

EXPECTED IMPLEMENTATION JULY 2019

924 ADMIXTURES FOR CONCRETE. (REV 1-25-19) (FA 2-14-19) (7-19)

SECTION 924 is deleted and the following substituted:

SECTION 924 ADMIXTURES FOR CONCRETE

924-1 General.

This Section covers admixtures for specific concrete applications. Admixtures shall comply with applicable ASTM specifications and the requirements of this Section. Admixtures that have been previously qualified for Department use are listed on the Department's Approved Product List (APL).

924-2 Acceptance of Admixtures.

924-2.1 Approved Product List (APL): All admixtures must be listed on the Department's Approved Product List (APL). Manufacturers seeking evaluation of their products shall submit an application in accordance with Section 6 and include product data sheets, certified independent test data showing the product meets the requirements of this Section, safety data sheet (SDS), and a certification of the average solids content and specific gravity.

Admixtures shall meet the following requirements:

Air-Entraining - ASTM C260

Type A Water-Reducing - ASTM C494

Type C Accelerating - ASTM C494

Type D Water-Reducing and Retarding - ASTM C494

Type E Water-Reducing and Accelerating - ASTM C494

Type F High Range Water Reducing - ASTM C494

Type G High Range Water-Reducing and Retarding - ASTM C494

Type I - Plasticizing - ASTM C1017

Type II - Plasticizing and Retarding - ASTM C1017

Type S Specific Performance - ASTM C494 and the performance

requirements of this Section.

Corrosion Inhibitors – ASTM G109 and the requirements of this Section.

The inclusion of any specific product on the APL, as specified in 6-1, indicates that the product has been given contingent approval, as evidenced by previous tests and apparent effectiveness under field conditions.

Unless otherwise specified, no further testing will be required for any product on the APL unless there is indication in actual field use of inadequate or unreliable results.

924-2.2 Additional Requirements for Corrosion Inhibitors: Calcium nitrite is a chemically reactive admixture used in concrete to inhibit the corrosion of embedded reinforcing steel and other metallic components. The calcium nitrite supplier shall submit to the Engineer test certificates from an independent laboratory indicating compliance with this Specification. The test certificate shall include corrosion inhibiting properties per ASTM G109 and results of physical tests included in this section. Calcium nitrite shall be supplied by the same manufacturing source throughout the project. If a single primary source of calcium nitrite cannot

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be maintained throughout the project, new test certificates shall be submitted. The Engineer will determine specification compliance of a new supplier's product, and evaluate the effectiveness of the new calcium nitrite product before approving the source.

The active ingredient shall be calcium nitrite $\text{Ca}(\text{NO}_2)_2$.

The calcium nitrite shall be furnished in solution containing not less than 29% calcium nitrite solids. The concentration of the calcium nitrite solution shall be verified by spectrophotometric analysis or other comparable methods. The nitrite concentration shall be measured in accordance with Standard Methods for the Examination of Water and Waste Water, 18th Edition.

A volume of one gallon of calcium nitrite solution shall weigh within the range of 10.40 to 11.92 lb.

The calcium nitrite solution shall be added to the concrete mixture at a rate of 4.50 to 4.60 gal/yd³ of concrete.

The addition of calcium nitrite to the concrete mix shall not adversely affect the properties of fresh and hardened concrete.

Calcium nitrite concrete shall meet the following physical requirements when mixed and tested in accordance with ASTM C494:

Water Content, % of control	95 to 100
Time of setting, allowable deviation from control, h:min:	
Initial: at least not more than	1:00 earlier nor 1:30 later
Final: at least not more than	1:00 earlier nor 1:30 later
Compressive Strength, min. % of control:	shall be 100 for all ages
Flexural strength, min, % of control:	shall be 100 for all ages
Length change, max Shrinkage (alternative requirements): % of control	135
Increase over control	0.010
Relative durability factor, min	80

The following table lists the corrosion inhibiting test result limits for calcium nitrite concrete tested in accordance with ASTM G109:

Maximum Allowable Test Results of Calcium Nitrite Concrete	
Measured average macrocell current any time during the test	10 μA
Average macrocell current at test completion	2 μA
Average visible corrosion measured as percent corroded area of control	85%

924-2.3 Type S (Specific Performance): Trial batches shall use concrete meeting the requirements of ASTM C494. Additional trial batches may be required. Dosage rate shall be the same for all testing.

924-2.3.1 Workability Retention: Workability retention admixtures are used to extend workability and slump life without retarding the setting time. The dosage rate used shall be capable of maintaining 80% of the initial measured slump after 60 minutes. Perform an initial slump test, hold the trial batch in the mixer for 60 minutes, remix for 30 seconds and perform a

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second slump test. Workability retention shall be calculated as the percent difference in the initial slump and the slump at 60 minutes.

924-2.3.2 Shrinkage Reducing: Shrinkage reducing admixtures are used to minimize the shrinkage of plastic and hardened concrete. The dosage rate used shall reduce shrinkage a minimum of 50% after dry curing for 28 days. Shrinkage shall be determined in accordance with ASTM C157, except omit curing period in ASTM C157(10.3). Air storage for the 28-day curing period shall be in accordance with ASTM C157(11.1.2). Shrinkage reduction shall be calculated as the percent difference in the control mix length change and the test mix length change.

924-2.3.3 Viscosity Modifying: Viscosity modifying admixtures are used primarily in flowing and self-consolidating concrete to maximize the rheology of plastic concrete and reduce segregation. The dosage rate used shall reduce static segregation to a minimum of 10%. A flowing concrete control mix shall be established by adding a compatible high range water-reducing or plasticizing admixture to increase the slump to 10 inches, plus or minus 0.5 inches. To establish the test mix, the control mix shall be reproduced with the addition of the viscosity admixture. The static segregation for both mixes shall be determined in accordance with ASTM C1610. Static segregation shall be calculated as the percent difference of the control mix static segregation to the test mix static segregation.

924-2.3.4 Rheology Modifying: Rheology modifying admixtures are used to maximize the rheology of plastic concrete. The dosage rate used shall be based on the manufactures recommendation and may vary for a specific application.

924-3 Retesting.

The approved admixtures are required to be tested for their uniformity and equivalence whenever there is an indication of erratic results. The tests shall be performed in accordance with the following procedure. The admixture shall be checked for comparison between infrared spectrophotometry, pH value, specific gravity, and solids content. Any marked variation from the original curve, pH value, specific gravity, or solids content will be considered sufficient evidence that the chemistry of the original material has been changed and, therefore, the use of this material will be rejected and the material will be removed from the APL.