

STATE OF VERMONT  
AGENCY OF TRANSPORTATION  
MATERIALS DIVISION

A. G. Anderson  
Berlin, Vermont  
Trial Mixes for Class A & Class B Concrete

Report 78-2  
March 1978

Reporting on Work Plan No. WP77-C-29

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Materials Division  
Highway Department  
Agency of Transportation  
March 15, 1978

Reviewed By:

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

Date: April 28, 1978

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STATE OF VERMONT  
AGENCY OF TRANSPORTATION  
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PLANT LOCATION:

A.G. Anderson, Berlin, Vermont.

LABORATORY EVALUATION:

To test mix designs. To be assured the designs, when used with the available aggregates, can produce concrete of the desired quality.

MATERIALS:

Coarse Aggregate: Whitcomb, Winooski, Vermont

Fine Aggregate: A.G. Anderson, Swanton, Vermont

Cement: Type II Northeast Cement Co. Inc., St. Constant, Quebec

Admixtures:

Air Entraining: Darex AEA - W.R. Grace & Co., Cambridge, Mass.

Water Reducing: Pozzolith 122N - Master Builders, Cleveland, Ohio

Retarding: Pozzolith 100XR - Master Builders, Cleveland, Ohio

Daratard 17 - W.R. Grace & Co., Cambridge, Mass.

PROCEDURES:

Aggregates were tested for gradation, specific gravity and absorption, and dry rodded unit weight.

The Class A concrete was proportioned to contain 660 Lbs/cy of cement and a retarding admixture. The Class B concrete was proportioned at two cement contents, 610 Lbs/cy and 634 Lbs/cy. A water reducing or retarding admixture was added to the Class B concrete containing 634 Lbs/cy of cement. The coarse aggregate used in the 610 Lbs/cy concrete was a blend of 50% 1 1/2" stone and 50% 3/4" stone while the 634 Lbs/cy concrete contained only 3/4" stone.

Concrete temperatures were increased in the Class A and Class B (610 Lbs/cy) batches to simulate conditions expected in the field during the summer months.

All concrete was tested for air content, slump, temperature, unit weight and yield, and 7, 14, and 28 day compressive strength.

RESULTS:

Results of all aggregate tests are as follows:

| Percent Passing                            |       | 1½" Stone | ¾" Stone | Sand        |
|--------------------------------------------|-------|-----------|----------|-------------|
| 1½"                                        | Sieve | 100       |          |             |
| 1"                                         | Sieve | 44        |          |             |
| ¾"                                         | Sieve | 10        | 100      |             |
| ⅜"                                         | Sieve | 1         | 39       | 100         |
| #4                                         | Sieve |           | 3        | 99          |
| #8                                         | Sieve |           | 1        | 86          |
| #16                                        | Sieve |           |          | 61          |
| #30                                        | Sieve |           |          | 36          |
| #50                                        | Sieve |           |          | 14          |
| #100                                       | Sieve |           |          | 3 F.M. 2.97 |
| Bulk (Dry) Specific Gravity                |       | 2.79      | 2.80     | 2.58        |
| Absorption %                               |       | 0.4       | 0.4      | 1.5         |
| Dry Rodded Unit Weight Lbs/Ft <sup>3</sup> |       | 104.95    | 99.29    |             |

Mix designs and results of all concrete tests are shown in the following table:

|                                    | Class of Concrete  |                     |          |         |                    |                    |             |
|------------------------------------|--------------------|---------------------|----------|---------|--------------------|--------------------|-------------|
|                                    | A                  | A                   | B(610)   | B(610)  | B(634)             | E(634)             | B(634)      |
| 1½" Stone (Dry)                    | ----               | ----                | 977      | 977     | ----               | ----               | ----        |
| ¾" Stone (Dry)                     | 1608               | 1608                | 978      | 978     | 1608               | 1608               | 1608        |
| Sand (Dry)                         | 1310               | 1310                | 1133     | 1133    | 1408               | 1408               | 1408        |
| Cement                             | 660                | 660                 | 610      | 610     | 634                | 634                | 634         |
| Air Entrain-<br>ing Admix-<br>ture | 10 oz/cy           | 8 oz/cy             | 11 oz/cy | 9 oz/cy | 5 oz/cy            | 3 oz/cy            | 2 oz/cy     |
| Brand                              | Pozzolith<br>100XR | Pozzolith<br>100 XR | None     | None    | Pozzolith<br>122 N | Pozzolith<br>122 N | Daratard 17 |
| Quantity                           | 4 oz/cwt           | 4 oz/cwt            | ----     | ----    | 5 oz/cwt           | 5 oz/cwt           | 5 oz/cwt    |
| Air<br>Content %                   | 7.0                | 5.6                 | 5.9      | 4.5     | 7.5                | 5.6                | 4.0         |
| Slump in.                          | 3 ¾                | 2 ½                 | 4        | 3       | 3 ½                | 3                  | 2 ½         |
| Temperature<br>of                  | 79                 | 80                  | 79       | 80      | 72                 | 72                 | 72          |
| Unit Weight<br>Lbs/Ft <sup>3</sup> | 143.72             | 145.10              | 147.95   | 150.32  | 141.99             | 146.70             | 149.72      |
| Yield Ft <sup>3</sup>              | 26.92              | 26.45               | 26.87    | 26.45   | 27.76              | 26.81              | 26.24       |
| Compressive Strength               |                    |                     |          |         |                    |                    |             |
| 7 days Avg.                        | 3930               | 3860                | 2931     | 3241    | 3661               | 3767               | 4187        |
| 14 days Avg.                       | 4589               | 4616                | 3161     | 3528    | 4077               | 4545               | 4536        |
| 28 days Avg.                       | 5053               | 5239                | 3612     | 3957    | 4545               | 5235               | 5323        |

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SUMMARY AND CONCLUSIONS:

The Class A concrete produced compressive strengths in excess of the desired 4875 psi and is therefore recommended for use in the field.

The Class B concrete containing 610 Lbs/cy of cement failed to achieve the desired 4275 psi compressive strength and is not recommended for use during the summer months. The desired strength was exceeded by the Class B containing 634 Lbs/cy of cement and a water reducing or retarding admixture. This mix is recommended for use during the summer months when it is difficult to achieve required strengths. Aggregate weights have been increased 1% to correct the yield. Minor adjustments may be required if the F.M. of the sand changes.

RECOMMENDATIONS:

The following mix designs are recommended for use during the summer months, based on the results of this evaluation. These mix designs are subject to change based on the results of field tests.

|                                                                            | Class A     | Class B     |
|----------------------------------------------------------------------------|-------------|-------------|
| 3/4" Stone (Dry) - Whitcomb, Winooski, Vt.                                 | 1624        | 1624        |
| Sand (Dry) - A.G. Anderson, Swanton, Vt.                                   | 1323        | 1422        |
| Cement - Type II, Northeast Cement Co. Inc.<br>St. Constant, Quebec        | 660         | 634         |
| Air Entraining Admixture - Darex AEA, W.R. Grace & Co.<br>Cambridge, Mass. | As required | As required |

Water reducing or retarding admixture will be required in both classes of concrete investigated in this report. Quantities will be adjusted for project requirements.

Materials Division  
 Highway Department  
 Agency of Transportation  
 March 15, 1978

Vermont Department of Highways

PRODUCT EVALUATION WORK PLAN

Number WP 77-C-29

Product Trial Mixes - A.G. Anderson -Berlin, Vt. - Class A and Class B Concrete

Manufacturer A. G. Anderson Distributor or NA  
Berlin, Vermont Representative

Evaluation Requested By In House Date NA

Date Information Required NA

Date Product Data & Application Instructions Received NA

Date Samples Received April 12, 1977

Sample Quantity NA Were sufficient samples received Yes

Purpose of Evaluation

To test our mix designs. To be assured our design when used with the available

aggregates can produce concrete of the desired quality . Class A - 4875 psi  
Class B - 4275 psi

Proposed Tests (Attach extra sheet if necessary)

- |                                           |                                 |
|-------------------------------------------|---------------------------------|
| 1. Two batches for Each Class of Concrete | Aggregate Tested for            |
| Air Content                               | Gradation                       |
| Slump                                     | Specific Gravity and Absorption |
| Temperature                               | Dry rodded unit weight          |
| Unit Weight and Yield                     |                                 |
| 7, 14 and 28 day compressive strength     |                                 |

Proposal Discussed with following Sub-divisions Research & Development, Compliance Testing

Projected Manpower Requirements 11 man days including report

Evaluation to be Conducted by Structural Concrete Subdivision

Proposed Starting Date May 3, 1977 Estimated Completion Date June 10, 1977

Approval/Disapproval by Materials Engineer R. J. Nichols 5/9/77

Comments by Materials Engineer \_\_\_\_\_