EVALUATION OF FINE AGGREGATE AND 3/4" CRUSHED GRAVEL FROM TWIN STATE SAND AND GRAVEL CORP. WEST LEBANON, N.H. FOR USE IN STRUCTURAL CONCRETE

> REPORT 91-01 AUGUST 1991

REPORTING ON WORK PLAN 90-C-12

STATE OF VERMONT AGENCY OF TRANSPORTATION MATERIALS AND RESEARCH DIVISION

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EXECUTIVE SUMMARY

To produce the optimum structural concrete, aggregate 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 and 3/4" crushed gravel for structural concrete. The materials tested were a fine aggregate and a 3/4" crushed gravel produced at the Twin State Sand & Gravel Corp. facilities in W. Lebanon, New Hampshire.

Test results and evaluation confirm these materials meet the required specifications as a fine aggregate source and as a 3/4" crushed gravel 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. William Ness, Construction Manager of the Twin State Sand & Gravel Corporation initially requested an evaluation of concrete sand and an evaluation of 3/4" crushed gravel processed at the Twin State Sand & Gravel facility, W. Lebanon N.H. in June 1990. Following his request, samples of the materials were obtained by Materials and Research Division representatives on June 7, 1990 and evaluated for compliance with the requirements of Section 704.01, and 704.02 of the Standard Specifications for Construction. The Agency of Transportation's Chief Geologist also traveled to the site to obtain samples for petrographic analysis of the materials.

The initial sample of 3/4" crushed gravel obtained on June 7, 1990 failed to comply with Gradation and Fractured Faces requirements and the manufacturer was informed of the problem. In October 1990 Mr. Ness indicated the 3/4" crushed gravel to be in compliance with specifications and desired to have more samples obtained. Samples of both concrete sand and 3/4" crushed gravel were obtained on October 31, 1990 by Materials and Research Division representatives. Subsequent testing confirmed the materials to be in compliance with

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 aggregates were sampled, by representatives of the Materials and Research Division, from a stockpile at the Twin State Sand & Gravel facilities in W. Lebanon, NH. The fine aggregate 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). The coarse aggregate (3/4" crushed gravel) was examined for Gradation (AASHTO T 27-84), Percent of Wear (AASHTO T 96-83), Thin and Elongated Pieces (VT AOT-MD 22), Fractured Faces (VT AOT-MD 23) and Sodium Sulfate Soundness (AASHTO T104-86).

Although the initial sample of coarse aggregate obtained on June 7, 1990, failed to comply with Fractured Faces & Gradation requirements. Additional Samples of each aggregate obtained on October 31, 1990 were found to be in compliance with requirements.

The reference aggregates were sampled from stockpiles at the Miller ready-mix concrete plant in Randolph, Vermont. The reference aggregate source was Lebanon Crushed Stone, W. Lebanon, NH. The reference fine aggregate was examined for Gradation (AASHTO T 27-84) and Organic Impurities (AASHTO T 21-86). The reference coarse aggregate was examined for Gradation (AASHTO T 27-84), Thin &

Elongated Pieces (VT AOT-MD 22), Fractured Faces (VT AOT-MD 22) and Percent of Wear (AASHTO T 96-83). 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 and Table 4. Aggregate test results are also shown in Laboratory Report Nos. G9000259, G9000262, G9000920, G9000921, G9000948, G9000949, G9000950, A900672 & A910173 in Appendix B.

The Vermont Agency of Transportation, Chief Geologist traveled to the facility in W. Lebanon, N.H. to obtain samples for analysis. Copies of the Chief Geologist's petrographic analysis are shown in Appendix C.

FINE AGGREGATE TEST DATA (Proposed New Aggregate)

	Twin State W. Leba Dates	V.A.O.T. Specification	
	06-07-90	10-31-90	Requirements
	%	%	%
Sieve Size	Passing	Passing	Passing
3/8"	100	100	100
# 4	100	99	95-100
#8	83	84	
#16	59	62	50-80
#30	32	34	25-60
#50	15	15	10-30
#100	8	7	2-10
Fineness Modulus	3.03	2.99	2.60-3.10
Organic Impurities, color	<1	<1	2 maximum
Compressive Strength of Mortar, % of Standard Sand			
3 days 7 days			100 minimum 100 minimum
Soundness, % loss		3.86	8 maximum

* Compressive Strength of Mortar testing could not be completed at this time - The Cement laboratory facilities are in a redesign and renovation stage.

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FINE AGGREGATE TEST DATA (Reference Aggregate)

1	Lebanon Crushed Stone,	
	W. Lebanon, N.H.	V.A.O.T.
	Date Sampled	Specification
	11-15-90	Requirements
	e/	0/
	76	10
Sieve Size	Passing	Passing
3/8"	100	100
#4	100	95-100
#8	87	~
#16	69	50-80
#30	46	25-60
#50	20	10-30
#100	6	2-10
Fineness Modulus	2.72	2,60-3,10
Organic Impurities, color	r <1	2 maximum

.

COARSE AGGREGATE TEST DATA (Proposed New Aggregate)

	3/4"	Crushed Stor	ne	
	Twin St W. Da 06-07-90	ate Sand & G Lebanon, N.H tes Sampled 10-31-90	ravel • 10-31-90	V.A.O.T. Specifications Requirements
Sieve Size	% Passing	% Passing	% Passing	% Passing
1"	100	100	100	100
3/4"	96	99	98	90-100
3/8"	34	26	23	20-55
#4	12	6	6	0-10
#8	6	3	3	0-5
L. A. Abrasion, % loss	28.4	28.7	30.2	35 maximum
Thin and Elongated Pieces, %	1.6	3.0	2.1	10 maximum
Fractured Faces, %	46.0	82.4	78.2	50 minimum
Soundness, % loss	0.24	-	-	8 maximum

COARSE AGGREGATE TEST DATA (Reference Aggregate)

	3/4" Crushed Stone		
	W. Lebanon, N.H. Date Sampled 11-15-90	V.A Speci Requi	A.O.T. ification irements
Giova Giov	%	D	%
Sleve Size	Passing	Pa	assing
1 "	100		100
3/4"	100	5	0-100
3/8"	35	2	20-55
#4	4		0-10
#8	2		0-5
L. A. Abrasion, % wear	23.2	35	maximum
Thin and Elongated Pieces, %	2.9	10	maximum
Fractured Faces, %	100.0	100	minimum
Soundness, % loss	-	8	maximum

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. <u>Proposed New Aggregate</u> Twin State Sand & Gravel Corp., W. Lebanon, NH
- B. <u>Reference Aggregate</u> Lebanon Crushed Stone Corp., W. Lebanon, NH

Coarse Aggregate

- A. <u>Proposed New Aggregate</u> Twin State Sand & Gravel Corp., W. Lebanon, NH
- B. <u>Reference Aggregate</u> Lebanon Crushed Stone Corp., W. Lebanon, NH

Cement

Type II Independent Cement Co., Joliette, Quebec

Air Entraining Admixture

Daravair W. R. Grace Co., Cambridge, MA

Water Reducing Admixture

WRDA with Hycol W. R. Grace Co. Cambridge, MA

Aggregate Properties used for preparing mix designs are shown in Table

5 and Table 6.

FINE AGGREGATE PROPERTIES

	Bulk Specific Gravity	Absorp., Percent	Fineness Modulus
Proposed New Aggregate Twin State Sand & Gravel West Lebanon, NH	2.61	1.0	3.03
Reference Aggregate Lebanon Crushed Stone West Lebanon, NH	2.64	1.2	2.67

TABLE 6

COARSE AGGREGATE PROPERTIES

	Bulk Specific Gravity	Absorp., Percent	Dry Rodded Unit Weight, lbs/cu. ft.
Proposed New Aggregate Twin State Sand & Gravel			
West Lebanon, NH	2.69	0.8	105.64
Reference Aggregate Lebanon Crushed Stone			
West Lebanon, NH	2.84	0.5	101.41

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 Class A and Class B concrete containing the new fine aggregate and the new coarse aggregate were prepared as well as two batches each of the Class A and Class B concrete containing the reference aggregates.

The mix proportions used are shown in Table 7 and Table 8.

NEW AGGREGATE MIX DESIGN BATCH QUANTITIES PER C.Y.

	Clas	ss A	Class B	
	Batch 7	Batch 8	Batch 3	Batch 4
*Coarse Aggregate, lbs.	1711	1711	1711	1711
*New Fine Aggregate, 1bs.	1169	1169	1310	1310
Cement, 1bs.	660	660	611	611
Air Entraining Admixture, oz.	5.5	6.0	3.5	3.5
Water Reducing Admixture, oz.	19.8	19.8	18.3	18.3
Net Water, gal.	32.7	33.9	34.1	33.5

*Weights converted to saturated surface-dry condition

TABLE 8

REFERENCE AGGREGATE MIX DESIGN BATCH QUANTITIES PER C.Y.

	Clas	s A	Class B		
	Batch 5	Batch 6	Batch 1	Batch 2	
*Coarse Aggregate, lbs.	1725	1725	1725	1725	
*New Fine Aggregate, lbs.	1280	1280	1401	1401	
Cement, 1bs.	660	660	611	611	
Air Entraining Admixture, oz.	6.0	5.5	3.5	3.5	
Water Reducing Admixture, oz.	19.8	19.8	18.3	18.3	
Net Water, gal.	32.9	33.4	34.4	34.1	

*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 3% NaCl solution.

RESULTS

Results of tests on the fresh concrete and compressive strength test results are shown in Table 9 and Table 10.

TABLE 9

PERFORMANCE TEST RESULTS NEW AGGREGATE

	Class A		Class B	
	Batch 7	Batch 8	Batch 3	Batch 4
Slump, inches	2 3/4	2 1/2	2 3/4	3 1/4
Air Content, percent	5.7	5.9	5.4	5.7
Unit Weight, 1bs/cu. ft.	146.09	145.57	147.42	145.85
Compressive Strength, psi				
7 days	3995	3960	3799	3710
14 days	4410	4315	4300	4240
28 days	4835	4715	4577	4510

(Design Compressive Strength, psi) (4000) (3500)

TABLE 10

PERFORMANCE TEST RESULTS REFERENCE AGGREGATE

	Clas	s A	Class B	
	Batch 5	Batch 6	Batch 1	Batch 2
Slump, inches	2 1/4	2 1/4	2 3/4	2 1/4
Air Content, percent	6.8	6.2	5.7	5.6
Unit Weight, lbs/cu. ft.	148.46	149.39	149.79	150.59
Compressive Strength, psi				
7 days	3940	4130	3992	4000
14 days	4485	4440	4455	4635
28 days	4899	4914	4797	5020

(Design Compressive Strength, psi) (4000) (3500)

The results of compressive strength tests are also shown on Laboratory Report Nos. C900835 through C900840, C900844 and C900845 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 11. The percent weight change resulting from freezing and thawing of specimens is shown in Table 12. 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 11

FREEZE-THAW TEST RESULTS - DURABILITY FACTOR

	New Aggregate			New Aggregate Reference					eference	Aggregat	e
	Clas	Class A		Class B Class A		Class A		ss B			
No. of	Batch 7	Batch 8	Batch 3	Batch 4	Batch 5	Batch 6	Batch 1	Batch 2			
Cycles				Durah	oility Fac	ctor					
50	110.9	98.9	101.7	100.0	98.7	98.1	102.1	100.2			
100	113.4	101.5	103.5	99.4	98.8	101.1	104.4	101.4			
150	114.8	101.5	107.0	100.2	99.4	98.7	106.0	103.0			
200	111.9	100.5	105.6	99.0	98.7	98.5	103.3	103.2			
250	111.2	101.4	105.5	98.5	98.4	97.9	104.1	102.6			
300	112.1	102.0	106.3	97.3	98.1	97.1	103.6	103.4			

FREEZE-THAW TEST RESULTS - PERCE						- PERCENT	OF WT.	CHANGE	
			New Agg	regate		Re	ference	Aggregate	e
		Cla	ss A	Clas	s B	Clas	s A	Clas	ss B
	No. of	Batch 7	Batch 8	Batch 3	Batch 4	Batch 5	Batch 6	Batch 1	Batch 2
	Cycles			Per	cent Of	Weight Ch	ange		
	50	-2.8	-2.7	-2.2	-1.0	-0.1	-1.3	-2.5	-1.7
	100	-5.8	-4.5	-5.4	-2.8	-2.3	-3.0	-4.9	-3.5
	150	-6.9	-6.1	-6.4	-3.9	-3.3	-4.3	-6.1	-4.3
	200	-7.9	-7.7	-8.2	-5.4	-4.5	-5.5	-7.5	-5.7
	250	-9.5	-9.0	-9.8	-6.9	-5.2	-6.6	-8.9	-6.7
	300	-10.7	-10.1	-11.3	-7.9	-5.9	-7.5	-10.3	-7.6

*





Bato	ch No	. Weight	Percent Weight	Fundamer Transver Frequenc	ntal rse cy	Individual Durability Factor	Average	Relative Durability Factor
No.	Cycl	es Lbs.	Loss	"N"	"N"	DF	DF	RDF
Refe	erence	Aggregate						
5	0	12.68	10.5	1613	260176	39		
5	300	11.32	10.7	1708	291726	54	107 1	
6	0	12.56		1608	258566	34	107.1	
6	300	11.29	10.1	1624	263737	102.0		
New	Aggreg	ate					÷.	109.7
7	0	13.01	5 9	1683	283248	39 98 1		
7	300	12.24	J.9	1667	277888	39.1	07 6	
8	0	12.88		1645	270602	25	91.0	
8	300	11.91	7.5	1621	262764	97.1 1		
			SUMMARY OF	FREEZE-TH	HAW TEST	RESULTS		

CLASS A

FIGURE III

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17

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			Percent	Fundamer Transver	ntal rse	Individual Durability		Relative Durability
Bato	ch No	. Weight	Weight	Frequenc) J	Factor	Average	Factor
NO.	Cycl	es Lbs.	Loss	N	N	DF	DF	RDF
Refe	erence	Aggregate						
1	0	12.56	11 0	1622	263088	106 2		
1	300	11.14	11.5	1672	279558	34	101 9	
2	0	12.50	7 9	1617	261468	89 97 3	101.5	
2	300	11.51	1.0	1595	254402	25		
New	Aggreg	ate						98.4
3	0	12.87	10.3	1647	271260	09 103.6		
3	300	11.55		1676	280897	76	103.5	
4	0	13.01	12.0	1676	280891	76 103.4		,
4	300	12.02		1704	29036	16		

SUMMARY OF FREEZE-THAW TEST RESULTS

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CLASS B

FIGURE IV

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SUMMARY AND CONCLUSIONS

- 1. An initial sample of the proposed new fine aggregate from the Twin State Sand & Gravel Corporation facility in West Lebanon, NH and a follow-up sample from the same facility were found to be in compliance with requirements of Section 704.01 when tested in conjunction with this evaluation.
- 2. An initial sample of the proposed new coarse aggregate from the Twin State Sand & Gravel Corporation facility in West Lebanon, NH failed to comply with gradation and fractured faces requirements. Subsequent samples of the proposed new coarse aggregate obtained from the same facility were found to be in compliance with the requirements of Section 704.02 when tested in conjunction with this evaluation.
- 3. The average 28 day compressive strengths of concrete containing the Twin State fine aggregate & 3/4" crushed coarse aggregate were approximately five percent less than the strengths of concrete containing the reference aggregate. The Class A concrete containing the Twin State aggregates had an average compressive strength of 4775 psi at 28 days, while the Class A concrete containing the reference aggregates yielded an average compressive strength of 4907 psi. The Class B concrete containing the Twin State aggregates had an average compressive strength 4544 psi at 28 days, while the Class B concrete containing the reference aggregates had an average compressive strength 4544 psi at
- 4. Results of freezing and thawing tests indicated the Class A concrete containing the new aggregates showed reduced performance

testing compared with Class A concrete containing the reference aggregate. The Average durability factor for the Class A concrete with the new aggregate was 97.6 while the Class A concrete with the reference aggregate had an average durability factor of 107.1. The Class A concrete containing the new aggregates, however, showed less weight loss (6.7%) than the Class A concrete containing the reference aggregate (10.4%).

- 5. The Class B concrete containing the new aggregate performed slightly better in sonic testing than the Class B concrete containing the reference aggregate. The average durability factor was 103.5 for the Class B concrete with the new aggregate and 101.8 for the Class B concrete with the reference aggregate. The Class B concrete containing the new aggregate, however, showed slightly greater weight loss (11.2%) than the Class B concrete with the reference aggregate (9.6%).
- 6. Mix Design Tables, shown on page 11, indicate the Class A and Class B mixtures containing the new aggregates having quantities of water relatively comparable to the mixes containing the reference aggregate develop approximately equal slump and air content (slump & air content indicated in tables 9 & 10, page 12).

RECOMMENDATIONS

- It is recommended that the present Twin State Sand & Gravel Corp. facilities in W.Lebanon, NH be approved as a source of fine aggregate and coarse 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&f. 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

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-inconcrete 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. Vermont A.O.T. VT-AOT-MRD 9-82 March 26, 1982 Page 2 of 2

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

- 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.
- 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.
- The material shall be tested at the Central Laboratory using the Structural Concrete Subdivision Annual Aggregate Testing Program procedure.
- Report the results (as an Evaluation Sample) on the Standard Materials and Research Division forms.

Phase II

- 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.
- 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.
- 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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Appendix B

STATE OF VERMONT AGENCY OF TRANSPORTATION MATERIALS AND RESEARCH DIVISION

W.NESS CARDOLL CONC CF Bonda

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

Laboratory Number	G90 002	259		Pay Itom	501
Project Name Parci	le CLu	6 1100	Dre	iect Number	
Sampled By By De	R. FOIL	Date San	npled X	67190	Examined For 774.01
Sampled From Stoc	koile	Pla	ant Co	rrall Co	write West Lebann M
Source of Material Two	in State	586	W. L	change	NH
Quantity Represented		Sample T	ype I	vastigativ	E - EVALUATION
Sample Comparison	Va		Cross	Reference Nu	mber
MATERIAL TEST	TED FI	NE AG	GREGAT	E FOR	GNCRETE
SIEVE	WEIGHT	% RE	TAINED	% PASSING	
SIZE	INDIV.	INDIV.	CUMUL.	CUMUL.	-
RET 34	0				
RET 4	2			100	
RET 8	126	17		83	_
RET 16	180	24		59	_
RET 30	204	27		32	
RET 50	123	17		15	-
RET (00	55	7		8	_
RET 2002	34	5		3	
PAN	21	3		0	
TOTAL	745				
Fineness Module Cumul. Te Organic Impuriti	us otal Retaine ies: Color	d/100	3.03		
T&F	_	_	% Thin &	Elongated Pie	YPES
Total Weight			/v xilli u	arongenou - ro	
Fractures	-	_ (% Fracture	dFaces	
Total Weight					
Original Weight Final Weight		- G	rading ercent Wea	r	AASHTO T96
. /					
(V) Test results are in	compliance	with spec	nications.		
() Test results are ou	itside specifi	ications.			
Comments:					
Tested By Chad	Otten		Reviewe	d By C. C. B	enda, P.E. <u>CUB</u> Initials
Date completed	156/20		24	1.0	

24

W. NESS
CARROLLON
C. 1-
BENDA

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

	Taban Ara	690	00262				
	Laboratory Number				Pay Item	501	
	Project Name Pc	ssible Fu	the Use	Pro	ject Number		
	Sampled By U. M	eyer	Date Sampl	ed X	07/20 E	xamined For	
	Sampled From Stoc	Kpile_	Plant	Car	TOIL CONC	rete-Wileb.	N.It
	Source of Material	win State	Sand #	Grave	1, west	Lebanon, N.H.	
	Quantity Represented		Sample Type	I	NVESTIGAT	VE. EVALUATION	
	Sample Comparison	No		_Cross	Reference Num	ber	
	MATERIAL TE	STED 3/4	Crushe	ed G	ravel for	Concrete	
	SIEVE	WEIGHT	% RETAIL	ED	% PASSING		
	SIZE	INDIV.	INDIV.	CUMUL.	CUMUL.		
	RET						
	RET						
	RET		· · · · ·		100		
	RET 3/4	644	4		96		
	RET 2	5904	39		57		
	RET 3/8	3445	23		34		
	RET 4	3374	22		12		
	RET 8	876	6		6		
	PAN	1004	6				
	TOTAL	15247	100				
	Fineness Modu	lus		•.			
	Cumul.	Total Retained	/100				
	Organic Impuri	ties Color					
	organic impuri	-					
		= 17 =	- 1.6 %	Thin & I	Elongated Piece	es .	
	Total Weight	1072	AC ~	-			
	Fractures =	= 475 =	= 76 %	Fracture	d Faces		
	Total weight	10/2			11 11		
	Original Weigh	t 5000 g	Grad	ing	B		
	Final Weight	35819	_ Perc	ent Wear	28.4%	AASHTO T96	
() Test results are i	n compliance	with specific	ations.			
(() Test results are o	outside specific	ations.				
(Comments: Moter	al faile	d the	Sic	e analy	sis and the	
	Instands to	st (7	% HI	H F	ASSING	THE NO. 4	
	SIEVE, 4%	LOW 0	N FRA	CTUT	2E FACE	s.)	
	,	1 14.					
T	'ested By Choo	allen		Reviewe	d By C. C. Ben	da, P.E. CUB	1.
'n	vale Completed	125/90		Date .	7.6.	<u>40</u>	
			2	C			

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

C. Benda

C.F

Laboratory Number	G900092	20		Pay Item	501.00
Project Name Passi	he Etr	1/00	Pro	ject Number	001
Sampled By W. D	ne roure	Date San	npled	131190	Examined For 704 01
Sampled From St	octoile	Pla	ant C	crall Cu	acte W. Lebanon N.H
Source of Material	Tuis Sta	Fr SA	nd # Ca	avel in	al and Alt
Quantity Represented	N/A	Sample T	VDE T	ovestigati	Ve
Sample Comparison	No	1	Cross	Reference Nu	mber
MATERIAL TE	STED fine	099 re	gate f	or concr	ete
		00	5		
SIEVE	WEIGHT	% RE	TAINED	% PASSING	
SIZE	INDIV.	IND'V.	CUMUL.	CUMUL.	-
PET					
3/0	_			100	-
RET 18				100	
RET	3.7	1	1	99	
RET 8	93.5	15	16	84	-
PET 16	138.4	22	38	62	
30	175.2	28	66	34	
50	116.8	19	85	15	
RET	47.6	8	93	7	
RET	47.3	7			-
PAN	622.5	100	299		ALL IS IN
iona.				<u> </u>	
Fineness Modu	ilus Total Retained	1/100	2 99		RECEIVED S
Cama.	I Utal Metallics		0.11		NOV: 12
Organic Impuri	ities: Color	<1	_		NOT PASS AND THE PARTY
T&E ==		-	% Thin &	Elongated Pie	eces
Total Weight					192 31
Fractures =		- (% Fracture	ed Faces	
Total Weight					
Original Weigh	t	_ · G	rading	79	AASHTO TOR
Final Weight		P	ercent wea	.r	AASHIO 190
(V) Test results are i	in compliance	with spec	ifications.		
() Test results are o	outside specifi	cations.			
Comments:					
Tested By Chac	1 A. allen		Review	ed By C. C. B	lenda, P.E. CCB
Date CompletedC	2/90		Date	11.14	70
			26		

C. Benda C.F

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

Laboratory Number	G900092	1		Pay Item	501.00	
Project Name Pos	sible Future	Use	Pro	iect Number		
Sampled By W. n	Rucr	Date Sam	pled 10	131/90	Examined For	704.02
Sampled From St	bekpile	Pla	nt Cor	roll Cor	crete W.	Lebanon NH
Source of Material	Twin Stat	e San	d and	Gravel	1. ichauan	NH
Quantity Represented	N/A	Sample Ty	pe Tr	West jagt	SIVC	
Sample Comparison	No		Cross H	Reference Ni	ımber	
MATERIAL T	ESTED 3/4 "	crushed	gravel	for con	crete	
	1				1	
SIEVE	WEIGHT	% RET	AINED	% PASSING		
SIZE	INDIV.	IND'V.	CUMUL.	CUMUL.	+	
RET	-					
RET						
<i>1</i> ′′	-			160		
RET				.00	t ·	
RET -14	84	1		99	1	
RET 1/2	4751	46		53		
RET 38	2763	27		26		
RET 4	2038	20		6		
8	284	3		3		
	289	3			T	
PAN	10,269	100				S STA
					- [S	
Fineness Mo	dulus Total Retained	1/100			le.	King MA
Cunto	, ittai netamet				1-	A Strange of the
Organic Impu	urities: Color	-	_			i i i i i i i i i i i i i i i i i i i
T&E	= 17.5 =	= 3.0	% Thin & 1	Elongated Pi	eces	WILL ESTANCH
Total Weight	592.6			U	· • • • •	in the second seco
Fractures	= 488 1 =	= 82.4 9	% Fracture	d Faces		STATING'
Total Weight	592.6					i with
Original Wai	the Sada	G	"	R ''		
Final Weight	3565.5 4	- 01 Pe	ercent Wea	r 28.7	7. AASHTO	T96
(V Test results are	in compliance	with spec	ifications.			
() Test results are	e outside specifi	cations.				
Comments:						
•						
						12. 12
Tested By Un	2 A. alle	1	Reviewe	ed By C. C. I	Benda, P.E.	LCY3
Date Completed	11/01/10		Date		- 10	_

CONCRIET
CE

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE

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1 m	9000948				·
Laboratory Number	8	60006)	Day Hom	ES1
Project Name 1, 201	nr ph	n ni	Dro	Fay hem	90-C-17.
Sampled By A Rins	TRADI	Date Sam	pled T//	E/9A	Examined For 204 DT
Sampled From ST	CIIP II	· Pla	nt k	2/100	Phanks/Phi 12
Source of Material		Lap	10/10/2	57600	A FILLEL DEL
Quantity Represented		Sample T	VDe To	27062-	4340
Sample Comparison	1 0		Cross	Reference Ni	imber
MATERIAL TE	STED F	Nº15 A	GEREE	Ats F	on Conchatis
				1	1
SIEVE	WEIGHT	70 RE	AINED	70 PASSING	1
SIZE	INDIV.	INDIV.	COMUL.	COMOL.	t
RET					1
RET					+
RET				160	
6	77	13.1	13	\$7	
14	105	12 8	31	69	
RET <u>10</u>	1217	22 4	RU	46	Ť
RET <u>50</u>	151	7/ 2	91	72	Ť
RET	07	111 1	all	1	t
RET JUC.	11	19.1 C.1	77	0	Ť
PAN	-24	218	200		+
TOTAL	287	1000	110	1	<u> </u>
Fineness Mod	ulus				
Cumul.	Total Retain	ed/100 2	2.12		
Organic Impu	rities: Color	_ 1	_		
T&E =	=		% Thin &	Elongated Pi	ieces
Total Weight					
Fractures :		- 9	% Fracture	ed Faces	
Total Weight					
Original Weigh	ht	G	rading		
Final Weight		P	ercent Wea	r	AASHTO T96
(<i>L</i> Test results are	in compliance	e with spec	ifications.		
() Test moulta are	outrido mori	Gentions			
() lest lestits ale	outside speci	ncations.			
Comments:					
			•		
1-t	5	1			ant
Tested By Sta.	1):1	t	Review	ed By G. C.	Bonda, R.E.
Date Completed	1-1-17- 1	X -	Date	_12/2	2-190 Initials

Conciete

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE C.F.

Laboratory Number	G9000349	Pay Item 501	
Project Name in and	Plan	Project Number 90-6	-10
Sampled By	Date Sampled	Il I Flor Examined For	704.02
Sampled From Stor	nile Plant	MUDE Produlet 14	101.06
Source of Material	Shaana Cruckad	Miller; Bandorra Pr	ALU -
Quantity Represented	Sample Type	The store the termon	YINe
Sample Comparison		ross Reference Numper	
· · · ·	<u></u>		
MATERIAL TES	TED 34 Crushed	Stone for Concrete	
SIEVE	WEIGHT % RETAINED	% PASSING	
SIZE	INDIV. INDIV. CU	MUL. CUMUL.	
RET			
RET			
RET			
3/4		100	
RET	(211) 201		
RET 2	6141 20 to	25.	
RET 18	5.740 26.C.		
RET	1.500 510		
RET <u>8</u>	530 23		
PAN	446 1.9		
TOTAL	23555100C		
Finances Modul	his		
Cumul. T	otal Retained/100		
Organic Impurit	ies: Color		
T&E ===	=31 = 2.9 % Th	in & Elongated Pieces	
Total Weight	1074		
Fractures =	= 1074 =190 % Fra	actured Faces	
Total Weight	1014		
	/ - / (6	
Original Weight	Secc Grading	_13	
Final Weight	<u>3839</u> Percent	Wear 23.2 AASHTO T	96
() Test results are in	o compliance with specificatio	ms	
() 10011054145416	r compriance with oppositioner		
() Test results are o	utside specifications.		
Comments:			
<u></u>			
·			
0 / S			10.1
Tested By ACan	1, ilimeting Re	viewed By C. C. Bonda, P.E.	MAA
Date Completed	11.27-90) Da	te 12/2/90	Initials
	2	9	(

Structure / Concrete

REPORT ON SAMPLE OF STRUCTURAL CONCRETE AGGREGATE CF

		009		
Laboratory Number	098000	C9000950	Pay Item	501
Project Name Work	Plan	P	roject Number	· 90-C-12
Sampled By U. N.	leyer	Date Sampled 10	1/31/90	Examined For 704.02
Sampled FromStoc	Kp11e	Plant Co	rroll Cor	priete, W. Leb. N.H
Source of Material	win Sta	te S&G.	W. Leb.	N.H.
Quantity Represented	<u> </u>	Sample Type p	climina	ry - Evaluation
Sample Comparison	No	Cross	Reference N	umber
MATERIAL TES	TED 3/4	"crushed	Frauel +	for Conciete
SIEVE	WEIGHT	% RETAINED	% PASSING	
SIZE	INDIV.	INDIV. CUMUL	CUMUL	
0.111				-
RET				+
RET /			100	
344	2,12	2	90	
RET	246		10	+
RET	5/13	76	52	+
3/9	3619	29	23	
4	2111	17	1.	
RET	2111		9	+
RET B	361		3	
RET	2011	2		Ť
PAN	377	2		+
TOTAL	12440			
Fineness Modu	lus Retel Deteine	1/100		
Cumu.	Iotal Retained	u/100		
Organic Impuri	ties: Color			
T. 8. F	207	- 2 / 0% Thin 8	Elongated P	ionos
	302 =	$= \underline{\zeta, 1}$ 70 mm e	t Elongated I	leces
Total weight	1931	70 701 Emotor	The second second	
Fractures =	= 1126 =	= 10.2% Fractu	rea Faces	
Total Weight	1434			
Original Waight	5000	Creding	R	
Final Weight	3000	- Dercent We		
	741	I ercent we		AASHIO 190
	1307	State Automatic		
(Test results are i	n compliance	with specifications.		
() Test results are o	outside specifi	ications.		
Comments:				
·				
<u> </u>				
~				
Trantad Day	Lool_	Deri	and Dr. C. C.	Pondo por P/11
Data Completed	12/2/2	Revie	wea by C. C.	Denua, T.E. Aff
Date Completed	11-1-170	Date		CITO V Initials
		30		

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



J

REPORT ON SAMPLE OF ABBREBRIEF

LAB NO. : 0900672		Report Date:	10/31/90
Project: Possible Futur	e Use		C
Pay Item: Structural Co	ncrete 501.	Sampled By:	W MRYer ,
Material Name/Type: Cru	shed Gravel for Concrete	Date Sampled:	26/07/90
Material Spec No. : 704.	02	Sampled From:	Stockpile
Quantity Represented:		Date Receiven:	\$6787790
Sample Source: Carnel (concepta li i chance Nid	Tested By:	M Lavin
Material Source: Twin S	tate Sand & Gravel W Leba	Test Date:	10/25/90
Sample Type: Investigat	i∨e	Comparison Sam X-Ref.No.:	ple':
Comments: 3/4 inch		•	
	۴		
	TEST RESULTS		
TOTAL SAMPLE SIEVE SIZE % PASSING	FINENESS MODULUS * COARSER THAN		
4-1-104	10 4	nerbore with the	NEOD
6 ¹⁰		DOCHTO TR	594
7 7	NU) 16	GRADINE	-
231	NO RA	631 10 167 2 1 11.5	
2-1/2"	NICI SID	CROCTURED	FORES &
(D)1	NO 1903	TARGE LINES	riulus, a
1-3/4"	1 The 2 Mar 14	THIN & FILL	NGGTEN
1-1/2"	ETWENESS MODULUS -	PIECES. *	4h.11 + h.C
1**			
3/4"	CDI DP =	SOUNDNESS.	% : USS Ø.
1.72"			
3/8"	COMMENTS: Teat Results	are to complian	n p
ND. 4	with superfic	ations	
NO. A		and an up that is an	
NO. 16			
110. 301			
NC. 50			
40. 1944			
NO. 200			

CHEMIST, TESTING LAB SOPERVISOR

FURE R. H. Haupt, MATERIALS & RESERVED EXCLUSION

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EMABRR13	VERMONT AGENCY OF TRA MATERIALS AND RESEAR	NSPORTATION CH DIVISION	DISTRIBUTION Central Files
	REPORT ON SAMPLE OF Preliminary Sam	AGGREGATE	Geologist
		,	Wever
Lab No: A910173		Report Da	te: 07/16/91
Project: Possible Futur	e Use		
Den Itere CONCRETE CIA	CC D 501 95	Sampled B	y: Meyer
Material Name/Type: Fin	e Aggregate for Concre	Date Samp	led: 10/31/90
		Sampled F:	rom:
Material Spec. No: 704.	01A	Data Data	
Sample Source: Carrol C	oncrete W.Lebanon N.H.	Date Rece	ived: 10/31/90
Material Source: TWIN S	TATE SAND & GRAVEL WES	Tested By T LEBANON NH	: M.Lavin
Quantity Bank		Test Comp	Lete: 05/03/91
Quantity Rep:		X-Ref No:	CS:
Comment:			
TOTAL SAMPLE OUTSI SIEVE PASSING SPEC: 4 1/2"	TEST RESULTS DE FINENESS MODULUS S % COARSER THAN ¦ No. 4	Fineness	OUTSIDE SPECS
4"	No. 8	Color :	-
3 1/2"	No. 16	Cardina	
2 1/2"	No. 30	Percent of V	lear l
2"	No. 50	AASHTO T96 =	
1 3/4"	No. 100		
1 1/2"		Frac Face =	
1"		Thine/Elon =	
3/4" 5/9"		Soundness =	3.83
1/2"			
3/8"			
No. 4(P)	Remarks: Results	s of tests per	formed are in
	compliance with	specificaitio	ons.
No. 4			
No. 16			
No. 30			
No. 40			
No. 50			
No. 100			
No. 200	1		
Comments:			
Reviewed By: R.J.O'Brier	n Chemist Testing Lab.	Supervisor	M.V.L.

For: R.F.Cauley Materials and Research Engineer

AGENCY OF TRANSPORTATION

OFFICE MEMORANDUM

TO:

John H. Weaver, P.E., Structural Concrete Engineer Alan J. McBean II, Chief Geologist

FROM:

DATE: July 24, 1991

SUBJECT: Petrographic Analysis of Fine Aggregate for Concrete from Twin State Sand and Gravel, Lebanon, NH

The following petrographic summary of washed sand for structural concrete from the Twin State Sand and Gravel pit in Hartland, Vt is based on a field inspection of the source on July 18, 1990 and a laboratory analysis conducted on July 16, 1991.

Samples were taken from an existing stockpile at the Twin State Sand and Gravel plant in Lebanon, New Hampshire. Materials from several points in the stockpile were combined to assure a random and representative mixture of aggregate in each sample. The petrographic analysis (Table 1) was done with a 10-70X stereozoom binocular microscope. The physical and chemical condition, lithologic variation and coatings of the aggregate were noted.

The Twin State pit in Hartland is shown on the 1970 Surficial Geologic Map of Vermont as a lake sand deposit. The working face of the pit consists of inclined, graded beds of pebbly sand with some cobbles. This material is capped by a finer sand of variable Depending on where in the face the material is being thickness. trucked from, the feed to the wash plant could have considerable variation due to the variable thickness of the upper fine sand layer.

As seen in Table 1, the material consists of a variety of rock types and minerals. Included are micaceous quartzite, quartzmuscovite schist, quartz-chlorite schist, pyritic phyllite, amphibolite, granite, quartz-mica granulite, calcium carbonate cemented conglomerate and individual grains of the minerals quartz, amphibole, mica, magnetite, garnet and pyroxene. Quartzite, schist, amphibolite and granulite are most abundant in the larger particle sizes with quartz and quartzite content increasing as grain size decreases. Only minor weathering is seen on any grains. Some iron oxide coatings are seen if pyrite or calcium carbonate cement are present. Some of the granulite grains are friable (break with finger pressure) but these grains account for a very small percentage of the total sample. The degree of roundness varies with particle size; decreasing as grain size decreases. Generally, the No.4, No.8 and No. 16 sieves are subrounded to rounded and the finer sizes are subrounded to subangular. The schist, amphibolite and granulite exhibit the highest degree of surface roughness.

The chemical stability of the aggregate is excellent. The majority of mineral types are silicates which resist both chemical and physical degradation. The only exception is the phyllite which contains pyrite but this is a small percentage of the total sample.

Overall the quality of this material is excellent. Every indication is that it will perform very well as a structural concrete aggregate.

AJM/lr

cc: RFC/Lab File AJM File Reading File Central Files

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Petrographic Analysis Twin State Sand & Gravel

TABLE 1

% of Lithology/Mineral Retained

.

Lithology/Mineral	<u>No.4</u>	No.8	<u>No,16</u>	No.30	<u>No.50</u>	<u>No.100</u>
Quartzite	25.0	34.4	23.3	24.2	11.9	2.4
Schist	27.2	21.9	25.2	13.4	4.1	5.7
Phyllite	2.2	1.7	0.4			
Amphibolite	9.8	5.9	5.8	6.7	2.7	
Granite	6.7	3.1	2.7	0.3		
Granulite	14.3	9.7	11.2	9.7	10.6	2.6
Conglomerate	0.4	1.0	1.9			
Quartz	14.3	22.2	29.5	43.2	67.7	67.9
Amphibole				0.5	1.1	1.1
Mica				0.8		16.2
Magnetite						0.7
Garnet					0.3	0.2
Pyroxene				1.1	1.6	3.1

AGENCY OF TRANSPORTATION

OFFICE MEMORANDUM

TO: John H. Weaver, PIE., Structural Concrete Engineer

FROM: Alan J. McBean II Chief Geologist

DATE: July 30, 1991

SUBJECT: Twin State Sand and Gravel Petrographic Analysis, Coarse Aggregate for Structural Concrete

The following petrographic summary of coarse aggregate for structural concrete from the Twin State Sand and Gravel pit in Hartland, Vermont is based on a field inspection of the source on July 18, 1990 and a laboratory analysis conducted on July 26, 1991.

Samples were taken from an existing stockpile at the Twin State Sand and Gravel plant in Lebanon, New Hampshire. Materials from several points in the stockpile were combined to assure a random and representative mixture of aggregate in each sample. The petrographic analysis (Table 1) was done with a 10X hand lens and a 10 - 70X steriozoom binocular microscope. The physical and chemical condition, lithologic variation and coatings of the aggregate were noted.

The Twin State pit in Hartland is shown on the 1970 Surficial Geologic Map of Vermont as a lake sand deposit. The working face of the pit consists of inclined, graded beds of pebbly and with some cobbles. This material is capped by a finer sand deposit of variable thickness. The pit run material is fed through a crusher to a wash/screen plant where the final product is produced.

As seen from Table 1, the material consists of a variety of rock types and minerals including quartz, calcium carbonate cemented conglomerate, igneous rock types (mostly granite), quartz-muscovitesericite schist, quartz-chlorite schist, amphibolite, siliceous limestone, quartz-biotite gneiss, pyritic phyllite, micaceous quartzite and quartz-biotite granulite. In general, the percent of granite and gneiss fragments decrease in the finer sizes while conglomerate particles increase. The other mineralogies are equally represented in all sieve sizes or had no trend in variation.

Overall, the material exhibits equant particle shape. Exceptions to this are the schist, phyllite and siliceous limestone which tend to be oblong in shape. Roundness increases in the No.4 and No.8 sieve size material due to a decrease in the presence of crushed material. Surface roughness varies with mineralogy and number of fractured faces. No deleterious surface textures are present. Physical strength of all mineralogies present is good (no friable particles were seen). Chemically, the aggregate is very stable. The pyritic phyllite weathers the most rapidly but accounts for a small percentage of the material present. With the exception of the phyllite, the other lithologies are slightly weathered. Some have a stain of iron oxide and the carbonate has been slightly to moderately leached from the siliceous limestone.

Overall this material should make an excellent concrete aggregate. It is not anticipated that any adverse reactions with Portland cement will occur.

AJM/lr

cc:RFC/Lab File AJM File Reading File Central Files

Table 1 Twin State Sand and Gravel Petrographic Analysis

	% Lithology/Mineral						
Lithology/Mineral	1/2"	3/8"	No.4	No.8			
Quartz	14.0	21.5	17.9	18.6			
Conglomerate	1.3	1.0	2.4	5.5			
Granite	15.3	8.9	7.6	3.8			
Schist	7.6	16.2	11.3	14.8			
Amphibolite	17.8	14.1	21.0	14.8			
Siliceous Limestone	10.2	14.7	10.7	15.1			
Gneiss	10.2	6.3	4.5	0.6			
Phyllite	4.5	3.1	4.1	1.7			
Quartzite	19.1	14.1	20.6	19.8			
Granulite				5.2			

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					1	Appendix	E
TA 188 Rev. 10/86	AGE MATERIF MONT	STATE OF VERMENCY OF TRANSPO ALS AND RESEARC IPELIER, VERMON	IONT IRTATION CH DIVISION IT 05602			Central F Benda	iles
	REPORT ON C	CONCRETE TEST B	EAM DR CYL	INDER			
LAB.NO. <u>C900835</u> Pf	AY. ITEM <u>501.22 (</u>	Concrete, Class	A				
PRDJ. NAME Work Plan		PROJ. NO. 90-C-	12		I	REPORTED	01/08/91
EXAM. FOR 501 CL. A Compre	essive Strength	SAMPL	E TYPE INV			SAMPLED	12/03/90
RESIDENT	ADDRESS						
SAMPLED/SUBMITTED BY Alle	<u>en</u>	TITLE LFP		FIELD	TEST E	BY <u>SCS</u>	
SAMPLE FROM Laboratory Mi	ixer QUANT. F	REPRESENTED 1.8	CF	LAB	TEST I	BY SCS	
SOURCE OF MATERIAL M&R	Lab		COARSE A	GREGA	TE Leba	anon Crust	ned St
FINE AGGREGATE Lebanon Cr	rushed St		TOTAL AG	GREGAT	E DRY	GT., LBS	/CY 3005
CEMENT BRAND Northeast	TYPE 2 LBS.	60 AIR ENT. AD	MIX. <u>Darava</u>	air	DOS	AGE 5.5 0	oz/cy
ADMIXTURE	DOSAGE	ADMIX	TURE WRDA/	Hycol	DOS	GAGE <u>3 oz</u>	/cwt
LOCATION USED Ref Mix Bat	ch No 6						
				SPECI	FICATIO	NS	
	TEST RE	SULTS		MIN.	ŗ	MAX.	
UNIT WGT. FRESH CONC., LBS	CF 149.3	9		N. A.	1	.A.	
SLUMP, INCHES	2.2	5		2.00	4	. 00	
TOTAL WATER, GAL/CY	33.4	0		N. A.		35.1	
CONCRETE TEMP. DEGREES F	: <u>0.42</u>	8		N. A. 50	Ĕ	80	
AMBIENT TEMP., DEGREES F	6	6		10		85	
SPECIMEN CYL.UNIT.WGT. NO. LBS/CF	DATE DATE REC'D BROKEN	DESIRED AGE AT BREAK	AGE AT (BREAK S	CURE S-F*	BREAK P.S.I.	AVG. BRK P. S. I.	BREAK TYPE*
R-2-A1 151.00	12/03 12/10	_7		SIC	4110	N.A.	N. D.
R-2-A2 151.00 R-2-A3 151.00	12/03 12/10 12/03 12/17	- 14	-7-14	5 5	4150	4130 N. A.	N. D.
R-2-A4 151.00	12/03 12/17	14	14	5	4460	4440	N.D.
R-2-A5 152.00	12/03 12/31 12/03 12/31	28	28	510	4949 4878	N. A.	N.D.
101100				-			

*See MATERIALS SAMPLING MANUAL for explanation.

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

DIRECTOR, DEPT. OF PLANNING & PRECONSTRUCTION RICHARD S. HAUPT ACTING MATERIALS & RESEARCH ENGINEER BY:

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

Central Files Benda

REPORT ON CONCRETE TEST BEAM OR CYLINDER

LAB. NO.	900836	PAY. ITEM	501.22 Co	ncrete,	Class	<u>A</u>				
PROJ. NAME	Work Plan		P	ROJ.NO.	<u>90-C-1</u>	2			REPORTED	01/08/91
EXAM. FOR	501 CL. A Comp	ressive S	trength		SAMPLE	TYPE I	VV		SAMPLED	12/03/90
RESIDENT		ADDR	ESS							
SAMPLED/S	UBMITTED BY ALL	len		TIT	LE LEP		FIEL	D TEST I	BY <u>SCS</u>	
SAMPLE FR	IOM Laboratory M	lixer	QUANT. REI	PRESENT	ED <u>1.8</u>	CF	LA	B TEST	BY <u>SCS</u>	
SOURCE OF	MATERIAL M & F	Lab				COARSE	AGGREG	ATE Leba	anon Crus	hed St
FINE AGGR	EGATE Lebanon (Crushed S	it ·			TOTAL A	GGREGA	TE DRY	WGT., LBS	CY 3005
CEMENT BR	AND Northeast		LBS. 660	AIR I	ENT. ADM	IX. Dara	wair	DOS	SAGE <u>6 oz</u>	/cwt
ADMIXTURE		DOSAGE			ADMIXT		A/Hycol	DOS	SAGE <u>3 oz</u>	/cwt
LOCATION	USED <u>Ref Mix Ba</u>	tch No 5								
							SPEC	IFICATIO	ONS	
			TEST RESU	JLTS			MIN.	, t	MAX.	
UNIT WGT. AIR CONTE SLUMP, IN TOTAL WAT W/C RATIO CONCRETE AMBIENT TO	FRESH CONC., LE NT, X CHES ER, GAL/CY TEMP., DEGREES EMP., DEGREES F	F	148.46 6.80 2.25 32.90 0.420 69 66				N. A. 5.00 2.00 N. A. N. A. 50 10		N. A. 7. 00 4. 00 35. 1 8. 44 80 85	
SPECIMEN NO.	CYL.UNIT.WGT. LBS/CF	DATE REC'D	DATE BROKEN	DESIREI AT BR) AGE REAK	AGE AT BREAK	CURE S-F*	BREAK P.S.I.	AVG. BRK P. S. I.	BREAK TYPE*
R-1-A1 R-1-A2 R-1-A3 R-1-A4 R-1-A5 R-1-A6	<u>151.00</u> <u>150.00</u> <u>150.00</u> <u>151.00</u> <u>151.00</u> 151.00	12/03 12/03 12/03 12/03 12/03 12/03	<u>12/10</u> <u>12/10</u> <u>12/17</u> <u>12/17</u> <u>12/31</u> 12/31		7744	7 7 14 14 28 28	ରୀ ରା ରା ରା ରା ର	3930 3950 4510 4460 4927 4871	<u>N. A.</u> <u>3940</u> <u>N. A.</u> <u>4485</u> <u>N. A.</u> 4899	N. D. N. D. N. D. N. D. N. D. 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 RICHARD S. HAUPT ACTING MATERIALS & RESEARCH ENGINEER BY:

STATE OF VERMONT Central Files 18 188 Rev. 10/86 AGENCY OF TRANSPORTATION Renda MATERIALS AND RESEARCH DIVISION MONTPELIER, VERMONT 05602 REPORT ON CONCRETE TEST BEAM OR CYLINDER PAY.ITEM 501.25 Concrete, Class B LAB. ND. C900837 PRDJ.NO. 90-C-12 REPORTED 01/08/91 PROJ. NAME Work Plan SAMPLE TYPE INV SAMPLED 12/03/90 EXAM.FOR 501 CL. B Compressive Strength ADDRESS RESIDENT TITLE LFP FIELD TEST BY SCS SAMPLED/SUBMITTED BY Allen SAMPLE FROM Laboratory Mixer QUANT. REPRESENTED 1.8 CF LAB TEST BY SCS COARSE AGGREGATE Lebanon Crushed St SOURCE OF MATERIAL M & R Lab TOTAL AGGREGATE DRY WGT., LBS/CY 3126 FINE AGGREGATE Lebanon Crushed St CEMENT BRAND Northeast TYPE 2 LBS. 611 AIR ENT. ADMIX. Daravair DOSAGE 3.50 oz/cwt ADMIXTURE WRDA/Hycol DOSAGE 3 oz/cwt ADMIXTURE DOSAGE LOCATION USED Ref Mix Batch No 1 SPECIFICATIONS TEST RESULTS MAX. MIN. 149.79 UNIT WGT.FRESH CONC., LBS/CF N. A. N.A. 5.70 4.00 6.00 AIR CONTENT, X SLUMP, INCHES 2.75 2.00 4.00 TOTAL WATER, GAL/CY 34.40 N.A. 35.8 N. A. W/C RATIO 0.470 0.49 69 50 80 CONCRETE TEMP., DEGREES F AMBIENT TEMP., DEGREES F 70 10 85 AGE AT CURE BREAK AVG. BRK BREAK DESIRED AGE SPECIMEN CYL. UNIT. WGT. DATE DATE REC'D BROKEN AT BREAK BREAK S-F* P.S.I. P.S.I. TYPE* NO. LBS/CF S 4043 N.A. N.D. R-1B1 151.00 12/03 12/10 3992 7 3940 N.D. R-1-B2 152.00 12/03 12/10 7 <u>s</u> S 4470 N.D. 12/03 12/17 N.A. 152.00 14 R-1-B3 S 4440 4455 N.D. 14 14 R-1-B4 152.00 12/03 12/17 28 S 4747 N.D. 12/03 12/31 28 N.A. R-1-B5 152.00 28 28 S 4846 4797 N. D. R-1-B6 152.00 12/03 12/31

*See MATERIALS SAMPLING MANUAL for explanation.

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

DIRECTOR, DEPT. OF PLANNING & PRECONSTRUCTION RICHARD S. HAUPT ACTING MATERIALS & RESEARCH ENGINEER BY:

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TA 188 Rev. 10/86	N	1	Central Fi Benda	les					
	REPORT ON CO	DNCRETE TEST BE	EAM OR CY	LINDER					
LAB.NO. C900838 PAY.ITEM 501.25 Concrete, Class B									
PROJ.NAME Work Plan	1	PROJ.NO. 90-C-1	12		ş		1/08/91		
EXAM. FOR 501 CL. B Compr	essive Strength	SAMPLE	E TYPE IN	v		SAMPLED 1	2/03/90		
RESIDENT	ADDRESS								
SAMPLED/SUBMITTED BY ALL	en	TITLE LFP		FIEL	D TEST E	BY SCS			
SAMPLE FROM Laboratory M	ixer QUANT. R	EPRESENTED 1.8	CF	LA	B TEST I	BY SCS			
SOURCE OF MATERIAL M & R	Lab		COARSE	AGGREG	ATE <u>Leba</u>	anon Crush	ed St		
FINE AGGREGATE Lebanon C	rushed St		TOTAL A	GGREGA	TE DRY	GT., LBS/	CY 3126		
CEMENT BRAND Northeast	TYPE 2 LBS. 61	11 AIR ENT. ADM	IX. Dara	vair	DOS	AGE 3.50	oz/cy		
ADMIXTURE	DOSAGE	ADMIX	fure <u>wrda</u>	/Hycol	DOS	SAGE 3 oz/	Cwt		
LOCATION USED Ref Mix Bat	tch No 2								
				SDEC	TETCOTIC	ING			
	TEST RES	GULTS		MIN.	h	AX.			
UNIT WGT. FRESH CONC., LB	S/CF 150.55	9		N. A.	h	I. A.			
AIR CONTENT, X	5.60	ā		4.00	6	5.00			
SLUMP, INCHES	2.2	5		2.00	4	.00			
HUTAL WATER, GAL/CY	34.1	0		N.H.		49			
CONCRETE TEMP. DEGREES	F 67	<u>.</u>		50	-	80			
AMBIENT TEMP., DEGREES F	70	<u>.</u>		10		85			
SDECTMEN CVI UNIT LIGT	DOTE DOTE	DECIDED OGE	OGE OT	CURE	BREOK	OUG BRY	BREOK		
NO. LBS/CF	REC'D BROKEN	AT BREAK	BREAK	S-F*	P.S.I.	P. S. I.	TYPE*		
R-2-B1 153.00	12/03 12/10	_7		S	3975	N. A.	N. D.		
<u>R-2-B2</u> <u>153.00</u>	<u>12/03</u> <u>12/10</u>	7	-7	S	4025	4000	N. D.		
R-2-R4 154 00	12/03 12/17	14	14	20	4610	4635	N.D.		
R-2-B5 153.00	12/03 12/31	28	28	S	4988	N. A.	N.D.		
R-2-B6 153.00	12/03 12/31	28	28	5	5051	5020	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 RICHARD S. HAUPT ACTING MATERIALS & RESEARCH ENGINEER BY: O 000

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14 180 KEV, 10/80		Central F Benda	iles					
	REPORT ON	CONCRETE TEST E	EAM OR CY	LINDER	2			
LAB. NO. C900839 PA	Y. ITEM 501.25	Concrete, Class	в					
PROJ.NAME Work Plan		PROJ. NO. 90-C-	12			REPORTED	01/09/91	
EXAM.FOR 501 CL. B Compressive Strength SAMPLE TYPE INV SAMPLED 12/03/90								
RESIDENT	ADDRESS							
SAMPLED/SUBMITTED BY Alle	<u>n</u> :	TITLE LEP		FIEL	D TEST	BY SCS		
SAMPLE FROM Laboratory Mi	xer QUANT.	REPRESENTED 1.8	CF	LA	B TEST	BY SCS		
SOURCE OF MATERIAL M&R	Lab		COARSE	AGGREG	ATE TWI	n State S	& G	
FINE AGGREGATE Twin State	S & G		TOTAL A	GGREGA	TE DRY	WGT., LBS	CY 3029	
CEMENT BRAND Northeast	TYPE 2 LBS.	611 AIR ENT. AD	MIX. <u>Dara</u>	vair	DO	SAGE 3.50	oz/cy	
ADMIXTURE	DOSAGE	ADMIX	TURE WRDA	/Hycol	DO	SAGE 3 oz/	Cwt	
LOCATION USED Test Mix Ba	tch No 3							
				SPEC	TEICOTI	ONS		
	TEST F	ESULTS		MIN.	11 10/11	MAX.		
UNIT WGT. FRESH CONC., LBS.	/CF 147.	42		N. A.		N. A.		
AIR CONTENT, %	5.	<u>40</u> 75		4.00		6.00		
TOTAL WATER. GAL/CY	34-	10		N. A.		35.8		
W/C RATIO	0.4	70		N. A.		0.49		
CONCRETE TEMP., DEGREES F		70		50		80		
AMBIENT TEMP., DEGREES F	-	70		10		<u>85</u>		
SPECTMEN CVI UNIT LIGT		DESTRED OGE	ORE OT	CURE	BREOK	OUG BOK	BREOK	
NO. LBS/CF	REC'D BROKEN	AT BREAK	BREAK	S-F*	P.S.I.	P. S. I.	TYPE*	
TS-1-B1 148.00	12/03 12/10		_7	S	3795	N. A.	N.D.	
<u>15-1-82</u> <u>148.00</u>	12/03 12/10	-7	-7	5	3802	3799	N.D.	
TS-1-B4 149.00	12/03 12/17	14	14	5 0	4380	4300	N.D.	
TS-1-B5 149.00	12/03 12/31	28	28	S	4644	N.A.	N.D.	
TS-1-B6 148.00	12/03 12/31	28	28	S	4510	4577	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 RICHARD S. HAUPT ACTING MATERIALS & RESEARCH ENGINEER BY: Contemporations of the second seco

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TA 188 Rev. 10/86

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

Central Files Benda

REPORT ON CONCRETE TEST BEAM OR CYLINDER

LAB.NO. C	900840	PAY. ITEM	501.25 Con	crete,	Class	B				
PROJ. NAME	Work Plan		PR	0J.NO.	<u>90-C-1</u>	2		1	REPORTED	01/09/91
EXAM. FOR	501 CL. B Compr	essive S	trength		SAMPLE	TYPE IN	<u>IV</u>		SAMPLED	12/03/90
RESIDENT		ADDR	ESS							
SAMPLED/S	UBMITTED BY ALL	en		TIT	LE LFP		FIEL	D TEST I	BY <u>SCS</u>	
SAMPLE FR	OM Laboratory M	lixer	QUANT. REP	RESENT	ED 1.8	CF	LA	B TEST I	BY SCS	
SOURCE OF	MATERIAL M & R	Lab				COARSE	AGGREG	ATE Twir	n State S	86
FINE AGGR	EGATE <u>Twin Stat</u>	e S&G	· ·			TOTAL A	GGREGA	TE DRY	HGT., LBS	CY 3029
CEMENT BR	AND Northeast	TYPE 2	LBS. 611	AIR	ENT. ADM	IX. <u>Dara</u>	vair	DOS	GAGE <u>3.50</u>	oz/cy
ADMIXTURE		DOSAGE			ADMIXT	URE WRDA	/Hycol	DOS	SAGE <u>3 oz</u>	/cwt
LOCATION	USED Test Mix B	atch No	4							
						·	SPEC	IFICATIO	ONS	
			TEST RESU	LTS			MIN.	1	MAX.	
UNIT WGT. AIR CONTE SLUMP, IN TOTAL WAT W/C RATIO CONCRETE AMBIENT T	FRESH CONC., LE NT, X CHES ER, GAL/CY TEMP., DEGREES EMP., DEGREES F	F	145.85 5.70 3.25 33.50 0.460 69 70				N. A. 4.00 2.00 N. A. N. A. 50 10		1. A. 5. 00 4. 00 35. 8 5. 49 80 85	
SPECIMEN NO.	CYL.UNIT.WGT. LBS/CF	DATE REC'D	DATE BROKEN	DESIRE AT B	d Age Reak	AGE AT BREAK	CURE S-F*	BREAK P.S.I.	AVG. BRK P. S. I.	BREAK TYPE*
<u>TS-2-B1</u> <u>TS-2-B2</u> <u>TS-2-B3</u> <u>TS-2-B4</u> <u>TS-2-B5</u> <u>TS-2-B6</u>	148.00 147.00 148.00 148.00 148.00 148.00	12/03 12/03 12/03 12/03 12/03 12/03	12/10 12/10 12/17 12/17 12/31 12/31		7 7 14 14 28 28	7 7 14 14 28 28	ରୀ ରା ରା ରା ରା ରା	3717 3703 4170 4310 4475 4545	N.A. 3710 N.A. 4240 N.A. 4510	N.D. N.D. N.D. N.D. N.D. 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 RICHARD S. HAUPT ACTING MATERIALS & RESEARCH ENGINEER BY: P.(O

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TA 188 Rev. 10/86

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

Central Files Benda

REPORT ON CONCRETE TEST BEAM OR CYLINDER

LAB. NO. C900844	PAY. ITEM	501.22 Com	crete, Class	A				
PROJ.NAME Work Plan		PR	DJ.NO. <u>90-C-</u>	12			REPORTED	01/03/91
EXAM. FOR 501 CL. A Com	pressive S	Strength	SAMPLE	TYPE IN	V		SAMPLED	12/04/90
RESIDENT	ADDR	RESS						
SAMPLED/SUBMITTED BY A	llen		TITLE LFP		FIEL	D TEST I	BY <u>SCS</u>	
SAMPLE FROM Laboratory	Mixer	QUANT. REPI	RESENTED 1.8	CF	LA	B TEST	BY SCS	
SOURCE OF MATERIAL M &	R Lab			COARSE	AGGREG	ATE Twi	n State S	& G
FINE AGGREGATE Toin St.	ate S & G			TOTAL A	GGREGA	TE DRY	WGT., LBS	CY 2880
CEMENT BRAND Northeast	TYPE 2	LBS. 660	AIR ENT. ADM	IIX. <u>Dara</u>	vair	DOS	SAGE 5.5	oz/cy
ADMIXTURE	DOSAGE		ADMIXT	URE WRDA	/Hycol	DOS	SAGE <u>3 oz</u>	/cwt
LOCATION USED Test Mix	Batch No	7						
		TEGT DECH	TC		SPEC	IFICATIO	ONS	
		IESI RESUL	215		PILIN.		MA.	
UNIT WGT.FRESH CONC., 1	BS/CF	146.09			N. A.	ļ.	N. A.	
SLIMP. INCHES		2.75			2.00		4.00	
TOTAL WATER. GAL/CY		32.70			N. A.		35.1	
W/C RATID		0.410			N. A.	9	0.44	
CONCRETE TEMP., DEGREES	5 F	_65			50		80	
AMBIENT TEMP., DEGREES	F	_64			10		<u>85</u>	
SPECIMEN CYL.UNIT.WGT. NO. LBS/CF	DATE REC'D	DATE I BROKEN	DESIRED AGE AT BREAK	AGE AT BREAK	CURE S-F*	BREAK P.S.I.	AVG. BRK P. S. I.	BREAK TYPE*
TS-1-A1 148.00	12/04	12/11	_7	_7	<u>s</u>	3990	N. A.	N. D.
<u>TS-1-A2</u> <u>148.00</u>	12/04	12/11	7	_7	5	4000	3995	N.D.
<u>18-1-A3</u> <u>148.00</u>	12/04	12/18	14	14	5	4380	N.A.	N. D.
TS~1-05 149 00	12/04	12/18	14	14	210	4440	4410 N 0	N.D.
TS-1-A6 149.00	12/04	01/02	28	29	S	4830	4835	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 RICHARD S. HAUPT ACTING MATERIALS & RESEARCH ENGINEER BY:

TH 185 Rev. 10/86 STATE OF VERMONT AGENCY OF TRANSPORTATION MATERIALS AND RESEARCH DIVISION MONTPELIER, VERMONT 05602									iles
		RE	PORT ON CO	ONCRETE TEST B	EAM OR CY	LINDER	2		
LAB. NO. C	0900845	PAY, ITEM	501.22 C	pricrete, Class	A				
PROJ. NAME	Work Plan		f	ROJ.NO. 90-C-	12			REPORTED	01/03/91
EXAM. FOR	501 CL. A Comp	ressive	Strength	SAMPL	E TYPE IN	<u>IV</u>		SAMPLED	12/04/90
RESIDENT		ADD	RESS						
SAMPLED/S	UBMITTED BY AL	len		TITLE LFP		FIEL	D TEST	BY SCS	
SAMPLE FR	OM Laboratory	Mixer	QUANT. RE	PRESENTED		LF	B TEST	BY SCS	
SOURCE OF	MATERIAL M&	R Lab			COARSE	AGGREG	ATE Twi	n State S	& G
FINE AGGR	EGATE <u>Twin Sta</u>	te S & G			TOTAL P	GGREGA	TE DRY	WGT., LBS	CY 2880
CEMENT BR	AND Northeast	TYPE	LBS. 66	AIR ENT. AD	MIX. <u>Dara</u>	vair	DOS	SAGE 6 oz	CY
ADMIXTURE		DOSAGE		ADMIX	TURE WRDA	/Hycol	DOS	SAGE 3 oz	/cwt
LOCATION	USED Test Mix	Batch No	8						
			TEST RES	ULTS		SPEC MIN.	IFICATIO	DNS MAX.	
UNIT WGT. AIR CONTEN SLUMP, IN TOTAL WAT W/C RATIO CONCRETE AMBIENT TO	FRESH CONC., LI NT, X CHES ER, GAL/CY TEMP., DEGREES EMP., DEGREES I	F	145.57 5.90 2.50 33.90 0.430 63 64			N. A. 5. 00 2. 00 N. A. N. A. 50 10		N. A. 7. 00 35. 1 3. 44 80 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*
<u>TS-2-A1</u> <u>TS-2-A2</u> <u>TS-2-A3</u> <u>TS-2-A4</u> <u>TS-2-A5</u> TS-2-A6	<u>148.00</u> <u>148.00</u> <u>148.00</u> <u>148.00</u> <u>148.00</u> <u>148.00</u>	12/04 12/04 12/04 12/04 12/04 12/04	12/11 12/11 12/18 12/18 01/02 01/02	7 7 14 14 28 28	7 7 14 14 29 29	01 01 01 01 01 01 01	3980 3940 4310 4320 4750 4680	N. A. 3960 N. A. 4315 N. A. 4715	N.D. N.D. N.D. N.D. N.D. 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 RICHARD S. HAUPT ACTING MATERIALS & RESEARCH ENGINEER BY TA 565 Rev. 4/79

Appendix F AFF Prepared By: R. Holt Date: 03/20/91 Sheet l of l

STATE OF VERMONT AGENCY OF TRANSPORTATION MATERIALS & RESEARCH DIVISION

RESEARCH INVESTIGATION

Work Plan No. 91-C-6

Subject Evaluation of Fine Aggregate and 3/4" Crushed Gravel Coarse Aggregate
Investigation Devents i D. Steven Devenue Devenue N.H.
Investigation Requested By Steven Persons Date 03/12/91
Date Information Required As soon as possible
Purpose of Investigation To evaluate a fine aggregate and a 3/4" crushed
gravel coarse aggregate from the Columbia Sand & Gravel facility in
Columbia, N.H., proposed for use as structural concrete aggregates.
Proposed Tests or Evaluation Procedure See Vermont Procedure for Evaluating
a New Source of Structural Concrete Aggregate, VT-AOT-MRD 9-82.
l. Performance_in_concrete tests will be made a line batches each of
Class A & Class B concrete containing the proposed new aggregates and two
batches each of Class A & Class B concrete containing a reference aggregate.
2. Prepare speciments from each batch of concrete to determine resistance to
freezing and thawing.
Proposal Discussed With John Weaver Projected Manpower Requirements 25 man-days
Investigation To Be Conducted By Structural Concrete Subdivision
Proposed Starting Date <u>03/25/91</u> Estimated Completion Date <u>05/24/91</u>
Approval/Disapproval by Materials & Research Engineer N.F. Cauly
Comments by Materials & Research Engineer
aterials & Research Division

Date Typed: 03/28/91