

Air Entraining Admixtures

Compliance Testing

Report 76-2 B

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VERMONT DEPARTMENT OF HIGHWAYS

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TABLE OF CONTENTS

	<u>Page</u>
Abstract.	1
Introduction.	2
Materials	3
Procedure	5
Results	6
Summary & Recommendations	7

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ABSTRACT

Tests were performed on two commonly available air entraining admixtures to determine compliance with Vt. Department of Highways Specifications. Test results confirm the manufacturers claims of acceptability.

INTRODUCTION

This series of tests on air entraining admixtures was conducted to determine their conformance with Vermont Department of Highways Specifications. The admixture brands tested represent those commonly available to the ready-mix industry in Vermont.

The specifications state that air entraining admixtures must conform to the requirements of AASHTO M154 (Air Entraining Admixtures For Concrete) for 3 day, 7 day, and 28 day compressive strengths and resistance to freezing and thawing. This program was conducted according to AASHTO specifications and does not necessarily reflect performance of the admixtures under field conditions.

It is intended that the results of this investigation will determine acceptability of the products for their inclusion on a list of advance certified materials.

MATERIALS

The materials used in this investigation are as follows:

A. Cement

The cement used in this test series was Type I as furnished by Glens Falls Portland Cement Co., Glens Falls, New York.

B. Aggregates

The aggregates used in this test series were as follows:

1. Coarse Aggregate

Lawrence Sangravco, Guildhall, Vermont

Gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>	<u>AASHTOT157 Requirements</u>
1"	100	100
3/4"	75	75
1/2"	50	50
3/8"	25	25
#4	0	0

2. Fine Aggregate

Lawrence Sangravco, Guildhall, Vermont

Gradation:

<u>Sieve Size</u>	<u>Percent Passing</u>	<u>AASHTOT157 Requirements</u>
#4	100	100
#8	95	
#16	70	65-75
#30	37	
#50	16	12-20
#100	6	2-5

Fineness Modulus 2.76

C. Admixtures

The admixtures used in this test series were as follows:

1. Reference Admixture:

NVX - Hercules Powder Co., Wilmington, Delaware

2. Test Admixtures:

Materials (Con't)

- (a) Darex AEA - Construction Products Division W.R. Grace & Co.,
Cambridge, Massachusetts
- (b) MB AE10 - Master Builders, Cleveland, Ohio

PROCEDURES

Concrete used in this investigation was proportioned and mixed according to AASHTO T157 (Testing Air Entraining Admixtures For Concrete). All batches contained the same quantities of cement (517 pounds/cubic yard), coarse aggregate and fine aggregate.

Tests were performed to determine the following concrete properties; slump, air content, temperature, unit weight and 3, 7, 14, and 28 day compressive strengths. The average of three batches of concrete for each test admixture was compared with the average of three batches of concrete containing the reference admixture.

Tests for determining resistance to freezing and thawing were not conducted due to unavailability of equipment.

RESULTS

Results of tests performed are as follows:

<u>Type of Test</u>	<u>NVX Reference</u>	<u>Darex AEA</u>	<u>MB AE10</u>	<u>AASHTO Specifications</u>
Slump (inches)	2.75	2.67	2.42	2.5 ± 0.5
Air Content (percent)				
Pressure	4.8	5.2	4.5	5.5 ± 0.5
Chace	4.7	4.4	4.5	
Temperature (°F)	71	71	71	
Density (PCF)	144.98	143.90	145.38	
Mix Yield (Cu.Ft.)	27.53	27.73	27.43	
Water Content (percent of reference)		99	98	
Compressive Strength (psi)				
3 days	2511	2417	2588	
Percent of Reference		96	103	90 minimum
7 days	2983	2773	3074	
Percent of Reference		93	103	90 minimum
14 days	3416	3248	3472	
Percent of Reference		95	102	
28 days	3643	3525	3861	
Percent of Reference		97	106	90 minimum

SUMMARY & RECOMMENDATIONS

1. Compressive strength requirements of AASHTO M154 (Air Entraining Admixtures For Concrete) were met and exceeded by both admixtures.
2. Although the minimum air content of 5% was not obtained in all cases, the average results were adequate for purposes of comparison
3. Minor variations in air content and unit weight appear to affect strength more than the particular brand of admixture used. As expected the basic relationship between air content density and strength followed normal patterns i.e., as the air content increases the density and strength decreases.
4. Both admixtures tested in this report should be listed as approved.