Mixer QUANT. REPRESENTED 1.8 cf LAB TEST BY Stone

SOURCE OF MATERIAL M & R Lab COARSE AGGREGATE Cooley Websterville

FINE AGGREGATE Manosh Hyde Park TOTAL AGGREGATE DRY WGT., LBS/CY 3026

CEMENT BRAND Northeast TYPE 2 LBS. 611 AIR ENT. ADMIX. Microair DOSAGE 2 oz/cy

ADMIXTURE POZZOLITH322N DOSAGE 5 oz/cwt ADMIXTURE DOSAGE

LOCATION USED Test Mix Batch No M4

	TEST RESULTS	SPECIFICATIONS MIN.	MAX.
UNIT WGT. FRESH CONC., LBS/CF	145.93	N.A.	N.A.
AIR CONTENT, %	5.70	4.00	6.00
SLUMP, INCHES	2.75	2.00	4.00
TOTAL WATER, GAL/CY	31.40	N.A.	35.8
W/C RATIO	0.429	N.A.	0.49
CONCRETE TEMP., DEGREES F	73	50	80
AMBIENT TEMP., DEGREES F	N.D.	10	85

SPECIMEN NO.	CYL. UNIT. WGT. LBS/CF	DATE REC'D	DATE BROKEN	DESIRED AGE AT BREAK	AGE AT BREAK	CURE S-F*	BREAK P.S.I.	AVG. BRK P.S.I.	BREAK TYPE*
M-4-B 1	N.D.	06/21	06/27	7	7	S	4220	N.A.	N.D.
M-4-B 2	N.D.	06/21	06/27	7	7	S	4080	4150	N.D.
M-4-B 3	N.D.	06/21	07/05	14	15	S	4460	N.A.	N.D.
M-4-B 4	N.D.	06/21	07/05	14	15	S	4390	4425	N.D.
M-4-B 5	N.D.	06/21	07/18	28	28	S	4800	N.A.	N.D.
M-4-B 6	N.D.	06/21	07/18	28	28	S	5020	4910	N.D.

*See MATERIALS SAMPLING MANUAL for explanation.

COMMENTS: This material meets the requirements for the tests indicated for Item 501

DIRECTOR, DEPT. OF
PLANNING & PRECONSTRUCTION
Milan W. Lawson
MATERIALS & RESEARCH ENGINEER
BY:

pla

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MONTPELIER, VERMONT 05602

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REPORT ON CONCRETE TEST BEAM OR CYLINDER

LAB. NO. C900267 PAY. ITEM 501,22 Concrete, Class A

PROJ. NAME Work Plan PROJ. NO. WP90-C-6 REPORTED 07/19/90

EXAM. FOR 501 Cl. A Compressive Strength SAMPLE TYPE PREL SAMPLED 06/20/90

RESIDENT ADDRESS

SAMPLED/SUBMITTED BY Meyer TITLE FIELD TEST BY SCS

SAMPLE FROM Laboratory QUANT. REPRESENTED 1.8 cf LAB TEST BY Graham

SOURCE OF MATERIAL M & R Lab COARSE AGGREGATE Cooley Websterville

FINE AGGREGATE Nadeau Johnson TOTAL AGGREGATE DRY WGT., LBS/CY 2877

CEMENT BRAND Northeast TYPE 2 LBS. 660 AIR ENT. ADMIX. Microair DOSAGE 3.5 oz/cy

ADMIXTURE POZZOLITH 322N DOSAGE 5 oz/cwt ADMIXTURE DOSAGE

LOCATION USED REF Mix Batch No R6

	TEST RESULTS	SPECIFICATIONS MIN.	MAX.
UNIT WGT. FRESH CONC., LBS/CF	145.41	N.A.	N.A.
AIR CONTENT, %	5.30	5.00	7.00
SLUMP, INCHES	3.25	2.00	4.00
TOTAL WATER, GAL/CY	31.10	N.A.	35.1
W/C RATIO	0.393	N.A.	0.44
CONCRETE TEMP., DEGREES F	72	50	80
AMBIENT TEMP., DEGREES F	N.D.	10	85

SPECIMEN NO.	CYL. UNIT. WGT. LBS/CF	DATE REC'D	DATE BROKEN	DESIRED AGE AT BREAK	AGE AT BREAK	CURE S-F*	BREAK P.S.I.	AVG. BRK P.S.I.	BREAK TYPE*
R-6-A 1	N.D.	06/21	06/27	7	7	S	4580	N.A.	N.D.
R-6-A 2	N.D.	06/21	06/27	7	7	S	4550	4535	N.D.
R-6-A 3	N.D.	06/21	07/05	14	15	S	4760	N.A.	N.D.
R-6-A 4	N.D.	06/21	07/05	14	15	S	4690	4725	N.D.
R-6-A 5	N.D.	06/21	07/18	28	28	S	5170	N.A.	N.D.
R-6-A 6	N.D.	06/21	07/18	28	28	S	5170	5170	N.D.

*See MATERIALS SAMPLING MANUAL for explanation.

COMMENTS: This material meets the requirements for the tests indicated for Item 501

DIRECTOR, DEPT. OF
PLANNING & PRECONSTRUCTION
Milan W. Lawson
MATERIALS & RESEARCH ENGINEER
BY:

pla

TA 188 Rev. 10/86

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION
MONTPELIER, VERMONT 05602

Central Files
[redacted]

REPORT ON CONCRETE TEST BEAM OR CYLINDER

LAB. NO. C900860 PAY. ITEM 501.22 Concrete, Class A

PROJ. NAME Work Plan PROJ. NO. WP90-C-6 REPORTED 07/19/90

EXAM. FOR 501 C., A Compressive Strength SAMPLE TYPE PREL SAMPLED 06/20/90

RESIDENT ADDRESS

SAMPLED/SUBMITTED BY Meyer TITLE FIELD TEST BY SCS

SAMPLE FROM Laboratory Mixer QUANT. REPRESENTED 1.8 cf LAB TEST BY Stone

SOURCE OF MATERIAL M & R Lab COARSE AGGREGATE Cooley Webosterville

FINE AGGREGATE Nadeau Johnson TOTAL AGGREGATE DRY WGT., LBS/CY 2877

CEMENT BRAND Northeast TYPE 2 LBS. 660 AIR ENT. ADMIX. Micro Air DOSAGE 3.5 oz/cy

ADMIXTURE POZZOLITH 322N DOSAGE 5 oz/cwt ADMIXTURE DOSAGE

LOCATION USED REF Mix Batch No R5

	TEST RESULTS	SPECIFICATIONS MIN.	MAX.
UNIT WGT. FRESH CONC., LBS/CF	144.73	N.A.	N.A.
AIR CONTENT, %	5.90	5.00	7.00
SLUMP, INCHES	3.00	2.00	4.00
TOTAL WATER, GAL/CY	30.50	N.A.	35.1
W/C RATIO	0.386	N.A.	0.44
CONCRETE TEMP., DEGREES F	72	50	80
AMBIENT TEMP., DEGREES F	N.D.	10	85

SPECIMEN ID	DATE MADE	DATE BROKEN	DESIRED AGE AT BREAK	AGE AT BREAK	CURE S-F*	BREAK P.S.I.	AVG. BRK P.S.I.	BREAK TYPE*
[illegible]	N.D.	06/27	7	7	S	3610	N.A.	N.D.
[illegible]	N.D.	06/27	7	7	S	4390	4500	N.D.
[illegible]	N.D.	07/05	14	15	S	4940	N.A.	N.D.
[illegible]	N.D.	07/05	14	15	S	4900	4920	N.D.
C-9-A 5	N.D.	07/18	28	28	S	5300	N.A.	N.D.
C-9-B 6	N.D.	07/18	28	28	S	5310	5305	N.D.

*See MATERIALS SAMPLING MANUAL for explanation.

COMMENTS: This material meets the requirements for the tests indicated for Item 501

DIRECTOR, DEPT. OF
PLANNING & PRECONSTRUCTION
Milan W. Lawson
MATERIALS & RESEARCH ENGINEER
BY: PSD

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AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION
MONTPELIER, VERMONT 05602

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REPORT ON CONCRETE TEST BEAM OR CYLINDER

LAB.NO. C900269 PAY.ITEM 501.25 Concrete, Class B

PROJ.NAME Work Plan PROJ.NO. WP90-C-6 REPORTED 07/19/90

EXAM.FOR 501 Cl. B Compressive Strength SAMPLE TYPE PREL SAMPLED 06/20/90

RESIDENT ADDRESS

SAMPLED/SUBMITTED BY Meyer TITLE FIELD TEST BY SCS

SAMPLE FROM Laboratory Mixer QUANT.REPRESENTED 1.8 cf LAB TEST BY Graham

SOURCE OF MATERIAL M & R Lab COARSE AGGREGATE Cooley Websterville

FINE AGGREGATE Nadeau Johnson TOTAL AGGREGATE DRY WGT., LBS/CY 2998

CEMENT BRAND Northeast TYPE 2 LBS. 611 AIR ENT.ADMIX. Micro-air DOSAGE 4 oz/cy

ADMIXTURE POZZOLITH322N DOSAGE 5 oz/cwt ADMIXTURE DOSAGE

LOCATION USED REF Mix Batch No R7

	TEST RESULTS	SPECIFICATIONS MIN.	MAX.
UNIT WGT.FRESH CONC., LBS/CF	143.45	N.A.	N.A.
AIR CONTENT, %	6.60	4.00	6.00
SLUMP, INCHES	3.25	2.00	4.00
TOTAL WATER, GAL/CY	30.20	N.A.	35.8
W/C RATIO	0.413	N.A.	0.49
CONCRETE TEMP., DEGREES F	73	50	80
AMBIENT TEMP., DEGREES F	N.D.	10	85

SPECIMEN NO.	CYL.UNIT.WGT. LBS/CF	DATE REC'D	DATE BROKEN	DESIRED AGE AT BREAK	AGE AT BREAK	CURE S-F*	BREAK P.S.I.	AVG.BRK P.S.I.	BREAK TYPE*
R-7-B 1	N.D.	06/21	06/27	7	7	S	3800	N.A.	N.D.
R-7-B 2	N.D.	06/21	06/27	7	7	S	3750	3775	N.D.
R-7-B 3	N.D.	06/21	07/05	14	15	S	4280	N.A.	N.D.
R-7-B 4	N.D.	06/21	07/05	14	15	S	4280	4280	N.D.
R-7-B 5	N.D.	06/21	07/18	28	28	S	4660	N.A.	N.D.
R-7-B 6	N.D.	06/21	07/18	28	28	S	4800	4730	N.D.

*See MATERIALS SAMPLING MANUAL for explanation.

COMMENTS: Test(s) outside specifications:
Air Content

DIRECTOR, DEPT. OF
PLANNING & PRECONSTRUCTION
Milan W. Lawson
MATERIALS & RESEARCH ENGINEER
BY: RJO

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AGENCY OF TRANSPORTATION
MATERIALS AND RESEARCH DIVISION
MONTPELIER, VERMONT 05602

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REPORT ON CONCRETE TEST BEAM OR CYLINDER

LAB. NO. C900270 PAY. ITEM 501.25 Concrete, Class B

PROJ. NAME Work Plan PROJ. NO. WP90-C-6 REPORTED 07/19/90

EXAM. FOR 501 Cl. B Compressive Strength SAMPLE TYPE PREL SAMPLED 06/20/90

RESIDENT ADDRESS

SAMPLED/SUBMITTED BY Meyer TITLE FIELD TEST BY SCS

SAMPLE FROM Laboratory Mixer QUANT. REPRESENTED 1.0 cf LAB TEST BY Graham

SOURCE OF MATERIAL M & R Lab COARSE AGGREGATE Cooley Websterville

FINE AGGREGATE Nadeau Johnson TOTAL AGGREGATE DRY WGT., LBS/CY 2998

CEMENT BRAND Northeast TYPE 2 LBS. 611 AIR ENT. ADMIX. Microair DOSAGE 3 oz/cy

ADMIXTURE POZZOLITH322N DOSAGE 5 oz/cwt ADMIXTURE DOSAGE

LOCATION USED REF Mix Batch No 8

	TEST RESULTS	SPECIFICATIONS MIN.	MAX.
UNIT WGT. FRESH CONC., LBS/CF	141.61	N.A.	N.A.
AIR CONTENT, %	7.10	4.00	6.00
SLUMP, INCHES	3.00	2.00	4.00
TOTAL WATER, GAL/CY	31.40	N.A.	35.8
W/C RATIO	0.429	N.A.	0.49
CONCRETE TEMP., DEGREES F	72	50	80
AMBIENT TEMP., DEGREES F	N.D.	10	85

SPECIMEN NO.	CYL. UNIT. WGT. LBS/CF	DATE REC'D	DATE BROKEN	DESIRED AGE AT BREAK	AGE AT BREAK	CURE S-F*	BREAK P.S.I.	AVG. BRK P.S.I.	BREAK TYPE*
R-8-B 1	N.D.	06/21	06/27	7	7	S	3660	N.A.	N.D.
R-8-B 2	N.D.	06/21	06/27	7	7	S	3850	3755	N.D.
R-8-B 3	N.D.	06/21	07/05	14	15	S	3950	N.A.	N.D.
R-8-B 4	N.D.	06/21	07/05	14	15	S	3890	3920	N.D.
R-8-B 5	N.D.	06/21	07/18	28	28	S	4410	N.A.	N.D.
R-8-B 6	N.D.	06/21	07/18	28	28	S	4590	4500	N.D.

*See MATERIALS SAMPLING MANUAL for explanation.

COMMENTS: Test(s) outside specifications:
Air Content

DIRECTOR, DEPT. OF
PLANNING & PRECONSTRUCTION
Milan W. Lawson
MATERIALS & RESEARCH ENGINEER
BY: [signature]

pla

TA 565 Rev. 4/79

Prepared By: C. C. Benda
Date: 04/30/90
Sheet 1 of 1

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

RESEARCH INVESTIGATION

Work Plan No. 90-C-6

Subject Evaluation of Fine Aggregate, H.A. Manosh Corp., Morrisville, Vermont

Investigation Requested By Gary Nolan Date April 25, 1990

Date Information Required As soon as possible

Purpose of Investigation To evaluate a fine aggregate proposed for use as a structural concrete aggregate from the H. A. Manosh Corp., Ferland Pit, located in Hyde Park, Vermont

Proposed Tests or Evaluation Procedure See Vermont procedure for evaluating a new source of structural concrete aggregate, Vermont AOT-MRD 9-82.

1. Performance in concrete tests will be performed using two batches each of Class A & Class B concrete containing the proposed new aggregate and two batches each of Class A & Class B concrete containing a reference aggregate.
2. Prepare specimens from each batch of concrete to determine resistance to freezing and thawing.

Proposal Discussed With D. C. Brown Projected Manpower Requirements 25 man days

Investigation To Be Conducted By Structural Concrete Subdivision

Proposed Starting Date May 1, 1990 Estimated Completion Date June 29, 1990

Approval/Disapproval by Materials & Research Engineer

Comments by Materials & Research Engineer

Materials & Research Division
Agency of Transportation
Date Typed: May 4, 1990