EVALUATION OF F.W. WHITCOMB/N. WALPOLE, N.H.
3/4" CRUSHED STONE FOR USE IN STRUCTURAL CONCRETE

REPORT 82-4
MARCH 1982

REPORTING ON WORK PLAN 82-C-3

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

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Date: March 29, 1982
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ABSTRACT

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

This report documents results of tests performed on a proposed new source of coarse aggregate for structural concrete. The material tested was a 3/4" crushed stone produced by Frank W. Whitcomb Construction Corporation at their facilities in North Walpole, New Hampshire.

Results indicate that the material performs satisfactorily.
INTRODUCTION

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

A request was received from Frank W. Whitcomb Construction Corp. to evaluate crushed stone coarse aggregate, produced at their facilities in North Walpole, New Hampshire, for use in structural concrete. Samples of 3/4 inch crushed stone were obtained from the source at North Walpole, New Hampshire and evaluated for compliance with the requirements of Section 704.02 of the Standard Specifications. Materials were obtained and the performance-in-concrete phase of the evaluation was conducted in the Central Laboratory of the Materials and Research Division.
PROCEDURES

PHASE I - SECTION 704.02 TESTS

The 3/4 inch crushed stone was sampled from an existing stockpile at the Whitcomb, North Walpole, New Hampshire quarry on February 17, 1982 by representatives of the Materials and Research Division. The material was examined for gradation, wear, fractured faces, thin and elongated pieces, and soundness. It was found to comply with the Section 704.02 requirements. The reports on Laboratory Nos. G82 0004 and A82 0178 which document these tests are in Appendix B.

PHASE II PERFORMANCE-IN-CONCRETE TESTS

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

Coarse Aggregate:

A. Proposed New Aggregate
   3/4 inch crushed stone
   Frank W. Whitcomb Construction Corp., N. Walpole, N.H.

B. Reference Aggregate
   3/4 inch crushed gravel
   Frank W. Whitcomb Construction Corp., N. Walpole, N.H.

Fine Aggregate:

   Frank W. Whitcomb Construction Corp., N. Walpole, N.H.
Cement:

Type II
Lehigh Portland Cement Co., Alsen, New York

Air Entraining Admixture:

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

Water Reducing Admixture:

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

Aggregate properties used for preparing mix designs are shown in Table 1 and Table 2.

TABLE 1
COARSE AGGREGATE PROPERTIES

<table>
<thead>
<tr>
<th></th>
<th>Bulk Specific Gravity</th>
<th>Absorption, Percent</th>
<th>Dry Rodded Unit Weight, lbs/ft³</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Aggregate - Crushed Stone</td>
<td>2.85</td>
<td>0.9</td>
<td>105.08</td>
</tr>
<tr>
<td>Reference Aggregate - Crushed Gravel</td>
<td>2.67</td>
<td>1.0</td>
<td>101.51</td>
</tr>
</tbody>
</table>

TABLE 2
FINE AGGREGATE PROPERTIES

<table>
<thead>
<tr>
<th></th>
<th>Bulk Specific Gravity</th>
<th>Absorption, Percent</th>
<th>Fineness Modulus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Aggregate</td>
<td>2.62</td>
<td>1.2</td>
<td>2.91</td>
</tr>
</tbody>
</table>

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

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

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

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

<table>
<thead>
<tr>
<th>Batch</th>
<th>Class A</th>
<th>Class B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Batch 1</td>
<td>Batch 2</td>
</tr>
<tr>
<td>*Crushed Stone Coarse Aggregate, lbs.</td>
<td>1747</td>
<td>1747</td>
</tr>
<tr>
<td>*Fine Aggregate, lbs.</td>
<td>1264</td>
<td>1264</td>
</tr>
<tr>
<td>Cement, lbs.</td>
<td>660</td>
<td>660</td>
</tr>
<tr>
<td>Air Entraining Admixture, oz.</td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>Water Reducing Admixture, oz.</td>
<td>19.8</td>
<td>19.8</td>
</tr>
<tr>
<td>New Water, gal.</td>
<td>31.5</td>
<td>32.9</td>
</tr>
</tbody>
</table>

*Weights converted to saturated surface-dry condition.

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

<table>
<thead>
<tr>
<th>Batch</th>
<th>Class A</th>
<th>Class B</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Batch 5</td>
<td>Batch 6</td>
</tr>
<tr>
<td>*Crushed Gravel Coarse Aggregate, lbs.</td>
<td>1689</td>
<td>1689</td>
</tr>
<tr>
<td>*Fine Aggregate, lbs.</td>
<td>1213</td>
<td>1213</td>
</tr>
<tr>
<td>Cement, lbs</td>
<td>660</td>
<td>660</td>
</tr>
<tr>
<td>Air Entraining Admixture, oz.</td>
<td>3 1/2</td>
<td>4</td>
</tr>
<tr>
<td>Water Reducing Admixture, oz.</td>
<td>19.8</td>
<td>19.8</td>
</tr>
<tr>
<td>Net Water, gal.</td>
<td>32.5</td>
<td>30.2</td>
</tr>
</tbody>
</table>

*Weights converted to saturated surface-dry condition.
Tests were performed on the fresh concrete to determine Slump, Air Content, and Unit Weight. Six test cylinders (6" x 12") were fabricated from each batch. The cylinders were tested for compressive strength, two each, at ages 7, 14, and 28 days.

RESULTS

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

**TABLE 5**

NEW AGGREGATE TEST RESULTS

<table>
<thead>
<tr>
<th></th>
<th>Class A</th>
<th></th>
<th>Class B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Batch 1</td>
<td>Batch 2</td>
<td>Batch 3</td>
<td>Batch 4</td>
</tr>
<tr>
<td>Slump, inches</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>2 3/4</td>
</tr>
<tr>
<td>Air Content, percent</td>
<td>4.3</td>
<td>5.3</td>
<td>6.8</td>
<td>4.9</td>
</tr>
<tr>
<td>Unit Weight, lbs/ft³</td>
<td>152.54</td>
<td>150.19</td>
<td>147.02</td>
<td>150.05</td>
</tr>
<tr>
<td>Compressive Strength, psi</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 days</td>
<td>4554</td>
<td>4218</td>
<td>3550</td>
<td>3829</td>
</tr>
<tr>
<td>14 days</td>
<td>5412</td>
<td>5000</td>
<td>4387</td>
<td>4722</td>
</tr>
<tr>
<td>28 days</td>
<td>6403</td>
<td>6230</td>
<td>5382</td>
<td>5770</td>
</tr>
</tbody>
</table>

(Design compressive strength, psi) (4000) (3500)

**TABLE 6**

REFERENCE AGGREGATE TEST RESULTS

<table>
<thead>
<tr>
<th></th>
<th>Class A</th>
<th></th>
<th>Class B</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Batch 5</td>
<td>Batch 6</td>
<td>Batch 7</td>
<td>Batch 8</td>
</tr>
<tr>
<td>Slump, inches</td>
<td>3 1/4</td>
<td>1 3/4</td>
<td>3</td>
<td>3 1/2</td>
</tr>
<tr>
<td>Air Content, percent</td>
<td>5.3</td>
<td>4.1</td>
<td>5.5</td>
<td>7.2</td>
</tr>
<tr>
<td>Unit Weight, lbs/ft³</td>
<td>146.64</td>
<td>149.14</td>
<td>145.49</td>
<td>142.90</td>
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<tr>
<td>Compressive Strength, psi</td>
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<tr>
<td>7 days</td>
<td>3930</td>
<td>4077</td>
<td>3462</td>
<td>3152</td>
</tr>
<tr>
<td>14 days</td>
<td>4700</td>
<td>4916</td>
<td>4196</td>
<td>3966</td>
</tr>
<tr>
<td>28 days</td>
<td>5531</td>
<td>5257</td>
<td>5187</td>
<td>4572</td>
</tr>
</tbody>
</table>

(Design compressive strength, psi) (4000) (3500)
The results of compressive strength tests are also shown on Laboratory Reports Nos. C82 0008 through C82 0015 in Appendix C. Strength-age plots illustrating average compressive strengths are shown in Figure I and Figure II.
AVERAGE COMPRESSIVE STRENGTH VS AGE
CLASS A
Figure I
AVERAGE COMpressive STRENGTH VS AGE
CLASS B
Figure II
CONCLUSIONS AND RECOMMENDATIONS

1) The 3/4 inch crushed stone coarse aggregate from the Frank W. Whitcomb Construction Corp. quarry in North Walpole, New Hampshire, complied with all requirements of Section 704.02 when tested in conjunction with this evaluation.

2) The compressive strengths obtained from the Class A and Class B laboratory mixes using the 3/4 inch crushed stone coarse aggregate were appreciably higher than the compressive strengths of the reference mixes.

3) It is recommended that the present Frank W. Whitcomb Construction Corp. quarry in North Walpole, New Hampshire be approved as a source of crushed stone coarse aggregate for use in structural concrete.

4) During the initial uses of concrete containing this aggregate on Agency projects, Materials and Research Division representatives shall conduct tests necessary to determine the performance of this aggregate in concrete under field conditions.
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,
- 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.
## REPORT ON SAMPLE OF AGGREGATE

**Report** Feb. 26, 1982  
**Laboratory No.** G82 0004  
**Tested By** M. Morissette  
**Name** Coarse Aggregate for Concrete, Item 501  
**Identification Marks** Evaluation sample, 3/4" crushed stone  
**Submitted by** M. Morissette  
**Title** PFP  
**Address**  
**Sampled** 2-17, 1982  
**Received** 2-17, 1982  
**Sample from** Stockpile @ F. W. Whitcomb Const. Corp., N. Walpole, N.H.  
**Quantity Represented**  
**Source of Material** F. W. Whitcomb Const. Corp., N. Walpole, N.H.  
**Location used or to be used** W.P. 82-C-3  
**Examined for** 704.02  

### TEST RESULTS

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
<th>Fineness Modulus % Coarser Than</th>
<th>Percent of Wear</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 1/2&quot;</td>
<td></td>
<td>No. 100</td>
<td></td>
</tr>
<tr>
<td>4&quot;</td>
<td></td>
<td>No. 50</td>
<td></td>
</tr>
<tr>
<td>3 1/2&quot;</td>
<td></td>
<td>No. 30</td>
<td></td>
</tr>
<tr>
<td>3&quot;</td>
<td></td>
<td>No. 16</td>
<td></td>
</tr>
<tr>
<td>2 1/2&quot;</td>
<td></td>
<td>No. 8</td>
<td></td>
</tr>
<tr>
<td>2&quot;</td>
<td></td>
<td>No. 4</td>
<td></td>
</tr>
<tr>
<td>1 3/4&quot;</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>99</td>
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<td>Fineness Modulus -</td>
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<td>3/4&quot;</td>
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<tr>
<td>5/8&quot;</td>
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<td>No. 100</td>
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<td></td>
</tr>
<tr>
<td>No. 200</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

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

**By:** R. F. Miller, P.E., Materials & Research Engineer
Laboratory No. A82 0178
Tested By M. Lavin

Name Coarse Aggregate for Concrete, Item 501

Identification Marks Evaluation Sample, 3/4" Crushed Stone

Submitted by M. Morissette Title PFP Address

Sampled 2-17, 1982 Received 2-18, 1982

Sample from Stockpile @ Frank W. Whitcomb Const. Corp., N. Walpole, N.H.

Quantity Represented


Location used or to be used W.P. 82-C-3

Examined for 704.02

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
<th>Fineness Modulus</th>
<th>Percent of Wear</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 1/2&quot;</td>
<td></td>
<td>No. 100</td>
<td></td>
</tr>
<tr>
<td>4&quot;</td>
<td></td>
<td>No. 50</td>
<td></td>
</tr>
<tr>
<td>3 1/2&quot;</td>
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<td>1 3/4&quot;</td>
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<tr>
<td>No. 200</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Comments:
This material was examined for soundness. The results are as indicated.

S. J. Gage, P.E., Chief Engineer
# Report on Concrete Test Beam or Cylinders

## Laboratory No. C82 0008 (28) Report of 7, 14, 28 Day Breaks Date typed 3-25-82

## Pay Item Performance in Concrete Type of Sample Evaluation

Submitted by W. Meyer
Title CLP
Address Materials & Research Lab

Source of Material
- Berlin, Vermont
- F. W. Whitcomb Const. Corp.

Coarse Aggregate
- N. Walpole, N.H.

Fine Aggregate
- N. Walpole, N.H.

Cement-Brand Lehigh
Type II Lbs. 611

Air Entraining Admixture Darex AEA Dosage 3 1/2 oz/cy Admixture RDA Hycol Dosage 3 oz/cwt

Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 3013

Field Tested by M. Morissette Lab. Tested by Eaton

Sampled from Sears Mixer @ lab Date Sampled: February 23, 1982

Location Used or to be Used Reference Mix Batch No. 7

Examined for Mod. of Rupture Compressive Strength

### TEST RESULTS

**Unit Weight**
- Fresh Concrete 145.49 lbs/cf

**Air: Pressure**
- 5.5% Chace

**Total Water**
- Gal/Cy Used 31.2 Slump 3"

**Temperature, Concrete**
- 70°F Ambient 72°F

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Cyl. Unit Wgt. P.C.F.</th>
<th>Date Rec'd</th>
<th>Date Broken</th>
<th>Desired age at break</th>
<th>Age at Break</th>
<th>Type S-F</th>
<th>Break 1 P.S.I.</th>
<th>Break 2 P.S.I.</th>
<th>Ave. P.S.I.</th>
<th>Break Type 1</th>
<th>Break Type 2</th>
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</thead>
<tbody>
<tr>
<td>NWG 7B</td>
<td>146</td>
<td>2</td>
<td>3-2</td>
<td>7</td>
<td>7</td>
<td>S</td>
<td>3404</td>
<td>3519</td>
<td>3462</td>
<td></td>
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*S = Standard Cured; F = Field Cured

Types of Breaks:

![Diagram of Break Types]

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

R. F. Nicholson, P.E., Materials & Research Engineer
Laboratory No. C82 0099 (28) Report of 7, 14, 28 Day Breaks Date typed 3-25-82  

Pay Item Performance in Concrete Type of Sample Evaluation  

Submitted by W. Meyer Title CLP Address Materials & Research Lab  


Coarse Aggregate N. Walpole, N.H. Fine Aggregate N. Walpole, N.H.  

Cement Brand Lehigh Type II Lbs. 611  

Air Entraining Admixture Darex AEA Dosage 3 1/2 oz/cy Admixture WRDA Hycol dosage 3 oz/cwt  

Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 3013  

Field Tested by M. Morissette Lab. Tested by Eaton  

Sampled from Sears Mixer @ lab Date Sampled: February 23, 1982  

Location Used or to be Used Reference Mix Batch No. 8  

Examined for Mod. of Rupture Compressive Strength  

TEST RESULTS  

Unit Weight Fresh Concrete 142.90 lbs/cf Air: Pressure 7.2% Chace  

Total Water, Gal/Cy Used 32 Slump 3 1/2” Temperature, Concrete 70°F Ambient 70°F  

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<th>Desired age at break</th>
<th>Age at Break</th>
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*S = Standard Cured; F = Field Cured  

Types of Breaks:  

Comments: TA 133H Rev. 1/81  

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

By: R. F. Nicholson, P.E., Materials & Research Engineer
Report on Concrete Test Beam or Cylinders

Laboratory No. C82 0010 (28) Report of 7, 14, 28 Day Breaks Date typed 3-25-82

Pay Item Performance in Concrete Type of Sample Evaluation

Submitted by W. Meyer Title CLP Address

Source of Material Berlin, Vermont Quantity Represented 1 1/2 C.F.
F. W. Whitcomb Const. Corp.
Coarse Aggregate N. Walpole, N.H. Fine Aggregate N. Walpole, N.H.

Cement Brand Lehigh Type II Lbs. 611

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

Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 3121

Field Tested by M. Morissette Lab. Tested by Eaton

Sampled from Sears Mixer @ lab Date Sampled: February 23, 1982

Location Used or to be Used Test Mix Batch No. 3

Examined for Mod. of Rupture Compressive Strength

TEST RESULTS

Unit Weight Fresh Concrete 147.02 lbs/cf Air Pressure 6.8% Chace

Total Water, Gal/Cy Used 33.5 Slump 3" Temperature, Concrete 70°F Ambient 70°F

<table>
<thead>
<tr>
<th>Specimen No.</th>
<th>Cyl. Unit</th>
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*S = Standard Cured; F = Field Cured

Types of Breaks:

![Break Types](image)

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

Comments:

[Signature]

RA7
# Report on Concrete Test Beam or Cylinders

**Laboratory No.** C82 0011 (28) **Report of** 7, 14, 28 **Day Breaks** Date typed 3-25-82

**Pay Item** Performance in Concrete

**Type of Sample** Evaluation

**Submitted by** W. Meyer **Title** CLP **Address** Materials & Research Lab

**Source of Material** Berlin, Vermont

**Quantity Represented** 1 1/2 C.F.

**Coarse Aggregate** N. Walpole, N.H.

**Fine Aggregate** N. Walpole, N.H.

**Cement Brand** Lehigh

**Type** II

**Lbs.** 611

**Air Entraining Admixture** Darem AEA

**Dosage** 1/2 oz/cy

**Admixture** MPDA Hycol

**Dosage** 3 oz/cwt

**Maximum allowable water content, Gal/Cy**

**Total Aggregate, Dry Wgt.**

**3121**

**Field Tested by** M. Morissette **Lab. Tested by** Eaton

**Sampled from** Sears Mixer @ Lab Date Sampled: February 23, 1982

**Location Used or to be Used** Test Mix Batch No. 4

**Examined for Mod. of Rupture** Compressive Strength

## TEST RESULTS

**Unit Weight Fresh Concrete** 150.05 lbs/cf

**Air: Pressure** 4.9%

**Chace**

**Total Water, Gal/Cy Used** 33.4

**Slump** 3/4"  

**Temperature, Concrete** 70°F

**Ambient** 70°F

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<th>Date Broken</th>
<th>Desired age at break</th>
<th>Age at Break</th>
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</tbody>
</table>

*S = Standard Cured; F = Field Cured

**Types of Breaks:**

- 1
- 2
- 3
- 4
- 5
- 6

**Comments:**

| CA 13E H | b | 1 | 2 | 3 | 4 | 5 | 6 |

---

S. J. Gage, P.E., Chief Engineer
# Report on Concrete Test Beam or Cylinders

**Laboratory No.:** C82 0012 (28) Report of 7, 14, 28 Day Breaks  Date typed 3-25-82

**Pay Item:** Performance in Concrete  **Type of Sample:** Evaluation

**Submitted by:** W. Meyer  **Title:** CLP  **Address:**

- **Source of Material:**
  - Coarse Aggregate: N. Walpole, N.H.
  - Fine Aggregate: N. Walpole, N.H.

- **Cement Brand:** Lehigh  **Type:** II  **Lbs.:** 660

- **Air Entraining Admixture:** Darex AEA  **Dosage:** 3 oz/cy

- **Maximum allowable water content:** Total Aggregate, Dry Wgt.: 2871

- **Field Tested by:** M. Morissette  **Lab. Tested by:** Eaton

- **Sampled from:** Sears Mixer @ lab  Date Sampled: February 23, 1982

- **Location Used or to be Used:** Reference Mix  **Batch No.:** 5

## TEST RESULTS

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<th>Specimen No.</th>
<th>Cyl. Wgt. P.C.F.</th>
<th>Date Rec'd</th>
<th>Date Broken</th>
<th>Desired Age at Break</th>
<th>Age at Break</th>
<th>Type*</th>
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<th>Ave. P.S.I.</th>
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<th>Break Type 2</th>
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</table>

*S = Standard Cured;  F = Field Cured

**Types of Breaks:**

- **1:** 1 2 3 4 5 6

**Comments:**

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

[Signature]
Report on Concrete Test Beams or Cylinders  

Laboratory No.: C82 0013 (28)  
Report of 7, 14, 28 Day Breaks  
Date typed: 3-25-82

Pay Item: Performance in Concrete  
Type of Sample: Evaluation

Submitted by: W. Meyer  
Title: CLP  
Address: Materials & Research Lab

Source of Material: Berlin, Vermont  
Quantity Represented: 1 1/2 C.F.

Cement Brand: Lehigh  
Type: II  
Lbs.: 660

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

Maximum allowable water content, Gal/Cy: Total Aggregate, Dry Wgt.: 2871

Field Tested by: M. Morissette  
Lab. Tested by: Eaton

Sampled from: Sears Mixer @ Lab  
Date Sampled: February 23, 1982

Location Used or to be Used: Reference Mix  
Batch No.: 6

Examined for Mod. of Rupture: Compressive Strength

TEST RESULTS

Unit Weight Fresh Concrete: 149.14 lbs/cf  
Air: Pressure: 4.1%  
Chace

Total Water, Gal/Cy Used: 30.2  
Slump: 1 3/4 "  
Temperature, Concrete: 68°  
Ambient -

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<th>Specimen No.</th>
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<th>Date Broken</th>
<th>Desired age at break</th>
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* S = Standard Cured;  F = Field Cured

Types of Breaks:

mlm

Comments:  
LA 13th Rev.  
2001

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

[Signature]
# Report on Concrete Test Beam or Cylinders

## Laboratory No. C82 0014 (28)

**Report of 7, 14, 28 Day Breaks**

Date typed 3-25-82

## Pay Item Performance in Concrete

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## Submitted by W. Meyer

Title: CLP

Address: Materials & Research Lab

## Source of Material

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## Coarse Aggregate

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## Cement Brand

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## Air Entraining Admixture

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<th>Darex AEA</th>
<th>Dosage 3 oz/cy</th>
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## Maximum allowable water content, Gal/Cy

| Total Aggregate, Dry Wgt. | 2980 |

## Field Tested by M. Morissette

Lab. Tested by Eaton

## Sampled from Sears Mixer @ lab

Date Sampled: February 23, 1982

## Location Used or to be Used

Test Mix  BAtch No. 1

## Examined for Mod. of Rupture

Compressive Strength

## TEST RESULTS

**Unit Weight Fresh Concrete** 152.54 lbs/cf

**Air: Pressure** 4.3% Chace

**Total Water, Gal/Cy Used** 31.5

**Slump** 2"

**Temperature, Concrete** 72°F

**Ambient** 68°F

## Specimen No. Cyl. Unit Wgt. P.C.F. Date Rec'd Date Broken Desired age at break Age at Break Type* Break 1 P.S.I. Break 2 P.S.I. Ave. P.S.I. Break Type

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*S = Standard Cured; F = Field Cured

Types of Breaks:

- 1
- 2
- 3
- 4
- 5
- 6

*S. J. Gage, P.E., Chief Engineer*
Laboratory No. C82 0015 (28) Report of 7, 14, 28 Day Breaks Date typed 3-25-82

Pay Item Performance in Concrete Type of Sample Evaluation

Submitted by W. Meyer Title CLP Address

Source of Material Berlin, Vermont Quantity Represented 1 1/2 C.F.
F. W. Whitcomb Const. Corp.
Coarse Aggregate N. Walpole, N.H. Fine Aggregate N. Walpole, N.H.

Cement Brand Lehigh Type II Lbs. 660

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

Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 2980

Field Tested by M. Morissette Lab. Tested by Eaton

Sampled from Sears Mixer @ lab Date Sampled: February 23, 1982

Location Used or to be Used Test Mix Batch No. 2

Examined for Mod. of Rupture Compressive Strength

TEST RESULTS

Unit Weight Fresh Concrete 150.19 lbs/cf Air: Pressure 5.3% Chace

Total Water, Gal/Cy Used 32.9 Slump 3" Temperature, Concrete 70°F Ambient 68°F

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<th>Specimen No.</th>
<th>Cyl. Unit Wgt.</th>
<th>Date Rec'd</th>
<th>Date Broken</th>
<th>Desired age at break</th>
<th>Age at Break</th>
<th>Type*</th>
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<th>Break 2 P.S.I.</th>
<th>Ave. P.S.I.</th>
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Comments: TA 1893 Rev. 2M 4/91
Subject Evaluation of Proposed Crushed Stone Coarse Aggregate, Frank W. Whitcomb Construction Corp., N. Walpole, N.H.

Investigation Requested By Frank W. Whitcomb Const. Corp. Date February 10, 1982

Date Information Required March 29, 1982

Purpose of Investigation To evaluate the proposed crushed stone coarse aggregate from the Frank W. Whitcomb Construction Corporation, N. Walpole, N.H. quarry for use as a structural concrete aggregate.

Proposed Tests or Evaluation Procedure see Vermont Procedure For Evaluating A New Source of Structural Concrete Aggregate, VT-AOT-MRD 9-82.

1. Performance-in-concrete tests will be performed using two batches each of Class A and Class B concrete containing the proposed new aggregate and two batches each of Class A and Class B concrete containing a reference aggregate.

Proposal Discussed With R. I. Frascoia Projected Manpower Requirements 15 mandays

Investigation To Be Conducted By Structural Concrete Subdivision

Proposed Starting Date Feb. 17, 1982 Estimated Completion Date March 29, 1982

Comments by Materials & Research Engineer

Materials & Research Division
Agency of Transportation
Date Typed: 3/26/82