

ITEM 01555.0498 M - ACCELERATED CONCRETE WITH CORROSION INHIBITOR FOR STRUCTURES

DESCRIPTION. Design, produce, place and finish an accelerated portland cement concrete with calcium nitrite corrosion inhibitor. The maximum repair area is 50 square meters. Repair areas shall be where indicated on the plans or as ordered by the Engineer.

MATERIALS.

A. General. All requirements of §557-2 apply, with the following specifications:

Recording Thermometer	§555-3.06 A 1.
Portland Cement	§701-01, Type III only
Calcium Nitrite Based Corrosion Inhibitor	§711-13
Insulating Boards	§711-07, R-value \pm 10
Air Entraining Admixture	§711-08; vinsol resin based material only
Polyethylene Film	ASTM C171, \pm 0.1 mm thick

B. Concrete. All requirements of §501 apply, with the following modifications:

1. Mix Proportions. The mix will use the parameters given in Table 1.

TABLE 1 MIX CRITERIA	
Cement content (kg/m ³)	490
Maximum water/cement ratio, by weight	Truck mixers - 0.41 Mobile mixers - 0.39
Corrosion Inhibitor (l/m ³)	26.7
Desired air content (%)	6.5
Allowable air content (%)	5.0 - 8.0
Desired slump (mm)	50
Allowable slump (mm)	40 - 100
Coarse aggregate gradation	CA 2
Minimum 24 hour compressive strength	21 MPa

Notes: No pozzolans such as fly ash or ground granulated blast furnace slag are allowed in these mixes.

2. Mix Design/Trial Batch At least three weeks prior to placement, develop a mix design and prepare a trial batch using those materials to be used on the project. Demonstrate the mix's ability to achieve the specified properties to the Regional Materials Engineer's satisfaction. Supply the mix design, compressive strength results, and maturity curves with corresponding temperatures. Changes other than minor fluctuations in admixture dosage rates will require a new mix design.

3. Batching and Mixing. Use only truck or mobile mixers. Heat the mix water as needed to achieve a concrete discharge temperature between 30 - 35_C. (Alternative mixing methods are subject to the approval of the Regional Materials Engineer).

a. Truck Mixers. All requirements of §501-3.03E apply, with the following modifications.

The maximum batch size is 5.0 cubic meters.

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Equip all truck mixers with in-line water flow meters capable of being easily reset to zero and withstanding water temperatures of up to 95_C. Provide certification from the manufacturer that the meter's flow rate is at least 265 l/minute. Mount the flow meters to allow easy access for reading.

Equip all truck mixers with air pressurized tanks capable of storing the design quantity of corrosion inhibiting admixture and discharging that quantity into the mixing drum in less than one minute. Equip each air pressurized tank with a pressure relief valve and clear plastic output hose.

Immediately prior to batching the truck, determine the total moisture content of the aggregates, and compute the quantity of water contained by both aggregates in liters per cubic meter. Subtract that quantity and the quantity of water in the corrosion inhibiting admixture from the design water, and submit these calculations to the Department representative for approval. Upon approval, write on the batch ticket the exact amount of water to be added to the mix.

Perform all mixing at the point of deposition. Before adding the water into the mixer, provide 20 dry mixing revolutions and reset the flow meter to zero. Add all water in one uninterrupted operation. After the water quantity designated on the delivery ticket has been added to the concrete, add the corrosion inhibiting admixture. Mix the concrete at 12 - 18 rpm for a minimum of 100 revolutions or until uniform concrete of the required consistency is produced, whichever is longer. The maximum mixing period is 15 minutes.

If the initial slump is less than 50 mm and, in the Engineer's opinion, the material can not be satisfactorily placed and finished, water may be added once with a maximum addition of 7.5 liters of water per cubic meter of concrete. After this addition, provide at least 30 mixing revolutions before discharging the concrete.

b. Mobile Mixers. All requirements of 501-2.04C apply, with the following modifications:

Use a mobile mixer with positive control of the flow of the corrosion inhibiting solution into the mixing chamber. Discharge the calcium corrosion inhibiting solution from the same point as the mixing water, at least 300 mm away from point of discharge for AEA. Use flow meters to control the quantity of admixture added to the mix. Provide a bypass valve for obtaining a calibrated sample of admixture to determine batching accuracy.

4. Cylinder Testing. During the trial period, cast six 150 mm x 300 mm cylinders and place them in autogenous (insulated) curing boxes furnished by the Engineer. The Engineer will test the cylinders for compressive strength, while simultaneously recording the temperature of the repair. From this data the Engineer will determine at what temperature the repair achieves a cylinder compressive strength of 21 MPa. Determine the approximate strength for all subsequent placements by this temperature. The Engineer reserves the right to take additional cylinders for testing at any time.

CONSTRUCTION DETAILS. All requirements of §555-3 apply, with the following modifications:

A. Blastcleaning. All requirements of §584-3.02 applies.

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B. Structural Slab Wetting. Continually wet all surfaces for at least 1 hour prior placing concrete. Remove all standing water before placing concrete.

C. Weather Limitations. Place concrete when the ambient temperature is between 10 and 35_C, and the ambient temperature for the following 48 hours, based on national weather service reports obtained on a daily basis, is expected to be between 5 and 35_C. During placement operations, record the minimum and maximum temperatures and general weather conditions for each 24 hour period.

D. Handling and Placing. When using truck mixers, begin placing only if a sufficient number of loaded trucks are present to place the entire repair area. Discharge the concrete using steel lined shoots, within 20 minutes of the completion of mixing. All concrete in the mixer at the end of the 20 minutes period will be rejected.

E. Curing. Apply polyethylene sheets and insulating boards immediately after initial set (as soon as no cement paste is lifted from the repair when it is lightly rubbed with a finger). Extend the curing materials 300 mm beyond the repair's edge, and secure the materials so that wind can not expose the repair. Place recording thermometers under insulation boards at least 300 mm inward from the repaired edge. Construct enclosures, for thermometers, using insulation boards to prevent hydration heat from escaping. If at any time during the curing period the ambient temperature drops below the acceptable range, the Engineer will inspect the concrete for damage. Repair any concrete, at no expense to the State, that, in the Engineer's opinion, has been damaged by low temperatures.

F. Opening to Traffic. When the repair area has reached the required temperature established by the cylinder testing, remove the insulating boards and polyethylene sheet, and open the repair to traffic.

METHOD OF MEASUREMENT. All requirements of §555-4 apply.

BASIS OF PAYMENT. All requirements of §555-5 apply.