Evaluation of Hinesburg
3/4" Crushed Gravel for
Use In Structural Concrete

Initial Report 81-6
December, 1981

Reporting On Work Plan No. 81-C-19

State of Vermont
Agency of Transportation
Materials & Research Division

T. Evslin, Secretary of Transportation
S. J. Gage, P.E., Director of Engineering and Construction
R. F. Nicholson, P.E., Materials and Research Engineer
P. A. Cover, Structural Concrete Engineer

Prepared by
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Reviewed By:

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

Date: January 13, 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 initial report documents results of tests performed on a proposed new source of coarse aggregate for structural concrete. The new material is a 3/4" crushed gravel produced by Hinesburg Sand and Gravel Co., Inc. at their facilities in Hinesburg, Vermont.

Initial results, to date, indicate that the material performs satisfactorily.
INTRODUCTION

As new aggregate sources are developed for use in structural concrete, they must be investigated 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. Since the concrete is produced at a ready-mix plant, the reference aggregate is the aggregate currently in use at the plant.

A request was received from Hinesburg Sand & Gravel Co., Inc. to evaluate a 3/4" crushed gravel coarse aggregate being produced at their facilities in Hinesburg, Vermont. They stated that they are currently interested in supplying the aggregate to A. G. Anderson, Co., in Berlin, Vermont for use on a highway project in that area. Their future goal, however, is to supply several ready-mix companies.

Samples of the 3/4" crushed gravel were obtained from the source at Hinesburg and evaluated in the Laboratory for compliance with requirements of Section 704.02 of the Standard Specifications. The performance-in-concrete tests were conducted at the A. G. Anderson, Co. ready-mix plant in Berlin.
PROCEDURES

PHASE I, SECTION 704.02 TESTS

The 3/4" crushed gravel was sampled from an existing stockpile at Hinesburg on July 29, 1981. The material was examined for gradation, wear, fractured faces, thin and elongated pieces, and soundness and was found to conform with Section 704.02 requirements.

The material was also sampled on October 3, 1981 from a stockpile prepared at the A. G. Anderson, Co. ready-mix plant in Berlin. The material was examined for gradation and complied with that requirement. See Appendix B for results of Section 704.02 tests.

PHASE II, PERFORMANCE-IN-CONCRETE TESTS

After it was determined that the proposed aggregate complied with the requirements of Section 704.02, Hinesburg Sand & Gravel Co., Inc. and A. G. Anderson established a schedule for conducting the performance-in-concrete tests at the ready-mix plant in Berlin. Mix designs were prepared by Structural Concrete Subdivision personnel for Class A, Class B, and Class C concrete and mixing and testing of the concrete was carried out on October 5, 1981.

Moisture content of the aggregates was determined prior to the start of mixing and aggregate weights were adjusted accordingly. Concrete was mixed in a standard truck mixer with batch size being one cubic yard. Batches were prepared for Class A, Class B, and Class C concrete containing the Hinesburg 3/4" crushed gravel and the reference aggregate.

The materials used in this evaluation are as follows:
Coarse Aggregates:

A. Proposed New Aggregate
3/4" Crushed Gravel
Hinesburg Sand & Gravel, Hinesburg, Vt.

B. Reference Aggregate
3/4" Crushed Igneous Stone
Cooley, Westerville, Vt.

Fine Aggregate:


Cement:

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

Air Entraining Admixture:

Darex AEA
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 as follows:

<table>
<thead>
<tr>
<th>Aggregate Type</th>
<th>Bulk Specific Gravity</th>
<th>Absorption, percent</th>
<th>Dry Rodded Unit Weight, lbs/ft³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hinesburg Coarse Aggregate</td>
<td>2.66</td>
<td>0.8</td>
<td>103.27</td>
</tr>
<tr>
<td>Reference Coarse Aggregate</td>
<td>2.59</td>
<td>1.1</td>
<td>94.50</td>
</tr>
<tr>
<td>Fine Aggregate</td>
<td>2.60</td>
<td>1.5</td>
<td>2.90</td>
</tr>
</tbody>
</table>
The mix designs used in this evaluation are as follows:

**NEW AGGREGATE MIX DESIGN**

<table>
<thead>
<tr>
<th>Batch Quantities Per Cubic Yard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Hinesburg Coarse Aggregate, lbs.</td>
</tr>
<tr>
<td>Fine Aggregate, lbs.</td>
</tr>
<tr>
<td>Cement, lbs.</td>
</tr>
<tr>
<td>Air Entraining Admixture, oz.</td>
</tr>
<tr>
<td>Water Reducing Admixture, oz.</td>
</tr>
<tr>
<td>Net Water, gal.</td>
</tr>
</tbody>
</table>

*Weights shown are for aggregates in the saturated surface dry condition.

**REFERENCE AGGREGATE MIX DESIGN**

<table>
<thead>
<tr>
<th>Batch Quantities Per Cubic Yard</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Reference Coarse Aggregate, lbs.</td>
</tr>
<tr>
<td>Fine Aggregate, lbs.</td>
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<tr>
<td>Cement, lbs.</td>
</tr>
<tr>
<td>Air Entraining Admixture, oz.</td>
</tr>
<tr>
<td>Water Reducing Admixture, oz.</td>
</tr>
<tr>
<td>Net Water, gal.</td>
</tr>
</tbody>
</table>

*Weights shown are for aggregates in the saturated surface dry condition.

Immediately following batching and mixing operations, each batch of concrete was tested to determine Air Content, Unit Weight and Yield, and Slump. Seven test cylinders (6"x12") were fabricated from each batch. Six of the cylinders were tested for compressive strength, two each at ages of 7, 14, and 28 days. The remaining cylinder from each batch was moist cured for 28 days. At age 28 days, three 2 inch cubes were cut from the center section of these cylinders and the cubes subjected to freeze-thaw testing in accordance with "Method of Test For Freeze-Thaw Durability of Structural Concrete Mixes" VT AOT No. 25.
RESULTS

The results of tests performed are as follows:

<table>
<thead>
<tr>
<th>Hinesburg Coarse Aggregate</th>
<th>Class A</th>
<th>Class B</th>
<th>Class C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slump, inches</td>
<td>2 1/2</td>
<td>3 1/2</td>
<td>3 1/2</td>
</tr>
<tr>
<td>Air Content, percent</td>
<td>4.4</td>
<td>5.4</td>
<td>7.5</td>
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<tr>
<td>Unit Weight, lbs/ft³</td>
<td>145.92</td>
<td>143.13</td>
<td>139.62</td>
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<tr>
<td>Relative Yield, percent</td>
<td>95.8</td>
<td>100.2</td>
<td>104.5</td>
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<tr>
<td>Compressive Strength, psi</td>
<td></td>
<td></td>
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<tr>
<td>7 days</td>
<td>4682</td>
<td>3909</td>
<td>3026</td>
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<tr>
<td>14 days</td>
<td>5323</td>
<td>4257</td>
<td>3541</td>
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<tr>
<td>28 days</td>
<td>5717</td>
<td>4764</td>
<td>3942</td>
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<tr>
<td>(Design Compressive Strength, psi)</td>
<td>(4000)</td>
<td>(3500)</td>
<td>(3000)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Reference Coarse Aggregate</th>
<th>Class A</th>
<th>Class B</th>
<th>Class C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slump, inches</td>
<td>1 1/2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Air Content, percent</td>
<td>4.6</td>
<td>5.8</td>
<td>6.4</td>
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<tr>
<td>Unit Weight, lbs/ft³</td>
<td>143.41</td>
<td>140.53</td>
<td>144.13</td>
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<tr>
<td>Relative Yield, percent</td>
<td>96.8</td>
<td>100.8</td>
<td>100.0</td>
</tr>
<tr>
<td>Compressive Strength, psi</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>7 days</td>
<td>4514</td>
<td>3916</td>
<td>3577</td>
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<tr>
<td>14 days</td>
<td>5266</td>
<td>4810</td>
<td>4289</td>
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<tr>
<td>28 days</td>
<td>6123</td>
<td>5230</td>
<td>4956</td>
</tr>
<tr>
<td>(Design Compressive Strength, psi)</td>
<td>(4000)</td>
<td>(3500)</td>
<td>(3000)</td>
</tr>
</tbody>
</table>

The results of compressive strength tests are also shown on Laboratory reports Nos. C8101229 to C8101234 in Appendix C. Strength-age plots are shown in Figures I, II, and III.

Freeze-thaw test results will be available following the completion of testing.
Conpressive Strength vs Age
Concrete Class A

Figure I
Concrete Class 'B'

- Cooley/Websterville (Granite)
- Casey/Hinesburg

Design Compressive Strength = 3500 PSI

Compressive Strength vs Age
Concrete Class B
Figure II
Compressive Strength vs Age
Concrete Class C
Figure III
CONCLUSIONS AND RECOMMENDATIONS

1. The 3/4" crushed gravel coarse aggregate from Hinesburg Sand and Gravel Co., Inc., Hinesburg, Vermont, complied with all requirements of Section 704.02 when tested in conjunction with this evaluation.

2. Although compressive strengths obtained from concretes using the Hinesburg aggregate did not reach the same levels as the reference concretes, the Hinesburg strengths were acceptable.

3. It is recommended that the Hinesburg 3/4" crushed gravel be approved for use in structural concrete subject to freeze-thaw test results.

4. A final report will be prepared when data from freeze-thaw tests is available.
APPENDIX A

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - STRUCTURAL CONCRETE SUBDIVISION

PROCEDURE FOR THE EVALUATION OF NEW STRUCTURAL CONCRETE AGGREGATE SOURCES TO DETERMINE COMPLIANCE WITH DOT SPECIFICATIONS

The evaluation of a new structural concrete aggregate source (i.e., one on which the Materials & 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.

The Materials and Research Division shall perform all Phase I and Phase II tests.

Phase I

1. A written request shall be made to the Materials & Research Engineer by the person requesting the evaluation, describing the type of material, quantity available for sampling, and the location of the stockpiles.

2. The Structural Concrete Engineer shall determine from a site visit,
   a) Does a stockpile of at least a day's production 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 the necessary arrangements and obtain samples from the stockpiles designated by the producer.

4. The material shall be tested at the Materials & Research Division using the Structural Concrete Subdivision Annual Aggregate Testing Program procedure.

5. Report the results (as a Preliminary Sample) on the standard Materials and Research Division forms, and send a copy of the test results to the aggregate producer.

Phase II

1. Aggregates which meet the requirements of the Phase I evaluation will then be tested in concrete. The Structural Concrete Engineer will inform the person requesting the evaluation of the Phase II requirements. The performance-in-concrete tests shall be carried out on Ready Mixed concrete containing the aggregate being evaluated. At the same time concrete with a control aggregate (selected by the Structural Concrete Engineer) will also be processed. Costs for processing the aggregate thru the Ready-Mix plant will be borne by the requesting party. The Phase II tests shall
conform to the Materials & Research Division Performance-in-Concrete Procedure for Evaluating a New Aggregate Source.

2. The Materials and Research Division shall carry out the work necessary for both the Phase I and Phase II sections of this evaluation process in a period of not more than 45 calendar days from the date the aggregate is available for testing. Any delays beyond the control of the Materials & Research Division shall be documented and the person requesting the evaluation shall be notified of the consequent extension of time required to complete the testing. Failure of the aggregate to pass the requirements of the Phase I section would terminate the evaluation.

3. Test results shall be the basis upon which the Structural Concrete Engineer shall recommend acceptance, further testing, or rejection to the Materials and Research Engineer.

4. The Materials and Research Engineer shall inform the person making the request of the acceptability of the aggregate, when the Phase II tests have been completed.
APPENDIX A
STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION - STRUCTURAL CONCRETE SUBDIVISION

PERFORMANCE-IN-CONCRETE

PROCEDURE FOR EVALUATING A NEW AGGREGATE SOURCE

1. Mix proportions shall be submitted for each class of concrete required; or designed by, the Materials and Research Division and shall conform to Table 501.03A.

2. Test shall be run on both Field and Laboratory Concrete.

3. Field Concrete shall be produced at an approved Ready-Mixed Concrete Plant. Cement, sand, water, and admixtures shall all be the same as in current use at the plant, and as approved by the Agency of Transportation.

4. Laboratory Concrete shall be prepared at the Central Laboratory with the same materials used in the Ready Mixed Concrete.

5. An approved aggregate in normal use at the Ready-Mixed Concrete plant shall be used as a control in a separate batch for both Field and Laboratory Concrete.

6. At least one cubic yard of Ready Mixed concrete shall be produced for each class of concrete containing each new and control aggregate being evaluated.

7. Test cylinders shall be fabricated and cured in accordance with AASHTO T23-76.

8. Tests of Slump, Air Content, Unit Weight, and Yield, shall be in accordance with AASHTO T119-74, AASHTO T152-80I, and AASHTO T121-79I respectively.

9. Batching, mixing, field testing, and specimen fabrication using Field Concrete shall be witnessed by a representative of the Materials and Research Division.

10. Cylinder specimens shall be tested at the Materials and Research Laboratory for compressive strength at ages 7, 14, and 28 days in accordance with AASHTO T22.

11. The Materials and Research Division's involvement in the evaluation shall be documented in a Materials & Research Division report. The procedure in current use by the Research Subdivision shall be followed (including the drafting and approval of a Work Plan before work has begun).
<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>% Passing</th>
<th>Total Sample</th>
<th>Fineness Modulus</th>
<th>Percent of Wear</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 1/2&quot;</td>
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<td>No. 100</td>
<td>AASHTO T3</td>
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<td>No. 50</td>
<td>AASHTO T4</td>
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<tr>
<td>3 1/2&quot;</td>
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<td>No. 30</td>
<td>AASHTO T96 29.7</td>
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<td>3&quot;</td>
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<td></td>
<td>No. 16</td>
<td>'B' Grading</td>
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<td>2 1/2&quot;</td>
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<td>Fractured Faces, % 56</td>
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<td>Thin &amp; Elongated</td>
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<td>1 3/4&quot;</td>
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<td>Fineness Modulus</td>
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<tr>
<td>1 1/2&quot;</td>
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<td>Soundness, % Loss 0.60</td>
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<tr>
<td>1&quot;</td>
<td>99</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>3/4&quot;</td>
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<tr>
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<tr>
<td>1/2&quot;</td>
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<td>3/8&quot;</td>
<td>35</td>
<td>No. 4</td>
<td>3</td>
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<td></td>
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<tr>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

**Comments:**
This material was examined for gradation, wear, fractured faces, T & E, and Soundness. The results are as indicated.

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

By: R. F. Nicholson, P.E., Materials & Research Engineer
Laboratory No. G8100701

**Name**
Coarse Aggregate for Concrete, Item 501

**Identification Marks**
Evaluation Sample, 3/4" Crushed Gravel

**Submitted by** J. Abair **Title** PFP **Address**

**Sampled** 10-3, 1981 **Received** 10-3, 1981

**Sample from** Stockpile @ A. G. Anderson, Berlin, Vt.

**Quantity Represented** 20 cy

**Source of Material** Hinesburg S & G, Hinesburg, Vt.

**Location used or to be used** W.P. 81-C-19

**Examined for** 704.02

### TEST RESULTS

<table>
<thead>
<tr>
<th>Total Sample</th>
<th>Fineness Modulus</th>
<th>Percent of Wear</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sieve Size</strong></td>
<td><strong>% Passing</strong></td>
<td><strong>% Coarser Than</strong></td>
</tr>
<tr>
<td>4 1/2&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4&quot;</td>
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</tr>
<tr>
<td>3 1/2&quot;</td>
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<tr>
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<tr>
<td>2 1/2&quot;</td>
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<td>1 3/4&quot;</td>
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<td>1 1/2&quot;</td>
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<td>5/8&quot;</td>
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<tr>
<td>No. 200</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fineness Modulus**

This material was examined for gradation. The results are as indicated.

**Comments:**

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. C8101231 (28) Report of 7, 14, 28 Day Breaks Date typed 11-3-81

Pay Item 501.20 Type of Sample Preliminary

Submitted by M. Morissette Title PFP Address

Source of Material A.G. Anderson, Berlin Quantity Represented 1 cy


Cement Brand Northeast Type II Lbs. 660

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

Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 2944

Field Tested by Morissette Lab. Tested by Eaton

Sampled from Trk. #37 @ plant Date Sampled: 10-5-81

Location Used or to be Used Examined for Mod. of Rupture Compressive Strength 4000 psi @ 28 days

---

**TEST RESULTS**

<table>
<thead>
<tr>
<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>
<th>Break 1 P.S.I.</th>
<th>Break 2 P.S.I.</th>
<th>Ave. P.S.I.</th>
<th>Break Type</th>
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<tbody>
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<td>7</td>
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<td>S - F</td>
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*S = Standard Cured; F = Field Cured

Types of Breaks: mlm

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

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

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

**Project Name:** W.P. 81-C-19  
**State of Vermont**  
**Agency of Transportation**  
**Materials and Research Division**  
Montpelier, Vermont 05602

## Laboratory No. C8101233 (28)  
**Report of:** 7, 14, 28 Day Breaks  
**Date Typed:** 11-3-81  
**Pay Item:** 501.25  
**Type of Sample:** Preliminary

### Submitted by
- **Morissette**  
- **Title:** PFP  
- **Address:**

### Source of Material
- **A.G. Anderson - Berlin**  
- **Quantity Represented:** 1 cy

### Coarse Aggregate
- **Hinesburg S & G, Hinesburg**  
- **Fine Aggregate:** A.G. Anderson - Highgate, Vt.

### Cement Brand
- **Northeast Type II**  
- **Lbs.:** 611

### Air Entraining Admixture
- **Darex AEA Dosage:** 4 oz/cy  
- **Admixture WRDA Hycol Dosage:** 3 oz/cwt

### Maximum allowable water content, Gal/Cy: 2997

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

### Sampled from
- **Trk. #41 @ plant**  
- **Date Sampled:** 10-5-81

### Location Used or to be Used
- **Examined for Mod. of Rupture:** Compressive Strength 3500 psi @ 28 days

## Test Results

### Unit Weight Fresh Concrete: 143.13

<table>
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<tr>
<th>Specimen No.</th>
<th>Cyl. Unit</th>
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<th>Date Broken</th>
<th>Desired age at break</th>
<th>Age at Break</th>
<th>Type* S - F</th>
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*S = Standard Cured; F = Field Cured

**Types of Breaks:**

- **Notes:**
  - **Comments:**
    - **TA 18311 Rev. 2M 4/81**

---

**By:**
- **S. J. Gage, P.E., Chief Engineer**
- **R. F. Nicholson, P.E., Materials & Research Engineer**
Laboratory No. C8101234 (28)  Report of 7,14,28 Day Breaks Date typed 11-3-81

Pay Item 501.30 Type of Sample Preliminary

Submitted by M. Morissette Title PFP Address

Source of Material A.G. Anderson - Berlin Quantity Represented 1 cy


Cement Brand Northeast Type II Lbs. 565

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

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

Field Tested by Morissette Lab. Tested by Eaton

Sampled from Trk. #37 @ plant Date Sampled: 10-5-81

Location Used or to be Used

Examined for Mod. of Rupture Compressive Strength 3000 psi @ 28 days

TEST RESULTS

Unit Weight Fresh Concrete 139.62 Air: Pressure 7.5% Chace

Total Water, Gal/Cy Used Slump 3 1/2 Temperature, Concrete 52°F Ambient 44°F

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*S = Standard Cured; F = Field Cured

Types of Breaks:

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

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. C8101230 (28) Report of 7,14,28 Day Breaks Date typed 11-3-81

Pay Item 501.20 Type of Sample Preliminary

Submitted by: Morissette Title: PFP Address


Cement Brand: Northeast Type: II Lbs: 660

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

Maximum allowable water content, Gal/Cy: Total Aggregate, Dry Wgt.: 2812

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

Sampled from: TK #41 @ plant Date Sampled: 10-5-81

Location Used or to be Used: Compressive Strength 4000 psi @ 28 days

TEST RESULTS

Unit Weight Fresh Concrete 143.41 Air: Pressure 4.6% Chace

Total Water, Gal/Cy Used Slump 1/2" Temperature, Concrete 60°F Ambient 53°F

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</table>

*S = Standard Cured; F = Field Cured

Types of Breaks: 

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

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

Comments: TA 183H Rev. 2M 4/81
Report on Concrete Test Beam or Cylinders

Laboratory No. C8101232 (28) Report of 7, 14, 28 Day Breaks Date typ'd 11-3-81

Pay Item 501.25 Type of Sample Preliminary

Submitted by Morissette Title PFP Address


Cement Brand Northeast Type II Lbs. 611

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

Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 2953

Field Tested by M. Morissette Lab. Tested by Eaton

Sampled from Trk. #43 @ plant Date Sampled: 10-5-81

Location Used or to be Used

Examined for Mod. of Rupture Compressive Strength 3500 psi @ 28 days

TEST RESULTS

Unit Weight Fresh Concrete 140.53 Air: Pressure 5.8% Chace

Total Water, Gal/Cy Used Slump 3 Temperature, Concrete 60°F Ambient 53°F

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<th>Specimen No.</th>
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Types of Breaks:

m11m

1 2 3 4 5 6

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

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. C8101229 (28) Report of 7, 14, 28 Day Breaks Date typed 11-3-81

Pay Item 501.30 Type of Sample Preliminary

Submitted by M. Morissette Title PFP Address

Source of Material A.G. Anderson, Berlin Quantity Represented 1 cy


Cement Brand Northeast Type II Lbs. 505

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

Maximum allowable water content, Gal/Cy Total Aggregate, Dry Wgt. 3060

Field Tested by M. Morissette Lab. Tested by Eaton

Sampled from Trk. #43 @ plant Date Sampled: 10-5-81

Location Used or to be Used

Examined for Mod. of Rupture Compressive Strength 3000 psi @ 28 days

TEST RESULTS

Unit Weight Fresh Concrete 144.13 Air: Pressure 6.4% Chace

Total Water, Gal/Cy Used Slump 4" Temperature, Concrete 58°F Ambient 50°F

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*S = Standard Cured; F = Field Cured

Types of Breaks: mlm

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

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

By: R. F. Nicholson, P.E., Materials & Research Engineer
Subject: Performance-In-Concrete Evaluation Of The Hinesburg Sand and Gravel 3/4" Crushed Gravel.
Investigation Requested By: Hinesburg Sand & Gravel, Inc. Date: July 14, 1981

Date Information Required: As Soon As Possible

Purpose of Investigation: To determine whether 3/4" crushed gravel from Hinesburg Sand & Gravel Inc. performs satisfactorily in concrete.

Proposal Tests or Evaluation Procedure:

1. Mix proportions for each Class of concrete shall conform to Table 501.03A. This data shall either be submitted by the person requesting the evaluation, or it shall be supplied by the Structural Concrete Subdivision from mix design procedures in normal use.

2. Concrete shall be produced at an approved Ready-Mixed Concrete Plant. Cement, sand, water and admixtures shall be the same as in current use at the plant, and as approved by the Agency of Transportation.

3. An approved aggregate in normal use at the Ready-Mixed Concrete Plant shall be used as a control in a separate batch for each Class of concrete.

Proposal Discussed With: R. Frascoia
Projected Manpower Requirements: 10 man days

Investigation To Be Conducted By: Structural Concrete Subdivision

Proposed Starting Date: Oct. 5, 1981
Estimated Completion Date: Jan. 5, 1982

Approval/Disapproval by Materials & Research Engineer: Received
Comments by Materials & Research Engineer: Information will be given out in report form with transmittal letter after completion of report.
4. A separate batch of at least one cubic yard of concrete shall be produced for each Concrete Class/Aggregate combination.

5. Batching and Mixing shall be witnessed and documented, and all materials shall be sampled by a Materials and Research Division representative. This person shall also conduct the necessary testing and fabrication of the test specimens.

6. Tests of Slump, Air Content, Unit Weight, and Yield shall be in accordance with AASHTO T119-74, AASHTO T152-80I, and AASHTO T121-79I respectively; also ambient and concrete temperatures shall be measured and recorded.

7. Standard 6" cylinder specimens shall be fabricated and cured in accordance with AASHTO T23-76. Seven specimens shall be fabricated from each batch, six of which shall be tested at the Materials and Research Laboratory for compressive strength at ages 7, 14, and 28 days in accordance with AASHTO T22. The remaining cylinder specimen from each batch, shall be cured with the 28 day compressive strength specimens. At age 28 days, three 2" cubes shall be cut from each of these cylinders, and tested for freeze-thaw durability in accordance with Vermont A.O.T. test procedure No. 25. The test shall be terminated for each set of three cubes, when twenty-five percent average weight-loss has occurred.

8. The details of the testing procedure, and the data obtained shall be documented in a Materials & Research Division report. The procedure in current use by the Research Subdivision shall be followed.