

EVALUATION OF CRUSHED STONE FROM
SWANTON LIMESTONE - SWANTON, VERMONT
FOR BITUMINOUS CONCRETE AGGREGATE

Report 84-1
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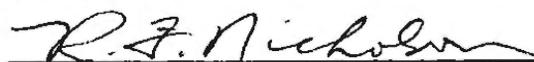
Reporting on Work Plan 83-B-44

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISION

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ABSTRACT

Crushed stone samples from Swanton Limestone, Swanton Vermont were tested for compliance with Section 704 Aggregate, Subsection 704.13 Coarse Aggregate for Bituminous Concrete Pavement. The samples were from the 3/8", 1/2" and 3/4" stockpiles. The material is referred to as "black limestone".

Results of the evaluation indicate that the 3/8" and 1/2" stockpile materials meet all requirements of subsection 704.13. The 3/4" material meets all but the gradation requirements.

This aggregate will not meet the acid insolubility requirements for Open Graded Friction Course, Item 409. There is no acid insolubility requirement for items 303 and 406.

INTRODUCTION

This report is an evaluation resulting from a request to determine the possible use of an aggregate from a new source in the production of bituminous concrete and structural concrete.

The request was submitted by Dennis Demers, President of Swanton Limestone on December 7, 1983.

On December 15, 1983, Earle L. Chaffee Jr., representing the Bituminous Concrete Section of the Vermont Agency of Transportation sampled the existing 3/8", 1/2" and 3/4" stockpiles in Swanton Limestone's yard. Each stockpile represented approximately 60 tons of material. On the same date, Mr. Chaffee visited the quarry site where the parent material exists. The material, which is black in color, is located in Swanton Limestone's #1 quarry in Swanton, Vermont at a lower level than perviously worked.

This report documents the testing and results of the material that was submitted as they relate to bituminous concrete.

PROCEDURES

The following tests were run on the material to determine its compliance with Vermont Standard Specifications, Subsection 704.13:

- a. Gradation
- b. AASHTO T-96, % Wear, B & C Grading
- c. Fractured Faces
- d. Thin and Elongated Pieces
- e. Sodium Sulfate Soundness was run on a sample taken by the Structural Concrete Subdivision.

Additional tests were run for information purposes. These tests were as follows:

- a. Acid Insolubility on the 3/8" stone
- b. Specific Gravity and Absorption tests on the 3/8", 1/2" and 3/4" samples.

RESULTS

The gradation results are as follows:

3/8" Stockpile

Sieve Size	% Passing	Vt. Specification Requirement % Passing
1/2"	100	100
3/8"	99	95 - 100
No. 4	23	-
No. 8	1	0 - 10

1/2" Stockpile

Sieve Size	% Passing	Vt. Specification Requirement % Passing
3/4"	100	100
1/2"	97	90 - 100
3/8"	20	-
No. 4	1	0 - 10

3/4" Stockpile

Sieve Size	% Passing	Vt. Specification Requirement % Passing
1"	100	100
3/4"	100	90 - 100
1/2"	79	-
3/8"	40	0 - 10

The AASHTO T-96 % Wear results were as follows:

B Grading = 20.5%

C Grading = 16.3%

The Vermont Specification requirement is 35% maximum.

The results for Thin and Elongated Pieces and the Fractured Faces are as follows:

	<u>Size</u>			<u>VT Specification Requirements</u>
	<u>3/8"</u>	<u>1/2"</u>	<u>3/4"</u>	
T & E %	2	2	4	10% Maximum
Frac. %	100	100	100	50% Minimum

The results of the soundness of aggregate by use of sodium sulfate was 0.85% loss. The maximum allowed is 8.0%.

The acid insolubility of this material was 45%. The minimum allowed for use in Open Graded Friction Course, Item 409, is 80%. There is no specification requirement for Items 303 and 406.

The specific gravity and absorption results are as follows:

<u>Test</u>	<u>3/8"</u>	<u>1/2"</u>	<u>3/4"</u>
Bulk Specific Gravity	2.700	2.711	2.698
Bulk Specific Gravity (SSD)	2.722	2.727	2.718
Apparent Specific Gravity	2.761	2.755	2.754
Absorption (%)	0.82	0.59	0.76

There are no specification requirements for the above values.

EVALUATION OF RESULTS

The gradation results of the 3/8" and 1/2" materials meet the specification requirements for 704.13. The gradation of the 3/4" material was 30% high passing the 3/8" sieve for 704.13.

The AASHTO T-96 % Wear results were well within specification requirements for both the "B" and "C" Gradings.

All the samples meet specification requirements for Thin and Elongated Pieces and Fractured Faces.

The Soundness test meets specification requirements.

The material is 35% low on acid insolubility for Open Graded Friction Course, Item 409.

The Specific Gravity and Absorption test results are for information only.

CONCLUSIONS AND RECOMMENDATIONS

The 3/8" and 1/2" crushed stone that was tested meets requirements for 704.13.

The 3/4" material was 30% high passing the 3/8" sieve for 704.13. This material was crushed to meet gradation for use in structural concrete subsection 704.02.

This material would not be acceptable for Open Graded Friction Course Item 409. It has an acid insolubility of 45%, indicating a carbonate material. The minimum allowed is 80%.

This evaluation has not addressed the workability of any mixes produced with these materials. Final approval of these materials could only be properly evaluated through actual field use.

It is, therefore, recommended that Swanton Limestone, at their own risk, demonstrate through actual production and lay down, the characteristics of a mix made with this material.

STATE OF VERMONT
AGENCY OF TRANSPORTATION
MATERIALS & RESEARCH DIVISIONRESEARCH INVESTIGATIONWork Plan No. 83-B-44Subject Black Limestone, Swanton Lime, Swanton, VermontInvestigation Requested By Swanton Lime Date December 6, 1983Date Information Required As soon as possiblePurpose of Investigation To examine aggregate produced from the abovesource for compliance with Section 704.13 Aggregate forBituminous Concrete Pavement, per request ofMr. Dennis DemersProposed Tests or Evaluation Procedure The following tests will be performedon the subject aggregate:AASHTO T-27 - Sieve AnalysisAASHTO T-96 - Resistance to Abrasion - L. A.Thin & Elongated piece countAcid Insolubility - Vt. Test Method MRD-6Testing will be done co-operatively with the Structural Concrete Subdivisionwhich is examining the same aggregate for Structural Concrete use. Underwork plan No. 83-C-43Proposal Discussed With D. Brown Projected Manpower Requirements 10 man daysInvestigation To Be Conducted By Bituminous Concrete SubdivisionProposed Starting Date December 19, 1983 Estimated Completion Date January 13, 1983 Final ReportApproval/Disapproval by Materials Engineer D. F. Nicholson 12-22-83Comments by Materials Engineer Coordinate with
work plan No. 83-C-43